AN INVESTIGATION INTO WHY PEOPLE TAN
DESPITE THE KNOWN HEALTH RISKS

by

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A thesis submitted in partial fulfillment
of the requirements for the degree

of

Master of Nursing

in

Family Nurse Practitioner

MONTANA STATE UNIVERSITY
Bozeman, Montana

April 2010
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Lindsay Renae Tudor McCarthy
April 2010
ACKNOWLEDGEMENTS

It is a pleasure to thank those who have made this thesis possible. I would like to express my sincere appreciation to the knowledgeable people on my thesis committee: Karen Zulkowski, DNS, RN, CWS, Jane Scharff MN, RN, Stephen Behlmer, MD, and Debra Remillard P.A.-C. I would like to extend a very special thank you to my mentor, Debra Remillard. Without her this thesis would not have been possible.

And lastly, I would like to express my deepest gratitude to my husband, who believed in me before I ever did. Thank you for showing me the way.
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Skin cancer is a major health concern in the U.S. today. The incidences of melanoma and non-melanoma skin cancers are rising at an alarming rate. It is thought this is partly due to the increasing numbers of people using indoor tanning facilities. Ultraviolet radiation exposure from indoor tanning bed use is a major risk factor the development of skin cancer. Public health campaigns have attempted to increase people’s knowledge about skin cancer and UV exposure. This study attempts to explore what dermatology patients know about UV exposure and skin cancer. Thirty three dermatology patients participated in a multiple choice survey about various UV and skin cancer related knowledges. Results were analyzed based on certain themes that developed from the question scores. Overall, dermatology patients demonstrated certain knowledge deficiencies in what they know regarding UV exposure, indoor tanning, and skin cancer. The results from this study indicated a need for skin cancer awareness campaigns to include additional information about UV exposure and tanning beds. This study also demonstrated a need for routine physicals to include a history of ultraviolet radiation exposure. And finally, the results illustrate the importance for healthcare professionals to educate patients on how to do a self exam.
CHAPTER 1

BACKGROUND

Skin cancer is the most common type of cancer, accounting for nearly half of all cancers in the United States (Reynolds, 2007). More than one million cases of skin cancer are diagnosed each year in the United States (Skin Cancer Foundation, 2008). Exposure to ultraviolet radiation (UV) is among the greatest risk factors for developing melanoma and other skin cancers (Rager, Bridgeford, & Ollila, 2005). Approximately 90% of non-melanoma skin cancers and 65% of melanoma cases are associated with UV exposure (Eisen-Maguire, 2001). In 2002, the United States Food and Drug Administration (FDA) added ultraviolet light to the list of known carcinogens (Melanoma Prevention Organization, 2008).

One of the most effective ways to prevent skin cancer is avoidance of exposure to UV (Rager, Bridgeford, & Ollila, 2005). Health organizations and foundations have focused their efforts towards public awareness and numerous programs provide education related to skin cancer prevention. However, the incidence of skin cancer is rising at an alarming rate (Skin Cancer Foundation, 2008). Tanning practices are believed to be a significant contributing factor. Approximately 30 million Americans utilize tanning beds each year; 2.3 million of whom are teens. Melanoma is “the most common form of cancer for young adults 25-29 years old…” (Skin Cancer Foundation, 2008).
Problem

National skin cancer foundations and organizations have been tireless in their efforts to educate the public about UV exposure. There are well over 50 skin cancer prevention programs in the United States today. Despite public awareness about the harmful effects of UV rays, the incidence of skin cancer continues to rise. In fact, new cases of skin cancer out number new cases of breast cancer, prostate cancer, lung cancer, and colon cancer combined (American Cancer Society, 2009).

Purpose

The purpose of this study is to explore knowledge about the harmful effects of UV in dermatology patients.

Significance

This study will provide insight into the public’s knowledge about UV exposure, and why people tan. It may provide needed information on how to change health behaviors related to tanning. Melanoma is the 6th leading cause of death in the United States (World Health Organization, 2008). Early detection is paramount to survival rates. Melanoma mortality has more than doubled from 1950 to 2004 (Skin Cancer Foundation, 2008). Although there is a 99% survival rate for those melanomas caught early, it drops to a frightening 15% chance of survival when detection is delayed and an advanced melanoma is diagnosed (Rager, Bridgeford, & Ollila, 2005). Ultraviolet radiation exposure is a major risk factor for developing skin cancer. Not only does UV exposure
increase the risk of skin cancer, but it has also been shown to cause ocular damage, premature skin aging, and immune suppression (FDA, 2007). Society continues to maintain the perception that being tan is “beautiful”. Tan skin is often associated with a “healthy” appearance. Approximately 30 million Americans utilize tanning beds each year; 2.3 million of whom are teens (Reynolds, 2007). It is estimated that tanning industries gross approximately $5 billion dollars a year (Skin Cancer Foundation, 2008). Medicare estimates the cost of treating melanoma skin cancer to exceed $5 billion in 2010 (Chinni, Schartz, Keilman, & Johnson, 2003).

Healthcare educators must determine if, despite recent efforts, does there continue to be a knowledge deficit about the harmful effect of indoor tanning. Although recent reports indicate an increase in sun protective knowledge, the number of people utilizing indoor tanning beds continues to rise (Reynolds, 2007). A 2007 literature review on research based articles regarding adolescent tanning practices indicated the need for nursing theory based research. The majority of research available is rooted in behavioral and social sciences (Reynolds, 2007). Research based in nursing theory may offer a unique insight into how health educators can change certain health behaviors.

**Definition of Terms**

Certain terms are defined to clarify important concepts related to the purpose of the study.
Ultraviolet Radiation Health Risks

Prolonged human exposure to solar UV radiation may result in acute and chronic health effects on the skin, eye and immune system. Over the longer term, UV radiation induces degenerative changes in cells of the skin, fibrous tissue, and blood vessels leading to premature skin aging, photodermatoses and actinic keratoses. UV also causes corneal degeneration. In the most serious cases, skin cancer and cataracts can occur (World Health Organization, 2010).

Skin Cancer Prevention

Actions taken to lower the chance of getting skin cancer which include: the utilization of sun safety measures, ability to identify high risk lesions, monthly self skin exams, and avoidance of indoor tanning booths (CDC, 2009).

Sun Safety

The application of sunscreen with sun protective factor (SPF) of at least 15 and that blocks both UVA and UVB, the use of clothing to cover exposed skin, the use of wide brimmed hat to protect the head, ears, and face, and the use of sunglasses to protect the eyes. Avoidance of sun especially during midday hours (CDC, 2009)

Knowledge Deficit

A lack of awareness or familiarity gained by experience of a fact or situation (American Heritage Dictionary, 2010).
Ultraviolet Radiation (UV) Exposure

Exposure to ultraviolet radiation rays which include ultraviolet radiation A (UVA), ultraviolet radiation B (UVB), and/or ultraviolet radiation C (UVC). Sources of ultraviolet radiation include the sun and artificial light from tanning lamps (American Heritage Dictionary, 2010).

Skin Cancer Awareness

To be informed of skin cancer prevention and sun safety measures and promote the highest level of public accountability in decreasing the incidence of skin cancer (Skin Cancer Awareness Foundation, 2010).

Conceptual/Theoretical Framework

The Health Promotion Model was developed by Nola J. Pender with the purpose of examining how individuals make decision about their own health (Tomey & Alligood, 2006). It serves as a tool to study certain health behaviors and wellness (Tomey & Alligood, 2006). The model includes several components of the health belief model but with significant differences. The Health Promotion Model is not limited to disease prevention behaviors and it does not include fear or threat as a motivating factor towards a certain behavior (Tomey & Alligood, 2006). The Health Promotion Model states that there are several cognitive-perceptual factors that influence health promoting behaviors. These cognitive-perceptual factors are: the importance of health, perceived control of health, perceived self-efficacy, a definition of health, perceived health status, perceived benefits of health promoting behaviors, and perceived barriers to health-promoting
behaviors (Tomey & Alligood, 2006). This conceptual model gives a foundation on which to understand why people make certain decisions about their health.

Health promotion and disease prevention are central concepts within the scope of nursing. Skin cancer prevention is becoming more important as the incidence of non-melanoma and melanoma cancers continue to rise. Primary care settings are no longer the main sources of educating the public about the risks of UV exposure (Rager, Bridgerford, & Ollila, 2005). Nurses are taking skin cancer prevention techniques into communities with the goal of increasing the public’s awareness. The clinical focus of this study is to explore knowledges and perceptions regarding the barriers to skin cancer prevention and avoidance of ultraviolet radiation exposure. The data collected in this study will be based on the Health Promotion Model’s cognitive-perceptual factors and analysis of the data will be grounded in the model’s major assumptions. Nola J. Pender’s Health Promotion Model provides the necessary structure to examine the factors influencing health promoting behaviors.

**Major Assumptions**

This study included the following assumptions: (a) participants responded to the survey accurately and to the best of their ability; (b) the study tool measured participants’ knowledge about UV exposure and skin cancer; (c) healthcare providers are an important part of the interpersonal environment and can impact patients’ health status (Tomey & Alligood, 2006); (d) healthcare providers value and promote primary preventative medicine; (d) dermatology patients are more knowledgeable about the harmful effects of UV exposure and skin cancer prevention than the general public.
Limitations

The sample of participants is taken from one dermatology out-patient clinic and may not be representative of the general population. However, the sample population may serve to strengthen the study’s importance as results from previous studies indicate that dermatology patients have an increased awareness of skin cancer prevention. The analysis, conclusions, and generalizations take this into consideration.

Maintaining anonymity throughout the study may limit the study. It is possible that the researcher and participant have a previous relationship, either from the surrounding community or from previous medical interactions. Therefore, survey materials will be distributed by a staff nurse other than the researcher and data will not include any identifying information such as name or residence.

Participants may decide not to participate due to concerns about the nature of the study. It is possible that some participants may not want to disclose their current knowledge of UV exposure based concerns of scrutiny from staff nurses or physicians. Maintaining confidentiality and anonymity will be crucial to control this limitation. A cover letter states that participation is voluntary and the results of the survey do not impact the healthcare they receive. Data will not include any identifying information such as name or residence. Access to data will be limited to the researcher.

Organization of the Study

This study is presented in five chapters. Chapter I discusses the background of the study, the statement of the problem, the purpose and significance of the study, a definition of terms, the theoretical framework, assumptions, and limitations. Chapter II
presents a literature review regarding ultraviolet radiation exposure knowledge and perceptions, increasing ultraviolet radiation exposure knowledge, and dermatology providers’ UV exposure education. Chapter III discusses the methodology used for this study. It describes the selection of participants, study tool, data collection, and data analysis. Chapter IV presents the results on the overall questions answered correctly, category of questions answered correctly, age of participants related to overall questions answered correctly, tanning bed use related to overall questions answered correctly, age of participants related to category of questions answered correctly, and tanning bed use related to category of questions answered correctly. Chapter V presents a discussion of the data analysis, research findings, implications for practice, and further recommendations.
CHAPTER 2

LITERATURE REVIEW

This chapter presents the rationale for conducting research on why people tan despite the known health risks. Researchers have turned their attention to ultraviolet radiation exposure as the incidence of skin cancer has significantly risen over the last decade. Studies have examined what people know and perceive about ultraviolet radiation exposure. This study attempts to build on the previous literature by exploring what people understand about skin cancer prevention.

Efforts to educate the public about skin cancer prevention and ultraviolet radiation have not been effective in changing tanning behaviors. The incidence of melanoma continues to rise and the number of people utilizing indoor tanning facilities is increasing (Skin Cancer Foundation, 2008). It is important to determine if skin cancer prevention efforts have been effective at educating people about UV exposure or is there a knowledge deficit.

The following review of literature represents research that is pertinent to this study. The Cumulative Index of Nursing and Allied Health Literature were searched using keywords tanning, ultraviolet exposure, exposure, and skin cancer prevention. The database search was further narrowed using keywords knowledge, perceptions and behavior, counseling, and physician screening. Initial searches of these databases showed 113 articles (articles that appeared in more than one database were counted only once). Article titles, abstracts, and text were scanned for those that were relevant to the study.
and met the inclusion criteria. Inclusion criteria include the following: research studies published within the last fifteen years, studies published in the English language, articles that were researched based, and studies that were published in peer reviewed journals. This literature review is organized into the following four sections: UV exposure knowledge and perceptions, increasing ultraviolet radiation exposure knowledge, healthcare providers and UV exposure education, and dermatology providers and UV exposure education.

Ultraviolet Radiation Exposure Knowledge and Perceptions

Ultraviolet radiation exposure is among the most significant risk factors for developing skin cancer. Literature regarding what people understand about ultraviolet radiation exposure and the perceptions surrounding skin cancer prevention was reviewed. The majority of literature focused on exposure to outdoor sunlight. Several of the research studies did not distinguish between ultraviolet radiation from the sun versus exposure from indoor tanning facilities. The literature tended to examine sun safety knowledge such as the benefits of wearing sunscreen.

Overall, individuals demonstrated adequate knowledge about sun safety and protective measures. But, knowledge did not correlate with sun safety behaviors. One study specifically examined dermatology patients’ knowledge and reported that dermatology patients perceived sun protective measures as positive. Ironically, dermatology patients demonstrated inadequate use of protective measures (Linton, 2009).
Cottrell (2005) also found that although college age students could correctly identify sun protective measures, their use of sunscreen and other UV protective behaviors were low. Although young adults were able to correctly identify sun safety measures, there were important gaps in knowledge and perceptions. Most individuals were able to identify sunscreen as a sun safety measure, however Lamanna (2004) found that the majority of people demonstrated poor knowledge about sun protective factors and could not correctly indicate at which time during the day is the sun’s rays strongest. Other knowledge deficits were demonstrated by Jones (2000) who found that 36% of participants did not list skin cancer as a potential harmful effect of sun exposure. Several studies found that although adolescent and young adults consistently reported a perceived risk of developing skin cancer from exposure to the sun’s rays, they considered it to be relatively low (Jones, 2000, Paul, 2008, Sjoberg, 2004). In Paul’s 2008 study on adolescents’ sun protective behaviors females ages 16-17 reported “an expectation they would inevitably develop some form of skin cancer, but it would be removed and not be fatal”.

Increasing Ultraviolet Radiation Exposure Knowledge

Research has attempted to address deficits in UV exposure knowledge. A review of pertinent literature found that a variety of methods were used to educate people about the harmful effects of ultraviolet radiation exposure including telephone interviews, surveys, printed materials, and school based intervention programs. Educational efforts were primarily sun safety oriented. The majority of results demonstrated a strong
correlation between knowledge and the use of sun protective measures. Overall, recent attempts to educate young adults about sun safety protective measures have been successful.

Literature identified risk perception as an important component to UV exposure education. Literature regarding the increased perception of risk associated with ultraviolet radiation exposure was reviewed. Gibbson (2005) studied the use of UV photography to demonstrate the effects of UV exposure to college students. Participants had a significant increase in risk perception and reported a decrease in tanning bed use. Green (2003) also reported an increase in risk perception by utilizing narrative and statistical based material regarding the harmful effects of indoor tanning. Research results consistently demonstrated that increased risk perception correlates with decreased tanning bed use.

A large study examined the relationship between indoor tanning bed use and skin cancer awareness from 1988 to 2007 (Robinson, 2008). This study is of particular significance in that it reported strong correlations over time between an increase in desire to look tan and a decrease in knowledge about skin cancer. Robinson also examined sources of skin cancer awareness knowledge and found that physicians, particularly dermatologists, were considered valuable sources of information (Robinson, 2008). Interestingly, only 14% of participants reported discussing indoor tanning with a physician (Robinson, 2008).
Healthcare Providers and UV Exposure Education

Healthcare providers are an important source of health information. Literature was searched for studies that examined skin cancer prevention and UV exposure counseling from healthcare providers. Results consistently reported that patients who receive counseling about the harmful effects of ultraviolet exposure are more knowledgeable about how to protect themselves than those who had not received counseling from their healthcare provider (Robinson, 2008, Freiman, 2005, Feldman, 2000). Education from healthcare providers, particularly primary care providers and dermatologists, tended to be more specific. Sunscreen education included counseling on sun protective factors and how often one should apply sunscreen. Providers also counseled patients about what to look for on their skin and how to assess unhealthy skin changes (Robinson, 2008).

Although studies reported that healthcare provider counseling had a positive impact on patients, the rate for which counseling was actually done was relatively low (Feldman, 2000, Frieman, 2005). Feldman (2000) reported that skin cancer prevention counseling occurred in less than 2% of ambulatory care office visits. For patients under 20 years old, the rate decreased to 1%. Interestingly, patients who had a previous diagnosis of melanoma or who were considered high-risk by their provider were significantly more likely to receive counseling (Freiman, 2005). Prior to their diagnosis, 52% of melanoma patients had not received skin cancer or UV exposure education (Freiman, 2005). UV education and sun tanning awareness was done more often as a secondary intervention than a primary intervention. Based on the literature review,
healthcare providers, particularly primary care providers and dermatology providers can have significant impact on UV exposure knowledge and skin cancer prevention.

Dermatology Providers and UV Exposure Education

Dermatology providers are considered experts on the harmful effects of UV radiation on the body. Literature regarding tanning, skin cancer awareness, and sun protection counseling from dermatology providers was reviewed. Reports consistently demonstrated that dermatologists are more likely to counsel patients about the use of sunscreen and skin cancer awareness than other types of providers (Polster, 1998, Saraiya, 2000). Johnson (2006) found that dermatologists were significantly more likely to address issues regarding indoor tanning than internists, pediatricians, and family physicians. This study also demonstrated that in general, dermatologists are more knowledgeable about outdoor UV exposure versus indoor UV exposure (Johnson, 2006).

Polster (1998) included reports from patients about how often they received counseling from their healthcare provider. Over 90% of participants reported they had received some form of skin cancer prevention counseling, but only 27% of patients received counseling from a dermatologist (Polster, 1998).

The literature highlighted issues surrounding sun protection and skin cancer awareness counseling. Although the majority of dermatologists agree that all patients should receive some form of counseling, there is no consensus as to what type of counseling should be done or who should be screened. Counseling tends to focus only on the use of sunscreen and the avoidance of sun exposure. Few studies were found that examined a thorough knowledge about UV exposure and indoor tanning.
Summary

The literature review examined research studies regarding knowledge, perceptions, and counseling of UV exposure. Research articles were organized and discussed based on four themes: UV exposure knowledge and perceptions, increasing ultraviolet-radiation exposure-knowledge, healthcare providers and UV-exposure education, and dermatology providers and UV exposure education.

In general, people are knowledgeable about certain sun protective measures such as the benefits of wearing sunscreen. However, the literature presented important deficits in knowledge such as incorrect perceptions that skin cancer is not lethal, an inability to identify skin cancer as a harmful effect of sun exposure, and the inability to identify when the sun’s rays are the strongest (Lamanna, 2004), Paul, 2008). Research studies that examined a more thorough understanding of UV exposure and indoor tanning were lacking.

Additional studies that attempted to address knowledge deficits about skin cancer prevention were reviewed. The majority of research focused on sun safety awareness and the use of sunscreen. Although previous research demonstrated an increase in sun safety awareness, researchers were unable to demonstrate change in tanning behaviors. Studies which addressed low risk perception were few. However, Gibbons (2005) and Greene (2003) were able to positively affect risk perception and tanning behaviors by utilizing appearance based interventional techniques.

Healthcare providers can positively impact knowledge and perceptions about skin cancer prevention and tanning. Robinson (2008) reported that individuals who received
counseling and education from their healthcare provider were better informed about skin
cancer prevention than those who were not. However, the benefits of sunscreen use
continued to be the focus of many researchers. Overall, counseling from healthcare
providers was more specific about UV exposure, especially when provided by
dermatologists.

Research studies demonstrated the benefits of skin cancer prevention and UV
exposure counseling when provided by a healthcare provider. Interestingly, the majority
of healthcare providers did not counsel patients on a routine basis. Although
dermatologists did counsel patient more frequently that other providers, counseling was
often given to individuals who had already been diagnosed with skin cancer. Information
given during counseling sessions was limited to sun safety information and many
providers focused only on the importance of sunscreen use.

It is evident from the review of literature that the public lacks a thorough
understanding about UV exposure, indoor tanning, and skin cancer. Healthcare
professionals, particularly dermatologists, have the potential to positively impact tanning
behaviors and skin cancer prevention efforts. Research shows that most dermatologists
value the importance of counseling patients about skin cancer prevention (Johnson, 2006,
Polster, 1998, Saraiya, 2000). This study attempts to better understand what dermatology
patients know about ultraviolet radiation, tanning, and skin cancer.
CHAPTER 3

METHODOLOGY

People are free to make healthy or unhealthy choices. One would assume that individuals would choose health promoting behaviors once they have been educated about the harmful effects of unhealthy behaviors. However, this is not the case, as evidenced by such behaviors as smoking, wearing a seatbelt, or tanning.

Previous studies indicate that although researchers and healthcare providers have attempted to educate the public about the harmful effects of ultraviolet exposure; it seems that the perceived benefits continue to out-way the perceived risks (Sjoberg et al., 2004). Studies regarding tanning behaviors and perceptions have focused on beliefs and perceptions regarding tanning and sun protective behaviors. Although research has demonstrated that people perceive harmful effects of ultraviolet radiation, there is little data that assess specific knowledge regarding the biological effects of UV exposure. If people are educated about the harmful effects of UV exposure, why do they continue to tan? The purpose of this study is to assess this premise: is the public educated about UV exposure or is there a knowledge deficit? This chapter is organized into four sections: (1) study design, (2) research tool, (3) study sample, and (4) data collection and analysis.

Study Design

This descriptive study utilizes a survey with convenience sampling. The survey includes questions related to UV exposure and the related health risks. Demographic data
is included for the purpose of inclusion and exclusion of participants. Participants are asked during an office visit to fill out a survey and return it to the receptionist before leaving.

Sample

Previous research studies have indicated that healthcare providers, specifically dermatology providers, are more likely to educate patients about the harmful effects associated with UV exposure. This study sample was determined based on the assumption that dermatology patients would have more knowledge regarding UV exposure than the general population. Participants surveyed are patients of Associated Dermatology in Helena, Montana. This sample included male and female patient’s ages 21-35. Age was selected based on utilization of the IRB’s guidelines as well the age group which utilizes tanning facilities most often (Skin Cancer Foundation, 2009). Participants were excluded if they have had a previous diagnosis of skin cancer as the theme of the study was prevention. Participants were also excluded if they had not had more than one previous visit based on the assumption that participants would have already been exposed to some form of UV education from the dermatology provider.

Tool

The study tool is a survey which was developed for the purpose of this study (see appendix). The survey consists of three demographic questions and twelve multiple-choice questions to assess level of knowledge regarding the risks of UV exposure. The survey includes several important facts, which were obtained from the National Skin
Cancer Foundation and the World Health Organization regarding knowledge of UV exposure: the ability to identify dangerous lesions, ability to describe the effects of UV radiation on the body, and the ability to describe the difference between indoor and outdoor tanning.

A cover letter is attached to the front of each questionnaire which describes the study and requested participation (see appendix). The letter states that participation in the study is optional and anonymous. The questionnaire is estimated to take approximately 2 minutes to complete. Instructions are given for participants to return the completed questionnaire to the receptionist upon exiting the office.

Instrument Validity

The questionnaire was reviewed by an expert panel. Recommendations included the survey presented to a sample of dermatology LPN and RN nurses for understandability. The validity of the questionnaire is established by review and evaluation of two dermatologists and a nursing expert in instrument development.

Steps for Data Collection

1. IRB approval was obtained

2. Permission to survey patients was obtained from Dr. Stephen Behlmer MD, Dr. Jeffrey Goldes MD, and Debra Remillard P.A.-C.

3. Staff nurses selected eligible patients and distributed the survey.
4. Questionnaires were given to patients during office visits from January 25, 2010 to February 5, 2010. Completed questionnaires were given to the receptionist before leaving the office.

5. Questionnaires were collected by the author at the end of each day during January 25, 2010 and February 5, 2010. All questionnaires were numbered for reference by the author.

**Analysis**

Results are analyzed based on questions answered correctly, questions answered incorrectly, and overall scores out of 100%. Questions answered correctly or incorrectly the majority of the time will be analyzed. Differences by age and tanning experience will be described if sample diversity permits.

**Conclusion**

This chapter reiterates the purpose of this study and the research questions being explored. The sample was obtained at an outpatient dermatology clinic through convenience sampling. A questionnaire was developed and tested for validity. Data collection and analysis methods were described. The results from the data analysis are discussed in the following chapter.
CHAPTER 4

RESULTS

The purpose of this study was to explore peoples’ knowledge about the harmful effects of ultraviolet-radiation exposure. A survey containing twelve multiple choice questions was developed and administered to dermatology patients. To facilitate data analysis, survey questions were divided into two categories: ultraviolet radiation questions and skin cancer questions. A total of 33 patients participated in the survey. Certain themes were developed based on the data collected from the survey. Results are presented by the following themes: overall questions answered correctly, category of questions answered correctly, age of participants related to overall questions answered correctly, tanning bed use related to overall questions answered correctly, age of participants related to category of questions answered correctly, and tanning bed use related to category of questions answered correctly.

Overall Questionnaire Scores

A survey consisting of twelve multiple choice questions was used to assess what dermatology patients know about UV exposure and skin cancer. The overall scores were calculated based on questions answer correctly and incorrectly (Figure 1). The average score was 71.46%. The lowest score was 33.3% and the highest score was 91.6%. One person scored 33.3% and three people scored 91.6%. Overall, 97% of participants correctly answered that car windshields do not always block all UV rays. Only 36% of
participants knew which UV rays are emitted from indoor tanning beds and 45.5% correctly identified that UVB causes the skin to burn. Nearly 60% of participants did not know that UV radiation is on the FDA’s list of known carcinogens. 66.6% of participants were able to correctly identify a dangerous skin lesion.

Figure 1. Percent of participants who answered each of the listed questions correctly, where Q1 to Q12 are questions 1 through 12, respectively.

Scores by Question Category

The survey questions were categorized into two themes: ultraviolet radiation questions and skin cancer questions. There were eight questions pertaining to ultraviolet radiation and four questions pertaining to skin cancer. Results were calculated based on ultraviolet questions answered correctly and skin cancer questions answered correctly (Figure 2). Participants scored an average of 73.46% on ultraviolet related questions and 67.42% on skin cancer related questions. It is important to note that the question people
did poorest on (question 3) and the question people did the best on (question 12) were UV related questions.

Figure 2. Percent of participants who answered survey questions correctly by category.

Scores by Participant Ages

Results were analyzed based on participant ages and overall questions answered correctly. The age of participants ranged from 21 to 35 years old. Two participants were 21 years old, two participants were 22 years old, three participants were 23 years old, four participants were 24 years old, two participants were 25 years old, two participants were 26 years old, three participants were 27 years old, one participant was 28 years old, one participant was 29 years old, four participants were 31 years old, four participants were 33 years old, three participants were 35 years old. The mean age of participants was
28 years old. Based on the linear regression, age was not related to questions that were answered correctly (Figure 3).

Figure 3. Percent of questions answered correctly in relation to participant age.

**Scores by Indoor-tanning Use**

Data was analyzed based on tanning bed use and questions answered correctly (Figure 4). Overall, non-tanning bed users scored an average of 69.9% on the questionnaire and tanning bed users scored an average of 72.5% on the questionnaire. More non-tanning bed users were able to correctly identify UV radiation as a known carcinogen than those who used tanning beds. More non-tanning bed users were able to correctly identify which UV rays people are exposed to on a cloudy day than tanning bed users. Survey question six demonstrated the greatest difference between tanning bed users and non-users. 46% of tanning bed users were able to correctly identify a dangerous skin lesion. However, 100% of non-tanning bed users were able to correctly identify a
dangerous skin lesion. Question four also demonstrated a significant difference in score between non-tanning bed users and those who used tanning beds. 56% of tanning bed users correctly identified which UV rays cause sunburn, compared to 31% of non-tanning bed users. It also important to note that significantly more tanning bed users than non-tanning bed users were able to correctly identify which UV rays are emitted from indoor tanning beds. 77% of non-tanning bed users correctly identified which skin cancers are caused from UV exposure. However, 96% of tanning-bed users were also able to correctly identify which skin cancers are caused by UV exposure as well.

Figure 4. Percent of participants who answered the questions correctly with the sample population split into two groups: indoor tanning beds and non indoor tanning bed users. Where Q1 to Q12 are questions 1 through 12, respectfully.
Age and Category of Questions Answered Correctly

Data was plotted based on age and category of questions answered correctly (Figure 5). Based on the linear regression, the category of survey questions answered correctly were not impacted by the participant’s age.

![Graph showing percent of participants who answered questions correctly in relation to age, with the sample population split into two groups: indoor tanning beds and non-indoor tanning bed users.](image)

Figure 5. Percent of participants who answered the questions correctly in relation to age, with the sample population split into two groups: indoor tanning beds and non indoor tanning bed users.

Scores by Indoor-Tanning Bed Use and Category of Questions Answered Correctly

Results were analyzed based on question type and indoor tanning use (Figure 6). In general, tanning bed users scored higher (78%) on ultraviolet questions than non-tanning bed users (68%). However, non-tanning bed users scored higher on skin cancer...
related questions (74%) than tanning-bed users (62%). The skin cancer related questions demonstrated a greater difference of questions answered correctly between those who have used indoor tanning beds and those who have not.

![Figure 6. Percent of questions answered correctly for each category of question, with the sample population split into two groups: indoor tanning beds and non indoor tanning bed users.](image)

**Summary**

In this chapter, an introduction to the data analysis was presented. Survey questions were divided into two categories: ultraviolet radiation questions and skin cancer related questions. Certain themes were developed and described based on the results of the data collected. Results were presented based on these themes in relation to the questions answered correctly.
The average survey score was 73.46%. None of the participants were able to answer all the survey questions correctly. In general, participants scored better on ultraviolet radiation related questions than on skin cancer related questions. Non-tanning bed users scored better than tanning bed users on skin cancer related questions. However, tanning-bed users scored better on ultraviolet radiation related questions. Interestingly, those who had never used an indoor tanning bed scored lower overall than those who had used an indoor tanning bed. Age did not impact how well participants scored.

The data in this chapter presented what people know and don’t know about ultraviolet radiation and skin cancer. From the study findings, certain implications can be drawn. The following chapter will provide a further analysis of the research findings and discuss the implications to practice.
Chapter four presented the results and analysis of the study. This chapter includes a brief summary of the study, discussion of the findings, implications for practice, and recommendations for further research. The purpose of this chapter is to provide a further understanding of the results. Implications for practices are presented and suggestions for future research are discussed. The chapter concludes with a brief statement to summarize the scope of what this study has attempted to accomplish.

Summary of the Study

The purpose of this study was to explore what people know and don’t know about UV exposure and skin cancer. It utilized Nola J. Pender’s Health Promotion Model as the theoretical framework. The Health Promotion Model recognizes healthcare professionals as part of the interpersonal environment and can influence health promotion and disease prevention (Tomey & Alligood, 2006).

A questionnaire was developed by the author to assess dermatology patients’ knowledge about specific UV exposure and skin cancer related topics. Demographic data such as age and indoor tanning bed use was incorporated. Dermatology patients were the targeted population based on the assumption that dermatology patients would have more knowledge regarding UV exposure and skin cancer than the general public. The questionnaire was administered to established dermatology patients in an outpatient
setting. Participants were selected by convenience sampling and were between the ages of 21-35. Thirty three patients completed the questionnaire.

Certain themes were developed based on the analysis of the results: overall questions answered correctly, category of questions answered correctly, age of participants related to overall questions answered correctly, tanning bed use related to overall questions answered correctly, age of participants related to category of questions answered correctly, and tanning bed use related to category of questions answered correctly.

Discussion of Findings

Overall Questionnaire Scores

The findings from the overall questionnaire scores indicate that dermatology patients’ knowledge about UV exposure and skin cancer is average. The purpose of this study attempted to gain further insight into more specific knowledges about UV exposure and skin cancer. The majority of participants were not able to identify which UV rays cause sunburn and which rays cause skin cancer. Participants also scored poorly when asked to identify what UV rays are emitted from indoor tanning beds. Only 39 % of participants correctly identified UV rays as a known carcinogen. Overall, participants performed below average when asked to identify a dangerous lesion. Although overall scores were average, participants demonstrated that there are gaps in dermatology patients’ knowledge about UV exposure and skin cancer.
The results of this study are similar to what previous research has demonstrated about the general public. In 2000, Jones reported that most individuals did not correlate UV exposure to skin cancer. Results of this study are consistent with current reports that show significant number of individuals are not knowledgeable about the carcinogenicity of UV exposure and cannot correctly identify when UV rays are strongest outside (Lamanna, 2004). Results from this study reiterate that although people are somewhat educated about UV exposure and skin cancer, there are important deficits in knowledge.

**Scores by Question Category:** Questions were divided into two categories: UV related questions and skin cancer related questions. Results were analyzed based on the types of questions answered correctly and incorrectly. Overall, participants did slightly better on UV questions than skin cancer questions. This indicates a potential knowledge deficit about skin cancer. However, it is important to note when comparing UV questions to skin cancer questions that there were eight UV questions and only 4 skin cancer questions. Skin cancer questions were potentially weighted more heavily than UV questions which could have created a bias during data analysis towards UV questions. Despite a potential bias when comparing the two categories of questions, the results from individual analysis of each survey question support a potential knowledge deficit regarding skin cancer.

Previous research has been primarily sun safety oriented, with limited focus on specific data regarding skin cancer and UV exposure. This study attempted to gain more insight about skin cancer knowledge and UV exposure by incorporating questions that were specific to each category. Few research studies were found that incorporated all of
the same concepts about UV exposure and skin cancer that this study attempted to. Previous research also did not distinguish between outdoor and indoor tanning concepts.

**Scores by Age:** The target population of this study was young adults ages 21-35 years old. Previous research has focused on a young adult population and incorporated populations that were younger than 21 years of age. This study’s results did not show a correlation between questionnaire scores and age. It is important to note that Feldman (2000) reported a significant decrease in patient education among patients who were under 20 years old. However, this study did not include adults younger than 21 years due to IRB guidelines.

**Scores by Indoor Tanning Use:** This study compared the knowledge of people who had utilized indoor tanning beds and those who had not. In general, those patients who had used tanning beds did better overall on the questionnaire than those who had not. In fact, non-tanning bed users scored below average on the questionnaire overall. There were no research studies found that specifically examined indoor tanning bed users’ UV and skin cancer knowledge. There were also no research studies found that compared the knowledge of indoor tanning bed users to non-tanning bed users.

It is important to consider why indoor tanning bed users scored higher on the questionnaire than non-tanning bed users. Previous research is not conclusive about whether or increasing a person’s knowledge correlates with behavioral change (Linton, 2009, Gibson, 2005 Green, 2003). Previous studies also reported that individuals who were considered at high-risk for skin cancer or who already been diagnosed with skin
cancer were significantly more likely to be counseled by a healthcare provider about skin cancer prevention (Freiman, 2005). Exposure to UV rays has been proven to increase one’s risk of developing skin cancer. Patients in this study who reported using indoor tanning facilities in the past may have been identified at high-risk for developing skin cancer by their dermatologist. It is possible then that indoor tanning bed users had more counseling than non-tanning bed users prior to the study. Based on this finding it is possible to assume then, that those patients would have a greater knowledge of UV exposure and skin cancer.

Although indoor tanning bed users performed better on the questionnaire overall, there were three survey questions in particular that non-tanning bed users scored higher than those that reported using indoor tanning beds. Non-tanners scored higher when asked to identify UV exposure as a known carcinogen. Although both populations demonstrated above average ability at identifying which UV rays they are potentially exposed to in the environment, more non-tanning bed users correctly identified which UV rays are present on cloudy days. The most significant difference between indoor tanners’ and non-indoor tanners; scores was demonstrated on the survey question which asked participants to identify which lesion was most dangerous. The question described three different lesions with varying characteristics. All of the non-tanning bed users were able to correctly identify the most dangerous lesion. However, only 46% of indoor tanning bed users were able choose the correct answer. Interestingly, all of the indoor tanning bed users who could not correctly identify the most dangerous lesion answered the same incorrect answer. These individuals consistently choose the “bumpy” lesion
over the other two potential answers. This finding is significant in that most serious type of skin cancer, melanoma, may not be bumpy or raised. Melanoma skin cancers that are bumpy or raised can be indicative of an advanced stage of melanoma (Melanoma Education Foundation, 2010). Despite the fact that indoor tanning bed users scored higher than non-tanning bed users, the results demonstrate a deficit in knowledge among both populations.

**Scores by Indoor-Tanning Bed Use and Category of Questions Answered**

*Correctly:* Results were analyzed based on indoor tanning bed use and type of survey question answered correctly and incorrectly. Individuals who reported using indoor tanning beds did significantly better on UV questions than non-indoor tanners. Results showed that non-indoor tanners did below average on UV questions. Those who reported using indoor tanning facilities scored above average. Despite scoring higher on UV related questions, indoor tanning bed users’ lowest scores were on UV related questions. For example, only 35% of tanning bed users correctly identified UV rays as a known carcinogen. Yet, several of the non-indoor tanners’ lowest scores were also on UV questions. Non-indoor tanners scored the lowest score overall on the survey question that asked participants to identify which UV rays are emitted from indoor tanning beds. Interestingly, those who reported using indoor tanning beds also scored well below average on the same question.

Participants who had never used an indoor tanning facility scored higher on skin cancer questions than indoor tanners. Indoor tanning bed users scored below average on skin cancer questions. Skin cancer questions demonstrated a greater difference between
scores among indoor tanners and non-indoor tanners. In fact, non-indoor tanners scored 12% higher on skin cancer questions than those who reported using indoor tanning facilities.

**Implications for Practice**

Skin cancer is a major health concern in the United States today. Several efforts have been made to educate the public about the risks associated with UV exposure. Although knowledge surrounding UV exposure and skin cancer prevention has improved, the results of this study show there continues to be important knowledge deficits.

Healthcare providers are an important source of information. Research has consistently demonstrated that patients value the knowledge and information they receive from their healthcare providers. Previous studies have demonstrated that healthcare providers have been successful at increasing the public’s awareness about sun safety knowledge. The results of this study will provide healthcare professionals insight into where additional educational efforts should focus. Patient education should include more detailed information about UV exposure and skin cancer. Skin cancer prevention counseling should not be limited to sun safety practices. Patients should be educated about what UV rays they are exposed to in different environments and how UV exposure affects the body. This study also demonstrated that a significant number of patients do not know how to correctly identify a dangerous skin lesion. Melanoma can have a 99% survival rate when diagnosed early. However, if a melanoma lesion is not identified early, the chance of survival can drop to 15% (Rager, Bridgeford, & Ollila, 2005). Healthcare
providers can increase people’s awareness about skin cancer by helping them become more competent at self skin exams and knowing how to identify a high-risk skin lesion.

Primary disease prevention interventions have been shown to decrease the incidence of certain health disparities including skin cancers (USDHHS, 2009). Previous research demonstrated that much of UV exposure and skin cancer counseling is done more frequently with individuals who are considered at high-risk and/or who have had a previous diagnosis of skin cancer. Previous research demonstrated that skin cancer prevention counseling done in healthcare settings is relatively low. In fact, Polster (1998) reported that although dermatologists are more likely to counsel patients on skin cancer prevention, only 27% of dermatology patients reported receiving skin cancer prevention counseling from a dermatologist. Primary care providers and dermatology providers could play an important role in implementing primary prevention interventions regarding skin cancer education. Routine physical examinations and dermatology visits provide healthcare providers with the opportunity to educate patients about UV exposure and skin cancer.

Unfortunately, there is no consensus when skin cancer prevention counseling should take place despite the increasing incidence of melanoma and non-melanoma skin cancers. Primary disease prevention is an effective way to decrease the incidence of disease and lower healthcare costs (Fitzgerald, 2008). Health organizations have standardized recommendations for numerous primary prevention interventions, such as smoking cessation counseling and self breast examination counseling (USDHHS, 2009). Currently, there is no consensus as to how skin cancer prevention education should be
accomplished. Standardized guidelines for skin cancer prevention counseling can help primary care and dermatology providers know when to counseling patients and what information to include. The results of this study can help healthcare providers and medical organizations create a more comprehensive approach to education about UV exposure and skin cancer.

The American Academy of Dermatology (AAD) recently released a statement regarding UV exposure and vitamin D. It states that UV exposure is no longer considered a safe method for people to obtain adequate levels of vitamin D (AAD, 2008). In addition to this important position statement, the International Agency for Research on Cancer (IARC) also released a statement that UV-emitting tanning devices unquestionably cause melanoma of the skin (Elmets, 2009). Important position statements, such as these, have sparked an interest in legislators to look closer at the indoor tanning industry. Several proposals have been presented to put more stringent regulations on the indoor tanning industry. Some states have already begun to implement such legislations. The results of this study demonstrated that there are important knowledge deficits about what people know about UV exposure from indoor tanning beds. Information such as this can be utilized to help create policy and protect the public from the harmful effects associated with indoor tanning.

**Recommendations for Further Research**

There are important limitations from this study to consider for additional research on UV exposure and skin cancer knowledge. One significant limitation of the study is that specific indoor tanning behaviors were not assessed and it was not known when and
how often those individuals who reported using indoor tanning facilities participated in indoor tanning behaviors. Additional research should include a more thorough examination of indoor tanning bed use practices. A second important limitation of the study is a potential bias. There were significantly fewer skin cancer questions than UV questions. As previously discussed under section *Scores by Question Category*, this creates a bias in favor of UV questions. It is therefore difficult to compare the two categories of questions without analyzing the results in favor of UV question scores overall. Results that involved comparing the two categories of questions could therefore be screwed. A third limitation is the small sample size. Future research should include a greater sample size and a larger number of dermatology clinics. Utilizing a greater sample size will strengthen future research generalizability.

**Conclusion**

The results of this study demonstrated a deficit in what dermatology patients know about UV exposure and skin cancer. Further research is needed to validate this finding and expand upon this topic of interest. The incidence of skin cancer is rising and UV exposure is a major contributing factor (Eisen-Maguire, 2001). Healthcare professionals and organizations have attempted to educate the public about the health risks associated with UV exposure. This study has shown despite current skin cancer prevention education efforts, there continues to be gaps in what people know about UV exposure and skin cancer. Future research can help fill these gaps and explore effective
ways to increase the public’s awareness about the harmful effects of UV exposure and skin cancer.


APPENDIX A

SURVEY TOOL
YOU ARE INVITED TO PARTICIPATE IN A RESEARCH STUDY
Skin Cancer and Tanning Awareness

Hello-My name is Lindsay McCarthy. I am a registered nurse here at Associated Dermatology. I am currently seeking my Masters of Nursing through Montana State University. As part of my course work, I am completing a research study that involves a questionnaire to be completed by patients at this clinic. I am interested in what our patients know and don’t know about UV exposure and tanning.

If you are interested in participating, please read the additional information below and complete the attached questionnaire. Please return the completed questionnaire to the receptionist before you leave. Note that this study is not mandatory and is purely optional.

If you have any questions or would like to contact me regarding this study, please email me at lincoupe@yahoo.com.

Thank you for participating,
Lindsay McCarthy, RN, DNC

Disclosures
Study Goal: This questionnaire is part of a study to assess what dermatology patients know about UV exposure and tanning

Benefits: Help assess and address the public’s knowledge about skin cancer prevention

Risks: Anxiety or stress related to filling out the survey

Confidentiality: The design of the study is to maintain anonymity. No personal identification information is included. Study results will be reported to Montana State University
Survey

Demographics

Age:

Have you ever been diagnosed or treated for skin cancer?

Have you ever utilized an indoor tanning bed?

Instructions: Please read each question and circle the correct answer.

1. Which UV rays are we exposed to in our normal environment?
   a. UVB & UVA
   b. UVS & UVA
   c. UVS & UVB

2. Which UV rays have the potential to cause skin cancer?
   a. UVB & UVS
   b. UVA & UVS
   c. UVB & UVA

3. Which UV rays are emitted from indoor tanning beds?
   a. UVB & UVA
   b. UVB & UVS
   c. UVA only
   d. UVB only

4. Which UV rays cause you to sunburn?
   a. UVB
   b. UVS
   c. UVA

5. Which type of skin cancer do UV rays cause?
   a. Basal cell carcinoma only
   b. Squamous cell carcinoma only
   c. Melanoma only
   d. All of the above
6. Which of the following skin lesions is most dangerous?
   a. A light brown freckle on the arm
   b. A 2 cm bumpy brown mole on the arm
   c. A 2 cm flat black and brown mole on the arm

7. The FDA includes the following on the list of known carcinogens (cancer causing agents): cigarette smoke, asbestos, and MSG. Does the FDA include UV rays on the list?
   YES   NO

8. Skin cancer occurs in which of the following age groups:
   a. Childhood through old age
   b. Middle adulthood through old age only
   c. Skin cancer affects those in old age only

9. Since 1970 the incidence melanoma skin cancer is:
   a. Rising
   b. Falling
   c. Remains the same

10. When walking outside, UV exposure causes:
    a. Damage to DNA
    b. Damage to the skin
    c. Damage to the eyes
    d. All of the above

11. If you are walking outside on a cloudy afternoon, which UV rays are you exposed to?
    a. UVA
    b. UVB
    c. Both

12. If you are in an indoor tanning booth, which UV rays are you exposed to?
    a. UVA
    b. UVB
    c. Both