KNOWLEDGE AND PERCEIVED RISK OF SKIN CANCER AMONG ADOLESCENTS:

A REVIEW

by

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DEDICATION

This Master’s Report is first dedicated to my loving husband, Brian, who encouraged and supported me consistently throughout the last 10 years. Even though he was sometimes more than 5,000 miles away with bigger problems to solve, he always assured and encouraged me to do my best. He was a constant positive force in my life and deserves the recognition for the impact he has had on my accomplishments.

To my amazing family, who supported me endlessly over the last two years, making it impossible to fail. To my parents, Sue and Scott, who always encouraged me to go after my dreams, and who are completely invested in my accomplishments.

To my Grandma Helen and Grandpa Ed, who have always been proud of everything I have accomplished, giving me the confidence to continue. Lastly, to my Gramma Jean and Pop who, with their generosity and support, allowed me to focus on my studies and do the best I can without any worries.
# TABLE OF CONTENTS

LIST OF TABLES ........................................................................................................................... 5

ABSTRACT ..................................................................................................................................... 7

1. CHAPTER ONE ....................................................................................................................... 9
   - Introduction ............................................................................................................................ 9
   - Problem Statement ............................................................................................................. 10
   - Significance of Problem ................................................................................................. 11
   - Purpose ............................................................................................................................... 12
   - Search Strategy .................................................................................................................. 12
   - Results ............................................................................................................................... 14

2. CHAPTER TWO ..................................................................................................................... 30
   - Synthesis of Findings ........................................................................................................ 30
     - What knowledge do adolescents have about skin cancer? ............................................. 32
     - What is adolescents’ perceived risk of skin cancer? ..................................................... 33
     - Does adolescents’ knowledge affect their skin safety behavior? ................................. 34
     - Limitations of the review............................................................................................. 36

3. CHAPTER THREE .................................................................................................................. 37
   - Clinical Implications ....................................................................................................... 37
     - Gap in the literature synthesis ..................................................................................... 39

REFERENCES .............................................................................................................................. 41
LIST OF TABLES

TABLE 1. Summary of Articles on Adolescents’ Knowledge, Perceived Risk, and Sun Safe Behavior
ABSTRACT

Problem: The incidence of melanoma, the most deadly form of skin cancer, has more than doubled since 1973 and it is the most common cancer in young people. Adolescents between the ages of 15 and 20 years who have sun exposure resulting in sun burn increase their risk of skin cancer.

Purpose: To review publications pertaining to adolescents’ perceived risk of skin cancer, knowledge of sun exposure risks, and how this knowledge affects sun safe behavior. The intent of this review was to answer the following questions: (1) What knowledge do adolescents have about skin cancer? (2) What is adolescents’ perceived risk of skin cancer? (3) Does adolescents’ knowledge affect their skin safety behavior?

Search Strategy: A search of the PsycINFO and PubMed databases for research articles published during 1999-2009. The key search terms were risk perception, adolescents, sun protection and sun exposure or sunbathing.

Results: A total of 12 articles that addressed the purpose of the review were selected. Findings on knowledge indicated that providing educational interventions to adolescents tended to increase their knowledge of sun safe behavior, but for no longer than four months. Knowledge of skin cancer did not tend to increase perceived skin cancer risk in adolescents. Knowledge affected sun safety behaviors by increasing amount of adolescents that wore sunscreen, but did not affect other sun safe behaviors.

Implications of Findings: Little is still unknown about primary prevention of skin cancer among adolescents. Themes of successful primary intervention with adolescents include continuous
early and long-term sun safety education, informing them of risk factors, using gender specific intervention, and peer, parent, and/or adult mentor involvement.
CHAPTER ONE

Introduction

Skin cancer is a major public health problem in the United States. The estimated incidence of nonmelanoma skin cancers (NMSC), basal cell carcinoma and squamous cell carcinoma, in 2006 was 3,507,693 (Rogers et al., 2010). Although NMSC rarely is deadly it has associated morbidity and health care costs (Center for Disease Control and Prevention [CDC], 2002). The estimated incidence of new melanoma cases in 2009 was 68,720 (Jemal et al.). Melanoma incidence has more than doubled in incidence since 1973, and is the most common cancer between the ages of 25-29 years (CDC). Men have a 1 in 39 chance, and women a 1 in 58 chance, of developing melanoma in their lifetime (Jemal et al., 2009). Melanoma, the most deadly form of skin cancer, caused an estimated 8,650 deaths in 2009 (Jemal et al.).

There are many risk factors that influence the chance of skin cancer; these include genetic characteristics and life style choices. Non-modifiable genetic risk factors include phenotypic characteristics (light skin color, light eyes, light hair, skin that burns, freckles, reddens easily), family history of skin cancer, personal history of skin cancer, and large numbers of certain types of moles (CDC, 2002). Exposure to ultraviolet (UV) light is the most well known risk factor for skin cancer. Squamous cell cancer is commonly caused by accumulation of UV light exposure; whereas melanoma and basal cell cancer risk increases with severe sunburns or intense sun exposure at young ages (Glanz et al., 2008). UV light from the sun and artificial tanning sources (e.g., tanning beds, sun lamps) cause 80% of all melanomas and NMSC (Cokkinides et al, 2006). Importantly, the risk of skin cancer increases in young people between the ages of 15 and 20 years who experience sunburn in their lifetime (Cokkinides et al).
Decreasing cancer risk and reducing skin cancer mortality is the goal of many national initiatives. The U.S. Department of Health and Human Services (USDHHS, 2001) Healthy People 2010 listed as a goal the reduction of melanoma cancer deaths from 5.9 per 100,000 people to 2.5 per 100,000 people. The CDC has a goal of increasing the number of people that use sun protective mechanisms to help reduce skin cancer risk (CDC, 2002). In particular, Healthy People 2010 listed as a goal to increase the proportion of adolescents in grades 9 through 12 that use sun safe behaviors to reduce their risk of skin cancer (USDHHS). The CDC has provided guidelines (but not policy) for schools to promote skin cancer prevention among adolescents and for ensuring shade at schools. The CDC has also formed alliances with community-based programs to implement community-based interventions that target skin cancer prevention for adolescents. Many government allotments are focused on prevention and increasing knowledge among the adolescent population (CDC); however, whether these resources have influenced the incidence of skin cancer has yet to be determined. In summary, the U.S. Department of Health and Human Services, in conjunction with the CDC and local community based programs, offer many resources for adolescents to prevent skin cancer.

Problem Statement

Skin cancer is a growing concern among the public, but the incidence of skin cancer is still increasing. Little research on skin cancer prevention has focused on adolescents. We know even less about adolescents’ skin cancer knowledge, perceived risk of skin cancer, and how knowledge and perceived risk translate into preventive behaviors.
Significance of Problem

Not being able to fully characterize adolescents’ skin cancer prevention knowledge and behavior is troublesome, especially in an era where there is more media attention on physical appearance, sun protection education in public schools, and increasing sun intensity. However, adolescents are a challenging, but important, group to study.

Adolescence is defined as ages 11-21 years and can be further categorized as young adolescence (age 10-13 years), middle adolescence (age 14-17 years), and late adolescence (age 18-21 years). Adolescence is characterized by the attitudes of independence and defiance, high-risk behaviors, and negative lifestyle patterns (Montalto, 1998). Adolescents are preoccupied with their bodies, significantly affected by peers, and are highly vulnerable (American Academy of Family Physicians [AAFP], 1999). Health risks in this population are more social in origin than medical, but appropriate interventions can help reduce high-risk behaviors and negative lifestyle patterns associated with high levels morbidity and mortality in adolescents (Montalto) and later in life can lead to cancer.

How adolescents perceive their risk of skin cancer may be important for understanding their choices of risk-reducing behaviors. Each person perceives risk of disease differently. People tend to view common and everyday risk factors, such as not being prepared for a test or speeding on the highway appropriately, but may have unrealistic perceived personal lifestyle risks; for example smoking, drinking alcohol, and tanning (Sjoberg, Holm, Ullen & Brandberg, 2004). Underestimation of personal risk is termed “unrealistic optimism”. The highest levels of unrealistic optimism have been found among adolescents (Sjoberg et al.). Adolescents seem to perceive their risk as lower than the general population risk. This may be because of a lack of
experience that makes risk difficult to imagine. Also, perceiving themselves as less at risk can improve their self esteem (Eiser, Eiser & Pauwels, 1993).

Adolescence is when the majority of lifetime exposure to UV rays occurs. Given the importance of UV exposure as a risk factor for skin cancer, adolescence is the opportune time to provide intervention (Weinstock et al., 1989). If adolescents participate in sun healthy behavior and acknowledge their risk, there could be a decrease in skin cancer occurrence later in life (Weinstock et al). Sun over exposure is significant to health care and nursing because if health care providers are aware of the risk of sun exposure during adolescence, they can educate their young patients about risk factors and sun safe behaviors during health care visits.

Purpose

The purpose of this project was to conduct a review to summarize adolescents’ perceived risk of skin cancer and knowledge of sun exposure risks, and how this knowledge affects sun safe behavior. Objectives were to identify literature that (1) described adolescents’ knowledge and perceived risk of skin cancer and sun exposure; and (2) explored the associations between knowledge, perceived risk, and sun safe behavior. This review sought to answer the following questions: (1) What knowledge do adolescents have about skin cancer? (2) What is adolescents’ perceived risk of skin cancer? (3) Does adolescents’ knowledge affect their skin safety behavior?

Search Strategy

The review was accomplished using PsycINFO and PubMed databases. These databases included articles that were focused on the target group and objectives. Limits to the search included publications from 1999-2009, English language, and research articles. The decision for
the time frame of the search was based on identifying seminal research within the last ten years and the most up to date information and studies. For the PsychINFO search key terms of “risk perception”, “adolescents,” and “sun protection” yielded 36 articles. For the PubMed search, key terms “adolescents” and “sun exposure or sunbathing” netted 91 articles. The search terms used in each database were focused on what would retrieve the most relevant information from that database. The search from both databases netted 127 articles. Seventeen articles were eliminated because they were redundant articles or expansions of original articles. Twenty-seven articles were eliminated because the main age group of focus in the article was young adults (over age 21) or children (under age 11). Fourteen articles were eliminated because they were not original research. Four articles were eliminated because their sample had a history of skin cancer. Nineteen articles were eliminated because they focused more on tanning bed use, and physical appearance (e.g. Olson, Gaffney, Starr & Dietrich, 2008).

The remaining 46 articles were then reviewed for relevance to the research questions. Fifteen articles were eliminated based on results that were not significant or relevant to the objectives of the review (e.g. Buller, Buller & Reynolds, 2006; Branstrom, Kristjansson & Ullen, 2005; Cokkinides et al, 2006; Davis, Cokkinides, Weinstock, O’Connell & Wingo, 2002; Glanz et al, 2008; Kasparian, Butow, Meiser, & Mann, 2007; Vries, Lezwijn, & Honing, 2005; Yaroch, Reynolds, Buller, Maloy & Geno, 2006). Ten more articles were eliminated because their focus was too specific or general for this literature review; for example focusing on school based intervention in all ages or general population intervention that involved adults, children, and adolescents (e.g. Dobbinson et al, 2009; Gellar et al, 2002; Reynolds, Buller, Yaroch, Maloy & Cutter, 2006). Randomized controlled trials (RCT) contribute the highest level of evidence; this
review was focused on having the majority of articles with this research design. Studies with a
descriptive design that did not include findings relevant to the objectives were eliminated (e.g.
Lucci, Citro & Wilson, 2001; Ma, Collado-Mesa, Hu & Kirsner, 2007). Therefore, this review is
based on 12 articles.

Results

The results of the review are presented in Table 1. This table categorizes pertinent
information in the 12 selected articles that pertains to the study purpose, sample, design,
framework, main concepts, measures, results, and implications of the research. Results reported
in the table are (a) results that address the objectives and research questions of this project and
(b) are significant findings. Implications reflect the results reported in the table.
Table 1: Summary of Articles on Adolescent’s Knowledge, Perceived Risk, and Sun Safe Behavior

<table>
<thead>
<tr>
<th>Source</th>
<th>Purpose</th>
<th>Sample/Setting</th>
<th>Framework/Design</th>
<th>Concepts</th>
<th>Measures</th>
<th>Results pertaining to knowledge, sun safety behavior, perceived risk</th>
<th>Implications</th>
</tr>
</thead>
</table>
| Alberg, Herbst, Genkinger, & Duszynski (2002) | Describe attitudes, practices, and knowledge of 7th graders regarding sun protection and skin cancer prevention. Describe gender differences among participants. | 2775 students average age 12.1 yrs., 55% female; unable to collect data on race/ethnicity but expected population is 67% white/Maryland Public Schools | Not identified/ Cross sectional Descriptive | • Attitudes • Behavior • Knowledge • Skin cancer prevention • Sun protection | Knowledge: 20 questions,( seven multiple choice, 13 true/false) Attitude: 3 questions (5 point Likert scale) Sun safe practices/behavior (3 questions) | • Knowledge scores for boys and girls < 50% signifying low skin cancer knowledge and likelihood to wear sunscreen.  
• Majority (53.8% boys, 62.4% girls) reported wearing sunscreen always/sometimes  
• Students ages 14-16 had increased knowledge of skin cancer and sun protection but decreased attitudes toward sun protection (p-for-trend <.001 for both).  
• > 50% had a sunburn during the last summer  
• Age not a risk factor for sunburn; boys and girls had equal risk for sunburn  
• Girls had higher knowledge score (p < .01), held more favorable attitudes toward sun protection (p <.01) | • Knowledge is low and does not increase sun protection.  
• Stronger messages needed to target boys  
• Education on proper use of sunscreen is important.  
• Increasing favorable attitudes towards sun protection may promote increased sun protection behaviors.  
• Validity and reliability of measures not identified. |
| Buller et al. (2006) | Test the effect of the Sunny Days, Healthy Ways (SDHW) skin cancer prevention program on self-reported sun protection. | 2038 adolescents grades 6-8 completed pre test; 1788 completed post test, 1759 final sample  
- 42.8% male, 57.2% female  
- 78% white  
- 25.4 Hispanic, 74.6 non Hispanic  
- 11 yr old 2.8%, 12 yr old 26.1%, 13 yr old 49.1%, 14 yr old 21.5%, 15 yr old 0.5%  
Colorado, New Mexico and Arizona schools | Social cognitive theory/ RCT. Intervention = 6 weeks of one hour SDHW curriculum. Control = no sun safety lessons | • Sun protection behavior  
- Sun safety  
- Self efficacy  
Self-report diaries on time outside, clothing worn, sunscreen used when outside during school hours.  
Researcher reviewed diaries and measured  
Time outdoors: 0-15 scale;  
Frequency of sunscreen use, clothing and sunglasses worn, time in sun or shade: 5-pt scale.  
Body coverage: estimated for each outdoor encounter and validated by direct observation.  
Knowledge: 10 true or false questions (KR reliability = .39).  
Attitudes: 17-item, 5 point scale (1 = disagree important & 5 = 100% important) | Intervention group reported more frequent sun protection (unrelated to age), wearing long sleeves at recess, greater use of sunscreen; demonstrated more knowledge of sun safety (p<.0001) than control group.  
• SDHW material influenced adolescents in middle school to improve their sun protection and improved their knowledge.  
• SDHW can be implemented by teachers with minimal training.  
• More students prefer to use sunscreen, but it is not effective as barrier protection like clothing/hat.  
• Schools are an effective venue for delivering sun protection education.
| Branstrom, Brandberg, Holm, Sjoberg & Ullen (2001) | Examine the effect of age, skin sensitivity, and gender, beliefs attitudes toward sunbathing. Examine knowledge about skin cancer, UV radiation and preventive measures on current and future sunbathing and sun protection behaviors. | 2,615 adolescents, 54% female, 46% males, 33% 13 years old, 33% 15 years old and 33% 17 years old, no ethnicity identified. Sweden community | Not identified/ Cross sectional descriptive comparative | • Knowledge  
• Sunbathing  
• Sun protection  
50 questions measured sun bed use, sun related behavior, knowledge and attitudes of tanning and danger and benefits associated with tanning. Present sunbathing (0=never; 5=often), future sunbathing habits (less often, same as today and more often), beliefs on sunbathing (0=Very healthy; 5= very harmful), attitudes (0=many more benefits; 5= many more disadvantages). Use of sun protection: 5 point scale (1= not at all; 5= very much) (Cronbach’s alpha = .67). Skin sensitivity: self agree surely) (KR reliability = .67)  
Self-efficacy: one 3- point item (1=not sure; 3= sure (KR reliability=.54) | • Sun bathing frequencies increased with age  
• Older female students and those with more sensitive skin types perceived sunbathing as more harmful  
• Girls overall had better knowledge of risk factors for skin cancer, preventive measures and UV radiation  
• Knowledge differed only in 15 year old boys and girls (p<.001).  
• Girls overall used sun protection more often than boys  
• Girls, older adolescents, and boys and girls with less sensitive skin type, higher knowledge of skin cancer, positive attitudes towards sunbathing were more likely to not be sunbathers (p<.001).  
• Adolescents pay little attention to known risk of tanning.  
• Stronger messages needed to target boys.  
• Stronger messages needed to target younger-age adolescents. |
<table>
<thead>
<tr>
<th>Study</th>
<th>Objective</th>
<th>Study Design</th>
<th>Intervention</th>
<th>Outcome Measures</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kristjansson, Helgason, Mansson-Brahme, Widlund-Ivarson &amp; Ullen (2003)</td>
<td>To determine the effectiveness of a 45-minute in-person presentation “You and your Skin” to educate adolescents on skin cancer.</td>
<td>184 adolescents ages 13-15 yrs</td>
<td>Transtheoretical Model (TTM)/RCT</td>
<td>Knowledge of UV light exposure, Risk factors for skin cancer/sun protection, Readiness to change behavior</td>
<td>Knowledge of skin cancer risk, UVR exposure and sun protection behavior: 15 statements (yes/no/don’t know). Attitudes towards sunbathing and tanning scored on a 5 pt scale. Readiness to change: measured by stage of change from a modified validated version of TTM. Test-retest reliability was over $r=0.70$ for attitude questions and under $r=0.70$ for stages of change. Both groups had increased knowledge of UVR exposure, risk factors for skin cancer and sun protection. Mean gain score (1.7) was greater in intervention group (0.7 in control group) ($p&lt;.05$). Intervention group more likely to increase knowledge 61% versus 39% ($p&lt;.05$). More students in intervention group were more ready to change sun protection behaviors ($p&gt;.05$). Educational materials can enhance general knowledge of skin cancer prevention in young and middle adolescents. Need more extensive intervention to affect attitudes and motivation. Increase readiness to change (consciousness raising) is important in changing behavior in this age group.</td>
</tr>
<tr>
<td>Lowe, Balanda, Stanton &amp; Gillespie (1999)</td>
<td>Evaluate school based program on skin cancer prevention.</td>
<td>3,400 students, tested in 8th, 9th and 10th grade. No gender, age or ethnic/race distribution identified.</td>
<td>Not identified/RCT</td>
<td>Skin cancer prevention, Sun protection behavior</td>
<td>Pre and Post testing questions regarding knowledge, behavior, and attitude. Intervention group (Grade 9): By the end of 8th grade, intervention group had a higher knowledge score than control group (13.42 vs. 12.70, $p=.002$). At end of the 9th grade,</td>
</tr>
</tbody>
</table>
| Lowe, Borland, Stanton, Baade, White & Balanda (2000) | Examine the extent to which key beliefs for sun protection are evident among secondary students. | Not Identified/Comparative Descriptive | • Sun protection behavior.
• Skin cancer beliefs. | Examine the extent to which key beliefs for sun protection are evident among secondary students. | No gender, age range or ethnicity distribution identified. Australian schools. | Anonymously survey on sun exposure and sun protection behavior (scale never/rarely to usually/always). Items on perceived risk. | • More boys than girls reported wearing a hat when it was sunny (62% vs. 38%); 
• More girls than boys applied sunscreen with maximum SPF; 
• Trends for skin protection decreased between primary and secondary school, therefore more education needs to be done in secondary. | limited by inability to track individual's increased knowledge. 
• Change was minimal and transient, and more successful in younger populations. Therefore, longer intervention time would be beneficial. 
• Low but acceptable internal consistency of measures. |
students. Examine usual sun protection behavior, previous sunburn experience and association of usual behavior and perceptions and experiences. and perceived concern of getting skin cancer, how they could avoid getting skin cancer, sun burn experience, and desire to suntan. (73% vs. 54%), reported wearing sun glasses (55% vs. 32%), sought shade during mid day (30% vs. 23%), were concerned about getting skin cancer (64% vs. 51%) • Use of sun protective clothing low, but significantly higher in boys and lower year level. • 1/5 of students said they wore less clothing to get more sun exposure • Use of sun glasses increased with age. • Lowest perception of skin cancer risk (36%) was in grade 7; increased to 51% in 12th grade • 10% of all students believed that there was little or nothing they could do to avoid skin cancer, 39% believed that they could avoid school. • Increased concern and knowledge about getting cancer by students leads to increased use of sun protection and behavior • Sustaining sun protection behavior can be done through community through changes in fashion, environment and structure, times that students are outside shade provision. • Messages to young and middle adolescent boys to seek shade and apply sunscreen. • This study was limited by using self reported behavior.
skin cancer, perceptions relatively consistent through the years.
• 83% wanted to be tan, (86% of those were girls)
• 36% of the students reported sunburn that resulted in blisters in their lifetime.
• Students' concerns and perceptions about skin cancer, personal sunburn experience and skin type were significantly associated with reported skin protection level (p < .001).
• Students reporting sun protective behavior were more likely to be concerned about getting skin cancer, thought they could avoid getting skin cancer or have skin that burns easily.
• Students
| Norman et al (2007) | Evaluate a multi component primary care-based intervention to increase sun protection behaviors among adolescents. | 760 adolescents aged 11-15 years old. 395 in intervention group, 424 in control group. • 53.5% female, 46.5% male • Mean age 12.7 years old • 3.2% Asian/pacific islander, 6.6% African American, 0.7% Native American, 13.1% Hispanic, 58.4% white, 18.1% multiethnic/other/ San Diego, CA primary care and homes | TTM/ RCT Intervention group: education on sun protection, brief counseling by primary care providers, interactive computer sessions, telephone assessments, feedback, education manuals, tip sheets, samples of sunscreen. Control group: education on exercise and diet to maintain good eating and physical activity behaviors. Participants were assessed at 0, 6, 12, and 24 months. | • Sun safe behavior  • Knowledge of skin cancer  • Sun protection behaviors (clothing, shade use, sun exposure and sun screen use) were self reported on a 5-point Likert scale (1=never, 5=always) (α= 0.78). • Stage of change was measured with the 5 levels of change, (0.70). • Sun sensitivity was measured on a scale of 0-10 based on skin reaction to sun, untanned skin color, and hair color.  • Results reported at 95% CI  • Intervention group had a greater increase in sun protection scores than control group. • Intervention group 25.1% were in action of maintenance stage of change of using more sun safe behavior vs. 14.9% in control group, (p<.01). • Sun protective behavior was greater with the number of intervention sessions completed (p=.002). • The relationship between intervention and sun protection behavior. | reporting low levels of sun protective behavior were more likely to suntan, perceived higher future risk for skin cancer, and were more likely to have had a blistering sunburn. | • Limited by self-report  • Can combine sun safety with other behavioral interventions for older adolescents.  • Web based intervention could be helpful in distributing information and participation of adolescents. • More compliance to program and longer participation in program positively correlated to increased sun protection behavior. |
| Olson, Gaffney, Starr, Gibson, Cole and Dietrich (2007) | Determine if multi component community-wide intervention could alter decline in sun protection. Determine if educating adults, | Communities in New Hampshire and Vermont, who had not participated in an earlier Sun Safe project at. Ethnicity not specified. Baseline: Control group: 42.3% male, 57.7% female. 98.2% 6th grade, 0.7% 7th grade, 1.1% in 8th grade | Roger’s protection motivation theory/Longitudinal RCT. Time points: baseline, 1 year and 2 year follow-up Intervention communities: Adults: yearly education sessions targeting adolescent | Sun protection behavior | Sun protection knowledge | Observation of UV index, temperature at local pools and beaches during peak hours of summer sun. UV meter was used to test levels hourly. Staff were trained and tested with a reliability of 0.90. | Students who sunburned more easily used higher levels of sun protection (clothing and sunscreen). (p<.001) Significant intervention effect (using sunscreen, protective) | Consistent messages of sun safe behaviors are present across different venues; community and classroom. Skin cancer prevention programs need to be started in early middle session and gender not significant. 55% in intervention group often or always wore sunscreen, compared to 45% in control group. 65% in intervention group always or often wore SPF 15 compared to 50% in control group. Greater improvement in stage of change, from preparation to action and maintenance, was seen in the 6-12 month period than the 12-24 month period. |
| Teachers and parents as change agents would help influence adolescents to be sun safe. | Grade. Intervention group: 43.7% male, 56.3% female; 97.2% in 6th grade, 1.7% in 7th, 1.1 in 8th. 1 year f/u: Control group: 42.9% male, 57.1% female; 0% 6th grade, 92.7% 7th grade, 7.3% 8th grade. Intervention group: 47.8% male, 52.2% female; 0% 6th grade, 89.1% 7th grade, 10.9% 8th grade. 2 year follow-up Control group: 50% male, 50% female; 0% 6th grade, 0% 7th grade, 100% 8th grade. Intervention group: 43.5% male, 56.5% female; 0% 6th grade, 0% 7th grade, 100% 8th grade. New Hampshire and Vermont schools awareness of sun protection, modeling good sun safe behavior and facial self-viewing in a dermascan. Younger Students: lessons from SunWise curriculum, completed other classroom activities on risk-increasing/reducing behaviors, self-viewing of facial skin under the dermascan. Older students: participated in peer education activities in the schools. During years two and three posters were place at pools and other outdoor activities in the community by research team. Lifeguards at local pools promoted sun safe behaviors and sunscreen use. | Adolescents directly observed by staff for clothing coverage, shade protection, hair and eye color. Clothing coverage then used to estimate total BSA coverage. Staff interviewed adolescents on sunscreen application, SPF factor, and noted body areas of application. Then estimated to determine BSA of sunscreen application. Adolescents were asked to show the bottle of sunscreen to collaborate report. Adolescents were also queried regarding propensity to burn and if any adult or in school has educated them on sun protection. clothing and adult remodeling) found in intervention communities after 2 years of exposure to education, not after 1 year (p<.01), and more effective in girls than boys (p =.02) Intervention group had 9.7% more BSA protected than control group. No significant changes in use of protective clothing. More youth applied sunscreen after 2 year intervention(p <.001) 36.1% intervention group versus 12.8% control group used sunscreen, shade and protective clothing(p<.001). Interventions are more successful when time of intervention is greater than 1 year. Incorporate collaborative members of the team including from school and community into intervention. Implementation of national recommendations and formal sun protection policies needed to compliment this intervention. | Paul, Tzelepis, To explore adolescents’ needs to be increased usage of

95 high school students between the Theory of planned behavior/ Fear of Skin cancer Questions regarding age, Females ages 16-17 expected to

school, with stronger messages to boys.
| Parfitt, and Girgis (2008) | self reported reasons for sun protection. | ages of 12-17 yrs. | • 51 Males, 44 females Ethnicity not identified/Australian schools | Descriptive correlational: Focus group discussions followed by survey. Focus groups were divided by gender and age (12-14, 14-16, and 16-17 year olds). | • Sun protection | • Perceived risk of skin cancer | • Barriers to sunscreen use | • Hair color, skin color, eye color and sun protection behavior (reasons for using and not using sun protection). | eventually get skin cancer but that it would be removed and not fatal; • Males 14-17 reported risk of skin cancer as long term, and not a current concern • All groups reported desire to tan as reason not to wear sunscreen, higher in 16-17 yr olds in both genders. • All groups, except females ages 14-16 yrs, said that having a personal experience with someone with skin cancer was motivation for using sun protection. • All groups, except ages 12-14, stated having a previous sunburn as motivation for using sun protective behavior. • All groups said they are prompted to use sunscreen when with family, which they also said influenced the use of sun protection independently. • All groups reported | age-appropriate media campaigns for sun protection | • Education needs to start early in childhood. • Parents, teachers, schools and sporting clubs are important in encouraging and supporting sun protection policies • Peer groups important for compliance with program • Fashion and media industry need to value natural skin tone • Adolescents motivated to not use sun protection because they dislike pale skin and desire tan. |
that prompts from teachers and coaches positively influenced use of sun protection.

- Males ages 12-14, and 16-17, and females ages 12-14 and 14-16 reported that using sun protection at a young age helped develop sun protection habits.
- All groups except females ages 14-16, reported using sun protection as an inconvenience and annoyance. Females ages 12-14 and 16-17 reported not using sun protection until they see or feel their skin burning.

<p>| Reynolds, Buller, Yaroch, Maloy, Geno and Cutter (2008) | Determine if exposure to skin cancer prevention program would improve sun protection in adolescents. Determine if including parents in education would help increase | 2038 adolescent students and their parents.  599 were in summer school intervention (n = 288) control (n = 311)  Male 42.1%, female 57.9%; White 81.3%, Black 6.6%, American Indian 5.9%, Asian 4.6%, Native Hawaiian 1.7%; | Not indentified/ RCT with pre/post test. Four experimental groups: (a) receiving no Sunny Days Healthy ways curriculum during middle school but receiving the summer intervention b) receiving no SDHW curriculum and no summer | Skin cancer prevention  Sun protection behavior  Sun protection knowledge | Questionnaires included self report of sun protection including time outside, shade coverage, protective clothing and hat, and wearing sunscreen, this was then converted into a weighted body coverage. | Intervention had no effect on sun protection outcomes, but had positive effect on overall knowledge (p=.006)  Exposure to at least one newsletter had significant change in self reported use of shade (p=.009), and decreased number of sunburns in last | Interventions need to target both parents and adolescents  Need to determine ways to engage adolescents in health communication. |</p>
<table>
<thead>
<tr>
<th>Study</th>
<th>Research Question</th>
<th>Participants</th>
<th>Methods</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
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<td>Sjöberg et al. (2004)</td>
<td>Investigate how risky behavior and unrealistic optimism develops. How risk perception and other attitudes account for risky behavior and risk exposure.</td>
<td>2,615 adolescent's ages 13, 15 and 17 years. Age, gender, grade level and ethnicity not described. / Swedish communities</td>
<td>UV risks, Skin cancer knowledge, Tanning, Risk perception tanning, Sun protective behavior</td>
<td>Older adolescents more likely to expose themselves to skin cancer risk factors (tanning and sun exposure), girls more likely than boys. Girls and older adolescents perceived larger risks of tanning. Girls and older</td>
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<td>Study</td>
<td>Methods</td>
<td>Participants</td>
<td>Interventions</td>
<td>Pre-intervention</td>
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<td>Swindler, Lloyd, and Gil (2007)</td>
<td>Monitor high school students' short- and long term changes in knowledge of skin cancer prevention and attitude toward, and sun protection behavior following a sun protection intervention.</td>
<td>517 students ages 13-18, 273 (53%) girls, 244 (47%) boys, 13-14 years old 20% male, 32% female, 15-16 years old 71% male, 56% female, Greater than 17 years old 9% male, 14% female. Grade level and ethnicity not identified.</td>
<td>Not identified/Longitudinal Quasi experimental. Intervention: lecture based on “Raising Awareness About Your Skin” task force and a questions and answer session. Pre and Post survey on day of lecture. Follow-up survey four months later.</td>
<td>Skin cancer prevention, Knowledge of skin cancer prevention, Sun protective Behavior change</td>
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that they would use sunscreen 4 months after intervention (p<.001)
  • Knowledge scores were higher immediately following lecture in comparison to 4 months after lecture.
  • Increased number of students said that they would wear sunscreen, and decreased numbers said that they would not wear sunscreen (P<.001).
  • Increased percentage of girls who reported using a tanning bed versus baseline (11% vs 3%) (p=.004).

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<td>• Knowledge not sustained after 4 months</td>
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<td>• Longer intervention time needed to have more successful results.</td>
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CHAPTER TWO

Synthesis of Findings

The articles synthesized for this review were incongruent among each other in regards to methodology and strength of evidence. The studies used different types of measures to determine knowledge of the adolescents. One study used a combination of true or false and multiple choice questions (Alberg et al., 2002), where as others used strictly true or false (Buller et al., 2006; Lowe et al., 1999), multiple choice (Branstrom et al., 2001; Sjoberg et al., 2004; Swindler et al., 2007) or statements (yes/no/don’t know) (Kristajansson et al., 2003). Therefore, a limitation to the synthesis of literature was inconsistent measurement of knowledge. Studies also use various forms of measures to determine use of sun protection mechanisms including: self report diaries (Lowe et al., 1999; Reynolds et al., 2008), questions on use of sun protection (Alberg et al., 2002; Branstrom et al.; Lowe et al., 2000; Norman et al.; Paul et al., 2008; Swindler et al., 2007), direct observation by researchers (Olson et al., 2007), and one study used a combination of all three (Buller et al.). The use of self report diaries are not as reliable as direct observation (Lowe et al., 2000), although one study stated self report diaries have been validated during previous studies. In addition, the studies did not consistently use the same form of assessing sun protection behaviors therefore the evidence obtained could not be compared effectively to determine best practice. Limitations to this literature review were in the measures and methodology of the studies differed so greatly.

Reliability of measures is important to consider when evaluating quality of the studies instruments. Reliability of measures were not reported in five of the twelve studies therefore we are unable to evaluate their instruments (Alberg et al., 2002; Lowe et al., 2000; Paul et al., 2008;
Sjoberg et al., 2004; Swindler et al., 2007). In the studies that did report reliability of measures (Buller et al., 2006; Branstrom et al., 2001; Kristjansson et al., 2003; Lowe et al., 1999; Lowe et al., 2000; Norman et al., 2007; Olson et al., 2007; Reynolds et al., 2008), adequate reliability was determined if the alpha coefficient was above 0.70. Two studies had reliability coefficients below 0.70, therefore their study measures are not stable and internal consistency is low (Buller et al.; Branstrom et al.). Six of the twelve studies had adequate reliability measures 0.70 or greater, therefore their study instruments were internally consistent and reliable. Evaluating reliability of the measures is important in considering the instruments used in the studies. Of the twelve studies, only eight evaluated their reliability with six having adequate reliability measures.

The majority of the studies did not use a theoretical framework when designing their research. This is problematic because when theory is used as a basis for generating predictions, the findings are more likely to have broad significance and utility. There also was not a consensus on theory used with social cognitive theory (Buller et al., 2006), Trans Theoretical Model (Kristjansson et al., 2003; Norma et al., 2007), theory of planned behavior (Paul et al., 2008) and lastly Roger’s protection motivation theory (Olson et al., 2007) all being used. Each of these theories and models provided framework for the studies but no conclusion can be made in regards to whether use of theory can help determine the variable of interest and relationship among variables.

What knowledge do adolescents have about skin cancer?

Providing educational interventions to adolescents tended to increase their skin cancer knowledge. These interventions did not maintain their knowledge of sun safe behavior and risk
for skin cancer for periods of longer than four months. The studies used various forms of educational interventions including school-based programs, community-based interventions, primary care instructions, and web-based information. Interventions consisted of skin cancer prevention education seminars for adolescents (e.g. Sunny Days, Healthy Ways curriculum, SunWise curriculum, and Raising Awareness About Your Skin), adult classes on modeling sun safe behavior, facial viewing in a dermanscan, interactive computer sessions, and peer provided educational activities. Some interventions also included community involvement including lifeguards promoting sunscreen use, primary care counseling, and posters promoting sun safe behaviors. Of these interventions, those that had the most significant effects on knowledge were educational seminars at school that started at a young age and had the curriculum reviewed annually.

Four randomized controlled trials immediately post intervention showed a significant increase in skin cancer knowledge in the intervention groups, though the knowledge was neither as high as predicted nor sustained for more than 4 months (Buller et al., 2006; Kristajansson et al., 2003; Lowe et al., 1999; Swindler, Lloyd & Gil, 2007). When the intervention was implemented over a longer period and started with young adolescents, ages 10 through 13, the results were more favorable. Late adolescents scored higher on knowledge tests, but young adolescents demonstrated more sustained knowledge over time. Among young adolescents, knowledge scores of boys and girls were equal; but as age increased girls scored higher than their male counterparts (Alberg et al., 2002; Branstrom et al., 2001). Some studies involved adult mentors, whereas most did not; studies including adults as mentors were successful in increasing skin cancer knowledge among adolescents. Despite the variety of information available on skin
cancer, including its causes, risk factors, and preventive measures, adolescents, overall, had low levels of knowledge (Alberg et al.; Branstrom et al.; Kristajansson et al.; Lowe et al.; Swindler et al.). Understanding this lack of knowledge among adolescents is important because risk of skin cancer increases in young people who have had excessive sun exposure during adolescence.

Since each study employed different forms of intervention and period of implementation, there is no consensus on the most successful form of intervention in this population. This lack of consistency does not allow validity testing of interventions. It creates a gap in the knowledge of how to successfully educate adolescents of skin cancer prevention. A conclusion is that providing intervention early in adolescence and over longer periods may be the best way to increase and sustain knowledge; however, the best type of intervention remains an enigma. Providing educational interventions to adolescents tended to increase their knowledge but did not maintain their knowledge of sun safe behavior and risk for skin cancer over longer periods. Thus, more research is needed on interventions that improve and sustain behavior change.

*What is adolescents’ perceived risk of skin cancer?*

Knowledge of skin cancer did not tend to increase perceived risk of skin cancer in adolescents. These findings were consistent between genders (Branstrom et al., 2001; Norman et al., 2007; Reynolds et al., 2008). Adolescents with light skin color and female late adolescents, who reported high levels of skin protection or personal experience with someone with skin cancer, tended to have appropriate levels of perceived risk of skin cancer. Older adolescents had decreased perceived risk towards skin cancer, especially in regard to tanning; those that did perceive risk of tanning had lower levels of reported sunburns. One study found that the lowest perception of skin cancer risk was in young adolescents and increased as the students aged.
(Lowe et al., 2000). Most students have an optimistic bias toward their perceived risk of skin cancer but felt that they could not avoid skin cancer. Skin cancer was not a current concern and the adolescents continued their risky behavior. Therefore, younger adolescents did not perceive their risk of skin cancer appropriately but perceived risk did increase with age. Information was lacking on why adolescents’ perceived risk was so overly optimistic, and whether this could be influenced in any way in the prevention interventions. The many factors that influence adolescents’ perceived risk of skin cancer are exemplified in these articles and include experience with someone that has had skin cancer, skin that easily burns, and high levels of sun protection.

**Does adolescents’ knowledge affect their skin safety behavior?**

Adolescents’ knowledge of skin cancer and sun protection does not tend to be positively associated with sun protective behavior. Half of the studies (Alberg et al., 2002; Buller et al., 2006; Norman et al., 2007; Olson et al., 2007; Paul et al., 2008; Swindler et al., 2007) demonstrated that after a knowledge-focused intervention, more boys and girls used sunscreen as a sun safety behavior.

The studies demonstrated that more girls wore sunscreen after an educational intervention but did not practice other sun safe behaviors such as wearing hats or seeking shade (Alberg et al.; Buller et al., 2006; Branstrom et al., 2001; Lowe et al., 2000; Norman et al., 2007; Sjoberg et al., 2004; Swindler et al., 2007). In contrast, boys were more likely to wear hats, sunglasses, and long sleeves, but not wear sunscreen (Alberg et al.; Buller et al., 2006; Branstrom et al., 2001; Lowe et al., 2000; Norman et al., 2007; Sjoberg et al., 2004; Swindler et al., 2007). This trend may have more to do with the adolescent’s activities outside or societal norms, and is affected
more by fashion than skin cancer prevention (Lowe et al., 2000). Adolescent-focused skin
cancer education needs to address this gender difference, i.e., encouraging boys to wear
sunscreen and seek shade and girls to wear hats and protective clothing.

Two studies explored the influence of parents and mentors on adolescents’ use of sun
safe behavior (Olson et al., 2007; Paul et al., 2008). Both studies found positive outcomes in
regards to parent and mentor involvement on adolescents’ sun protection behavior. Adolescents
were more likely to use sunscreen independently if they had been prompted to do so by their
parents in the past. Adolescents also reported higher levels of sun protection when reminded and
when observing role modeling of sun protection by coaches and teachers. Parent and mentor
involvement in the adolescents’ knowledge of sun protection behaviors greatly influences the
adolescents’ independent use of sun protection behavior.

Increased sun protection knowledge appeared to decrease the amount of adolescents’
sunburns (Alberg et al., 2002; Branstrom et al., 2001; Lowe et al., 1999; Paul et al., 2008). Girls
during middle-to-late adolescence are seven times more likely participate in risk seeking
behaviors like tanning and using sunlamps than girls of younger age and boys. These girls also
hold a more favorable opinion on tanned skin despite education on the risks of tanning (CDC,
2006).

Adolescents who showed a higher concern for skin cancer, or perceived themselves at
greater risk for skin cancer, were more likely to use sun safe behavior (Lowe et al., 2000; Olson
et al., 2007; Paul et al., 2008). Adolescents’ knowledge of sun safe behaviors led to their voicing
a greater intent of improving sun safety behavior, but ultimately did not affect their sun safe
behavior (Kristajansson et al., 2003; Norman et al., 2007; Reynolds et al., 2008). Despite
education on skin cancer, risk factors, and sun protective behavior adolescents, in general, still participate in unsafe sun behavior.

Consistently more girls than boys who had high scores on skin cancer knowledge and perceived risk and sun protection showed more favorable attitudes towards sun protection (Alberg et al., 2002; Branstrom et al., 2001; Lowe et al., 2000; Olson et al., 2007; Sjoberg et al., 2004). However, adolescents, despite knowledge, still participated in risky behaviors like tanning despite knowledge of the risks. Therefore, knowledge of skin cancer and prevention did not consistently affect sun safety behavior.

Limitations of the Review

A limitations of this review potentially was the choice of key words to search databases, which may have eliminated important articles that may have been beneficial for the review. Including the key term “knowledge” could have allowed inclusion of important articles related to the purpose of this literature search. Also including search terms such as such as “social context” “geography” or “culture” may have uncovered more specific info to explain adolescents’ knowledge, risk perception and sun safety behavior. In addition, this specific project was constrained by the numbers of articles required to include in the review, therefore articles that may have been beneficial to this project were eliminated.
CHAPTER THREE

Clinical Implications

Little is still unknown about skin cancer primary prevention behaviors among adolescents. Different studies have tried different tactics of educational intervention and behavior change and while some are successful, most do not yield significant results through all ages of adolescents and both genders. Although studies in this review are few and have inconsistent findings, there are some points that should be considered for implementation in a primary care practice to help increase skin cancer awareness and increase sun safe behavior. Through this review, four themes of successful primary intervention with adolescents have been identified: (1) continuous early and long-term education, (2) description of risk factors, (3) increasing perceived risk, and (4) peer, parent, and/or adult mentor involvement.

Continuous early and long term education can be accomplished in primary care practices by beginning early and repeating the information at designated intervals. This can be accomplished by reviewing sun safety during annual well child visits, and then with sick visits in primary care and pediatric clinics. Reviewing this information with the child/adolescent and parents at a regular interval re-introduce the concepts of sun safety in a pattern that can help reinforce behaviors or start sun safe behaviors. Assessment of sun safe behaviors can be included in a visit as part of the social history, to facilitate dialogue with the parents and adolescents about sun safety. Therefore, including sun safety in primary care can be accomplished by establishing a pattern for delivering important information over time.

Description of risk factors and increasing perceived risk have also been identified as successful themes of primary intervention. Educating adolescents on the risk factors of skin
cancer has been somewhat successful. Adolescents who are aware that they are at high risk and that they burn easily or somewhat easily are more likely to practice sun safe behavior. On the other hand, adolescents that tan easily and do not see themselves as at risk tend to participate in risky behaviors such as sun bed tanning and not using sun protective mechanisms. All groups of adolescents need to be educated on their risk because even if they burn easily they may still participate in unsafe sun behavior. The primary care provider or nursing staff during the adolescent’s yearly well child visit can provide individual education and mentoring to all adolescents in order to help them indentify how much they are at risk and implement healthy sun safe behaviors. This can be done with quick instruction, posters or handouts. During quicker visits, the primary care provider or nursing staff can reinforce this information.

Using peer, parent, and adult/mentor involvement can be beneficial in primary intervention of sun safe behaviors. In addition, parents that participated in sun safe behavior, and encouraged their children to do so as well, had children that used more sun protective mechanisms. Therefore, when adults come into primary care practices, either for their own care or to accompany their children, they should be reminded of skin cancer risk factors and sun safe behaviors. Schools and communities can use peer based intervention to provide intervention among this population since adolescents are more receptive to peers, and value peer approval greater.

Adolescents, dependent on gender, are more likely to use one type of sun safety behavior over another. Using this as a guideline, primary care providers can encourage adolescents to participate in sun safe behaviors dependent on what they may be more likely to follow. Encouraging and providing resources to increase adolescents’ usage of sun safe behaviors may
increase the chances of preventing sun damage and, ultimately, skin cancer. Success was seen when the intervention was started early, therefore primary care providers should start educating children and their parents at an early age on the risks of skin cancer and how to prevention techniques.

Based on the findings of this literature review, educational strategies that clinicians can use that might have a measure of success are long term, young age of intervention, description of risk factors and parental involvement. The findings also suggest that single intervention with no introduction of risk cancer or education about cancer statistics as a strategy for educating adolescents may not be successful.

Gaps in the literature synthesis

In terms of adolescents and their sun safe behavior, some topics would also have been important to include in this literature search. Focuses for future review of this problem could be differences of the sample, use of primary care, school nurse, and appearance based intervention. For this review, the articles varied in study location from Sweden, to Australia to the United States. Location is important to consider among populations in terms of latitude, social norms and vitamin D and how they affect compliance and use of sun safe behavior.

Involvement of primary care providers as a source of knowledge or education was not well-presented in the studies, but can be used as another source of educational intervention targeting adolescents. A gap in the research was utilization by one of the schools’ greatest resources for health education, the school nurse. Educating regarding skin cancer and sun safe behaviors should not only be done in health care arenas, but also within the school system by school nurses. Teachers or the researchers themselves provided the education interventions of
the studies listed above and not one article used the school nurse. The school nurse is a key participator in health related activities in schools they could help form school policies on sun safety, hold small group discussions, or lead small peer group interventions. However, with many more school nurses and teachers laid off, the onus for education may rest on primary care and the community.

More attention can be paid to addressing other factors that help shape adolescents’ behaviors; such as personal experience with someone with skin cancer, the effects of aging on their skin, and more cosmetic reasons like looking attractive and fitting in. Based on this literature review, gaps in the state of knowledge about skin cancer knowledge that remain include appropriate time and length of intervention, appropriate age to initiate interventions, gender specific educational strategies, and use of school nurses and primary care in prevention education.
REFERENCES


