Skin Cancer Prevention for the Primary Care Physician: 
A Proposal

By

Cristy Parker

A Master's Paper submitted to the faculty of 
The University of North Carolina at Chapel Hill 
In partial fulfillment of the requirements for 
The degree of Master in Public Health in 
The Public Health Leadership Program.

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Advisor 

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[Signatures]
Abstract

Skin cancer accounts for one third of newly diagnosed cancers in the United States, making it the most common human malignancy. Although nonmelanoma skin cancers are the most common, melanoma is generally the malignancy that receives the most interest among public health professionals due to its relatively high mortality rate. Malignant melanoma accounts for over 75% of deaths due to skin cancer. The incidence of this cancer seems to be increasing worldwide, doubling approximately every decade. Persons with increased risk include those with clinical evidence of melanocytic precursor or marker lesions (i.e., atypical moles, certain congenital moles), a large number of common moles, immunosuppression, a family or personal history of skin cancer, substantial cumulative lifetime sun exposure, intermittent intense sun exposure or severe sunburns in childhood, freckles, poor tanning ability, and light skin, hair, and eye color.

More than 90% of skin cancers are attributed to ultraviolet radiation (UVR) from the sun, and exposure to UVR is the most significant risk factor for skin cancer. Due to this strong association, nearly all skin cancers could be prevented through the use of sun protection strategies for reducing risk. Primary prevention of skin cancer involves reducing avoidable sun exposure and protecting the skin when sun exposure is unavoidable. People know very little about skin cancer and in relationship to a perception that a suntan is attractive, persons in the general population remain committed to seek sun and have low rates of sun protection. Public education campaigns are an important part of the
attempt to prevent skin cancers. These interventions include education through the media, outreach to professionals, school-based education, and education and policy changes at outdoor sun exposure sites.

Physician counseling is another component of primary prevention. At the American Academy of Dermatology and Centers for Disease Control and Prevention Consensus Conference in 1996, the following recommendations were developed: “a) limit exposure to UC radiation, especially between 10a.m. and 4p.m., b) wear protective clothing and sunglasses, c) use sunscreens (SPF-15 or higher) including SPF lip balms, d) avoid artificial tanning devices, e) for children younger than 6 months of age, use hats, clothing, and shading rather than sunscreen, f) encourage children to practice the shadow rule: seek shade when your shadow is shorter than you are tall. Provision of shady areas and preservation of the ozone layer should contribute to primary prevention of skin cancer” Because no studies have evaluated whether physician counseling reduces morbidity and mortality from skin cancer, recommendations regarding physician counseling vary.

Secondary prevention efforts are aimed at preventing death from cutaneous malignant melanoma by detecting cancers early. Strategies for skin cancer screening can be categorized in four ways: 1) routine screening of the general population in an out-patient setting; 2) surveillance screening, or the examination or individuals who are at high risk or have had a previous skin cancer; 3) mass screening, or population-based screening of asymptomatic individuals; and 4) skin self-examinations. The goal of screening for skin cancer
is to decrease skin cancer related mortality; however, there have been no controlled trials evaluating this potential impact. Because evidence is based on intermediate measures rather than morbidity and mortality outcomes, recommendations for screening practices widely vary. Screening and surveillance of high-risk persons may be an effective way of detecting melanoma before the malignancy has metastasized. Two studies have also demonstrated that screening high-risk patients for melanoma may be cost effective.

Primary Care Physicians are in an ideal position to implement skin cancer prevention counseling and early detection in their practices. Approximately 79% of persons in the US visit their primary care doctor at least once a year, and routine examinations are among the 10 most common reasons for patient visits. Further, in a study of patients diagnosed with malignant melanoma, 87% stated that they had regular physicians, 63% had seen those physicians in the year prior to diagnosis, but only 24% had regular dermatologists.

Despite the potential for effectiveness, multiple studies show that skin cancer control practices are performed less frequently than other preventive practices. One key barrier to skin cancer prevention practices involves the conflicting recommendations and lack of morbidity and mortality outcomes from randomized controlled trials. Until the evidence clarifies effective recommendations, efforts in prevention of skin cancer morbidity and mortality will remain anchored in the implicit potential of primary prevention and early detection. During this period of uncertainty, we must use the available evidence to target prevention practices to those who may benefit the most—persons at high
risk for skin cancer. The MacKie method of identifying a high-risk population appears to be a feasible way to target high-risk patients for skin cancer prevention efforts. A second barrier to skin cancer prevention practices in the primary care setting is the lack of physician confidence and skill in this area. Education is the answer to overcoming this obstacle. Several studies have demonstrated that educational interventions can improve primary care providers' attitudes, skills, and self-reported behavior toward preventing skin cancer.

North Carolina physicians have expressed interest in learning about skin cancer control practices through continuing medical education (CME) presentations, and a CME curriculum focused on improving physician skills and ability to target high-risk patients is warranted. A one-hour CME curriculum is included in this proposal. It will be tested in a randomized controlled trial fashion to determine whether it is effective in improving physician attitudes, knowledge, skill, and self-reported behavior before it is implemented as a CME for North Carolina primary care physicians.
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INTRODUCTION

Skin cancer affects over one million persons each year, and the incidence of skin cancer is increasing at an alarming rate. Multiple efforts have been made in both primary and secondary prevention with the hope of reducing the morbidity and mortality resulting from skin cancer. The primary care physician may have an important role in reducing the morbidity and mortality from skin cancer, but strong evidence to defend these practices is limited and multiple barriers to preventive care exist.

This paper provides an overview of the problem of skin cancer, the literature regarding primary prevention as it pertains to the primary care physician, and the literature regarding secondary prevention strategies. It then examines current practices of skin cancer prevention strategies made by primary care physicians, barriers that exist, and ways to overcome those obstacles. Finally, it includes a proposal for educating primary care physicians through a continuing medical education curriculum focused on diagnostic skills and strategies to target prevention efforts to high risk patients, as well as a proposal for evaluating this intervention.
II. THE PROBLEM OF SKIN CANCER:

Burden of Suffering

Skin cancer represents an increasingly urgent worldwide public health problem. The American Cancer Society estimated that approximately 1 million new cases of nonmelanoma skin cancer (basal cell and squamous cell carcinomas) and an additional 47,700 new cases of malignant melanoma were diagnosed in 2000. The total incidence is roughly equal to that of all other cancers combined, and in 2000 alone, skin cancer claimed the lives of almost 9,600 people. Skin cancer accounts for one third of newly diagnosed cancers in the United States, making it the most common human malignancy.

Although nonmelanoma skin cancers are the most common, melanoma is generally the malignancy that receives the most interest among public health professionals due to its relatively high mortality rate. Malignant melanoma accounts for over 75% of deaths due to skin cancer. Melanomas alone account for 2% to 3% of all cancers in the United States. The incidence of this cancer seems to be increasing worldwide, doubling approximately every decade. The lifetime risk for an American to develop malignant melanoma has been steadily increasing since 1935. Current data estimate that 1 in 74 newborns in the United States will develop melanoma in their lifetime, compared with 1/1500 in 1935. In addition, a study by the CDC has reported that over the past two decades, malignant melanoma incidence and mortality have increased by 4% and 2% per year, respectively.
The effect of melanoma is particularly noticeable because it is one of the few malignancies that frequently affects young people. With a median age at diagnosis of 53 years, melanoma ranks second among adult-onset cancers in years of potential life lost per death.\footnote{5} According to the Skin Cancer Foundation, malignant melanoma is the most frequent cancer in women in the United States aged 25 and 29 years and is the second most common malignancy after breast cancer for women aged 30-34 years.\footnote{2} Overall, about 15% of melanoma patients will die of their disease, with one fifth of these victims being younger than forty years. This translates to approximately 1200 deaths per year of people in a young age group.\footnote{3}

The average thickness of melanoma at the time of diagnosis has fallen. This may have led to an overall increased survival rate for persons with Stage I melanoma from approximately 50% in the 1950's to approximately 90% today. However, despite this, the death rate from melanoma continues to rise. It has consistently risen by an average of 2% annually since 1950. In fact, during the 1973-1991 SEER interval, the mortality rate for melanoma increased faster than for any other tumor except for prostate cancer.\footnote{6}

- **RISK FACTORS AND RECENT TRENDS**

Persons with increased risk include those with clinical evidence of melanocytic precursor or marker lesions (i.e., atypical moles, certain congenital moles) (relative risk [RR] 7-70), a large number of common moles (RR 1-64), immunosuppression, a family or personal history of skin cancer (RR 2-8),
substantial cumulative lifetime sun exposure (RR 3-5), intermittent intense sun exposure or severe sunburns in childhood, freckles, poor tanning ability (RR 2-3), and light skin, hair, and eye color. Geller et al found that, compared with patients of various socioeconomic strata, Massachusetts patients with the lowest socioeconomic status (census tracts with lowest proportion of high school graduates and households with low median income) were more likely to be diagnosed with advanced-stage tumors and die from their melanoma. Studies suggest that melanoma is more common among persons in the higher socioeconomic strata, except among those over 70 years of age, but the case fatality may be greatest among the lower socioeconomic groups. Data show that whites, older age groups, and men face a greater risk of melanoma than do blacks, younger people, and women, respectively.

- COST

According to Tsao et al, in an article in 1998 with estimates of the annual direct cost of treating melanoma, the annual direct cost of treating newly diagnosed melanoma in 1997 was estimated to be $563 million. Stage I and Stage II disease each comprised about 5% of the total cost; Stage III and Stage IV disease consumed 34% and 55% of the total cost, respectively. About 90% of the total annual direct cost of treating melanoma in 1997 was attributable to less than 20% of patients (those patients with advanced disease).
I. PRIMARY PREVENTION

More than 90% of skin cancers are attributed to ultraviolet radiation (UVR) from the sun, and exposure to UVR is the most significant risk factor for skin cancer. Due to this strong association, nearly all skin cancers could be prevented through the use of sun protection strategies for reducing risk. Primary prevention of skin cancer involves reducing avoidable sun exposure and protecting the skin when sun exposure is unavoidable.

This section will review (a) current knowledge, attitudes and behavior of the general population toward skin cancer and sun protection, (b) a brief overview of public health programs to prevent skin cancers, (c) a review of counseling to prevent skin cancer, including the evidence regarding recommended sun-protection measures.

- CURRENT KNOWLEDGE, ATTITUDES, AND BEHAVIOR

"There is good news: skin cancer can be prevented. The challenge, however, lies in changing the attitudes and behaviors that increase a person’s risk of developing skin cancer." --David Satcher, MD, PhD, Assistant Secretary for Health and Surgeon General

People know very little about skin cancer and in relationship to a perception that a suntan is attractive, persons in the general population remain committed to seek sun and have low rates of sun protection. The studies included in this section are all large surveys performed in the U.S. or Australia. Survey
data may be limited by recall bias, which would likely provide an underestimate of sun protection factors, and reporting bias, which might lead to an overestimation (if respondents to the survey report the socially desirable answer). Further, definitions such as “use of sunscreen” often vary by the interpretation of the respondent, and therefore may not represent the recommended use of sunscreen. (i.e., a man may place a small amount of sunscreen with SPF 4 on his nose when it feels burned and report that he “regularly uses sunscreen”.)

**Knowledge**

Multiple surveys have shown that people in the general population know little about skin cancer. In 1996 the American Academy of Dermatology (A.A.D.) performed a random telephone survey of 1000 U.S. adults to poll knowledge, attitudes, and behaviors associated with skin cancer and sun protection. This survey was in follow-up of a similar 1986 survey by the A.A.D. The 1996 survey revealed that only one third of the surveyed adults knew melanoma was a skin cancer, and 50% of men and 35% of women did not know the word “melanoma.” Further, only 26% of adults knew early signs of melanoma. Common misperceptions included that there is no risk from the sun during the winter, that sun exposure is not harmful if one gradually tans to “build up resistance”, and that tanning beds are “safe”. However, comparing data for adults from 1986 to 1996, adults’ knowledge of the perceived harmful effects of the sun significantly improved.¹²
Studies have also shown that in children and adolescents, knowledge about sun protection and the effects of the sun increase as age increases. In one study by Pion et al. of 693 school children ranging from 4-13 years of age, 4% of children 4-6 years old were aware of the need to wear sunscreen, versus 95% of children 9-10 years old. While almost all children were aware of the negative immediate effects of sun exposure, namely sunburn, the same study found that only 30% of children 11-13 years old knew that sun exposure is a risk for skin cancer. A common misperception in children was that they should not be worried about sunburns since sunburns usually go away in a few days.

**Attitudes**

A prevailing attitude of both adults and children is that having a suntan is attractive. The 1996 AAD survey found that women in a high-risk group had a higher desire for a tan than women in low-risk groups. Results from the same survey indicated that up to 68% of adults in the U.S. may feel healthier and more attractive with a suntan. A study by Dixon et al. of primary school students and their parents in Australia revealed that thirty percent of 735 primary school parents believed their children looked healthier with a tan and 40% intended to let their children get suntans the following summer. Trends analyzed by the AAD from 1986 to 1996 show that the attitude of adults that having a tan is healthy became less prevalent, although the attitude that having a tan enhances appearance remained, especially among men.
The Pion et al study of 693 school children found that 10% of children 4-6 years old already perceived having a suntan as attractive. The Dixon et al Australian study showed that attitudes about sun protection behaviors decline as children approach adolescence. Many adolescents hold positive attitudes toward tanning, reporting that having a tan is attractive and that it suggests physical and emotional good health. The social influences of appearance and tanning are especially important in the adolescent population.

**Behavior**

Adults and children are intentionally tanning, and have generally low rates of sun protection behavior. A general population-based telephone survey of 2459 white adults found that about 25% report frequent sunbathing, and only about a quarter of these sunbathers use sunscreens at recommended levels. According to the Behavioral Risk Factor Surveillance system data from 1999, only 40% of men and 65% of women were likely to protect their skin when outdoors. Other studies report 26%-75% compliance with sunscreen use. Data from 10,048 white respondents to the 1992 national Health Interview Survey Cancer Control Supplement found that a large percentage of US white adults did not protect themselves from sun exposure. Proportions of 32%, 28%, and 30% were reported for use of sunscreen, protective clothing, or seeking of shade if outside for more than one hour on a sunny day, respectively. In North Carolina, during 1997-1999, 48% of adults reported using sunscreen or protective clothing always, or nearly always, when outside, according to the Centers for Disease Control.
Several studies have indicated that sun protection practices are more common at the beach or on vacation than at other outdoor activities. In a beach setting the following measures were used by 871 children ages 2-9 years (as reported by children themselves and their caregivers): sunscreen, 79% of the time; pants to the knee, 49%; shirts, 22%; shade, 12%; and hats, 3%. Trends also suggest that more preventive practices are used among the following groups: persons with fairer skin, females, persons with a personal or family history of skin cancer, persons with higher education, older people, and persons with more knowledge about skin cancer.

Some studies have reported that sunscreen is the most common form of solar protection in children, adolescents, and adults. According to the AAD national survey of adults, from 1986 to 1996 the regular use of sunscreen increased from 35% to 53%. A large survey of 489 parents’ behaviors with respect to their children indicated that after sunscreen (which was used by 53%), the most frequently used forms of sun protection ranked as follows: using shade (30%), wearing hats (27%), and wearing shirts (8%).

In North Carolina, the percentage of children who always or nearly always used sunscreen or protective clothing when outdoors ranged from 53% to 71% during 1997-1999. In a study of a randomly selected sample of 200 adolescents and 150 children, adequate sun protection measures were used in only 63% of 3 year olds and 38% of adolescents. Other studies support that sun protective behaviors decrease as children become adolescents. Two studies reported that only 9% of adolescents always use sunscreen with an SPF of 15 or higher and
that 33% of adolescents never use sunscreen. For all ages, sunscreen use was greater for girls than for boys.

Children and adults in the United States are getting sun-burned. Because an estimated 50% to 80% of the skin's lifetime sun damage is thought to occur in childhood and adolescence, it is during these critical periods that intense, intermittent sun exposure causing burning increases melanoma risk, making it of concern. One survey of parents in a single pediatric office found that 53% of infants and young children had a history of sun-burning, with 31% having had moderate or severe burns. Another survey of 133 mothers in Australia reported that by the age of six months, 33% of the infants had been sun-burned and by three years of age, 82% had been sun-burned. A random telephone survey in Chicago of one child from each of 500 households found that 13% of children had been sunburned during the previous week. North Carolina statistics from the CDC show that 24% of adults reported that they had been sunburned during 1999 and 36% reported that they had more than two sunburns that year. The AAD data trends for adults indicate that from 1986 to 1996, the number of adults reporting “at least one sunburn per year” increased from 30% to 39% in the U.S.

There are multiple barriers to using sun protective methods, such as products being too expensive, sunscreen being uncomfortable to wear, and sunscreen being too inconvenient to put on. Sun protective clothing is reported by some to be unattractive, too hot, too difficult to wear while active, and expensive. Along the same lines, the desire to obtain a tan is a major barrier to compliance with sun protection behaviors. AAD national data trends indicated
that from 1986 to 1996 tanning booth use increased from 2% to 6%.\textsuperscript{12} In the 1996 survey, 28% of adolescents reported using a tanning facility at least once a month.\textsuperscript{12} In adults in North Carolina, 8% report regularly using a tanning facility, and 21-25% reported trying to get a suntan in 1999.\textsuperscript{18} Perceptions of tans as attractive and as an indicator of good health for both adolescents and adults are important causes of ignoring sun protection methods.\textsuperscript{25,26}

- **PUBLIC HEALTH CAMPAIGNS**

Public education campaigns are an important part of the attempt to prevent skin cancers. These interventions include education through the media, outreach to professionals, school-based education, and education and policy changes at outdoor sun exposure sites. Programs to educate the general public have been implemented in numerous countries, although the evaluation of these programs is limited. The aim of public educational interventions is to increase public awareness and knowledge of the dangers of excessive sun exposure and to teach people how to protect themselves from the sun with the hope of improving sun protection behaviors.\textsuperscript{7,56} Of the few programs that have been evaluated, most programs have been shown to increase knowledge, but only a few have been able to report significant change in behavior.\textsuperscript{7}

For more than 25 years, Australians have implemented numerous public health campaigns toward primary prevention of skin cancer.\textsuperscript{7} In Australia, melanoma incidence rates are leveling off in the younger age groups, but continue
to rise in older groups. Many public health professionals believe that these changes are due to the reduction in sunlight exposure that has occurred in the young age groups as a result of public education campaigns.\(^{32}\) Australians have a high level of knowledge about skin cancer; more than 90% of Australians have heard of the term melanoma and more than 95% believe that skin cancer is a dangerous disease.\(^{32}\) Of note, significant improvement in behaviors has also been documented. In a study of 4,428 adults in Melbourne, Australia from 1988 to 1995, the use of wide-brimmed hats when outdoors during peak hours increased from 9% to 20%, the use of sunscreen increased from 19% to 34%, and sunburns dropped from 15% to 9% in men and from 9% to 5% in women.\(^{21}\) Although the community interventions in Australia may be producing a positive impact, their use of many different complementary interventions makes it difficult to evaluate the relative contribution of each intervention.

The United States did not begin coordinated efforts toward primary prevention campaigns until the eighties. Because of the 10-20 year latency between exposure and clinical appearance of skin cancer, it is too early to evaluate morbidity and mortality outcomes in the U.S.\(^{33}\) In order to measure the success of public education programs, evaluators must rely on a variety of intermediate outcomes, including increased levels of knowledge and improvement in attitudes, decreased rates of intentional tanning, decreased rates of sunburn, and an increased use of sunscreens and protective clothing.\(^{23,7,8,29}\) However, results based on these intermediate measures must be interpreted with caution. Although surveys indicate that knowledge about sun protection and sunburn has increased
and attitudes about the desirability of tanning has moderated during the past ten years, there is little evidence that sun protective behaviors have significantly changed.\textsuperscript{12,30} Many studies have shown that knowledge about the dangers of sun exposure and about methods of sun protection does not ensure positive attitudes toward sun protection or practicing sun protection behaviors.\textsuperscript{12,34}

- COUNSELING TO PREVENT SKIN CANCER

Individual physicians must consider whether to take time to counsel patients about skin cancer and sun protection. Additionally, when undertaking counseling, knowing what behaviors and practices to recommend in order to reduce a patient's risk of skin cancer is crucial.

The Recommendations for Primary Prevention (See Table 1)

At the American Academy of Dermatology and Centers for Disease Control and Prevention Consensus Conference in 1996, the following recommendations were developed: “a) limit exposure to UC radiation, especially between 10a.m. and 4p.m., b) wear protective clothing and sunglasses, c) use sunscreens (SPF-15 or higher) including SPF lip balms, d) avoid artificial tanning devices, e) for children younger than 6 months of age, use hats, clothing, and shading rather an sunscreen, f) encourage children to practice the shadow rule: seek shade when your shadow is shorter than you are tall. Provision of shady
areas and preservation of the ozone layer should contribute to primary prevention of skin cancer. Further, one of the CDC Healthy People 2010 goals is to “increase the proportion of persons who use at least one of the following protective measures that may reduce the risk of skin cancer: avoid the sun between 10 a.m. and 4 p.m., wear sun-protective clothing when exposed to sunlight, use sunscreen with a sun-protective factor (SPF) of 15 or higher, and avoid artificial sources of ultraviolet light.”

A Review of the Evidence

Avoiding sun and staying in the shade

The sun’s UVR is strongest during peak sun hours, when a person’s shadow is shortest. Although UVR intensity varies with latitude and altitude, the general recommendation is to avoid the sun between the hours of 10 a.m. and 4 p.m. Using shade is certainly important, but it is also essential to keep in mind that sun exposure, and even sunburns, can occur while in the shade. Up to 90% of UVR can be reflected by bright colored surfaces, water, white sand, concrete, snow, and ice. The degree of protection provided by a canopy (or umbrella) is a function of the material lining the canopy and the height of the canopy off the ground.
Dressing in protective clothing

Protection from clothing can be quantified in terms of SPF, although few studies have examined the protective abilities of different fabrics. Studies show that specially designed sun protective clothing can provide up to an SPF of 30, while normal summer weight clothing provides an SPF of around 5-6.\textsuperscript{39,40} Hats, depending on the style, can provide around SPF 15 for the forehead and SPF 3-7 (if wide-brimmed) to the nose, cheek, and back of neck.\textsuperscript{38} Nylon stockings provide an SPF of 2.\textsuperscript{39} The available studies show that woven nylon and cotton and other tightly woven fabrics provide the most protection and that the tightness of the weave and not the thickness of the fabric is most important.\textsuperscript{38,41} Recommended protective clothing includes wide-brimmed hats that shield the face, ears, and neck, long-sleeved shirts and tee shirts rather than tank tops, long shorts to the knees, socks, tennis shoes rather than sandals, and sunglasses with UVR protection. The more coverage provided by clothing, the more it protects from the sun.\textsuperscript{38,41,42}

Using Sunscreen

Recent data have shown that regular use of sunscreens can prevent the development of new actinic keratoses and hasten the remission of existing ones. By inference, they are capable of reducing the long-term risk of nonmelanomatous skin cancer.\textsuperscript{43,44,3} Investigators have estimated that regular use of sunscreens with a SPF of 15 during the first 18 years of life may yield as much
as a 78% reduction in the lifetime incidence of basal cell cancer and squamous cell cancer.\textsuperscript{45,46,34}

The protective link between melanoma and sunscreens has been much more controversial. Practical evidence suggests that since UVR is implicated in melanoma risk and that sunscreens reduce the amount of UVR absorbed by the skin, sunscreen use would be important in melanoma prevention. Further, lack of sunscreen has been associated with melanoma.\textsuperscript{47} However, early studies have suggested that sunscreen use might not reduce the risk for melanoma and some critics have even suggested that sunscreen use might actually increase the risk for melanoma. These studies—despite weakness in design (i.e., retrospective nature and potential for recall bias, interval bias, lack of power, and definitions for sunscreen use)—have led to debate over the evidence involving the use of sunscreens.\textsuperscript{33,48} Skeptics have also suggested that people who wear sunscreen may actually stay out in the sun longer, since they can endure more hours in the sun before their skin burns.\textsuperscript{7}

More recent, prospective studies are showing favor for sunscreen. A recent randomized controlled trial found that the number of new nevi—a risk factor for melanoma—was decreased in children regularly using sunscreens.\textsuperscript{37,49} Although we do not yet have direct evidence of sunscreen use on melanoma risk, we can also look at the melanoma incidence rate in areas where regular sunscreen use is common. In Australia, where 74% of the population regularly uses sunscreen, melanoma incidence and mortality rates are beginning to decline.\textsuperscript{50}
Melanoma rates are also decreasing in white persons in Hawaii, a group that has among the highest per capita use of sunscreen in the United States.\textsuperscript{51}

**Deliberate tanning (indoor and outdoor)**

Approximately 2 million Americans use tanning beds each day, and approximately 28 million Americans tan indoors annually.\textsuperscript{52} Behavior studies show that many people who tan indoors also seek outdoor sun. The use of tanning facilities has not been directly linked to cancer risk, but skin damage after use is common.\textsuperscript{5,58} Since skin damage can occur from the UV radiation found in tanning beds, as well as UVR received directly from the sun, both indoor and outdoor tanning should be discouraged.\textsuperscript{36}

**EVALUATION OF PHYSICIAN COUNSELING**

No studies have evaluated whether physician counseling reduces morbidity and mortality from skin cancer. From 1983-1987, Robinson et al performed a prospective study to see if patients who received education about sun protection coupled with the removal of a nonmelanoma skin cancer changed behavior. After 2-6 years of annual education by physicians in addition to written materials, the study population—which consisted primarily of women—reduced tanning by only 1\%.\textsuperscript{59} The authors also reported a small increase the use of protective clothing, increase in the use of sunscreen, and decrease in the amount of deliberate tanning among patients.\textsuperscript{59} Worksite educational interventions have demonstrated significant increases in use of sun protection measures such as hats,
shirts, and use of shade after the intervention,\textsuperscript{60,61} although whether this is
generalizable to physician counseling is unknown.

Prevention strategies must be weighed with regard to harms and benefits. The main harm associated with physician counseling is time, which is precious to the busy physician. Further, physicians may not be financially compensated for their time spent counseling. Another potential harm is a strain on the doctor-patient relationship, particularly if the patient is not interested in changing behavior. The benefits are difficult to assess without strong prospective data showing that physician counseling reduces morbidity and mortality associated with skin cancer. In theory, education and advice by a physician would result in more persons protecting themselves from the sun, which would result in a decreased incidence of skin cancer and thus lower associated morbidity and mortality. Most certainly, this is a difficult area of research, and more study is needed.

Based on the established efficacy of risk reduction from sun avoidance, the potential for large health benefits, low cost, and low risk of adverse effects from counseling, the United States Preventive Services Task Force concludes that counseling adults and children at increased risk of skin cancer to avoid excess un exposure and use protective clothing is recommended, even though the effectiveness of physician counseling is not well established. They conclude that there is insufficient evidence to recommend for or against counseling patients to use sunscreen to prevent skin cancer.\textsuperscript{5}
IV. SECONDARY PREVENTION AND EARLY DETECTION STRATEGIES

As an external tumor, melanoma should be more readily discovered than other types of cancer—"Melanoma writes its message in the skin with its own ink and is there for all to see."\(^{62}\) A wide range of opinion exists, however, about the value and efficacy of screening. (See Table 2) The American Academy of Dermatology and the American Cancer Society endorse regular skin cancer examinations. The Canadian Task Force on the Periodic Health Examination recommends skin examinations only for high-risk patients, including those with a personal or family history of skin cancer, precursor lesions, or increased exposure to sunlight. The US Preventive Services Task Force and the International Union Against Cancer do not recommend for or against screening for melanoma based on insufficient evidence.\(^{5,63}\)

- THEORY

Screening is appropriate when 1) the disease is highly prevalent and causes considerable morbidity and mortality, 2) the natural history of the disease includes a detectable pre-symptomatic phase, 3) early treatment is more beneficial in preventing morbidity and mortality than later treatment, and 4) an acceptable, safe, and inexpensive screening test exists, (the benefits of testing outweigh the harms). In theory, screening for skin cancer meets these criteria and should therefore be recommended. Skin cancer has the highest incidence of all cancers
and the incidence and mortality of melanoma are increasing at an alarming rate. There is a detectable pre-symptomatic phase, and removal of "early", thinner lesions is associated with longer survival than "later" thicker lesions (although lead time bias may exist). The skin is accessible and easy to treat. In fact, many biopsy procedures are both diagnostic and therapeutic. Screening is noninvasive, inexpensive, and acceptable to the public.

• HOW DO WE MEASURE SCREENING STRATEGIES?

The goal of screening for skin cancer is to decrease skin cancer related mortality; however, there have been no controlled trials evaluating this potential impact. Because there is no randomized trial data evaluating the effects of screening on mortality, other types of studies track intermediate outcome measures, including: a decrease in the rate of thick melanoma lesions in a defined population following introduction in screening, reversing years of potential life lost (YPLL) per death for melanoma, improving quality of life by detecting thinner, more curable melanoma (and thereby reducing levels of physical and psychosocial morbidity seen with recurrent melanoma), and cost-effectiveness analysis.²

STRATEGIES

Secondary prevention efforts are aimed at preventing death from cutaneous malignant melanoma by encouraging early detection and thus removal of thin melanomas. Strategies for skin cancer screening can be categorized in four ways: 1) routine screening of the general population in an out-patient
setting; 2) surveillance screening, or the examination or individuals who are at high risk or have had a previous skin cancer; 3) mass screening, or population-based screening of asymptomatic individuals; and 4) skin self-examinations.

- ROUTINE SCREENING OF THE GENERAL POPULATION

Integration of a total skin examination—consisting of a thorough examination of patients’ skin—into a health maintenance visit for primary care patients may be a practical and efficient strategy for reducing skin cancer morbidity and mortality. Many opportunities for such screening exist, since approximately 85% of the population of the United States sees a physician every 2 years\(^7\), and routine examinations are among the 10 most common reasons for patient visits\(^8\) (16.5% of total outpatient visits in 1996 according to the NIH).\(^{110}\) In one study of 216 melanoma cases, 87% had regular physicians and 63% had seen those physicians in the year prior to diagnosis, but only 20% reported having had a “physician skin examination”, as defined by the patient (although this may be an underestimate due to the retrospective nature of the study).\(^8\) Studies of melanoma case-finding note that an estimated 14% to 25% of melanoma is discovered by the doctor at a time when the patient had not noticed anything wrong.\(^7\)

However, routine screening will not work unless general physicians can make accurate assessments. The sensitivity and specificity of a dermatologist-conducted total cutaneous examination approach 93.3% and 97.8%, respectively, using histopathologic diagnosis as the gold standard.\(^{64}\) Other literature shows that
the sensitivity and specificity of well trained physician skin exam ranges from 84.5%-97% and 72.4%-97.8%, respectively. However, studies suggest that primary care physicians are less skilled at detecting skin cancers. Cassileth et al showed that only 12% of nondermatologists could correctly identify at least five of six melanomas, as compared with 69% of dermatologists. In another study, 89% of second-year medical students were capable of identifying a clinical photograph of a melanoma; however, only one fourth-year student of 285 detected a melanoma on a standardized patient. In another study, primary care residents failed 50% of the time to diagnose correctly nonmelanoma skin cancer and malignant melanoma. Routine screening will not work unless primary care providers are educated to make more accurate assessments.

A total skin examination (TSE) may be performed in 5-10 minutes, and many physicians view the additional time required to be a barrier to implementation. Other barriers include lack of reimbursement and distraction by other health problems. Further, the fact that only 20% of melanomas occur on normally exposed body surfaces likely decreases the yield of screening for skin cancer. Patient embarrassment may be an adverse effect of TSE, although no serious adverse affects of TSE and follow-up biopsies have been reported. Other limitations include the low positive predictive value from screening (with a likely increase in biopsies) in a low prevalence population and the resulting morbidity from false positive findings. There are no studies available that describe the effect on reducing mortality (or intermediate markers) from routine screening practices.
• MASS SCREENING

Few studies have been conducted on the efficacy of mass screening programs, which are typically designed to attract people in the community to attend a skin screening fair. Most studies to date have reported on the number of individuals screened and the results of screenings in terms of lesions identified. Little is known about the long-term follow-up of individuals who participate in these screenings. However, a few mass screening programs have demonstrated feasibility and success in detecting thinner melanomas than those of the general population. For example, the American Academy of Dermatology (AAD) has provided free skin screenings by volunteer dermatologists for more than 6,000 Americans from 1985 to 1993. The AAD screenings appear to detect early melanomas, with stage and thickness distributions comparing favorably with those of the SEER population-based data. However, self-selection bias and other screening biases exist, and there is no information available on improved mortality.68,69

One proposed benefit of mass screening is to provide a mechanism by which persons, especially the poor, can gain access to medical care. Based on 1992-3 data from the AAD, greater than 75% of participants reported not having a regular dermatologist, 47% would not have seen a physician without the AAD screen, and 9% had no health insurance.10

However, formal evaluation of mass screening programs to date has been limited. Randomized controlled trials to assess the effectiveness of these programs have not been published. Programs that are supported by substantial
evidence in the absence of RCT's are those aimed at very high-risk patients, such as those with familial melanoma. Although these programs have detected substantially thinner melanomas than the melanomas that occurred prior to enrollment in the program, these programs are resource-intensive and give rise to only a minority of melanomas.10

In addition, most mass screening programs are in fact voluntary screening programs in which the people who participate are in a higher risk population. Studies of screening in Massachusetts showed that many persons at risk attended the American Academy of Dermatology screening programs. Greater than 86% had at least one risk factor and 78% had at least two risk factors.19 Thus, the mass screening programs available for evaluation may in fact be screening programs dedicated to high-risk populations. Since their outcome measures include comparing lesion thickness to the general population, this may be comparing apples to oranges (no appropriate control group). However, these screening programs may be a feasible way to target screening efforts toward high-risk patients.

The main potential problems with population based screening for melanoma are that the sensitivity and specificity have not been quantified and the cost is substantial. Further, if every individual in the United States were put through a skin cancer screening, and the screeners were so well trained that their specificity approached 99.9%, more than 200,000 false-positives would result. Each of these individuals would be advised to pursue further evaluation at considerable cost and
time spent. Studies with long-term follow-up and formal control groups should determine the impact of early detection programs on melanoma mortality.

- SCREENING HIGH-RISK PATIENTS

Screening and surveillance of high-risk persons may be a more effective way of detecting melanoma before the malignancy has metastasized. Targeting screening to high-risk persons should improve the predictive value of the visual exam, since the baseline prevalence in this population is higher than the general population. The percent of the total population that is at “high-risk” is unknown, since risk factors and high-risk definitions vary significantly in studies. The value in targeting screening and surveillance to high-risk persons is dependent on the extent to which readily measurable markers of risk status may be obtained and used in the screening program. The most desirable markers are those with high attributable risk percentages; however, specific data about attributable risk (estimates with narrow confidence intervals) are lacking. There may be special value in screening those at risk for advanced disease and death, including middle-aged and older white men and possibly those of lower socioeconomic status in addition to the risk factors mentioned previously.

A precedent for screening high-risk persons has evolved by monitoring and educating persons with multiple nevi or atypical moles/dysplastic nevi within the familial melanoma setting. Although such persons comprise only a small fraction of the population, they represent a model for a comprehensive program to enhance early detection. Surveillance of family members of melanoma patients in
The Netherlands and in Philadelphia led to the detection of thinner melanomas, which is often used as an intermediate marker for morbidity and mortality. In both sites, family members receiving intensive screening and education were more likely to be diagnosed with thinner lesions than were index cases. The authors of both studies concluded that surveillance and education within such a high-risk population could have a beneficial effect on early detection.\textsuperscript{7,8}

Other studies have focused on identifying high-risk populations that may benefit from targeted screening practices. In Scotland, Mackie et al followed 85 patients after the diagnosis of three or more clinically atypical nevi in the absence of a personal or family history of melanoma. After 583 person-years of follow-up, they found five invasive melanomas, compared with an expected number of invasive melanomas of 0.054 (RR 92, 95% CI:30-216).\textsuperscript{70} Rigel et al found 18 newly diagnosed melanomas during a 27 month follow-up of 452 patients with dysplastic nevi.\textsuperscript{6} Kang et al concluded that careful monitoring of patients with atypical nevi yielded thin, early melanomas.\textsuperscript{2} Similarly, Marghoob followed patients with classic atypical moles and found five melanomas, all less than 0.80mm.\textsuperscript{7} In a case-control study, Tucker et al noted that family members of unselected persons with dysplastic nevi are more likely to have dysplastic nevi (RR 7.2, 95% CI: 2.1-24) and may be at an increased risk for melanoma.\textsuperscript{7}

Asking patients to count moles is one way of identifying patients at high risk of developing melanoma. These counts have been shown to be comparable to a physician's count. One study considering whether an individual patient could assess his or her own risk revealed that when patients considered number of
freckles, number of palpable nevi, and number of nevi greater than 5mm in diameter, specificity ranged from 80% to 95% (using physician exam as the gold standard). Taking this one step further, MacKie has developed a risk factor flow chart, which incorporates four independent risk factors---freckling, more than 20 moles, presence of atypical nevi, and history of episodes of severe sunburn---that is suitable for patients to complete themselves. This flow chart was derived from weightings of independent risk factors found in cases and controls matched for age and sex. One study by Jackson et al of 3,105 patients in 16 randomly selected group practices showed that 8.7% of patient respondents to the MacKie questionnaire were at "high-risk", and agreement existed with the results of the skin examination for the three physically recordable high risk factors--freckles, moles, and atypical nevi. The MacKie risk factor flow chart showed that this combined high-risk group had a median excess risk for melanoma of 60-90 times base risk in men and 40 or more times base risk in women. This method of identifying a high-risk population appears to be feasible and may be an important step in implementing screening of high-risk individuals.

- **SKIN SELF-EXAMINATIONS**

  The patient's ability to perform visual skin examinations is another consideration. Skin self-examination (SSE) can raise awareness and familiarity of one's own moles, but until recently little data existed about the value of this type of activity. One study of 195 patients showed that using a seven-point checklist, most melanomas would be found by the patient, promoting referral to a
dermatologist. The patient checklist had a sensitivity of 71%, specificity of 99%, and positive predictive value of 7% for malignant melanoma diagnosis, using the dermatologist's clinical diagnosis as the "gold standard". Healsmith et al compared the seven-point checklist and the ABCD system and found all melanomas (n=65) to have at least one of the three major criteria of the seven-point list. Gruber et al studied the ability of dermatology patients without melanoma to accurately record factors associated with an increased risk for melanoma (the number of freckles on the right forearm, the number of palpable arm nevi, and nevi greater than 5mm in diameter on the entire body). These persons were first asked to examine their own skin and were subsequently examined by a physician. Using physician examination as the standard, they found that specificity ranged from 83% to more than 95% for these three cutaneous markers.

Berwick et al performed a population-based case-control in Connecticut, showing that only 15% of patients performed skin self-examinations. However, the performance of SSE was associated with a reduced risk of advanced disease (unadjusted RR 0.58; 95% CI: 0.31-1.11). Koh et al have reported that only one in five patients with melanoma practiced self-screening prior to diagnosis. One study documented that only 6% of patients followed recommendations for self-examination.

Benefits of self-screening include ease and patient comfort, time efficiency, and inexpensive nature of the practice. Limitations include the need to train both primary care providers and patients to enable them to effectively
examine their skin for suspicious lesions. This would take a massive public health effort that may be costly. In light of the low performances of patients who have been advised by their physicians to perform SSE, the massive effort to teach the public may not be cost-effective.

**THE BALANCE BETWEEN BENEFITS AND HARMS OF SCREENING FOR SKIN CANCER.**

The main benefit from aggressive screening strategies is that they may improve prognosis for individuals whose disease is detected by screening. On a population level, this may translate to decreased mortality from skin cancer. In addition, because thinner, less advanced lesions will be detected more frequently, less radical treatments may be utilized to cure some cases, which would lower treatment costs on a population level. Further, screening may provide reassurance for individuals with negative results.

On the other hand, although prevention strategies are aimed to benefit people, they can lead to harms that may outweigh potential benefit. Firstly, because there may be lead-time in diagnosis from screening, patients whose prognosis is unaltered may experience an unnecessarily longer period of morbidity. Further, there is potential for over-diagnosis, which may lead to the over-treatment of borderline abnormalities. In addition, screening may provide false reassurance for those with false-negative tests or unnecessary surgery for those with false-positive results, initiating a complex series of diagnostic tests. Histopathological diagnosis has shown to be invalid in several studies, lending
investigators to conclude that there is no gold standard for diagnosis.\textsuperscript{79} Without a valid and reliable gold standard, it is not possible to evaluate a screening test and there is a strong likelihood for causing harm through misdiagnosis. If a malignant nevus is misdiagnosed as being benign, the diagnostic process of excisional biopsy may or may not cure it. If a benign nevus is misdiagnosed as malignant, that patient will unnecessarily undergo routine skin examinations for the rest of his or her life and may be unable to obtain health or life insurance in the future. That patient's family members also may undergo skin cancer screening for an indefinite period of time.\textsuperscript{79} Although no serious adverse effects have been reported, there is potential for wound infection and scarring from the diagnostic test. Finally, screening strategies may bear a high economic burden, stemming from administration, diagnosing, and over-treatment. There may be limitations in adequate facilities for diagnosis and treatment of detected cancers.

- **COST EFFECTIVENESS STUDIES**

  Freedberg et al published a cost-effectiveness analysis for screening high-risk patients in a clinic setting for malignant melanoma in the Journal of the American Academy of Dermatology in 1999.\textsuperscript{78} They developed a decision analysis cost-effectiveness model to project the impact of large-scale (one time) skin cancer screening in high-risk patients in the United States. Results showed that the cost-effectiveness ratio for the screening program is $29,170 per year of life saved compared with no screening. This translated to $30,360 per QALY saved.\textsuperscript{78}
In a sensitivity analysis, Freedberg et al. discovered that as long as the prevalence in the screened population was above 9 per 10,000, the cost-effectiveness ratio remained below $50,000 per year of life saved. The cost-effectiveness in men 50 and over (prevalence 25 per 10,000) was $15,580 per ear of life saved, compared with women younger than 50 years (prevalence 8 per 10,000) with a ratio of $51,320 per year of life saved. The results of the model were highly dependent on the cost of screening, which was estimated to be $30 per screen (not counting the cost of biopsy, follow-up visit, pathology, or treatment). As long as the true screening cost is below $57, the cost-effectiveness ratio fell below $50,000 per year of life saved.

According to this study, skin cancer screening appears to be likely to increase both life expectancy and quality-adjusted life expectancy. For every 1 million persons screened, the authors project an increase of 1200 years of life saved, with total expenditures, including screening and treatment, of $826 million. This translates to a cost-effectiveness ratio of $29,170 per year of life saved compared with the unscreened group. A rough ranking suggests that a one-time skin cancer screening of high risk individuals is generally comparable in cost-effectiveness to other cancer screening programs (i.e., every 3rd year pap=$46,410/YLS, annual mammogram age 55-65 =$32,130/YLS).

In the only other published cost-effectiveness study of melanoma screening Girgis et al. found that screening of Australians age 50 years and older by family practice doctors had a cost-effectiveness of Aust. $6,900 for men and Aust. $11,100 for women if done once every 5 years. It was less cost-effective if
done more frequently. These results translated to US $12,137 per life saved if screening was implemented by family practitioners for men over the age of 50 years.78·7

There are several limitations to this study. First, the authors assume that screening itself is effective, which has not yet been proven. The survival benefit from screening in this model is projected from thickness and stage distribution from available screening and population-based data and not from randomized trials. Lead-time and length bias may be involved in any apparent survival advantage seen with thinner melanoma lesions. Better data on the incidence rates and growth rates of melanoma would ideally be incorporated into these models as they become available. Finally, this model addresses the impact of screening by dermatologists rather than primary care physicians, and therefore may not be generalizable.
V. SKIN CANCER PREVENTION AND THE PRIMARY CARE PHYSICIAN

Primary Care Physicians are in an ideal position to implement skin cancer prevention counseling and early detection in their practices. Approximately 79% of persons in the US visit their primary care doctor at least once a year, and routine examinations are among the 10 most common reasons for patient visits. Further, in a study of patients diagnosed with malignant melanoma, 87% stated that they had regular physicians, 63% had seen those physicians in the year prior to diagnosis, but only 24% had regular dermatologists.

In this section, I will briefly review the literature showing that primary care physicians are not screening and counseling patients about skin cancer, describe two primary barriers to skin cancer prevention practices, and discuss ways to overcome these obstacles.

- **Primary care providers are not screening and counseling patients about skin cancer**

  Despite the potential for effectiveness, multiple studies show that skin cancer control practices are performed less frequently than other preventive practices. Oliveria et al published a descriptive study analyzing 1-page summaries by physicians on 784 primary care visits, revealing that skin examinations were recorded in only 15.8% of all outpatient visits by whites or non-hispanics to family practitioners or internists. The frequencies for other cancer screening were 30.3% for breast examination, 27.6% for pelvic
examination, and 27.6% for rectal examination. Skin cancer prevention education and counseling was reported at 2.3% of visits versus 13.0% for breast self-examination, 25.3% for diet and nutrition, 5.7% for tobacco cessation, and 17.9% for exercise. Federman et al also assessed the frequency of documented skin examinations in the charts of 200 randomly selected patients older than 50 and receiving care in outpatient clinics, reporting that skin examination was performed in 18% of patients without skin-related complaints. The frequency of skin cancer examination was much lower when compared to other cancer screening examinations such as fecal occult blood testing, rectal examination, sigmoidoscopy, prostate examination, mammography, and pap smear.

In another study—a telephone survey conducted in Rhode Island—48% of respondents reported that their general medical physician or nurse practitioner rarely or never examined their skin. Recommendations by a physician to regularly examine skin for signs of skin cancer were reported by 25% of these participants. The American Cancer Society conducted a survey of physicians' attitudes and practices in early cancer detection, revealing that 59% of internists and 62% of family practitioners discussed skin cancer with their patients. Only 27% and 32% of internists and family physicians, respectively, cautioned most patients about skin cancer. In a survey of 216 melanoma patients, Geller et al found that only 20% reported having a physician skin examination in the year prior to their diagnosis (although data on patient recollection of physician skin examinations may be an underestimate). Dolan et al assessed skin cancer control practices of 52 physicians in a university-based general medicine practice and
based on self-report, the results showed that 44% of physicians performed a complete skin examination at the first visit for a new patient 61-100% of the time, while only 15% performed these examinations at follow-up visits. More than half of the physicians reported that they infrequently counseled their patients about skin cancer.

A large study of outpatient physicians examined 703 million office visits and found that skin cancer prevention counseling or education was documented in 12 million visits (1.5%). For patients younger than 20 years, counseling was documented in only 1% of 169 million office visits. For patients who are high-risk—defined as having a current or previous history of nonmelanoma or melanoma skin cancer or actinic keratosis that was identified by the treating physician—35% of 7.9 million patients received documented counseling about skin cancer prevention. In these high-risk patients, dermatologist documented counseling at 41% of visits, compared with 24% for general and family practice and 7.7% for internal medicine. This same study revealed that in high risk patients, skin examinations were documented at 78% of dermatology visits versus 27% of family physician visits and 0% of internal medicine visits. Likely many counseling and screening efforts are not recorded in medical records, thus giving results that are falsely low. Further, it is unclear if the authors identified which providers referred counseling and screening efforts to a dermatologist.

Regarding counseling practices, the largest study of 756(60%) of 1263 eligible pediatricians showed that almost 70% indicated that they recommended
safe sun practices to more than half of their patients and their parents during the summer months. In this study, four variables were independently associated with a practitioner's providing safe sun recommendations to more than 50% of parents and children: 1) private setting and health maintenance organization practitioners as opposed to academic physicians, 2) high ranking of patients' safe sun knowledge, 3) high priorities of both parents and physicians for sun protection counseling and parental knowledge of safe sun practices relative to other recommendations, and 4) pediatrician interest in receiving instructional materials.

In a 1986 survey of pediatricians, Pupo et al found that 62% of pediatricians included sun protection as part of their well-child care. Of these respondents, 66% said patients asked questions related to sun exposure in an average month, and 65% of pediatricians requested further information regarding sun-related issues. Another study in New Jersey found that only 30% of 96 pediatric faculty and residents at 3 pediatric centers warned their patients about sun exposure. A survey of 600 US pediatricians showed that, although most pediatricians believed that they had a professional responsibility to counsel about sun protection and that counseling would be effective in decreasing skin cancer the number of sunburns, 78% believed they had not had adequate training on sun protection counseling in their residency program. Only 13% indicated that they “always” counseled parents and children about sun protection, and 47% “usually” counseled. Comparing 261 primary care providers for children, one study reported that 56.2% of pediatricians often or always counseled on sun protection,
compared to 43.8% of N family practitioners.94

- Why are primary care doctors not counseling and screening for skin cancer?

Barriers to skin cancer prevention practices include conflicting recommendations, lack of physician confidence and inadequate training, time and reimbursement issues, and potential perception of lesser importance compared with other medical issues. I will address the former two barriers and suggest ways to overcome these obstacles.

**Barrier #1: Conflicting Recommendations (See Table 2)**

Regarding primary prevention, the American Cancer Society, the American Academy of Dermatology, the American Medical Association, and an NIH Consensus Panel all recommend patient education concerning sun avoidance and sunscreen use as well as avoiding artificial tanning devices. Further, the American Academy of Family Physicians recommends protection from ultraviolet light for all persons with increased exposure to sunlight.5

The U.S. Preventive Services Task Force states that there is insufficient evidence to recommend for or against counseling patients to perform periodic self-examination of the skin, and adds that “clinicians may wish to educate patients with established risk factors (i.e., patients with atypical moles, certain congenital moles, large numbers of common moles, immunosuppression, a family or personal history of skin cancer, substantial cumulative lifetime sun exposure,
intermittent intense sun exposure or severe sunburns in childhood, freckles, poor
tanning ability, and light skin, hair, and eye color) for skin cancer concerning
signs and symptoms suggesting cutaneous malignancy and the possible benefits of
periodic self-examination". For adults and children at increased risk of skin
cancer, they recommend avoidance of sun exposure during the peak hours of the
day along with the use of protective clothing such as shirts and hats when outdoors. “Counseling such patients to avoid excess sun exposure and use protective clothing is recommended, based on the established efficacy of risk reduction from sun avoidance, the potential for large health benefits, low cost, and low risk of adverse effects from such counseling, even though the effectiveness of such counseling is less well established.” They also conclude that there is insufficient evidence to recommend for or against counseling patients to use sunscreen.

Recommendations concerning skin cancer screening are even more varied. The U.S. Preventive Services Task Force concluded in their most recent publication on the subject that the evidence is insufficient to recommend for or against routine screening for skin cancer using a total-body skin examination for the early detection of skin cancer. The National Cancer Institute recommends skin cancer examinations in routine care without specific screening exams. The American Cancer Society suggests screening every 3 years in patients between the ages of 20 and 39 years and annually thereafter. The American Academy of Dermatology recommends annual screening for all adults. The American College of Preventive Medicine recommends total-body skin examination in high-risk
individuals, including those with a family or personal history of skin cancer, predisposing phenotypic characteristics, and increased occupational or recreational exposure to sunlight, or clinical evidence of precursor lesions, but does not recommend routine screening. The American College of Obstetricians and Gynecologists recommends yearly, or as appropriate, skin examination of persons over the age of 12 based on risk factors of increased recreational or occupational exposure to sunlight, family or personal history of skin cancer, or clinical evidence of precursor lesions. The Canadian Task Force on Preventive Health Care concluded that the evidence was insufficient to recommend for or against skin cancer screening for the general population, but suggests that regular total-body skin examination be performed for a subgroup of very high-risk individuals.96,97,5

An interesting finding in a large study of 1363 Family Physicians and Internists (with a 30% response rate) was that the responding primary care physicians considered skin examination less important and less often performed than the digital rectal examination, which has also been subject to conflicting recommendations.112 Another study of 465 primary care providers in Florida found that despite low reported rates of skin cancer screening for routine patients (31%) as well as for high risk patients (around half of respondents), only 4% of respondents believed that skin cancer screening did not alter outcome.98 Further, only 18% of respondents were aware of any recommendations by any policy groups regarding skin cancer screening, and the authors conclude that “it appears that the majority of our physician population were unaware of any controversy
These studies suggest that the lack of strong evidence and consistent recommendations may not be the primary barriers to skin cancer prevention practices in the primary care setting.

The inconsistent recommendations for both physician counseling and screening stem from the fact that there are no randomized controlled trials or good case-control studies that directly examine whether these prevention practices improve clinical outcomes such as reduced morbidity or mortality from skin cancer. Because of the 20-30 year latency period and relatively rare incidence of melanoma in the general population along with low mortality from nonmelanomous skin cancers, we must currently rely on indirect evidence to assess these practices.

**Overcoming barriers: Lack of evidence and inconsistent recommendations**

The inconsistent recommendations reflect both optimism and uncertainty about the public health utility of skin cancer prevention practices in the primary care setting. Future studies are most certainly needed to guide physician practices. Elwood published a recent review examining the options for conduction a randomized trial of screening in detail. He calculated that to have a 90% chance of detecting a 1/3 reduction in mortality for melanoma, a trial of screening with total-body skin examination in the general population aged 45-69 would require 400,000 participants in each group (i.e., about 21,000 people would need to be screened to prevent one death). If the study were to focus on high risk patients
identified through a risk assessment questionnaire, he assumed that 7% of the population would be classified as high-risk, 35% of all melanomas occur in this high-risk group, 60% of patients complete the questionnaire, and 80% of the high risk patients would comply with total-body skin examination. Using these criteria, he found that to have a 90% chance of detecting a 1/3 reduction in mortality, 6 million questionnaires would need to be administered to enroll 100,000 high risk subjects in each group. Thankfully, a trial involving 600,000 participants has begun in Australia and is expected to be completed in 2010. Efforts in physician counseling are particularly difficult to evaluate, since they are usually not done in isolation from larger public health interventions. However, a randomized controlled trial assessing whether physician counseling of high-risk patients impacts morbidity and mortality from skin cancer is also warranted (but may not be feasible).

Until the evidence clarifies effective recommendations, efforts in prevention of skin cancer morbidity and mortality will remain anchored in the implicit potential of primary prevention and early detection. During this period of uncertainty, we must use the available evidence to target prevention practices to those who may benefit the most—persons at high risk for skin cancer. Unfortunately, the desirable markers—those with high attributable risk percentages—are not clearly defined in the literature. Again, the risk factors for skin cancer include: clinical evidence of melanocytic precursor or marker lesions (i.e., atypical moles, certain congenital moles) (relative risk [RR] 7-70), a large number of common moles (RR 1-64), immunosuppression, a family or personal
history of skin cancer (RR 2-8), substantial cumulative lifetime sun exposure (RR 3-5), intermittent intense sun exposure or severe sunburns in childhood, freckles, poor tanning ability (RR 2-3), and light skin, hair, and eye color.\textsuperscript{5,7} These risk factors all have associated estimates with relatively wide confidence intervals, which makes it difficult to determine the best markers for persons at risk. Thus, the definition of “high risk” varies between studies, and the exact percent of the general population who is high risk is not clearly defined.

As discussed in section III of this paper, several methods have been developed to help physicians identify high-risk patients, including asking patients to report a personal or family history of skin cancer or dysplastic nevi, to count moles, and/or to complete a questionnaire that assesses four independent risk factors. The risk assessment tool that has been best studied is the MacKie risk factor flow chart, which was validated with agreement between patient response and the results of a physician skin examination for three physically recordable high risk factors: freckles, moles, and atypical nevi.\textsuperscript{75} This study showed that the high risk group identified by the MacKie risk factor flow chart had a median excess risk for melanoma of 60-90 times base risk in men and >40 times base risk in women.\textsuperscript{75} Use of this or similar risk assessment tools may be a feasible and important step in implementing prevention efforts in the primary care setting.
Barrier #2: Lack of physician confidence and inadequate training

A major barrier to skin cancer prevention efforts in the primary care setting cited in the literature is a lack of physician confidence and skill in this area. (See Table 3) Multiple studies show that primary care physicians are less skilled than dermatologists at recognizing skin lesions. Cassileth et al showed that only 12% of 105 nondermatologists could correctly identify at least five of six melanomas, as compared with 69% of 48 dermatologists. In another study, 89% of 285 second-year medical students were capable of identifying a clinical photograph of a melanoma; however, only one fourth-year student detected a melanoma on a standardized patient. A study performed in the Irish Health System comparing dermatologists and family practitioners diagnoses of 493 patients with suspected skin malignancy revealed that the diagnoses of family practitioners agreed with the diagnoses of the dermatologists in 54% of the cases. Of the 38 histologically proven skin malignancies, the referring family practitioner accurately diagnosed 22% of patients versus 87% for dermatologists. Wagner et al performed a study involving the recognition of 21 color transparencies of benign and malignant skin disease. Non dermatologists made accurate diagnoses in 35.93% of the cases versus 51.5% for dermatologists. Ramsay and Fox performed a similar study involving recognition of color slides in which 54% of nondermatologists made the correct diagnosis versus 96% for dermatologists. In the Kirshner et al study of the prevalence and barriers of skin cancer screening in primary care providers in Florida, more than 50% of their respondents lacked confidence in their ability to
recognize melanoma. Further, less than 30% of respondents reported that skin cancer screening was emphasized during their training.98

Overcoming Barriers: Teaching physicians through continuing medical education (CME) methods (See Table 4)

Several studies have examined whether educational interventions improve primary care providers’ attitudes, skills, and self-reported behavior toward preventing skin cancer. (See Table 4) Dolan et al performed a randomized controlled trial that analyzed the effects of a brief educational curriculum consisting of two 1-hour seminars on beliefs, knowledge, and behaviors related to skin cancer control among 76 internal medicine house staff and attending physicians. There were non-significant improvements in the intervention group’s attitudes about adequacy of skin cancer identification and triage training and in their risk factor identification scores. However, there was a significant change in the mean proportion of high risk patients per physician stating that they were advised to watch their moles, increasing more in the intervention group compared with control physicians.103

In another study, Girgis et al examined the effect of a more vigorous intervention consisting of 3 sessions incorporating epidemiology, diagnosis, management, and clinical and surgical skills given to 41 family practitioners in Australia. They reported significant improvements in physicians’ levels of confidence and knowledge in skin cancer control as well as in their diagnosis and management of skin cancer. As for behavior change, there was a significant
increase only in the number of pathology request forms on which a diagnosis of the specimen was attempted in the intervention group versus control group. Gerbert et al examined whether a brief, multi-component intervention involving face-to-face teaching in both interactive and didactic fashions could improve the skin cancer diagnosis and evaluation planning performance of primary care residents to a level equivalent to that of dermatologists. This was a small randomized controlled trial with pretest and posttest measurements, in which investigators compared the abilities of a control and an intervention group of 52 primary care residents and a group of 13 dermatologists to diagnose and make evaluation plans for six categories of skin lesions including the three types of skin cancer. At post test, both the intervention and control group demonstrated improved performance, with the intervention group revealing significantly larger gains. The intervention group showed greater improvement than the control group across all six diagnostic categories and in evaluation planning for malignant melanoma and squamous cell carcinoma. The intervention group performed as well as the dermatologists on five of the six skin cancer diagnosis and evaluation planning scores with the exception of the diagnosis of basal cell carcinoma. The authors conclude that primary care residents can diagnose and make evaluation plans for skin cancer lesions at a level equivalent to dermatologists if they receive targeted and relevant education.

A more recent study performed at Brown University evaluated the effects of a 2-hour curriculum designed to augment provider skin cancer control practices through instruction in basic skin cancer triage (BSCT) and a brief summary of
skin cancer epidemiology, prevention, and counseling on 28 primary care providers. Following participation in the curriculum, provider attitudes toward the total body skin examination significantly improved but attitudes toward skin cancer prevention counseling did not change. Significant increases were also seen in provider self-reported skin cancer control practices during an initial visit with a new patients (2.17 to 3.21, p<.0001) and a routine visit with a patient at high risk for melanoma (2.15 to 3.0, p<.0001). The self-reported increase in providers’ changes in practice patterns was confirmed by patient exit interviews. The main limitations of this study are its small size and nonrandomized design.

Finally, Harris et al performed two studies examining the effects of a brief internet-based education program on physicians’ abilities to manage pigmented skin lesions. The first study involved 17 volunteer medical students, house officers and faculty members on a general medicine service of an academic medical center in Arizona. The 1-hour computer-based education program had a positive effect on the subjects’ overall skin cancer knowledge and had significantly positive effects on their confidence and ability to apply management guidelines for pigmented skin lesions. Following this small, nonrandomized study, Harris et al refined the program and made it available to physicians via the internet. They examined whether this approach to continuing medical education (CME) increased physicians’ confidence in managing pigmented skin lesions, increased knowledge, and improved physicians’ decision making skills. In this study, 354 physicians completed the online program as well as a pretest and identical posttest. Use of the CME was associated with significant improvements
in physician confidence, correct answers to a 10-question knowledge test, and
correct answers to a 15-question clinical skills test. Although this study is also
limited by a lack of control group, the authors conclude that their findings
demonstrate that CME can be effectively and efficiently distributed via the
internet, and that an online program can improve physician confidence and
knowledge and possible improve skills in managing skin cancer. "This type of
program could be beneficial because lack of confidence in identifying suspect
lesions is a major barrier to primary care physicians performing skin cancer
screening," the authors stated.108

North Carolina physicians have expressed interest in learning about
Committee on Cancer Coordination and Control contracted the Department of
Public Health Sciences, Wake Forest University School of Medicine to conduct a
survey among primary care physicians in NC to assess their perceived need for
cancer care and treatment continuing medical education. Interest in participating
in cancer-related CME topics was high, with 58% being 'very interested' in
general screening and 53% 'very interested' in techniques to identify high risk
patients for prevention efforts. Skin cancer was among the cancer-related topics
of which primary care physicians expressed high interest. The preferred method
of accessing a cancer-related CME was by in-person lecture (63%). AHEC
sponsorship was viewed as the most favorable mode.109
VI. PROPOSAL

I propose the implementation of a brief continuing medical education (CME) curriculum for North Carolina primary care physicians. The curriculum (see Appendix A) will present the burden of disease from skin cancer and the goals of primary and secondary prevention. It will review early detection, screening, and decision making criteria with a goal of improving diagnostic and triage skills. The Basic Skin Cancer Triage Algorithm (from Weinstock et al 1996)\(^{110}\), will be presented to aid physicians in decision making. It will also present counseling recommendations. In light of limited evidence for the effectiveness of primary and secondary prevention aimed at the general population, the CME will present strategies of targeting patients at high risk for developing skin cancer. The MacKie questionnaire (from Jackson et al 1998)\(^{72}\) will be presented as a potential risk assessment tool. Implementing a curriculum of this nature will meet the goals of both the “ultraviolet radiation prevention subgroup” and the “early detection of malignant melanoma subgroup” of the North Carolina Advisory Board on Cancer Coordination and Control and respond to the feedback from North Carolina physicians requesting more education in skin cancer prevention.

Before implementing the CME, I propose a pilot test of the curriculum in primary care residency programs in North Carolina to evaluate its effectiveness on changing physician attitudes, knowledge, skills, and self-reported behavior. Following IRB approval, an email will be sent to internal medicine and family
medicine residency program directors explaining the CME and study and inviting them to participate. Ideally, at least 10 programs will participate, yielding a sample size of at least 150 residents. The programs that agree to participate will be randomized to intervention or control group using a random number generator. After randomization, the programs will be informed of their intervention or control status and appointments would be scheduled. The control groups will receive a 10-15 minute pretest survey assessing attitudes, skills at diagnosing lesions from colored photographs, decision-making skills, and self-reported behavior regarding skin cancer prevention practices. (see Appendix B and C) They will receive the same survey 2-4 weeks later. The intervention group will receive the pretest survey followed by the 1-hour curriculum supplemented with handouts of the curriculum and a patient education booklet. (see Appendix D). The intervention group will also complete the identical follow-up survey 2-4 weeks after the intervention. Signed consent will be obtained from all participants using an IRB-approved consent letter. (See Appendix E) The intervention will be offered to the programs in the control group after completion of the study.

Initial analysis will be performed on the baseline survey results, which will provide information regarding general attitudes, knowledge, skills, and behavior of primary care residents in North Carolina toward the prevention of skin cancer. To analyze the change in correct multiple choice questions between intervention and control group, the Pearson's chi-squared test will be used. To
analyze the change in likert scales between the intervention and control group, a 2 sided t-test with alpha of 0.05 will be used.

The hypothesis of this proposed study is that a brief educational intervention will improve physician attitudes, knowledge, skills, and self-reported behavior. The study has several limitations. First, both the assessment of skills and the curriculum itself are based on residents’ ability to learn from and recognize skin lesions from color photographs rather than live patients. Further, relying on self-report for assessment of behavior change is subject to reporting bias. If money and time were to permit, it would be ideal to validate the study with patient interviews. Also, the study will only evaluate change over the 2-4 weeks post-intervention, and the results—if positive—may not be sustainable over time. Further, the practices of the study population (residents) do not necessarily represent those of primary care physicians out in practice. Residents, because they are still in training, may be more or less receptive to the curriculum compared with practicing North Carolina physicians. Further, residents are not regularly seeing as many patients on a day-to-day basis as practicing physicians. Thus, the results may not be generalizable. The strengths of the proposed study are in its randomized design and large sample size.
Table 1: Recommendations for sun protection

<table>
<thead>
<tr>
<th>Group</th>
<th>Wear Protective Clothing</th>
<th>Stay in the shade</th>
<th>Avoid peak sun hours</th>
<th>Apply sunscreen (at least SPF 15)</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Academy of Dermatology</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>American Cancer Society</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Skin Cancer Foundation</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>U.S. Preventive Services Task Force</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Insufficient evidence to recommend for or against the use of sunscreen</td>
</tr>
<tr>
<td>American Medical Association</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>American Academy of Family Physicians</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Group</td>
<td>Screening method</td>
<td>Frequency</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>------------------------------------------</td>
<td>------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>American Academy of Dermatology</td>
<td>Self-examinations</td>
<td>Periodically</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Complete skin exam by physician</td>
<td>Annually</td>
<td></td>
<td></td>
</tr>
<tr>
<td>American Cancer Society</td>
<td>Self-examinations</td>
<td>Every month</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Complete skin exam by physician</td>
<td>Age 20 to 39: every 3 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Age over 39: annually</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skin Cancer Foundation</td>
<td>Self-examination</td>
<td>Every three months</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Complete skin exam by physician</td>
<td>Annually</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.S. Preventive Services Task Force</td>
<td>Insufficient evidence to recommend for or against routine skin examinations</td>
<td>n/a</td>
<td></td>
<td></td>
</tr>
<tr>
<td>American Academy of Family Physicians</td>
<td>Self-examination</td>
<td>Every six months</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Complete skin exam by physicians for high risk persons</td>
<td>Periodic</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 3: Comparisons of diagnostic accuracy

<table>
<thead>
<tr>
<th>Study</th>
<th>Subjects</th>
<th>Method</th>
<th>Non-dermatologist Score</th>
<th>Dermatologist Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cassileth et al.(^{83})</td>
<td>105 non-dermatologists and 48 dermatologists</td>
<td>Recognition of lesions on color transparencies</td>
<td>12% identified 5 of 6 melanomas</td>
<td>69% identified 5 of 6 melanomas</td>
</tr>
<tr>
<td>Robinson et al.(^{99})</td>
<td>285 second year medical students and fourth year medical students</td>
<td>Recognition of clinical photographs of melanoma as well as recognition on standardized patient</td>
<td>89% of second year students identified 1 melanoma photograph, &lt;1% (one student) of fourth year medical students detected melanoma on standardized patient</td>
<td></td>
</tr>
<tr>
<td>Morrison et al.(^{100})</td>
<td>Family Practitioners of 493 patients and 2 dermatologists</td>
<td>Clinical recognition of 40 skin cancers</td>
<td>17% of 40 skin cancers identified</td>
<td>87% of 40 skin cancers identified</td>
</tr>
<tr>
<td>Wagner et al.(^{101})</td>
<td>Medical students, residents, and attendings and dermatologists</td>
<td>Recognition of 21 color transparencies of benign and malignant skin disease</td>
<td>35.93% made accurate diagnosis of skin lesions</td>
<td>51.5% made accurate diagnosis of skin lesions</td>
</tr>
<tr>
<td>Ramsay and Fox(^{102})</td>
<td>Primary care physicians and dermatologists</td>
<td>Recognition of 20 color slides of benign and malignant disease</td>
<td>54% made correct diagnosis</td>
<td>96% made correct diagnosis</td>
</tr>
</tbody>
</table>
### Table 4: Education interventions on skin cancer prevention practices for primary care physicians

<table>
<thead>
<tr>
<th>Study</th>
<th>Subjects</th>
<th>Intervention</th>
<th>Results</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dolan et al(^{103})</td>
<td>76 IM residents and attendings</td>
<td>2 1-hour seminars on beliefs, knowledge, behavior</td>
<td>Non-sig. ↑ in attitudes and knowledge</td>
<td>RCT</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sig. ↑ in proportion of pts. / physician told to watch moles</td>
<td></td>
</tr>
<tr>
<td>Girgis et al(^{104})</td>
<td>41 FP’s in Australia</td>
<td>3 sessions on epi, dx, management, clinical &amp; surgical skills</td>
<td>Sig. ↑ in MD levels of confidence, knowledge, and dx. &amp; management skills</td>
<td>RCT</td>
</tr>
<tr>
<td>Gerbert et al(^{105})</td>
<td>52 primary care residence and 13 dermatologists</td>
<td>Face-to-face teaching, both interactive &amp; didactic on dx and management</td>
<td>Sig. ↑ in dx and evaluation planning for MM and SCC</td>
<td>RCT</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Residents = Dermatologists for MM and SCC</td>
<td></td>
</tr>
<tr>
<td>Mikkilineni and Weinstock(^{106})</td>
<td>28 primary care providers</td>
<td>2-hour curriculum, interactive &amp; didactic on epi, dx, triage, and counseling</td>
<td>Sig. ↑ in attitudes, self-report behavior (confirmed w/ pt. interview) for screening No change in attitudes for counseling</td>
<td>No control group</td>
</tr>
<tr>
<td>Harris et al(^{107})</td>
<td>17 medical students, residents, and attendings</td>
<td>1-hour computer based education Program</td>
<td>Sig. ↑ in knowledge, confidence, and management</td>
<td>No control group</td>
</tr>
<tr>
<td>Harris et al(^{108})</td>
<td>354 physicians</td>
<td>~ 1-hour internet based education program</td>
<td>Sig. ↑ in confidence, knowledge, and clinical skills</td>
<td>No control group</td>
</tr>
</tbody>
</table>
References

37. Centers for Disease Control, Healthy People 2010 Website.
94. Dietrich AJ et al. Sun Protection Counseling for Children: Primary Care Practice Patterns and Effect of and Intervention on Clinicians.
109. Survey by the Department of Public Health Sciences, Wake Forest University School of Medicine, as requested by the North Carolina Advisory Committee on Cancer Coordination and Control. 1999.