
ULTRAVIOLET RADIATION EXPOSURE AND ITS IMPACT ON SKIN CANCER RISK

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OBJECTIVES: *To review research and evidence-based resources on skin cancer prevention and early detection and their importance for oncology nurses.*

DATA SOURCES: *Journal articles, federal reports, cancer surveillance data, behavioral surveillance data.*

CONCLUSION: *Most cases of skin cancer are preventable. Survivors of many types of cancer are at increased risk of skin cancers.*

IMPLICATIONS FOR NURSING PRACTICE: *Oncology nurses can play an important role in protecting their patients from future skin cancer morbidity and mortality.*

KEY WORDS: *skin cancer, melanoma, ultraviolet radiation, cancer survivors, skin cancer prevention, cancer prevention.*

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The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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Most skin cancers are preventable, but incidence rates continue to rise, leading the US Surgeon General to deem skin cancer “a major public health problem.”¹ In the United States, nearly 5 million people are treated for skin cancer each year, at a cost of \$8.1 billion.² The three most common types of skin cancer, in order of incidence, are basal cell carcinoma (BCC), squamous cell carcinoma (SCC), and melanoma. Cutaneous BCC alone is thought to be more common than any other cancer and can be disfiguring, but is generally treatable.³ Cutaneous SCC is less common than BCC but, in rare cases, can lead to death.⁴ Melanoma is less common than BCC and SCC, but is the skin cancer responsible for the most deaths, and is also the most common skin cancer for which incidence and mortality data are systematically tracked in the US.¹ According to national cancer incidence data, invasive melanoma is among the 10 most common

invasive cancers for both men and women in the US.⁵ In 2012, the most recent year for which national data are available, 67,753 people in the US were diagnosed with melanomas of the skin, and 9,251 people in the US died from the disease.⁵

Skin cancer incidence has been increasing. The number of persons treated for all skin cancers combined increased by 44% from the period 2002–2006 to 2007–2011.² The incidence of melanoma has been increasing for several decades, with rates doubling between 1982 and 2011.^{6,7} Mortality rates have remained relatively stable, although rates have risen slowly among males.⁶

Overall, skin cancers are most common among sun-sensitive populations, especially non-Hispanic whites, who have approximately 25 times the incidence rate of melanoma compared with blacks and approximately six times the rate among Hispanics.¹ Incidence rates are most common overall among males, although among those younger than age 50, rates are higher among females than males.¹ Mortality rates are also higher among males and increase with age, similar to incidence rates. Although whites have the highest incidence and mortality rates, black and Hispanic populations are often diagnosed at later stages and have poorer survival outcomes.⁸

Skin cancer reporting poses challenges to our understanding of the disease. BCC and SCC are not captured in central cancer registries.⁹ Melanomas are required by law to be reported to central registries in all states. However, melanomas diagnosed at in situ or early invasive stages are often diagnosed and treated in outpatient settings and thus are prone to underreporting or delayed reporting.¹⁰

RISK FACTORS FOR SKIN CANCER

Most skin cancers are caused by a combination of both non-modifiable (eg, genetic) and modifiable (eg, environmental) risk factors. The most common modifiable risk factor for skin cancer is exposure to ultraviolet radiation (UV). [Table 1](#) provides estimates of relative risk for modifiable and non-modifiable skin cancer risk factors that have been reported in different epidemiologic studies.

Genetic Risk Factors

Genetic factors strongly influence the risk of skin cancer. The following individual characteristics increase the risk of skin cancer: having a naturally fair skin tone, light colored eyes, blonde or red

hair, dysplastic nevi or many common moles, and skin that burns, freckles, reddens, or becomes painful after too much time in the sun.¹¹ Having a previous diagnosis or family history of skin cancer, especially melanoma, also increases risk.^{12,13} Less obvious genetic factors, such as gene variants or mutations, may also play a role in some melanomas among those without the traditional risk factors of fair skin and hair, and rarely, genetic syndromes such as Familial Atypical Mole Melanoma Syndrome and xeroderma pigmentosum are responsible for the development of melanoma.¹⁴⁻¹⁶

Melanocytes, cells found in the basal layer of skin that give skin and eyes their color, are genetically programmed to produce a specific amount of melanin. The amount of melanin or degree of pigmentation is inversely correlated with sun sensitivity and skin cancer risk.¹⁷ Melanin absorbs and scatters energy from UV light, protecting the epidermal cells from damage. The Fitzpatrick skin phototyping system provides a numerical classification based on the reaction of unexposed skin to UVA (tanning) and UVB (burning) radiation exposure. For example, Fitzpatrick Type I phototype is defined as very fair skin that burns easily and never tans; Type III is skin that burns and tans moderately; and Type VI skin never burns, tans profusely, and is naturally dark brown.¹⁸

In addition to skin tone, melanoma risk is associated with total nevi count. Melanomas often develop from nevi, and nevi indicate both genetic propensity to develop melanoma and UV exposure.¹⁹ Skin tone and nevi count are also somewhat associated; studies show that children with light skin, pale eyes, freckles, and a tendency to sunburn have a significantly higher nevi count.²⁰ In addition, patterns of nevi differ by skin type, both by site on the body and by cell type.²¹

Melanoma incidence and mortality rates are highest among non-Hispanic whites because of their typically lighter skin tone. However, black and Hispanic patients tend to be diagnosed with melanoma at later stages and subsequently have poorer survival outcomes.^{8,22} Differences in prognosis and survival rates may also be related to socioeconomic factors, which may include insurance or transportation disparities that delay diagnosis and treatment.²³⁻²⁵ Aeral lentiginous melanoma (ALM) is a rare subtype of melanoma that is not thought to be UV-related because of its occurrence on the palms of the hands and soles of the feet. Blacks and non-Hispanic whites have similar rates of ALM, with slightly higher rates among Hispanics and lower among Asian/Pacific Islanders.²⁶ However, the lower

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