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Review

Art of prevention: The importance of melanoma surveillance

Lindsey Goddard, MD^{a,*}, Lauren Yorozya, MMS^b, Jane Hirokane, MD^c

^a Micrographic Surgery and Cutaneous Oncology, Scripps Health, San Diego, CA, United States

^b Loma Linda University School of Medicine, Loma Linda, CA, United States

^c Department of Dermatology, Loma Linda Veteran Affairs, Loma Linda, CA, United States



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Skin cancer is the most common type of cancer in the United States ([American Cancer Society, 2019](#)). Of these skin cancers, melanoma is the third most common after basal cell carcinoma and squamous cell carcinoma ([American Cancer Society, 2019](#)). Although cutaneous melanoma represents only 1% of skin cancer cases, it causes the vast majority of skin cancer-related deaths. In 2019, cutaneous melanoma was predicted to claim 7230 lives in the United States alone ([American Cancer Society, 2019](#)). Additionally, the incidence of melanoma is increasing faster than any other solid tumor ([Holmes, 2014](#)). Controversy exists as to whether this increased incidence is the result of increased surveillance and biopsy or a true epidemiologic phenomenon; however, melanoma

remains the fifth leading cause of new cancer diagnoses in the United States ([American Cancer Society, 2019](#)).

Genetic risk factors for melanoma include skin type (with an increased risk in fairer skin types), numerous melanocytic nevi (especially dysplastic nevi), a family history of melanoma, and certain genetic mutations or syndromes ([Miller and Mihm, 2006](#)). Modifiable risk factors are primarily natural and artificial ultraviolet (UV) exposure, including a history of indoor tanning ([Boniol et al., 2012](#)). Although the incidence of cutaneous melanoma is disproportionately in non-Hispanic white patients, increased mortality is associated with melanoma in patients of color, thought to be secondary to a lack of early intervention due to a perceived lower risk among both providers and patients ([Dawes et al., 2016](#)).

* Corresponding author.

E-mail address: goddard.lindsey@scrippshealth.org (L. Goddard).

Practical intervention: Sun protection and surveillance

Primary prevention: Protection

As UV exposure is the main modifiable risk factor for melanoma, the most important aspect of primary prevention of melanoma is limiting it through avoidance and protection. Avoidance can be accomplished by decreasing total duration of sun exposure and avoiding peak sun hours (10:00–16:00; [U.S. Environmental Protection Agency, 2004](#)). Although the intensity of UV exposure depends on geography, altitude, and time, general UV protective measures can be implemented by wearing sun-protective clothing, broad-brimmed hats, and sunglasses. Another critical aspect of primary prevention is the use of sunscreen agents.

Sun protective factor (SPF) is a measure of a sunscreen's ability to block UV-B radiation, which is traditionally associated with sunburns and skin cancers. However, recent evidence shows that UV-A rays, formerly associated with aging, also cause indirect DNA damage and may have a relationship with melanoma ([Kamenisch et al., 2016](#); [Khan et al., 2018](#)). With this and other advances in knowledge, the U.S. Food and Drug Administration as of this year has set forth new requirements for over-the-counter sunscreens. All sunscreens rated SPF 15 or higher are required to be “broad spectrum” and thus prevent UV-A exposure in addition to UV-B. Additionally, the regulations increase the maximum labeled SPF value to 60+ and examine the safety of active ingredients in sunscreen, among other initiatives ([U.S. Food and Drug Administration, 2019](#)).

Randomized controlled trials on the safety and efficacy of sunscreen for the prevention of cutaneous cancers are difficult because people who are more likely to use sunscreens are also more likely to have sun exposure. Prior meta-analyses have found null or even a positive association of sunscreen use and cutaneous melanoma risk ([Rueegg et al., 2019](#)). An increasing body of evidence supports the use of sunscreen as a form of secondary prevention. SPF is a significant factor when determining which sunscreen to use for the prevention of skin cancer. Higher SPF numbers are more protective (up to a point), with one study finding decreased melanoma rates with the use of sunscreen with an SPF higher than 15 (hazard ratio: 0.67; 95% confidence interval [CI], 0.3–0.83; [Chiasvand et al., 2016](#)).

Several other studies in Australia point to the benefit of sunscreen use for the prevention of cutaneous melanoma. A randomized controlled trial from researchers at the University of Queensland showed a significant decrease in invasive melanoma for people who used sunscreen daily (hazard ratio: 0.27; 95% CI, 0.08–0.97; [Green et al., 2011](#)). Another case-control study found that the risk of melanoma was less with higher use of sunscreen in childhood (odds ratio for highest vs. lowest tertiles: 0.60; 95% CI, 0.42–0.87; $P = .02$ for trend; [Watts et al., 2018](#)). What we can gather from these data is that sunscreen use is multifactorial, and patients should be educated on the proper use of sunscreen to include use of an SPF of at least 15 and reapplication once within 1 hour of application ([Petersen and Wulf, 2014](#)). Because most patients do not apply sunscreen in accordance with recommendations, supplementary prevention via UV-protective clothing may be beneficial to recommend ([Olsen et al., 2018](#); [Vasicek et al., 2018](#)).

Additionally, a recent factor in the prevention of melanoma and other skin cancers is increasing knowledge of the dangers associated with indoor tanning use (especially during teenage years) and thus the avoidance of this exposure when it comes to melanoma prevention. A 2012 meta-analysis of incidences of cutaneous melanoma attributable to sunbed use in Europe concluded that a first time exposure for adults age <35 years was associated with

a relative risk of 1.59 (95% CI, 1.36–1.85; [Bonniol et al., 2012](#)). Recognition of the dangers and regulation of indoor tanning began in the late 2000s, when in 2009 the use of indoor tanning was classified as a known carcinogen by the World Health Organization ([Ghissassi et al., 2009](#)). Such awareness may be responsible for trends in tanning bed use, and indoor tanning declined in popularity among U.S. high school students from 2009 to 2015 ([Guy et al., 2017](#)).

A collective public trend toward sun safety and skin cancer can be seen in the U.S. Surgeon General's Call to Action to Prevent Skin Cancer in 2014 ([U.S. Department of Health and Human Services, 2014](#)), which focused on five main calls to action:

- Increase sun protection outdoors
- Educate the public about UV exposure
- Promote skin cancer prevention policies
- Decrease indoor tanning harms
- Strengthen research, surveillance, monitoring, and evaluation related to skin cancer prevention

Secondary prevention: Surveillance

Appropriate recommendations for skin cancer screenings are the subject of controversy. In 2016, the U.S. Preventive Services Task Force reaffirmed its position that there is insufficient evidence to support public screening programs for the prevention of cutaneous malignancies, including melanoma ([U.S. Preventive Services Task Force, 2016](#)). A 2019 Cochrane review on individual and physician screenings for cutaneous melanoma concluded that general adult population screening is “not supported or refuted” by well-conducted randomized controlled trials to the extent that screening programs can be implemented ([Johansson et al., 2019](#)).

Critique of these positions commented that this blanket assessment does not take into account populations with an increased risk of cutaneous melanoma. Drs. Mariah Johnson and Sancy Leachman from the University of Oregon have attempted to create evidence-based guidelines for groups who would most benefit from regular screenings ([Johnson et al., 2017](#)). The outlined criteria include a personal or family history of melanoma, fair skin type with multiple and/or atypical nevi, and a history of UV radiation overexpo-



Fig. 1. A pigmented lesion (later biopsy-proven to be cutaneous melanoma) demonstrating several visual features of the “ABCDE” mnemonic: asymmetry, border irregularity, and color variation.

sure as evidenced by burning or peeling sunburns or indoor tanning bed use (Johnson et al., 2017).

With such patients who have an increased risk for melanoma, secondary prevention occurs through increased self and physician surveillance and screenings. Secondary prevention is of particular importance in melanoma because the key to increased survival in melanoma is early detection. A study of a specialized high-risk clinic in Sydney, Australia showed that melanomas were caught earlier with specialized surveillance versus standard care (Watts et al., 2017). In a statement issued by the American Academy of Dermatology in response to the U.S. Preventive Services Task Force's verdict, the academy encouraged self-advocacy through self-examinations and regular skin cancer screenings for at-risk patients (Torres, 2016). Self-skin examinations have been found to be associated with thinner tumor at diagnosis in men >60 years of age (odds ratio: 2.66; 95% CI, 1.48–4.80; Swetter et al., 2012).

Additionally, in-office examinations with specialists provide the opportunity to use skin surface microscopy, such as dermoscopy, to assist in diagnostic accuracy of melanocytic lesions (Holmes, 2014). Studies have shown that dermoscopy improves diagnostic accuracy for melanoma. A 2019 Cochrane review of the accuracy of dermoscopy versus visual inspection for the diagnosis of cutaneous melanoma found that dermoscopy increased the sensitivity of diagnosis, with in-person dermoscopy having higher accuracy than image-based evaluations (Dinnes et al., 2018).

Patients of color have a much lower incidence of cutaneous melanoma but, when diagnosed, have advanced tumor stage and higher mortality (Byrd et al., 2004). Cutaneous melanoma on non-sun-exposed surfaces appears more commonly in African American patients. These data suggest that specific population-based education and intervention may be an appropriate primary measure of prevention, with self-examinations as a secondary prevention method. Dermatologists of color have used social media platforms, such as Instagram, to draw attention to population-based issues and increase awareness (author observation).

The most common and readily utilized system of diagnosis is the ABCDE's of melanoma (Fig. 1):

- Asymmetry of a lesion
- Border irregularity
- Color variation
- Diameter (greater than 6 mm = pencil eraser)
- Evolution of a lesion (or any changes to a mole; Rigel et al., 2005).

Conclusions

Despite advances in awareness and perception, melanoma remains a public health risk, with incidence increasing every year. UV light exposure is a well-established risk factor for cutaneous melanoma and should be decreased with sun avoidance, UV-protective clothing, and sunscreen. Patients with risk factors for melanoma, such as fair skin type, personal or family history of skin cancer, history of blistering sunburns, or abundant nevi, should be screened at least annually.

Regardless of the individual risk factors, all patients should be informed of how melanoma affects their communities, perform occasional skin examinations, and bring lesions of concern to the attention of their dermatologist for further evaluation. Patients of color should be educated on their risk for melanoma as well as potential unique presentations, such as acral or mucosal variants.

Conflict of interest

None.

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Study Approval

The author(s) confirm that any aspect of the work covered in this manuscript that has involved human patients has been conducted with the ethical approval of all relevant bodies.

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