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Cost-effective Melanoma Screening

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Despite recent advances in immunotherapy and molecularly targeted therapies for advanced melanoma, early detection remains the most effective means of preventing death from melanoma. In 2015, an estimated 73 000 new cases of invasive melanoma will be diagnosed in the United States, and approximately 9900 people will die of the disease.¹ To date, early-detection efforts for melanoma in the United States have relied on self-detection and opportunistic screening. The recent experience in Germany suggests a role for organized population-based screening to reduce melanoma mortality. The Skin Cancer Research to Provide Evidence for Effectiveness of Screening program in Schleswig-Holstein, Germany, was associated with a 40% decrease in melanoma mortality.^{2,3} In comparison, mortality in nearby Denmark and the rest of Germany changed very little during the same period (2000–2009). If reduction in melanoma mortality is sustained in the current program for the rest of Germany, then the benefit of organized screening in reducing mortality will have been replicated on a large scale.

The screening effort in Schleswig-Holstein had enormous community outreach and almost universal physician training, with heavy reliance on screening by general practitioners. Although all adult participants in the health care system were eligible for screening, only 19% of individuals 20 years and older among a population of 2.8 million were screened. Two lessons may be derived from this experience. First, physician office–based screening has limited capacity for reaching most of the population. Second, screening a relatively small fraction of the population may have considerable effect on mortality. The latter may be the result of enrichment of the screened population for higher-risk individuals or from increased self-detection associated with a screening program.

The Belgian study by Hoorens et al⁴ tests 2 potential innovations for population-based organized screening for skin cancer. First, they compared a general population–based invitation for screening with a more selective approach based on concerning lesions in 2 communities with equivalent populations. Second, they compared limited skin examinations for concerning lesions to total-body skin examinations. They conducted the screenings in sessions akin to those provided by the American Academy of Dermatology, which were

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restricted to diagnosis of skin cancer without providing therapy or tending to other concerns. Skin cancer detection rates (number of melanoma and nonmelanoma skin cancer cases divided by the number of patients screened) were slightly higher among those with concerning lesions than those presenting for total-body skin examination (3.2 vs 2.3 per 100 participants). However, screening invitations restricted to individuals with concerning lesions attracted a much smaller percentage of the population (3.3% vs 17.9%) and an overall smaller number of skin cancers (8 vs 39). It is interesting that the overall participation rate in the unselected population (17.9%) was similar to the participation rate of 19% in the Schleswig-Holstein study. Of note, among participants presenting with a concerning lesion, total-body skin examination had a significant yield for additional skin cancers.⁴

The German experience and the findings of the Belgian study have significant implications for early-detection efforts for melanoma in the United States and elsewhere. First, identifying and educating higher-risk individuals has the potential to improve self-detection and enrich the yields of opportunistic screening. The Belgian study participants acted on the recommendation to seek screening for one or more of the following criteria: ABCD (asymmetry, border, color and diameter) rule, ugly duckling sign, new lesion for more than 4 weeks, and/or a red, nonhealing lesion. Participants apparently understood the criteria well enough to implement them, checked their skin, and sought care. Engagement of people at increased risk of melanoma may be aided by building social networks among family and friends of the estimated 73 000 people with new invasive melanoma and the additional approximately 76 000 people with melanoma in situ each year in the United States. Dermatologists know the ripple effect of a person newly diagnosed as having melanoma creating demand among friends and relatives to be screened. It is time to make the ripple of enhanced relevance of early detection of melanoma benefit people by providing online tools to help people quantify their risk of developing a melanoma and skin self-examination tools to identify concerning lesions for these motivated learners.^{5,6} In addition, those among the more than 875 000 Americans with a history of melanoma who return for follow-up appointments with their dermatologist could be encouraged to share online skin self-examination tools with their friends and family.⁷ It may be feasible to harness the meaningful use component of the Patient Protection and Affordable Care Act to encourage the use of electronic medical records to provide an effective web-based risk assessment and skills training program for early detection of melanoma to patients with newly diagnosed melanoma with the recommendation that they share the link with family and friends. The focus of these efforts should be to engage people to (1) recognize their risk of having melanoma, (2) perceive the importance of early detection of melanoma to their survival, and (3) appropriately seek medical care for concerning lesions.

Use of US health care resources may also be informed by the Belgian and German experience. Second, the Belgian study emphasizes the importance of doing a total-body skin examination on individuals who present for evaluation of a lesion that, in the assessment of a skilled examiner, is suggestive of skin cancer. Third, the German experience and the Belgian study support the feasibility of organized melanoma screening but also underscore the logistic and financial hurdles to implementation in health care systems like the US system. A major logistic barrier for melanoma screening is access to expert skin cancer diagnosis. The

Belgian study points to an intriguing strategy for achieving screening efficiency by moving the screening process outside usual office-based practice. In the Belgian study, the examiners were dermatologists, but the economics and size of the dermatology workforce make this an impractical approach in the United States, as it was in Germany. Targeted screening could be performed by health care professionals, including physician assistants and nurse practitioners, who will need to be trained to perform skin cancer screening and triage patients to dermatologists. Because the limited supply of primary care physicians in the United States is already overwhelmed with other health care concerns, it is likely that large-scale melanoma screening and triage will be most efficiently accomplished by physician assistants and nurse practitioners under dermatologist supervision. In Schleswig-Holstein, nondermatologist physicians were required to attend an 8-hour training course and complete a performance evaluation.³ In the United States, Eide et al⁸ trained primary care physicians with a 1- to 2-hour interactive web-based course and found appropriate management of benign lesions and use of dermatologist referral. It is important to recognize that training health care professionals to triage lesions into 2 groups (benign with nothing further needed and concerning enough to warrant dermatologic evaluation) is less difficult than training them to accurately diagnose a lesion, which is the level of competency required of dermatologists.

Beyond the logistics of screening is the issue of cost. In 2011, the annual cost of treating newly diagnosed melanoma in the United States was \$457 million, and by 2030 it is expected to increase 252.4% to \$1.6 billion.⁹ In the study by Hoorens et al,⁴ the screening cost per melanoma detected varied from €4631 to €7449. The cost of detecting a melanoma by self-detection of concerning lesions was, not surprisingly, less than by population-based screening. Although this approach yielded 75% fewer melanomas (1 vs 4), it underscores the importance of pairing public education in the signs of skin cancer with easy access to the assessment of concerning lesions. One possible strategy for the latter would be the effective use of teledermatology for the triage of individual concerning lesions.

If population-based screening for melanoma is to be undertaken in the United States, new strategies will be required to make the associated costs sustainable. The strategy of specialized screening centers separated from routine outpatient practice may be associated with cost savings. Although this strategy sacrifices the convenience of immediate biopsy and runs the risk of nonadherence with referral to a dermatologist, the personnel, space, and logistics could all be tailored for maximal cost-efficiency. Regardless of the strategy implemented, dermatologists will be faced with an increased volume of skin cancer screening, diagnosis, and therapy and will play a critical role in the success or failure of the process. To make screening sustainable, dermatologists will need to exercise restraint in performing unnecessary biopsies to assuage patients' anxiety and their own anxiety about the possibility of failing to diagnose a melanoma. Increasing dermatologists' expertise in dermoscopy and short-term digital dermoscopy may improve diagnostic accuracy and reduce biopsy rates. Dermatologists will need to play a critical role in the training, oversight, and support of the nondermatologists employed in the effort. Does the US health care system and dermatology community have the will to provide screening for those at risk, the desire to allocate resources, and the ability to train the workforce?

Resource allocation should ideally depend on evidence that is developed by careful research with randomized clinical trials. Closed health care systems and affordable care organizations offer unique opportunities to test the cost-effectiveness of competing melanoma detection strategies.¹⁰ The research should address the effect of screening on the numbers of biopsies and treatments, patient anxiety, quality of life, and, ultimately, melanoma mortality.

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