also occur in the setting of clonal evolution for tumor cells that have a compensatory amplification of genes downstream from SMO such as Gli.4,5

In individuals with multiple resistant BCCs, the isogenic background of a single individual may facilitate molecular studies of these resistant BCCs because some of the tumors may become resistant through multiple mechanisms. Future efforts to attack or prevent resistance in BCCs may involve the use of more than 1 drug at a time to target multiple pathways that contribute to abnormal basal cell growth.4,5

We were surprised that our case series did not show secondary resistance in the 8 patients with mBCC. It is possible that with longer follow-up times, mBCCs may be observed to acquire resistance while the patient is undergoing vismodegib treatment. In addition, larger sample sizes may be needed to observe this phenomenon: the regrowth rate we observed was only 1 in 5 in patients with laBCC.

Because of the risk of regrowth, frequent skin examinations of patients undergoing treatment with vismodegib are essential to monitor for acquired resistance, even if the original tumor appears to be gone on clinical examination. When identified and biopsied early, these secondarily resistant BCCs may be more likely to be treated effectively. Non-SMO inhibitor treatments such as surgical excision can be essential to optimize patient outcomes.

With increased vismodegib usage, it is likely that tumor regrowth may be an increasing phenomenon. Future studies with larger numbers of patients observed for longer periods are needed to confirm our observations, identify factors associated with regrowth, and characterize the molecular mechanisms by which regrowth occurs.

Anne Lynn S. Chang, MD
Anthony E. Oro, MD, PhD

Accepted for Publication: May 25, 2012.
Published Online: August 20, 2012. doi:10.1001/archdermatol.2012.2354

Author Affiliations: Program in Epithelial Biology, Department of Dermatology, Stanford University School of Medicine, Stanford, California.

Correspondence: Dr Chang, Department of Dermatology, Stanford University School of Medicine, 450 Broadway St, Mail Code 5334, Redwood City, CA 94063 (alschang@stanford.edu).

Author Contributions: Both authors had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. Study concept and design: Chang and Oro. Acquisition of data: Chang and Oro. Analysis and interpretation of data: Chang and Oro. Drafting of the manuscript: Chang and Oro. Critical revision of the manuscript for important intellectual content: Chang and Oro. Obtained funding: and Oro. Administrative, technical, and material support: Chang and Oro. Study supervision: Chang and Oro.

Financial Disclosure: Drs Chang and Oro are clinical investigators in studies sponsored by Genentech, Infinity, and Novartis.

Funding/Support: Research for this article was funded by National Institutes of Health grant R01AR046786 (Dr Oro).

Role of the Sponsors: The sponsor had no role in the design and conduct of the study; in the collection, analysis, and interpretation of data; or in the preparation, review or approval of the manuscript.


Computerized Interactive Educational Tools Used to Improve Use of Sun-Protective Clothing and Sunscreen: A Randomized Controlled Study

Skinsafe™ is a computer-assisted learning (CAL) program developed to educate patients on melanoma risk factors, melanoma symptoms, and the importance of sun-protective behavior. The program asks users to complete in a single sitting (<30 minutes) computerized modules containing a combination of interactive and didactic seg-

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ments. We sought to determine if interactive CAL patient education delivered through Skinsafe, used as a part of a multimodal patient education program, could influence use of sun-protective clothing and sunscreen.

Methods. This interventional study was approved by the institutional review board and conducted at University Hospitals Case Medical Center. Any individuals presenting to the dermatology clinic lobby, spoke English, and were at least 18 years old were eligible. At enrollment, participants were randomized into the control or intervention arm using permuted block randomization. The intervention group completed a multimodal education program that included the following components: (1) the CAL Skinsafe tutorial; (2) a skin self-examination tutorial while clothed, under the guidance of clinicians; and (3) a self-selected telecommunication reminder (phone call, text message, e-mail, or letter) to receive monthly for 12 weeks, which reminded the participant to perform skin self-examinations. All participants received a melanoma brochure, a common form of patient education distributed in dermatology clinics.

Survey data were collected on the day of enrollment and 3 months after enrollment, at the conclusion of the study. The data collected included demographic information and self-reported use of sun-protective clothing (ie, wide-brimmed hat, long-sleeved shirts) and sunscreen.

A logistic regression was used to analyze the data. We constructed 2 models controlling for sex, age, race, education, and family history of melanoma.

Results. A total of 132 participants completed the study. At baseline, participants in the control and intervention groups were similar in terms of sex, age, race, and education level. There was no significant difference in response rate in the intervention and control groups (P = .77).

At baseline, 34.7% reported “always” or “frequently” using sun-protective clothing, and 39.1% reported “always” or “frequently” using sunscreen. Those in the intervention group were 2.4 times more likely to wear sun-protective clothing at the end of the study (odds ratio [OR], 2.4 [95% CI, 1.09-5.29]) (Table). Men were less likely to use sunscreen (OR, 0.32 [95% CI, 0.14-0.72]) (Table).

Comment. The CAL Skinsafe education system, when used as a part of a multimodal patient education program, was successful at increasing sun-protective clothing use. We suspect that this is attributable to the education supplied during the CAL Skinsafe tutorial, which emphasizes the importance of UV protection in 2 separate modules. Of note, moderate increases in performance in sunscreen use occurred in both groups at the 3-month follow-up, and we believe that subjects may have been more inclined to engage in sun-protective behaviors in the months after visiting a dermatologist’s office. Men were less likely to use sunscreen—perhaps because they do not use topical products as frequently as women. Other studies have also noted sunscreen use and other sun-protective behaviors to be greater in women.

It is unclear why the intervention had a greater effect on sun-protective clothing use rather than sunscreen use. We hypothesize that purchasing and applying sunscreen at least 20 minutes before engaging in outdoor activities (as directed in the Skinsafe modules) is more cumbersome than donning sun-protective clothing. Many dermatologists frequently remind patients of the importance of sunscreen use—our findings suggest that perhaps sun-protection education in the office can be improved by encouraging patients to regularly use sun-protective clothing as well as sunscreen.

There are several limitations to our study. Primarily, all outcomes measured relied on self-reported behavior. In addition, we have to consider the Hawthorne effect, whereby subjects modify their behavior in response to being studied. Alternatively, participants might have been dishonest in follow-up surveys because they knew the aim of our intervention. Furthermore, all of the subjects in the intervention group received all 3 aspects of the multimodal educational program (CAL Skinsafe program, skin self-examination tutorial, and telecommunication reminders to perform skin self-examinations), but only the CAL Skinsafe program emphasized the use of sun-protective clothing and sunscreen. Therefore, it is not clear whether the

### Table. Logistic Regression Follow-up Assessment

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Odds Ratio (95% CI) (SE)</th>
<th>z-Score</th>
<th>P Value &gt; z-Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of Sun-Protective Clothing at 3-mo Follow-up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention group</td>
<td>2.40 (1.09-5.29) (0.97)</td>
<td>2.18</td>
<td>.03</td>
</tr>
<tr>
<td>Male sex</td>
<td>0.93 (0.43-2.02) (0.37)</td>
<td>-0.19</td>
<td>.85</td>
</tr>
<tr>
<td>Age</td>
<td>0.98 (0.96-1.00) (0.01)</td>
<td>-1.76</td>
<td>.08</td>
</tr>
<tr>
<td>Family history of melanoma</td>
<td>1.39 (0.50-3.89) (0.73)</td>
<td>0.63</td>
<td>.53</td>
</tr>
<tr>
<td>White race</td>
<td>0.61 (0.20-1.92) (0.36)</td>
<td>-0.64</td>
<td>.40</td>
</tr>
<tr>
<td>College education</td>
<td>1.59 (0.72-3.54) (0.65)</td>
<td>1.14</td>
<td>.25</td>
</tr>
<tr>
<td>Use of Sunscreen at 3-mo Follow-up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention group</td>
<td>1.26 (0.58-2.77) (0.51)</td>
<td>0.58</td>
<td>.56</td>
</tr>
<tr>
<td>Male sex</td>
<td>0.32 (0.14-0.72) (0.13)</td>
<td>-2.76</td>
<td>.01</td>
</tr>
<tr>
<td>Age</td>
<td>0.10 (0.97-1.02) (0.01)</td>
<td>-0.36</td>
<td>.72</td>
</tr>
<tr>
<td>Family history of melanoma</td>
<td>0.60 (0.21-1.71) (0.32)</td>
<td>-0.95</td>
<td>.34</td>
</tr>
<tr>
<td>White race</td>
<td>0.39 (0.12-1.28) (0.24)</td>
<td>-1.55</td>
<td>.12</td>
</tr>
<tr>
<td>College education</td>
<td>1.88 (0.83-4.269) (0.78)</td>
<td>1.52</td>
<td>.13</td>
</tr>
</tbody>
</table>
changes observed are attributable to synergy among the 3 interventions or primarily to the CAL Skinsafe program.

Savina Aneja, BA
Angela K. Brimhall, DO, MS
Sanjay Aneja, BS
Douglas R. Kast, DO
Diana Carlson, DO
Kevin D. Cooper, MD
Jeremy S. Bordeaux, MD, MPH

Accepted for Publication: June 12, 2012.

Author Affiliations: Case Western Reserve University School of Medicine, Cleveland, Ohio (Ms Aneja and Drs Cooper and Bordeaux); Department of Dermatology (Drs Brimhall, Kast, Carlson, Cooper, and Bordeaux), Case Comprehensive Cancer Center (Drs Cooper and Bordeaux), Skin Diseases Research Center (Drs Cooper and Bordeaux), University Hospitals Case Medical Center, Cleveland; and Yale School of Medicine, New Haven, Connecticut (Mr Aneja).

Correspondence: Dr Bordeaux, Department of Dermatology, University Hospitals Case Medical Center, 11100 Euclid Ave, Lakeside 3500, Cleveland, OH 44124 (Jeremy.Bordeaux@uhhospitals.org).

Author Contributions: Ms Aneja and Drs Brimhall, Kast, Carlson, Cooper, and Bordeaux had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. Study concept and design: Brimhall, Cooper, and Bordeaux. Acquisition of data: Savina Aneja, Brimhall, Kast, and Carlson. Analysis and interpretation of data: Savina Aneja, Brimhall, Sanjay Aneja, Kast, Cooper, and Bordeaux. Drafting of the manuscript: Savina Aneja, and Kast. Critical revision of the manuscript for important intellectual content: Brimhall, Sanjay Aneja, Kast, Carlson, Cooper, and Bordeaux. Statistical analysis: Savina Aneja and Sanjay Aneja. Obtained funding: Cooper. Administrative, technical, and material support: Savina Aneja, Brimhall, Kast, and Cooper. Study supervision: Cooper and Bordeaux.

Financial Disclosure: Dr Bordeaux is supported by the Dermatology Foundation Clinical Career Development Award in Dermatologic Surgery. Funding/Support: Dr Bordeaux is supported by the Dermatology Foundation Clinical Career Development Award in Dermatologic Surgery. This publication was made possible by the Case Western Reserve University Skin Diseases Research Center Grant Number P30AR039750 from National Institute of Arthritis and Musculoskeletal and Skin Diseases.

Additional Information: Study No.: Case 1610. The trial protocol is available through the Case Western Reserve Cancer Center Institutional Review Board office.


Impact of Bar-Code Labeling of Clinical Photographs on Patient Care and Practice Workflow

Dermatologists rely on clinical photographs to observe lesions over time and to identify surgical sites. Studies have shown that without photographs at the time of surgery, patients could not identify 17% to 29% of biopsy sites, and surgeons could not identify 5% to 12% of biopsy sites. With photographs, all biopsy sites were identified.1,2

Accurate labeling and secure storage of clinical photographs is a universal problem within dermatology. From 2008 through 2011, our department used prints of clinical photographs stored in the patients’ physical medical charts. Photographs were sometimes missing or unavailable at the various clinic sites, so we stored digital images on a secure server. Authorized users could access and print images at any site (2011). These methods were time intensive, error prone, and had less security than our online medical record.

Our practice uses demographic labels with a Code-39 bar code to identify patient specimens. Bar codes are a validated tool for error reduction in many areas of health care.3 We developed software (in C# for Windows Desktop) that uses photographs of these Code-39 bar-code labels to identify and upload clinical photographs into the patient’s online medical record, enabling all providers to view these images. To format images for this software, we photograph the patient’s demographic label prior to photographing the patient (the label with identifiers are not in the clinical photograph) (Figure).

Methods. At our academic medical center, for two 1-month periods, before (January 2010) and after (January 2012) implementation of the bar-code system, we assessed the proportion of Mohs surgery referrals with a photograph present in the medical record. To quantify the effort required under both our prior systems and the current bar-code system, we measured time for associated activities. We measured the time to log and process clinical photographs using our bar-code software to calculate the total administrative time per photograph. We compared this time to 2 prior systems that our practice used: (1) printing (Epson Photolab Personal) and labeling 2 copies of the digital photograph (for the medical chart and dermatologic surgeons); and (2) manually moving digital photographs onto a secure drive.

To determine the electronic readability of Code-39 barcode images obtained in our practice, we examined the demographic data extracted from 200 sequentially barcode images obtained during clinic visits. The Fischer exact test was used to determine P values for 2×2 frequency tables; the t test was used to compare group means. Institutional review board approval was waived.

Results. With our bar-code system, the percentage of patients with photographs available at the time of surgery increased from 84% (54 of 64) to 95% (73 of 77) (P < .049). Under the bar-code system, an average of 20 seconds of administrative time was required per clinical photograph, significantly faster than the 50 seconds per photograph needed.