Time Required for a Complete Skin Examination With and Without Dermoscopy

A Prospective, Randomized Multicenter Study

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Objective: To determine the time required to perform a complete skin examination (CSE) as a means of opportunistic screening for skin cancer both without and with dermoscopy.

Design: Randomized, prospective multicenter study.

Setting: Eight referral pigmented lesion clinics.

Patients: From June 2006 to January 2007, 1359 patients with at least 1 melanocytic or nonmelanocytic skin lesion were randomly selected to receive a CSE without dermoscopy or CSE with dermoscopy. For each patient, the total number of lesions and the duration of the CSE were recorded. A total of 1328 patients were eligible for analysis (31 were excluded because of missing data).

Main Outcome Measures: The median time (measured in seconds) needed for CSE with and without dermoscopy and according to total cutaneous lesion count.

Results: The median time needed for CSE without dermoscopy was 70 seconds and with dermoscopy was 142 seconds, a significant difference of 72 seconds ($P < .001$). The use of dermoscopy increased the duration of CSE, and this increase was in direct proportion to the patient’s total lesion count. In contrast, the time required to perform a CSE without dermoscopy remained the same irrespective of whether the patients had few or many lesions.

Conclusions: A CSE aided by dermoscopy takes significantly longer than a CSE without dermoscopy. However, a thorough CSE, with or without dermoscopy, requires less than 3 minutes, which is a reasonable amount of added time to potentially prevent the morbidity and mortality associated with skin cancer.

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There is ample evidence that early detection of skin cancer can be facilitated by performing a complete skin examination (CSE) and by using dermoscopy.1-16 The advantages of dermoscopy as an addition to the naked-eye skin cancer screening are numerous but can be summarized as follows: improved diagnostic sensitivity for melanoma and nonmelanoma skin cancer12 and reduced biopsy rate of benign skin lesions.13 Although the US Preventive Services Task Force17 does not currently recommend routine CSE, claiming a lack of evidence for its efficacy in reducing mortality rates, recent studies reveal that a higher proportion of thinner melanomas are being detected during skin cancer screening than previously suggested.5-7,18 Furthermore, melanoma mortality rates appear to be leveling off, and because few advances have been made in the treatment of advanced-stage disease it is reasonable to assume that this effect is primarily due to early detection.19 Based on the aforementioned statistics, it would seem reasonable to encourage the opportunistic screening of individuals at risk for developing skin cancer. Unfortunately, most physicians do not endorse the concept of opportunistic screening of their patients for skin cancer because of a lack of evidence for its efficacy, lack of reimbursement, patients’ embarrassment, and a lack of time, among other factors.20-24 It is interesting and troubling to note that most melanoma patients have had at least 1 medical visit in the year before their melanoma diagnosis, yet only 20% of them reported receiving a skin cancer examination during that visit.25

Dermoscopy is a noninvasive optical instrument that allows physicians to ob-
serve colors and structures within skin lesions that are otherwise not visible to the unaided eye. Because these colors and structures correspond to well-defined histopathological characteristics, it should come as no surprise that dermoscopy allows physicians to more precisely predict the histopathological diagnosis, and thereby improve upon their clinical diagnostic accuracy.10-16 Unfortunately, many physicians, including dermatologists, are of the opinion that performing a CSE, especially if coupled with dermoscopy, is too time-consuming to be incorporated into a routine office appointment.27,28 However, the perception that CSE and dermoscopy are time-consuming endeavors has never been formally studied. Thus, we tested this perception via an e-mail survey, which was sent to 51 dermatologists at the Department of Dermatology, Medical University of Graz. We asked these dermatologists to answer the following 2 questions: (1) “Please tell us how many minutes it takes you on average to perform a CSE,” and (2) “Please tell us on average how many minutes longer you think a CSE would take if you also used dermoscopy.” Sixteen dermatologists (31%) replied to our questions. They estimated that an average clinical CSE took 6.3 minutes and was prolonged by 4.4 minutes if dermoscopy was used. Although not explicitly asked, most colleagues additionally expressed that the time for the CSE would strongly depend on the total cutaneous lesion count (TLC) of the patient (Table 1). In other words, a CSE with dermoscopy would take much longer for patients with high nevus counts. The purpose of this randomized, prospective multicenter study was to determine the actual time required to perform a CSE with and without the added benefit of dermoscopy.

Table 1. Estimated Length of CSE and Dermoscopic Evaluation

<table>
<thead>
<tr>
<th>Physician No.</th>
<th>CSE Without Dermoscopy a,b</th>
<th>Dermoscopic Evaluation Alone a,b</th>
<th>Depends on the Patient’s TLC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3.0 (NA)</td>
<td>3.0 (NA)</td>
<td>Yes</td>
</tr>
<tr>
<td>2</td>
<td>2.0 (NA)</td>
<td>3.0 (NA)</td>
<td>Yes</td>
</tr>
<tr>
<td>3</td>
<td>3.0 (NA)</td>
<td>0.5 (NA)</td>
<td>Yes</td>
</tr>
<tr>
<td>4</td>
<td>1.0 (NA)</td>
<td>3.0 (NA)</td>
<td>NA</td>
</tr>
<tr>
<td>5</td>
<td>15.0 (NA)</td>
<td>10.0 (5.0-10.0)</td>
<td>Yes</td>
</tr>
<tr>
<td>6</td>
<td>7.5 (5.0-10.0)</td>
<td>7.5 (5.0-10.0)</td>
<td>Yes</td>
</tr>
<tr>
<td>7</td>
<td>7.5 (5.0-10.0)</td>
<td>7.5 (5.0-10.0)</td>
<td>Yes</td>
</tr>
<tr>
<td>8</td>
<td>3.0 (NA)</td>
<td>5.0 (NA)</td>
<td>Yes</td>
</tr>
<tr>
<td>9</td>
<td>4.0 (3.0-5.0)</td>
<td>3.5 (2.0-5.0)</td>
<td>Yes</td>
</tr>
<tr>
<td>10</td>
<td>7.5 (5.0-10.0)</td>
<td>7.5 (5.0-10.0)</td>
<td>NA</td>
</tr>
<tr>
<td>11</td>
<td>10.0 (NA)</td>
<td>5.0 (NA)</td>
<td>NA</td>
</tr>
<tr>
<td>12</td>
<td>7.5 (5.0-10.0)</td>
<td>4.0 (3.0-5.0)</td>
<td>NA</td>
</tr>
<tr>
<td>13</td>
<td>10.0 (NA)</td>
<td>0.0 (NA)</td>
<td>NA</td>
</tr>
<tr>
<td>14</td>
<td>5.5 (4.0-7.0)</td>
<td>2.5 (2.0-3.0)</td>
<td>Yes</td>
</tr>
<tr>
<td>15</td>
<td>4.0 (3.0-5.0)</td>
<td>4.0 (3.0-5.0)</td>
<td>Yes</td>
</tr>
<tr>
<td>16</td>
<td>10.0 (NA)</td>
<td>5.0 (NA)</td>
<td>NA</td>
</tr>
</tbody>
</table>

Abbreviations: CSE, complete skin examination; NA, not applicable; TLC, total cutaneous lesion count.

a Survey questions are described in the introduction.
b The median (range) time for CSE without dermoscopy is 6.3 (3.8-8.1); for dermoscopic evaluation alone, 4.4 (3.8-7.3).

Patients were recruited from 8 referral pigmented skin lesion clinics in Austria (Graz and Vienna), France (Lyon), Germany (Konstanz), Italy (2 centers in Naples), Spain (Barcelona), and the United States (New York, New York) between June 1, 2006, and January 15, 2007. In Austria, Germany, Italy, and Spain, individuals are able to freely attend the clinics, whereas patients at the centers in France and the United States are mostly referred by general physicians. All individuals who sought a CSE for a routine skin examination, for 1 or more suspicious skin lesions, or for any other problems requiring the patient to be undressed for examination were eligible for inclusion in the study. The only prerequisite for enrollment was that each participant possess at least 1 melanocytic or nonmelanocytic skin lesion requiring evaluation. All patients were informed of the nature and purpose of the study. The medical records of patients who provided verbal consent indicating their willingness to participate in the study were flagged.

Consecutive patients whose records were flagged were randomly assigned to receive CSE by visual examination without dermoscopy (arm 1) or with dermoscopy (arm 2). Each center was asked to enroll at least 80 patients for each arm of the study. Randomization was performed by alternatively assigning consecutive patients to arm 1 or arm 2, irrespective of initial complaint, diagnosis, or past history. For each enrolled patient, an intake form was completed that included the following information: age, sex, TLC, and the amount of time required to perform the examination (in seconds). The duration of the examination was measured via a chronometer (ie, a stopwatch), which was activated at the start of the CSE and stopped upon completion. All participating investigators were dermatologists who had used dermoscopy for more than 3 years and who knew they were being timed during the examination. For each center, the same investigators performed examinations for both arms of the study. The time required to obtain the patient’s medical history, have the patient undress for the examination, contemplate the findings, and provide an assessment and management plan were not recorded. However, during timed examination, the dermatologist was allowed to interact with the patient and to ask specific questions regarding individual lesions or to obtain other anamnestic data.

For both groups, the CSE included pigmented and nonpigmented lesions over the entire skin surface, except for the scalp and the genitals. However, patients were asked to report the presence of lesions in these sites and if lesions were present they were also examined. For dermoscopic assessment, Heine Delta 20 (Heine Optotechnik, Herrsching, Germany) or Dermlite (3Gen LLC, Dana Point, California) dermoscopes were used. Because reliance on dermoscopy is a standard of care in the diagnosis of skin lesions in all participating centers, patients assigned to arm 1 received dermoscopic evaluation of all lesions at the end of the timed clinical examination.

STATISTICAL ANALYSIS

Continuous data are provided as means and the standard deviations. However, because the distribution of the time needed to perform a CSE was skewed, the raw time data are depicted as the median and interquartile range (25th-75th percentile). The comparison of the raw time data between groups was performed with nonparametric tests (Mann-Whitney tests or Kruskal-Wallis tests, as appropriate). The raw data were logarithmically transformed to achieve a normal distribution. The
transformed data were evaluated via parametric tests (t tests, analysis of variance, and tests for linear trend), which showed results similar to those from the nonparametric tests applied to the raw data. All P values are 2 tailed, and \( P < .05 \) indicates statistical significance.

## RESULTS

Of 1359 patients enrolled in the study, 31 were excluded because of missing data. Of 1328 patients eligible for analysis, 659 received a CSE without dermoscopy (arm 1; 356 women; mean [SD] age, 40 [18] years), and 669 received a CSE with dermoscopy (arm 2; 363 women; mean [SD] age, 39 [19] years). Patients were assigned to 1 of 4 groups according to TLC; group 1, 1 lesion; group 2, 2 to 10 lesions; group 3, 11 to 50 lesions; and group 4, more than 50 lesions. Randomization achieved a balanced distribution of patients in both study arms without significant differences in terms of number of patients, mean age, sex, and TLC.

With the exception of patients presenting with a solitary lesion, the overall median duration of CSE in arm 1 was 70 seconds (Figure 1). This was significantly shorter than the time to perform a CSE in arm 2 (median, 142 seconds) \( (P < .001) \) (Table 2). As expected, the duration of the CSE was influenced by the TLC and steadily increased with an increasing TLC in arm 2 of the study \( (P < .001 \) for linear trend of logarithmically transformed data) (Figure 2). However, this trend was not observed in arm 1. The time necessary to perform a CSE remained the same irrespective of the TLC. In fact, in study arm 1, it appears that the time needed to perform a CSE may actually decrease as the TLC increases. The median time for CSE in patients with more than 50 lesions was 69 seconds, compared with 79 seconds for those with fewer than 10 lesions.

## COMMENT

Although most physicians consider screening for skin cancer to be an important endeavor,20,21,29 many do not routinely perform CSES, stating that the lack of time is a major barrier.20,21 The added pressure of managed care, lower reimbursement, and the need formeticulous documentation aimed at justifying billing charges and addressing liability concerns has indeed added time to each office visit.30,31 In fact, there is evidence demonstrating that the average duration of patient visits has significantly increased over the past 10 years.30,31 Thus, it should come as no surprise that physicians are reluctant to add procedures such as CSES to their routine office visits. Furthermore, many physicians are of the opinion that the addition of dermoscopy will further prolong the time needed for the examination. We demonstrated this fact in the study-related survey we conducted, the results of which are presented in the introduction and Table 1. However, many of the aforementioned time concerns are based on subjective perceptions, and, to date, objective data regarding the amount of time required to perform a CSE with dermoscopy are lacking.

This study provides the first objective data concerning the actual length of time necessary to perform a CSE for skin cancer screening. Surprisingly, conducting a CSE was much less time-consuming than our colleagues anticipated (Table 1). The average time that physicians anticipated requiring for the performance of a CSE without dermoscopy was 6.3 minutes. However, the actual time necessary for a CSE was a mere 1.1 minute (study arm 1). The average time that physicians anticipated requiring to perform a CSE with the added benefit of dermoscopy was 10.7 minutes. However, the actual time required for a CSE with dermoscopy was only 2.4 minutes (arm 2). Based on the findings of this study, we deem it feasible to incorporate CSE, with or without dermoscopy, into routine practice for the purpose of opportunistic skin cancer screening. We consider the argument of not having enough time to be the result of a misperception rather than a reality.

An interesting observation made in this study was that the length of time required to perform a CSE without dermoscopy was independent of the TLC, whereas in the dermoscopy group there was an almost linear increase in the time necessary to perform the examination with increasing TLC. We speculate that the explanation for these divergent results rests with the human image recognition process, as was recently described by Gachon et al.32 To differentiate skin cancer from benign growths, expert physicians rely on the unconscious recognition of the overall pattern of individual lesions (cognitive recognition), the ugly duckling sign (differential recognition), and analytic recognition of the individual features, such as the well-known ABCD criteria (Asymmetry, Border irregularity, Color, and Diameter) for melanoma. Although all of these recognition processes are working in concert, some may override others, depending on circumstances. If time is any reflection of these recognition processes, our results suggest that the visual perception during the screening examination switches from a primary analytic recognition process of features in patients with few lesions to a primary differential recognition process in patients with multiple lesions. In other
words, if there are only a few lesions present, the physician will analytically evaluate each lesion independently. However, if there are many lesions present, the physician will evaluate the lesions as clusters. As long as all lesions within a cluster look similar to each other, no further analytical evaluation of individual features is performed. It is intuitively obvious to most that the differential recognition process is faster than analytical evaluation, and this fact is reflected in the data presented in this study.

Dermoscopy, however, forces the physician to use the analytic assessment method for each lesion evaluated. Thus, it stands to reason that as the number of lesions increases so will the time necessary to complete the examination. It is our opinion that the approximately 72 seconds added to the CSE with use of dermoscopy is well worth it, since early and nodular melanoma can be clinically difficult to differentiate from benign skin lesions without the added information provided by dermoscopy.

The main limitation of this study was that the treatment for study arm 1 was carried out “virtually,” since each physician was allowed to perform a dermoscopic examination of the patient immediately upon completion of the study. Thus, the length of time required to perform a CSE in arm 1 might be an underestimation of the actual time. However, this limitation in no way detracts from the core message that a CSE is not too time-consuming because even the time recorded in arm 2 was only 142 seconds. We also argue that even though the participating investigators knew the purpose of the study, this did not alter their scrupulous examination and care of patients in a daily routine setting. On the other hand, this study was carried out by dermatologists with special interest in skin cancer. It remains, therefore, to be clarified whether less experienced physicians would achieve the same results in terms of average time needed for screening. In summary, although CSE aided by dermoscopy takes significantly longer than CSE without dermoscopy, the total duration of a thorough CSE, regardless of whether dermoscopy is used, requires less than 3 minutes—a reasonable amount of added time to potentially avoid the morbidity and mortality associated with the most common malignancy. Although conclusive evidence is still lacking on the benefit of CSE on mortality and morbidity rates from melanoma and nonmelanoma skin cancers, we believe that 70 seconds for a naked eye CSE and 142 seconds for a dermoscopy CSE are within an acceptable time range for detecting a potentially life-threatening disease.

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Table 2. Duration of CSE With Respect to Dermoscopy and TLC

<table>
<thead>
<tr>
<th>TLC</th>
<th>CSE Without Dermoscopy</th>
<th>CSE With Dermoscopy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of Patients</td>
<td>Median CSE Duration, s</td>
</tr>
<tr>
<td>1</td>
<td>34</td>
<td>91</td>
</tr>
<tr>
<td>2-10</td>
<td>194</td>
<td>79</td>
</tr>
<tr>
<td>11-50</td>
<td>268</td>
<td>65</td>
</tr>
<tr>
<td>&gt;50</td>
<td>163</td>
<td>69</td>
</tr>
</tbody>
</table>

Abbreviations: CSE, complete skin examination; TLC, total cutaneous lesion count.

*Comparison of raw data by Mann-Whitney test. P<.05 indicates statistical significance.
celona, Spain (Drs Malvéy and Puig). Dr Blum is in private practice in Konstanz, Germany.

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Author Contributions: Dr Argenziano had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. Study concept and design: Zalaudek. Acquisition of data: Kittler, Marghoob, Balato, Blum, Dalle, Ferrara, Fink-Puches, Giorgio, Hofmann-Wellenhof, Malvéy, Moscarella, Puig, Scalvenzi, Thomas, and Argenziano. Analysis and interpretation of data: Zalaudek, Kittler, and Marghoob. Drafting of the manuscript: Zalaudek. Critical revision of the manuscript for important intellectual content: Argenziano. Statistical analysis: Kittler. Administrative, technical, or material support: Giorgio and Moscarella.

Study supervision: Argenziano.

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REFERENCES