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## Internet based health promotion campaign against skin cancer – Results of www.skincheck.ch in Switzerland

Conventional skin cancer prevention programs appeal to limited populations, and the middle aged male population responds less frequently. Our objective was to establish a complementary health promotion campaign tool for skin cancer prevention. Internet-based education, instruction for self assessment and teledermatological evaluation of skin lesions by an expert commission of dermatologists was used. Compliance and clinical diagnosis was assessed in a subgroup. 12,000 users visited the educational website. There was strong interest among the middle aged male population (53% (N = 262): male; mean age: 42). 28.5% of examined lesions (N = 494) were considered suspicious. Email requests, sent to the group whose lesions were considered suspicious, were answered by 46.0% of females (N = 29) and 59.7% of males (N = 46) with a female distribution predominantly in younger ages (52.6% of females with known age: < 30 years). Males were predominantly represented over 30 years (86.2% of all males). According to user's declarations, at least 8 (8.5%) malignant lesions (1 melanoma *in situ*, 1 squamous cell carcinoma, 4 basal cell carcinomas, 2 malignant lesions without declared diagnosis) were finally diagnosed by physicians. We conclude that internet-based, interactive, educational programs, in addition to existing health promotion campaigns, can enhance public participation in the middle aged male population in skin cancer prevention.

**Key words:** skin cancer prevention, internet-based education

**S**kin cancer accounts for the majority of all cancers world-wide. Because UV irradiation is responsible for the majority of all skin cancers [1, 2], extensive health promotion programs regarding sun protection have been conducted in recent times. Nevertheless, incidence rates of skin cancer continue to rise worldwide [2], and Switzerland leads in incidence in the list of equivalent countries [3, 4].

Melanoma is dreaded as there is no standard and efficient treatment for metastasized melanoma. In young and middle-aged populations, melanoma is one of the leading causes of cancer deaths [5]. However, melanoma in early stages has an excellent prognosis [6, 7]. Therefore, primary prevention (in terms of knowledge about skin cancer and avoidance of risk factors) and secondary prevention (in terms of early detection) are of the utmost importance. Studies have shown an association between health promotion campaigns and melanoma incidence rates, citing increases in melanoma rates during periods of decreased prevention campaign funding [2]. The improvements since 1983 in the general population's knowledge about sun protection and the trend towards smaller tumors at the time of diagnosis, can be attributed to improved education [8, 9]. A large Australian cross-sectional study interviewed almost 12,000 adults between 1987 and 2002

and found a significant improvement in sun protective behaviors with the nationwide televised skin cancer health promotion campaign SunSmart [10, 11].

In Switzerland, skin cancer prevention campaigns have been conducted since 1988 [12]. Nevertheless, public knowledge is often still insufficient, and sun protective behavior and periodic self examination of the skin usually decreases significantly after specific health programs. Thus, continuous promotion activities are required in order to maximize public awareness [10, 13, 14]. The national *Skin Cancer Day*, which has taken place annually in Switzerland since 2006, is a service run by the Swiss Cancer League and the Swiss Society of Dermatologists. On this day, people may present skin lesions without an appointment and free of charge. Every year, men consistently use these screening activities at a lower frequency in all age groups [15, 16]. Interestingly, there is an especially marked gender difference in the population between 30 and 49 years, with females in this population (and overall) more actively participating in screening activities. In 2008, participants were 56% female (n = 3953) and 44% male (n = 2920), and in the age group between 30-49, 1281 females and 878 males chose to participate in the screening. The reasons for this have not yet been elucidated but may potentially be found in reduced

attention, risk awareness, or concern about the body [17] as well as in lack of time or convenience issues. It may be assumed that it is mainly the full-time labor force, with the impossibility of consulting a physician during the operating hours of a hospital or a private practice, which participated more infrequently than other population groups. It may be further supposed that males, in particular, show less motivation to spend time waiting and travelling to participate in health campaigns against skin cancer.

Regarding the fact that men reveal more rapidly increasing incidence rates of melanoma, higher Breslow thickness at the time of diagnosis [8, 18], underestimation of their individual skin cancer risk based on their skin type, and lower attendance in previous skin cancer prevention programs than women [13, 15], additional health promotion programs should be established to better target at higher risk population.

Dermatology provides ideal preconditions for telemedicine techniques. Teledermatology provides an efficient and cost-effective [19-21] diagnostic tool for populations unable or unwilling to refer to a dermatologist. In a store-and-forward (SAF) system, photographs may be sent via email to specialists for management recommendations [22]. Compared to a physical dermatologist's visit, this approach requires only minimal effort; thus, acceptance of teledermatology in specific populations is expected to be higher. Several studies have achieved a high accuracy for the diagnosis of skin cancer, pigmented lesions [23-25], and various skin diseases [25-29] in store-and-forward systems when compared to face-to-face consultations. Used as a tool for consulting a second opinion, almost 80% accuracy was achieved using teledermatology (confirmation was conducted by histopathology afterwards) [30]. The internet is becoming increasingly important. Studies have revealed a high usage of the internet in health-related questions and health promotion campaigns, particularly in our targeted groups *i.e.* males and middle aged populations [31-38]. However, skin cancer education web sites are often of poor quality due to incomplete or incorrect information [39, 40].

Based on these data, we established a teledermatological service called Skincheck<sup>®</sup>. Skincheck<sup>®</sup> is provided by a group of board-certified dermatologists in Switzerland. The lesion assessment portion of Skincheck<sup>®</sup> was only available during the month of May 2008, was free of charge and available for everybody with internet access. Participants sent images of skin lesions via internet for evaluation and standardized management recommendations from the specialist group. The participation was anonymous; participants received individual passwords to upload their images and view the responses from the dermatologist.

In Autumn 2008, participants who agreed to participate in the data analysis were interviewed via email with follow-up questions regarding the rate of compliance with the management recommendations given by the Skincheck<sup>®</sup> team and the final histological diagnoses, if available. Here, we present the data of the first Skincheck<sup>®</sup> in Switzerland.

## Patients and methods

Internet access was a prerequisite. In order to increase participation in the program, Skincheck<sup>®</sup> was intensively

promoted in the mass media, internet, and via on-site promotions in pharmacies during April 2008. The Skincheck<sup>®</sup> website ([www.skincheck.ch](http://www.skincheck.ch)) provides a wealth of educational information about skin cancer, its risk factors, and instructions for self examination, based on the ABCD rule. *Tables 1 and 2* list the questions which were answered prior to self and expert evaluation. *Table 3* shows the risk assessment and standardized management recommendations that were performed based on the answers. All lesions were judged by the specialists as 1) "Your lesion is harmless", or 2) "Your picture is of insufficient quality", or 3) "Your lesion is suspicious". 3-5 months later, 97 participants who had been advised to attend a physician and agreed to be contacted (68.8%) were questioned about their compliance to the management recommendations via email. The following questions were asked:

- 1) Did you show your skin lesion to a physician?
- 2) Location of the skin lesion?
- 3) Has the skin lesion been removed?
- 4) Did the physician classify the skin lesion as benign or malignant?
- 5) What was the physician's final diagnosis?

## Statistics

Data were collected from August until October 2008. The answers to the above mentioned questions were classified as follows:

Answer to question (Q) 1: dermatologist/other physician/  
no consultation

Answer to Q2: face/thorax/back/abdomen/upper extremities/  
lower extremities

Answer to Q3: Yes/No

Answer to Q4: benign/malignant/unknown

**Table 1.** Evaluation of risk factors (the more positive answers the higher the skin cancer risk)

1) Fair skin type (fair skin, eye and hair color)
2) Genetic factors
– Multiple pigmented moles
– Skin cancer in your or your family's medical history
3) Intense and numerous sunburns in the past:
– Particularly during childhood under the age of 15
4) Frequent usage of sun beds

**Table 2.** Evaluation of skin lesions (Answers on the right side argue for a more malignant lesion)

1) How does the shape look?	Round and symmetric	OR	Asymmetric
2) How does the outline look?	Regular and sharply demarcated	OR	Irregular, not sharply demarcated
3) How many colors in the lesion?	One	OR	More
4) Did the lesion change rapidly?	No	OR	Yes

**Table 3.** Advice given by the dermatologists after evaluation of the images

<p><b>1) Your skin lesion is harmless.</b> If you do not observe any change over the next 6 months, you may be reassured. If you should notice any change, please consult a dermatologist.</p>
<p><b>2) The quality of your photograph is insufficient</b> for diagnostic purposes. Please send a new photograph with a higher resolution.</p>
<p><b>3) Your lesion is suspicious.</b> Please immediately consult a physician or dermatologist.</p>

Answer to Q5: melanoma in situ/ basal cell carcinoma/ squamous cell carcinoma/ dysplastic melanocytic nevus/ melanocytic nevus/ lentigo benigna/ seborrheic keratoses/ others (lipoma, fibroma, angioma, and mycosis) Frequency and descriptive statistics were conducted with SPSS 16.0.

## Results

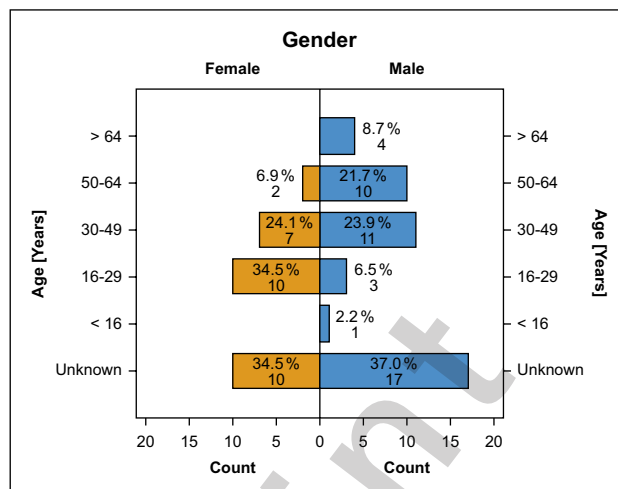
More than 12,000 visitors visited the webpage during May 2008; between May 2008 and May 2009, there were over 22,000. 494 digital photographs were sent in for evaluation (232 originated from females (47%), and 262 from males (53%)). The mean age of all users was 37.6 years (females: 34.33 years, males: 40.5 years). 141 of 494 lesions were teledermatologically classified as *suspicious*, 63 of these derived from females (45%) and 77 from males (55%). Participants with lesions classified as suspicious were recommended to consult a dermatologist or a general practitioner. 97 (68.8%) of the 141 participants with suspicious lesions agreed to answer follow-up questions. 75 of the 97 (29 females, 46.0% of all females with suspicious lesions, and 46 males, 59.7% of all males with suspicious lesions) answered the follow up questions. The gender distribution of the 75 patients from whom we received data, was 38.7% females and 61.3% males. The mean age of females was 33.4 years (median: 29 years); in males it was 47.7 years (median 48.5 years). They represented a total of 94 lesions.

### Follow-up questions

61% of the participants who answered follow-up questions were male (n = 46), 38.7% (n = 29) were female. 48 of the 75 patients who answered follow-up questions declared their age (64%). The majority of them were younger than 50 years of age (32 patients; 66.7%). Beyond the age of 30, there were more males than females in each age class; beyond the age of 64 years, only males participated. Remarkably, the majority of females were represented in the age class below 30 years (*figure 1*).

### Adherence to management recommendation

60 (80%) of the 75 recalled participants informed us that they had visited a dermatologist; 3 (4%) had visited another physician (2 general practitioners (male patients), 1 pediatrician (female patient)). Altogether, 86.2% of the females (n = 25) and 82.6% of the males (n = 38) followed the online recommendation. 12 (16%) of the 75



**Figure 1.** Gender distribution by age group of patients who answered follow-up questions.

responding participants did not follow the advice to refer to a physician; female patients did not refer to a physician in 4 cases (13.8%), male patients in 8 cases (17.4%).

### Excisions

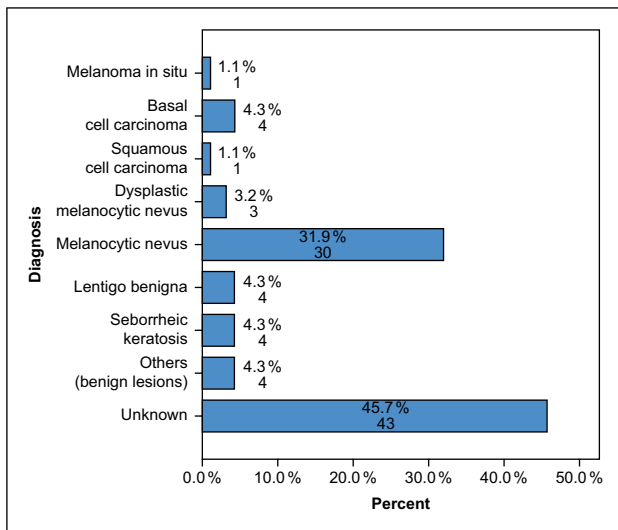
The 75 participants who answered our feedback questions presented a total of 94 lesions, 80 of which were shown to physicians (85.2%). 34 lesions (42.5% of all lesions shown to a physician) were excised; all of these were shown to a dermatologist. 60 lesions (63.8% of all lesions) were not excised.

### Anatomical distribution

The majority of all documented skin lesions (56 out of 94; 59.6%) were located on the trunk (29 lesions on the back (30.9%), 21 on the thorax (22.3%), 6 on the abdomen (6.4%)) and 18 out of 94 (19.2%) on the face. Lesions on the upper (N = 10; 10.6%) and lower (N = 8; 8.5%) extremities presented less frequently. Locations of 2 lesions were not declared (2.1%).

### Diagnosis

72 of the 94 lesions (76.6%) were evaluated as *benign* by the consulted physician. The 8 lesions (8.5% of the 94 lesions) that were evaluated as *malignant* all occurred in males (14.0% of all known males' lesions). 68.4% of the lesions (n = 39) in male patients and 86.5% in female patients (n = 32) presented as benign. Malignant lesions were found predominantly in age groups over 50 years old (4 cases, 4.3% of the 94 lesions); in 50% of all malignancies (n = 4) age was not declared. Diagnoses were performed clinically in 61 cases (64.9% of 94 lesions) and histopathologically in 34 cases (36.2% of 94 lesions). Unfortunately, in 43 cases (45.8% of 94 lesions) the participants could not provide the definitive diagnosis. In 15 of these cases without diagnosis (34.9% of the 43 cases) participants did not refer to a physician. Three participants who visited a doctor reported having received cryotherapy but could not indicate a definitive diagnosis; in these cases we suspected actinic keratoses as a probable diagnosis.



**Figure 2.** Diagnoses of consulted physicians following teledermatological-based advice to visit a physician.

The benign diagnoses included 30 melanocytic nevi, 3 dysplastic nevi, 4 benign lentiginos, 4 seborrheic keratoses, 1 fibroma, 1 lipoma, 1 angioma, and 1 tinea corporis. Based on the participants' surveys, the 8 malignant lesions consisted of 1 melanoma *in situ*, 4 basal cell carcinomas, 1 squamous cell carcinoma, and 2 with unknown diagnoses (figure 2).

Finally, 22 participants (22.7%), who were advised to present their skin lesion to a physician and gave permission for follow-up questions, did not respond, resulting in 47 suspicious lesions (33.3% of all 141 suspicious lesions), on which all information is lacking. Information about grading is missing on 63 suspicious lesions (44.7% of all suspicious lesions).

## Discussion

Prevention is essential in the fight against skin cancer, and a combination of primary [41] and secondary prevention [42] is predicted to yield the best results. Because in the majority of melanoma cases the lesion is first recognized by the patient or their partner and not by a physician [43], skin health education is of utmost importance. Effective prevention programs, therefore, ought to include interactive educational activities. In order to maximize their benefits, prevention programs should appeal to and elicit maximum participation from the populations at highest risk of skin cancer. The traditional "walk-in" skin cancer prevention activities as well as increased awareness of doctors and of the general population has led to earlier detection of malignant melanoma, a decreased Breslow-Index at the time of diagnosis, and thus increased overall survival in newly diagnosed malignant melanoma. However, men use the traditional walk-in preventive activities significantly less frequently than women. In addition, men reveal more drastically increasing incidence rates of melanoma, higher Breslow indices at the time of diagnosis, and a generally lower attendance at skin cancer prevention programs than women [9, 13, 15, 43-45]. Additionally, on Swiss Skin Cancer Day, conducted between 2006 and

2008, which was offered by dermatologists and dermatological university clinics for free, women used this service much more frequently than men (In 2008 participants consisted of 56% of female and 44% of males) [16].

Due to the rising incidence of melanoma worldwide, government run health campaigns against skin cancer are conducted in several countries. These health campaigns are conducted most aggressively in Australia, the country with, by far, the highest skin cancer rate. One example is the SunSmart program, a combination of public education with mass media campaigns. In the US, there is a similar program called SunSmart. Both programs educate about skin cancer and sun protective behaviors via television advertisements, but also in schools, work places, and other public institutions. Both programs have proven the effectiveness of mass media education, evidencing improvements in sun protective behavior and lower rates of sunburns [10, 11, 46].

Another nationwide strategy for improving secondary prevention would be the institution of designated dermatological consultation days, on which suspicious lesions may be shown to physicians gratis and appointment-free. In several countries there are skin protection TV advertisements to improve primary prevention; in Switzerland, for example, this is conducted by the Swiss Cancer League [47]. Additionally, in Germany, skin assessment for the population over 35 years is supported every 2<sup>nd</sup> year by the common health insurance for secondary prevention issues [48]. Important, but yet not fully sufficient, these efforts should be expanded further to appeal to the whole population.

Large and partly multicentered studies have evaluated the accuracy of teledermatological techniques compared to face-to-face dermatology and histopathology. They found the accuracy of teledermatological diagnoses comparable to that of face-to-face consultation and histopathological diagnoses (concordance > 80%) for pigmented lesions and skin cancer [23, 25, 49, 50]. Teledermatological techniques reduce waiting times. Due to high patient and physician satisfaction with teledermatological techniques, teledermatology might play an increasing role in ruling out melanoma and other skin cancers in the future [23, 25, 49].

Over recent years, the internet has become an increasingly important tool for seeking out healthcare information. Particularly amongst middle aged populations, the internet is a common source of information [31-36]. Further studies predict that internet-based health campaigns will elicit good results in the public, particularly in the population between 31 and 50, as well as in males [31-35, 37, 38, 51-54]. Since health education websites are often of poor quality and contain incorrect information [39, 40], a widely used, easy to understand, fundamental skin cancer education website for all populations is required. This led us to create Skincheck<sup>®</sup>, an internet-based health education and prevention program which targets groups that do not participate in common prevention campaigns because of lack of time or for other reasons. The web-site describes skin cancer's underlying causes and gives descriptive instructions for self examination of the skin. With the help of illustrations, the sites are easy to understand yet well founded and informative. Skincheck<sup>®</sup> was received with strong interest. By modifying the recruitment we were able to target more male participants and generally both a younger and more middle aged population. Thus, we were

able to focus on groups with higher potential benefit from primary and secondary prevention.

A limitation of this study was that participation in follow-up questions was voluntary. Hence, we have data of about half of the participants with a teledermoscopically suspicious lesion and definitive diagnoses of half of this population. This results in a high number of unknown cases. Nevertheless, as participants had to give up anonymity and by agreeing to follow-up questions, the participation of more than 50% is higher than expected. It might be further discussed particularly whether those participants who showed a malignant lesion might not have answered more frequently due to data protection.

Additionally, Skincheck<sup>®</sup> interactive learning emphasizes early recognition of skin cancer. Participants were introduced into primary and secondary prevention. Importantly, even patients with unsuspecting skin lesions were advised to periodically reassess their lesions.

Before sending in photographs, users had to think critically about their skin lesions by answering several educational questions. Consequently, participants became familiar with relevant skin cancer risk factors and characteristics of suspicious skin lesions, based mainly on the ABCD rules.

Aside from our main aim, skin cancer education, at least 8 malignancies were detected. Because those malignancies were found in a sample of only about 50% of lesions, even more malignancies are suspected to have been identified via Skincheck<sup>®</sup> during the month of May 2008.

Further studies of internet-based prevention campaigns in the fields of colorectal cancer, back pain, atherosclerosis, and physical activity have educated participants about primary and secondary prevention and produced significant long lasting changes in life-style [37, 38, 51, 55]. Additionally, an internet-based teledermatological training program for laymen about early recognition of melanoma increased the recognition rate of early melanoma [54]. Because of different primary aims, these commonly conducted internet-based health campaigns are not comparable to the unique study design of Skincheck. Nevertheless, online interactive health prevention campaigns, such as Skincheck<sup>®</sup>, are important, innovative complementary tools to add to conventional health prevention in this web-oriented age and should be utilized more frequently to increase health awareness and knowledge about health issues, particularly in the prevention-resistant, middle-aged male population. ■

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