

Patients' Perception of Skin Cancer Screening Conducted by Trained and Untrained Doctors: A Controlled and Non-Randomized Intervention Study

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ABSTRACT

Background and Objectives: Due to a lack of evidence regarding patient-reported outcomes in the scope of doctors' training programs for skin cancer screening, data of the Skin Cancer Screening Education Study (SCSES) are going to be evaluated. The object of research is to analyze differences in the patients' perception of skin cancer screening between an intervention region with trained doctors and a control region where doctors did not receive any training. Patient's perception of the screening by trained family physicians and dermatologists is also going to be compared.

Methods: In the scope of the SCSES, a non-randomized controlled trial carried out in Canada, the German training program for skin cancer screening was translated and taught to doctors of the intervention region, Calgary. In Calgary and in the control region, Edmonton, data was collected by the Association of Dermatological Prevention, using a patient questionnaire. Ten selected variables of the questionnaire regarding patients' perception of the doctor's screening procedure and patients' satisfaction with the screening examination were evaluated using IBM SPSS. In addition to descriptive statistics, chi-square-tests and t-tests for independent samples were performed within two-sided testing.

Results: In result a total of 2,317 questionnaires were analyzed with 1,985 in the intervention region and 332 in the control region. Comparing participants of the two regions, significant differences regarding the screening procedure, i.e. preciseness of the whole-body examination and counseling, as well as concerning patients' satisfaction were found in favor of the intervention region. Furthermore, participants obtaining skin cancer screening from a trained dermatologist were likely to show slightly higher satisfaction levels and report a better assessment of the skin examination than participants obtaining the screening from a trained family physician.

Conclusions: The statistical analysis of the data set provides initial findings that training doctors on skin cancer screening has positive effects regarding the perceived thoroughness of the screening examination and participant satisfaction. Also, participants obtaining skin cancer screening from a dermatologist tend to be more satisfied and report a better assessment of the examination carried out by the doctor.

Since the training program was adopted from the training program of the German statutory skin cancer screening, statements about its effectiveness are transferrable.

INTRODUCTION

Skin cancer is one of the most common types of cancer, in Germany, Canada and worldwide [1]. Around 300,000 cases of malignant melanoma and more than one million cases of non-melanoma skin cancer were diagnosed worldwide in 2018 [2]. In 2016 malignant melanoma of the skin accounted for 4.8% of all new cancer cases in Germany. The percentage of skin cancer deaths from malignant melanoma in Germany was 1.2% in 2016 and that of non-melanoma skin cancer was 0.4% [3]. Malignant melanoma and non-melanoma carcinoma can generally be identified by screening in the early phase [1,4]. In advanced stages of the disease, curative therapy is often no longer possible [5].

In 2008, a statutory skin cancer screening was introduced in Germany. Prior to the implementation, a feasibility study (SCREEN) was carried out [6]. However, the effectiveness of training doctors on skin cancer screening was not examined during this study [1,4]. Anders et al. only evaluated the effectiveness of the German training program within a pre-post-survey using questionnaires for participating doctors. The analysis showed a significant increase in knowledge of screening and early detection, skin cancer and skin cancer screening as well as an increase in diagnostic accuracy in general practitioners [7]. International research regarding training programs for early detection of skin cancer showed similar effects. In a systematic literature review by Goulart et al. 18 of 20 studies found a significant improvement in measured outcomes such as knowledge and skills in treatment and consultation caused by the intervention [8]. Moreover, Harkemanne, Baeck & Tromme conducted a literature review of 45 articles on training programs for general practitioners, mostly resulting in improvements of i.e. diagnostic accuracy and confidence [9].

However, patient-reported outcomes with regard to the skin cancer screening have only been investigated as part of a representative survey of the German population. Participants were asked how the screening has been carried out by a doctor, showing that the quality of the implementation differs mainly between general practitioners and dermatologists. In

addition, deficiencies can generally be found when performing the whole-body examination. For example, only 73.7% (dermatologist) and 55.7% (general practitioner; $p < 0.001$) of the patients stated that their genital area was examined during the screening [10].

In the scope of the German training program on skin cancer screening, effects of training doctors on patient-oriented outcomes, in addition to the clinical screening outcomes (i.e. identification of abnormal skin lesions), have not been examined yet [11]. A controlled study design can no longer be carried out in Germany due to the statutory screening and the lack of a control region that does not routinely screen for skin cancer [12,13]. Due to the evidence gap and the lack of a control region in Germany, the Association of Dermatological Prevention (ADP) conducted a controlled, non-randomized intervention study (Skin Cancer Screening Education Study, SCSES) in the Canadian province of Alberta. Within the study, the training of Canadian doctors based on the German training program for the statutory skin cancer screening was examined [14]. This analysis aims to investigate patient-reported outcomes regarding the patients' perception of the performance and satisfaction with the skin cancer screening.

METHODS

Skin cancer screening education study

The Skin Cancer Screening Education Study is a controlled, non-randomized and unblinded intervention study. It was carried out by the Association of Dermatological Prevention in the Canadian province Alberta in the cities Calgary and Edmonton and was funded by the LEO Foundation. The study was appraised by the Health Research Ethics Board of Alberta – Cancer Committee [15]. The aim of the study was to determine whether training of doctors on skin cancer screening is associated with an increase in knowledge and improved screening outcomes compared to a group of doctors who did not receive any training. In addition, the well-being and perception of the participants was analyzed and possible psychosocial harms of skin cancer screening were filtered out [14].

As part of the SCSES, a total of 70 doctors were recruited and trained in the Intervention Region (IR) in the city of Calgary, including 7 dermatologists and 63 family physicians. In the Control Region (CR), the city of Edmonton, 6 dermatologists and

22 family physicians were recruited. In Calgary, doctors were recruited from March to September 2015 while recruitment in Edmonton remained open until March 2016 due to low recruitment rates. Family physicians were invited via mail by the University of Calgary's CME Office. Dermatologists were invited via email by the principle investigators. Doctors who had received special training in skin cancer screening within the past two years were excluded.

Furthermore, three dermatologists and four family physicians were trained to conduct the training with the doctors from the intervention region. The doctors in the intervention region received training at the beginning of the study, while the doctors in the control region received training after the study was completed [16]. The training is based on the training program within the statutory skin cancer screening in Germany. The curriculum includes an overview of epidemiological aspects of skin cancer, measures to address screeners, etiology, risk factors, risk groups and their assessment, the skin cancer screening examination incl. harms and benefits, communication strategies, documentation and interdisciplinary collaboration [16].

Within the scope of the SCSES, the German training program including all training materials was translated into English. The translated screening program was approved by the University of Calgary's CME Office. Following the completion of the training, family physicians received 5.5 Main Pro-C points and dermatologists 5.5 MOC points. These are the highest advanced training points awarded by the CME [16]. The approximately five-hour training was carried out by two trainers: a family physician and a dermatologist. All participants of the intervention region received a training manual, a folder with instructions and a DVD with additional study information. They were asked to carry out the screening according to the instructions in the training.

The doctors of the control region received the same study materials via email (with exception of the training manual) with no further instructions or training. They were encouraged to use the knowledge acquired through self-directed study to identify suspicious skin lesions [4,16]. Over a period of 20 months a total of 3,229 patients were screened in the intervention region and 443 were screened in the control region. Participating patients had to be English-speaking residents of Calgary,

Alberta (intervention region) or Edmonton, Alberta (control region) with at least 20 years of age. All Participants and doctors gave written consent to participate [16].

Data collection

Questionnaires were handed out to participants by doctors or medical assistants immediately following the screening examination. Participation was voluntary and the questionnaire was answered anonymously. The patient questionnaire consisted of 29 (family physician) or 30 (dermatologist) questions, split up into 35 and 36 variables. In addition to demographic aspects of the participant, the questionnaire included the participants knowledge on skin cancer and risk factors, a self-assessment of personal skin cancer risk, an assessment of the examinations carried out by the doctor and an assessment on the process of informed decision-making.

Statistical analysis

This analysis focuses on the patients' perception of the doctor's screening procedure (5 items, yes/ no/ don't know) and on the patients' satisfaction regarding the screening examination carried out by the individual doctor (5 items, five-point likert scale). Sample characteristics were analyzed descriptively using relative frequencies. Chi-square-tests and t-tests for independent samples were performed within two-sided testing to examine differences between the intervention and control region as well as between dermatologists and family physicians. Differences with $p < 0.05$ were considered to be statistically significant. The Phi-coefficient (Φ) and Cohen's d were calculated as effect sizes. Data analysis was performed using IBM SPSS.

RESULTS

General data

3,406 patient questionnaires were completed, whereby 1,089 could not be assigned to any of the regions due to administrative inaccuracies. In result a total of 2,317 questionnaires were analyzed: 1,985 questionnaires were collected in the intervention region (with 467 from participants screened by a trained dermatologist and 1,518 from participants screened by a trained family physician) and 332 questionnaires collected in the control region (from participants screened by a family physician who didn't receive any training).

The age group 50 to 59 is most strongly represented in both regions (Table 1), with higher proportions in the control region (IR: 25.8%; CR: 30.4%). In the intervention region, the age group 40 to 49 is higher represented compared to the control region (IR: 21.3%; CR: 14.0%). Moreover, no significant difference in gender was observed between the two regions ($p = 0.097$). The majority of the participants in both regions is female (IR: 74.4%; CR: 78.7%). Regarding education, the majority of the participants have achieved a college diploma (IR: 28.3%; CR: 35.5%) or a university undergraduate degree (IR: 29.8%; CR: 28.7%). 1.3% of the participants in the intervention region and 2.8% of the control region have no educational qualifications.

Table 1: Sociodemographic characteristics of participants in the intervention and control region.

Characteristics	Participants in intervention region		Participants in control region	
	n	%	n	%
Age $p=0.001$				
20-29	124	6.3	36	10.9
30-39	312	15.8	56	17.0
40-49	422	21.3	46	14.0
50-59	510	25.8	100	30.4
60-69	424	21.4	66	20.1
70-79	164	8.3	19	5.8
80 and above	23	1.2	6	1.8
Total	1985	100	329	100
Gender $p=0.097$				
Male	503	25.4	69	21.1
Female	1474	74.6	258	78.9
Total	1977	100	327	100
Education $p=0.030$				
None	26	1.3	9	2.8
High School diploma	470	24.3	63	19.3
College diploma	549	28.3	116	35.5
University u.d.	577	29.8	94	28.7
University p.d.	275	14.2	40	12.2
Other	40	2.1	5	1.5
Total	1937	100	327	100

ud: undergraduate degree; pd: postgraduate degree

Intervention region vs. control region

Patients' perception of the family physician's screening procedure: Concerning the perceived screening procedure, 88.0% of the participants in the intervention region indicated that the family physician asked about their family history of skin cancer (Table 2). In the control region, only 65.3% of the participants were questioned in this regard ($p<0.001$). In the

scope of the standardized whole-body examination of the skin, 98.2% of the participants in the IR stated that the family physician examined their scalp, 95.5% reported examination of the area between the toes and 89.0% of the skin in the external genital area. However, in the control region, family physicians were less likely to perform an examination of the scalp (64.0%, $p<0.001$), of the area between the toes (64.5%, $p<0.001$) and of the skin in the external genital area (70.6%, $p<0.001$). Moreover, 58.2% of the patients participating in the intervention region indicated that the doctor showed the skin self-examination, whereas in the CR only 46.8% replied in this regard. Chi-square tests between the intervention and control region (Table 2) found significant differences for the respective five variables ($p<0.001$) with varying effect sizes from $\phi=0.11$ to $\phi=0.49$.

Patients' satisfaction regarding the screening examination and the family physician's performance: Regarding the participants' satisfaction with the screening examination and the family physician's performance, t-tests comparing the intervention and control region detect significant differences in the analyzed variables (table 3): On average, participants in the intervention region were better informed about UV-protection than those in the control region (IR: Mean = 4.42, SD = 0.93; CR: Mean = 3.68, SD = 1.45; $p < 0.001$). Moreover, the length of the screening was slightly more acceptable in the IR (Mean = 4.86, SD = 0.43) compared to the CR (Mean = 4.68, SD = 0.71; $p < 0.001$). Participants in the intervention region consider the screening method more adequate (Mean = 4.69, SD = 0.58) than participants in the control region (Mean = 4.46, SD = 0.77; $p < 0.001$). Furthermore, the confidence in the family physician is rated slightly better among patients in the IR as compared to those in the CR (IR: Mean = 4.85, SD = 0.43; CR: Mean = 4.74, SD = 0.59; $p = 0.002$). On the contrary, participants in the control region found the screening to be less uncomfortable than respondents in the intervention region (IR: Mean = 4.66, SD = 0.68; CR: Mean = 4.77, SD = 0.61; $p = 0.005$). The effect sizes according to Cohen's d is to be assessed as small to medium (Table 3). When pooling up all means regarding the participants satisfaction, the average mean value is 4.70 for the intervention region and 4.47 for the control region.

Table 2: Perceived procedure of the family physician's screening (intervention vs. control region)–frequency percentage, chi-square test, phi coefficient.

Variable	Scale	Family physicians in intervention region (%)	Family physicians in control region (%)	p	Phi (φ)
Family history (IRn=1503, CRn=317)	Yes	88.0	65.3	<0.001	0.24
	No	10.7	31.2		
	Don't know	1.3	3.5		
Examination scalp (IRn=1511, CRn=325)	Yes	98.2	64.0	<0.001	0.49
	No	1.5	32.9		
	Don't know	0.3	3.1		
Examination between the toes (IR n=1508, CR n=324)	Yes	95.5	64.5	<0.001	0.40
	No	3.6	30.6		
	Don't know	0.9	4.9		
Examination skin in the external genital area (IR n=1499, CR n=326)	Yes	89.0	70.6	<0.001	0.20
	No	8.0	22.1		
	Don't know	3.0	7.4		
Show self-examination (IR n=1480, CR n=327)	Yes	58.2	46.8	<0.001	0.11
	No	38.0	51.4		
	Don't know	3.9	1.8		

IR: Intervention Region; CR: Control Region

Family physicians vs. dermatologists in the intervention region

Patients' perception of the family physician's vs. dermatologist's screening procedure: Concerning the perceived procedure of the doctor during the screening, chi-square tests found significant differences between participants being screened by a dermatologist compared to a family physician (Table 4): 97.4% of participants being screened by a dermatologist report that their doctor examined the skin in the external genital area, whereas only 89.0% of participants screened by a family physician were examined ($p < 0.001$). Regarding the skin self-examination, 66.1% of the dermatologists and 58.2% of the family physicians showed their patients how to perform a self-examination ($p = 0.010$). No significant differences can be found between family physicians and dermatologists regarding the examination of the scalp, the area between the toes and asking about the participants family history ($p > 0.05$).

Table 3: Participants' satisfaction with family physician's screening (intervention vs. control region)– descriptive statistics, t-test for independent samples, effect size cohen's d.

	Descriptive statistics				T-test				
	Region	n	Mean	SD	p	MD	95% CI		Cohen's d
Information UV protection	IR	1509	4.42	0.93	<0.001	0.74	0.58	0.90	0.61
	CR	327	3.68	1.45					
Length screening	IR	1513	4.86	0.43	<0.001	0.18	0.10	0.26	0.31
	CR	327	4.68	0.71					
Screening uncomfortable	IR	1510	4.66	0.68	0.005	-0.11	-0.18	-0.03	0.17
	CR	326	4.77	0.61					
Screening method adequate	IR	1504	4.69	0.58	<0.001	0.22	0.14	0.31	0.34
	CR	326	4.46	0.77					
Confidence in doctor	IR	1511	4.85	0.43	0.002	0.11	0.04	0.17	0.21
	CR	326	4.74	0.59					

IR: Intervention Region; CR: Control Region; SD: Standard Deviation; MD: Mean Difference; CI: Confidence Interval

Patients' satisfaction regarding the screening examination and the family physician's vs. dermatologist's performance:

Looking at the patients' satisfaction in the intervention region, significant differences detected by t-tests can be found (Table 5): Participants who were screened by a dermatologist rated the provided information on UV-protection better (Mean = 4.63, SD = 0.75) than participants screened by a family physician (Mean = 4.42, SD = 0.93; $p < 0.001$). Moreover, with a mean score of 4.79 (SD = 0.44), dermatologists' patients consider the screening method slightly more adequate compared to patients screened by family physicians (Mean = 4.69, SD = 0.58; $p < 0.001$). Regarding the confidence in the doctor, dermatologists obtain a slightly better rating by their patients (Mean = 4.92, SD = 0.30) than family physicians (Mean = 4.85, SD = 0.43; $p < 0.001$). No significant differences between dermatologists and family physicians can be found concerning the questions, whether the length of the screening was acceptable and whether the examination was uncomfortable ($p > 0.05$). When pooling up all means regarding the participants satisfaction, the average mean value is 4.70 for family physicians and 4.75 for dermatologists.

Table 4: Perceived procedure of the family physician's vs. dermatologist's screening in the intervention region – frequency percentage, chi-square test, phi coefficient.

Variable	Scale	Family physicians (%)	Dermatologists (%)	p	Phi (ϕ)
Family history (family physicians: n=1503, dermatologists: n=462)	Yes	88.0	89.8	0.488	0.03
	No	10.7	9.3		
	Don't know	1.3	0.9		
Examination scalp (family physicians: n=1511, dermatologists: n=466)	Yes	98.2	99.6	0.084	0.05
	No	1.5	0.2		
	Don't know	0.3	0.2		
Examination between the toes (family physicians: n=1508, dermatologists: n=466)	Yes	95.5	96.4	0.704	0.02
	No	3.6	2.8		
	Don't know	0.9	0.9		
Examination skin in the external genital area (family physicians: n=1499, dermatologists: n=462)	Yes	89.0	97.4	<0.001	0.13
	No	8.0	2.2		
	Don't know	3.0	0.4		
Show self-examination (family physicians: n=1480, dermatologists: n=454)	Yes	58.2	66.1	0.010	0.07
	No	38.0	31.1		
	Don't know	3.9	2.9		

Table 5: Participants' satisfaction of the family physician's vs. dermatologist's screening in the intervention region– descriptive statistics, t-test for independent samples, effect size cohen's d.

	Descriptive statistics				T-test				
	Region	n	Mean	SD	p	MD	95% CI		Cohen's d
Information UV protection	phys.	1509	4.42	0.93	<0.001	-0.21	-0.30	-0.12	-0.25
	derm.	464	4.63	0.75					
Length screening	phys.	1513	4.86	0.43	0.060	0.04	0.00	0.09	0.09
	derm.	467	4.82	0.45					
Screening uncomfortable	phys.	1510	4.66	0.68	0.062	0.07	0.00	0.15	0.10
	derm.	464	4.59	0.73					
Screening method adequate	phys.	1504	4.69	0.58	<0.001	-0.11	-0.16	-0.06	-0.19
	derm.	465	4.79	0.44					
Confidence in doctor	phys.	1511	4.85	0.43	<0.001	-0.07	-0.11	-0.04	-0.19
	derm.	466	4.92	0.30					

Phys.: Family Physician; derm.: Dermatologist; SD: Standard Deviation; MD: Mean Difference; CI: Confidence Interval

DISCUSSION

The statistical analysis of the data set provides important findings that training doctors in skin cancer screening has positive effects on patient-oriented outcomes. With regard to the perceived procedure of the screening, significant differences between family physicians of the intervention and control region concerning the whole-body examination and counseling on self-examination and family history are detected. Besides, participants' satisfaction with the family physician's screening indicates significant differences in favor of the intervention region. It can thus be stated that training in skin cancer screening contributes to preciseness of the whole-body examination and promotes counseling on other important aspects such as family history self-examination of the skin. The patients rate these aspects positively, which is reflected in a higher level of satisfaction with the screening. Comparing family physicians with dermatologists in the intervention region, significant differences in the screening procedure can only be detected regarding the examination of the external genital area and the self-examination. In the scope of participants' satisfaction, minor differences in favor of dermatologists can be found. The results can be placed in the context of other studies [8], which were also able to show that training doctors leads to improved patient satisfaction as well as an increase in the knowledge of the participating doctors for other training programs. The fact that the patients rated the screening in the intervention region more frequently as uncomfortable can be interpreted as a side effect of a precise examination. In the intervention region, areas of the body such as the genitals and anus were examined more often, still remaining insufficient though. However, this could be evaluated as uncomfortable by the patient, but is evidence for the quality of the examination. Furthermore, the data indicates that the information on UV protection and the explanation of the self-examination need to be expanded. Although differences between the control region and the intervention region can be seen, the approval values are low compared to the other variables in both groups.

In addition to the differences between the evaluation of the doctors in the intervention and control regions, differences concerning the professional background of the doctors could be identified. On average, dermatologists receive a slightly better rating from patients than family physicians. These can possibly

be explained by the higher level of experience of dermatologists and the associated higher level of routine. Recently published data by Görig et al. [10] confirm this result in a representative patient survey on German statutory skin cancer screening. They derive the need for a quality offensive from this. In the future, it is important to compensate the differences due to the professional background and to create a uniform examination quality and patient satisfaction. However, methodological limitations must be considered. With regard to the doctors' adherence to the protocol, it should be noted that in the analyses exclusively subjective statements by the patients are investigated and that the actual performance/ the doctors view may differ. Since the survey took place immediately after the examination, memory losses are unlikely. Considering the study population, differences in sample characteristics regarding age and education in the intervention and control region must be taken into account, when assessing effects of the training program. Moreover, it must be stated that the majority of the doctors are family physicians, which is due to the fact that the healthcare system in Canada has very few specialists compared to the German system. Therefore, no dermatologist was included in the control region and the number of dermatologists in the intervention region is rather small. This does only allow for a comparison of intervention and control region for family physicians. Besides, a comparison of doctors' specialty is only possible for the intervention region, so that differences of trained family physicians and trained dermatologists were assessed. Hence, no statements can be made as to whether the differences associated with the professional background arose or were reinforced by the training.

CONCLUSIONS/PERSPECTIVES

Since the training program is based on the German skin cancer screening training program, this evaluation can be used to derive significant information about the training program for the statutory skin cancer screening in Germany. Its effectiveness has so far only been examined in the form of pre-post-evaluations with regard to the increase in knowledge and diagnostic reliability [7]. In addition, the need to expand preventive counseling on UV protection and skin cancer screening should also be considered in the revision of the German advanced training program, and efforts should also

be made to remove barriers to carrying out preventive advice in the context of skin cancer screening and promote transfer into everyday routine.

The results are also interesting with regard to the differences between the different medical backgrounds of the performing doctors. Dermatologists do better than general practitioners in most areas. Here, the results can only be transferred to the German health system to a limited extent, since the proportion of specialists in Germany is much larger and the range of tasks of a family doctor is smaller. The evaluations carried out here can show that there are patients perceived differences between trained and untrained doctors. However, it must be noted that the evaluations measured in the context of this study only provide evidence of effects in the short term, i.e. immediately after the investigation, and that no statements can be made on medium and long-term effects. Further parameters, including those relating to long term, objective data, were also collected within SCSES and will be published in further publications. Further research such as the use and the effectiveness of refresher training courses and their optimal time intervals in order to maintain the high standard in the long term need to be investigated.

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CONFLICTS OF INTEREST

None

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