ORIGINAL ARTICLE

Sun protection advice mediated by the general practitioner: An effective way to achieve long-term change of behaviour and attitudes related to sun exposure?

MAGNUS FALK^{1,2,3} & HENRIK MAGNUSSON^{1,3}

¹The Research and Development Unit for Local Healthcare, County of Östergötland, Linköping, ²Kärna Primary Healthcare Centre, Linköping, and ³Department of Medical and Health Sciences, Faculty of Health Sciences, Linköping University, Linköping, Sweden

Abstract

Objective. To investigate, in primary health care, differentiated levels of prevention directed at skin cancer, and how the propensity of the patients to change sun habits/sun protection behaviour and attitudes towards sunbathing were affected, three years after intervention. Additionally, the impact of the performance of a phototest as a complementary tool for prevention was evaluated. **Design.** Randomized controlled study. **Setting and subjects.** During three weeks in February, all patients ≥ 18 years of age registering at a primary health care centre in southern Sweden were asked to fill in a questionnaire mapping sun exposure habits, attitudes towards sunbathing, and readiness to increase sun protection according to the Transtheoretical Model of Behaviour Change (TTM) ($n = 316$). They were randomized into three intervention groups, for which sun protection advice was given, in Group 1 by means of a letter, and in Groups 2 and 3 orally during a personal GP consultation. Group 3 also underwent a phototest to demonstrate individual skin UV sensitivity. **Main outcome measures.** Change of sun habits/sun protection behaviour and attitudes, measured by five-point Likert scale scores and readiness to increase sun protection according to the TTM, three years after intervention, by a repeated questionnaire. **Results.** In the letter group, almost no improvement in sun protection occurred. In the two doctor's consultation groups, significantly increased sun protection was demonstrated for several items, but the difference compared with the letter group was significant only for sunscreen use. The performance of a phototest did not appear to reinforce the impact of intervention. **Conclusion.** Sun protection advice, mediated personally by the GP during a doctor's consultation, can lead to improvement in sun protection over a prolonged time period.

Key Words: Family practice, phototest, prevention and control, primary health care, skin cancer, sun protection behaviour

The relationship between Western societies' extended sun exposure habits and the rapidly increasing skin cancer incidence has been thoroughly described [1–3]. In Sweden, malignant melanoma incidence has almost tripled during the most recent decades, and the same accounts for squamous and basal cell carcinomas [4]. Preventive measures to counteract the increasing incidence are basically constituted by two important components: change in sun exposure habits (primary prevention), and early detection of malignant skin tumours (secondary prevention). This paper focuses primarily on the first of these components.

Within a multiplicity of medical fields, primary health care constitutes a strategic base for prevention. In a previously presented study the impact of differentiated levels of primary prevention used in primary

health care has been described [5]. The three effort levels studied were: (1) solely written information/advice by means of a letter, (2) information/advice delivered during a GP consultation, and (3) information/advice delivered during a GP consultation including the performance of a phototest. Results indicated that the solely written information led to a lower tendency to change sun exposure/protection, compared with the two other intervention groups. Additionally, in the phototest group, the phototest appeared to reinforce the effect for individuals with high UV sensitivity.

In reviews within the field, varying impact of prevention has been described, some studies showing significant change in sun exposure habits [6–8]. However, most of these refer to relatively short study periods, from a few weeks up to 12 months. Glanz & Mayer

Long-term effectiveness of skin cancer primary prevention has in previous studies been shown to be difficult to achieve.

- Sun protection advice mediated in primary health care during a personal GP consultation led to improved sun protection behaviour, persisting three years after intervention.
- Similar, solely written information led to almost no improvement in sun protection, but the better outcome seen in the doctor's consultation group was only significant for sunscreen use.
- The performance of a phototest to enhance awareness of individual UV sensitivity did not seem to reinforce the effect of the intervention mediated during the GP consultation.

stated that 40% of the reviewed studies followed subjects for less than one month, and only 13.6% for more than one year, pointing out a need for prolonged follow-up intervals [8]. Only a limited number of studies have reported results using follow-up intervals longer than two years [9–11].

The aim of the present paper was to investigate, in a primary health care setting, differentiated levels of prevention directed at skin cancer, and how the propensity of the patients to change sun habits/sun protection behaviour and attitudes towards sunbathing was affected, three years after intervention. Additionally, the impact of the performance of a phototest as a complementary tool for prevention was evaluated. The study hypothesis was that a higher preventive effort level, represented by the three intervention groups, would lead to a higher degree of behaviour change towards increased sun protection.

Material and methods

The study constitutes a three-year follow-up of the half-year study performed earlier, which was initiated in 2005 and published in 2008 [5]. The study design is schematically displayed in Figure 1 (flowchart).

Study population

The study was performed at Kärna Primary Health Care Centre, situated in a suburb of Linköping, southern Sweden, a population consisting of suburban and rural/outer metropolitan inhabitants with mixed socioeconomic status, totalling about 13 500 individuals. Regardless of the purpose of their visits (including visits to doctors, nurses, physiotherapists

etc., or for laboratory tests), all patients ≥ 18 years of age registering at the health care centre during three weeks in February (inclusion criteria) were asked to fill in a questionnaire concerning sun exposure habits. Abnormal UV sensitivity, current intake of UV-sensitizing medication, and cognitive disorders (e.g. dementia) were exclusion criteria. The questionnaire was administered in the reception area at registration, together with written information concerning the study, and the participants gave written consent to voluntary participation. Estimated sample size was based on sizes and outcomes of previous studies using equivalent measures [7,8,17].

The questionnaire

Besides demographic data (age, sex, educational level, skin type according to Fitzpatrick's classification [12], and personal or family-related history of skin cancer, q. 1–8), the questionnaire consisted of three parts: questions on sun habits/sun protection, mapping of readiness to change behaviour, and questions concerning attitudes towards sun bathing.

The first part (q. 9–16, see Table I) contained questions on sun habits/sun protection behaviour, with response alternatives presented on five-point Likert scales (e.g. “never”, “seldom”, “sometimes”, “often”, or “always”). Full presentation of response alternatives for each question is available in the previous paper [5].

The second part (q. 17a–d, see Table II) addressed readiness to change behaviour, based on the *Transtheoretical Model of Behaviour Change* (TTM). This model, presented by Prochaska et al. [13], has gained wide acceptance and extensive use, in studies on both sun exposure [14–17] and other health risk behaviours, not least tobacco smoking [18]. The principle of the model is to classify the individual, by use of grading statements, into any of five stages representing increasing propensity to change behaviour: the *pre-contemplation*, *contemplation*, *preparation*, *action*, or *maintenance* stage. Four behavioural items were investigated: (a) giving up sunbathing, (b) using covering clothes for sun-protection, (c) using sunscreens, and (d) staying in the shade during the hours of strongest sunlight. At analysis, the five stages of change were scored as 1–5, from maintenance to pre-contemplation stage.

The third part (q. 18–22, see Table III) concerned attitudes towards sunbathing, represented by Likert scale scores. Full presentation of response alternatives is again given in the previous paper [5].

Group intervention/randomization

Included subjects were randomized into three intervention groups. In all groups, subjects received the same general sun protection advice but also individual

Figure 1. Flowchart showing study design, group distribution, and response frequencies at follow-up.

feedback on the questionnaire, with adjusted advice based on their responses. At randomization, the possible maximum number of subjects in groups 2 and 3 was limited by the capacity of doctors' consultations required, to a total of 200. Therefore, excess of subjects >300 (group 1 included) were randomly

selected for group 1, before equal randomization of the remaining subjects to all three groups.

In group 1, subjects received feedback in the form of a letter, with standardized comments on skin type, sun habits, and sun protection. It concluded with a summarized risk assessment with personally adjusted

Table I. Baseline mean values of the five-point Likert scale scores, for the questions concerning sun habits/sun protection behaviour (questions 9–16 in the questionnaire), and the mean change after three years, presented for each of the three groups.

Q. no		Questions on sun habits/sun protection behaviour		Scoring mean values				Sign. (ANCOVA)		
				Group 1 (n = 82)		Group 2 (n = 80)			Group 3 (n = 76)	
				Baseline	Mean change at 3 years	Baseline	Mean change at 3 years		Baseline	Mean Change at 3 years
9	How often do you sunbathe with the intention to tan during the summer in Sweden?	3.00	−0.16	3.09	−0.38**	3.08	−0.37**	–		
10	How often do you usually go on a “sun vacation” abroad?	1.88	−0.02	1.90	−0.09	1.86	0.00	–		
11	Do you usually use a sunscreen when sunbathing?	2.81	0.16	3.04	−0.39*	3.07	−0.15	p < 0.05 (Gr. 1 and 2)		
12	If you use sunscreens, which sun protection factor do you choose?	3.01	−0.30	3.06	−0.57**	3.12	−0.38**	–		
13	When in the sun, without intention to tan, how often do you use any of the following ways to protect from the sun:									
	(a) sunscreens	3.18	0.30	3.70	−0.55*	3.59	−0.15	p < 0.05 (Gr. 1 and 2)		
	(b) shirt or sweater with short sleeves	2.55	−0.17	2.35	0.04	2.69	−0.31*	–		
	(c) shirt or sweater with long sleeves	3.98	−0.02	3.92	−0.28*	3.83	−0.11	–		
	(d) sun hat or cap	3.48	−0.03	3.06	−0.19	3.17	−0.06	–		
	(e) trousers with long legs	3.80	−0.24	3.89	−0.35*	3.67	−0.25*	–		
	(f) staying in the shade	3.03	−0.15	2.89	−0.29*	3.10	−0.17	–		
14	How many times have you been sunburnt during the past year?	1.44	−0.04	1.63	−0.18*	1.63	−0.19*	–		
15	How often do you use a sunbed?	1.21	−0.14*	1.18	−0.13*	1.34	−0.17*	–		
16	How long do you usually stay in the sun between 11 am and 3 pm (Jun–Aug)?	3.10	−0.31**	3.26	−0.39**	2.99	−0.05	–		

Notes: A negative value indicates change towards lowered risk behaviour. Significance values of between-group differences (ANCOVA) are displayed in the right-hand column. Significance values marked with asterisks refer to within group differences (paired t-test; * = $p < 0.05$, ** = $p < 0.01$, shown in bold).

sun protection advice, and an additional information folder from Apoteket (Swedish public pharmacy) was enclosed, containing general information on sun exposure risks and sun protection.

Group 2 received feedback by means of a personal GP consultation at the primary health care centre, performed by one of the authors (MF). The consultation was free of charge, took approx 20 minutes, and consisted of the same, this time oral, feedback on the questionnaire as well as adjusted information and sun protection advice. Additionally, nevi inspection was performed, and the same information folder from Apoteket was distributed as in group 1.

Group 3 received the same feedback as group 2, but the GP consultation also included a phototest

(Skin-tester Kit, Cosmedico Medizintechnik GmbH, Schwennigen, Germany), applied on the palmar side of the forearm, consisting of six quadratic (12×12 mm) fields emitting separate, increasing UV doses, illuminated simultaneously for 25 seconds. After 24 hours, the subjects themselves performed test reading, by simply counting the number of erythematous reactions and then reporting the result, by mail, on a specific protocol. Feedback based on the phototest result was then mailed back to the subjects. Test information and how to read and report it took a maximum of two minutes, and did not interfere with the time needed for the consultation. Both the phototest technique and the self-reading procedure have in previous studies proved reliable [19,20].

Table II. Baseline mean values for the five stages of change, scored as 1–5 (from maintenance to pre-contemplation stage), and for each of the four behavioural items, and the mean change after three years, presented for each of the three groups.

Q. no	Stages of change	Behavioural item	Scoring mean values						Sign. (ANCOVA)
			Group 1 (n = 82)		Group 2 (n = 80)		Group 3 (n = 76)		
			Baseline	Mean change at 3 years	Baseline	Mean change at 3 years	Baseline	Mean Change at 3 years	
17a	Giving up sunbathing	2.94	−0.40*	3.01	−0.60**	2.91	−0.53**	—	
17b	Using clothes for sun protection	2.41	−0.19	3.72	−0.28	2.40	−0.27	—	
17c	Using sunscreens	3.31	−0.09	3.42	−0.29*	3.23	−0.14	—	
17d	Staying in the shade	2.89	−0.28*	2.79	−0.72**	3.00	−0.21	p<0.05 (Gr. 2 and 3)	

Notes: A negative value indicates change towards increased readiness to change behaviour. Significance values of between-group differences (ANCOVA) are displayed in the right-hand column. Significance values marked with asterisks refer to within-group differences (paired t-test; * = $p < 0.05$, ** = $p < 0.01$, shown in bold).

Three-year follow-up

After six months and after three years, all subjects received a repeat questionnaire. The results from the six months' follow-up have previously been reported [5].

Statistical analysis

Mean values of the five-point Likert scales and the five scored stages of change according to the TTM were calculated at baseline and at the three-year follow-up, and the differences used as a measure of change in sun habits/sun protection behaviour and in readiness to increase sun protection. Between-group differences were analysed using ANCOVA with age and sex as covariates. Additionally, within-group differences were analysed using a paired-sample t-test. Bonferroni correction was performed for all multiple comparisons and a p-value of < 0.05 was considered as statistically

significant. The assessment was, according to sample size, based on the assumption of questionnaire responses being normally distributed. However, since they were in fact ordinal data, within-group differences were also analysed by complementary non-parametric assessment, using the Wilcoxon signed-ranks test. The statistical software package SPSS (version 17.0; SPSS, Inc., Chicago, IL) was used for all analyses.

Results

A flowchart describing the inclusion and randomization process, group distribution, and response rates at follow-up occasions is shown in Figure 1. Of 652 patients registering at the primary health care station during the inclusion period, 330 subjects filled in the questionnaire. Of these, 14 were excluded due to insufficient contact information or errors in inclusion,

Table III. Baseline mean values of the five-point Likert scale scores, for the questions on attitudes towards sunbathing (questions 18–22 in the questionnaire), and the mean change after three years, presented for each of the three groups.

Q. no	Questions on attitudes towards sunbathing	Scoring mean values					
		Group 1 (n = 82)		Group 2 (n = 80)		Group 3 (n = 76)	
		Baseline	Mean change at 3 years	Baseline	Mean change at 3 years	Baseline	Mean Change at 3 years
18	How do you like sunbathing?	3.48	–0.10	3.35	–0.14	3.43	0.04
19	Do you think that the advantages of sunbathing outweigh the disadvantages?	2.92	–0.26*	2.83	–0.27*	2.81	–0.07
20	How extensive do you consider the health risks of sunbathing?	2.76	–0.06	2.81	–0.33**	2.73	0.05
21	How extensive do you consider the risk for you to develop skin cancer?	3.09	–0.12	3.05	–0.05	3.00	0.00
22	How important is it for you to get tanned during the summer?	2.20	0.04	2.14	0.02	2.41	–0.15*

Notes: A negative value indicates change towards lowered risk attitude. Significant values refer to within-group differences (paired t-test; * = $p < 0.05$, ** = $p < 0.01$, shown in bold). No significant differences occurred between groups.

leaving 316 subjects to be included. Of these, 116 subjects were randomized to group 1, 100 subjects to group 2, and 100 subjects to group 3. Three subjects in group 2, and five subjects in group 3, failed to come to the doctor's consultation, leaving 97 in group 2, and 95 in group 3. Of subjects eligible for assessment ($n = 308$), 61% were female and 39% were male. Five percent were between 18 and 25 years, 24% were between 26 and 40 years, 47% were between 41 and 65 years, and 24% were older than 65 years. Among non-responders, gender distribution was 57% female and 43% male, with a similar age distribution to those filling in the questionnaire. Response frequencies at three years were 71% in group 1, 82% in group 2, and 80% in group 3.

Sun habits/sun protective behaviour

In Table I, the change in mean values of the five-point Likert scale scores between the initial and the follow-up questionnaire, for questions on sun habits/sun protection behaviour (q. 9–16), are displayed. Significant group-dependent differences according to ANCOVA were only seen between groups 1 and 2, for q. 11 ($p < 0.05$) and q. 13a ($p < 0.001$), both measuring sun-screen use. Questions for which the paired t-test showed significantly lowered risk behaviour appeared most frequently in group 2, and were in all cases the same as when assessed by non-parametric analysis.

Stages of change

In Table II, the change in mean values for the five scored stages of change (q. 17a–d), between the

initial and the final questionnaire, is presented. Significant group-dependent difference according to ANCOVA was seen only between groups 2 and 3, for q. 17d (staying in the shade) ($p < 0.05$). Significant changes within groups, based on a paired t-test, were in all cases consistent with the non-parametric analysis.

Attitudes towards sunbathing

Table III displays the results of the questions on attitudes towards sunbathing (q. 18–22), following the same principle as for sun habits in Table I. No statistically significant differences in outcome between groups could be demonstrated. Questions where the paired t-test showed significant change in attitude appeared most frequently in group 2, which again corresponded to the outcome of the non-parametric statistics.

Change of behaviour and attitudes according to UV sensitivity

In order to investigate the role of the phototest and whether UV sensitivity according to the phototest result affected the outcome in group 3, the group was subdivided into subjects with low UV sensitivity (0–2 phototest reactions) and high UV sensitivity (3–5 phototest reactions; no subjects reported six reactions), and results are presented in Table IV. No statistically significant differences between the two subgroups could be demonstrated by ANCOVA.

Table IV. Baseline mean values of the five-point Likert scale scores in group 3 (phototest group), subdivided according to UV sensitivity based on the phototest result, and the mean change after three years.

Q. no	Sun habits/sun protection behaviour	Phototest result			
		Low UV sensitivity (n = 29)		High UV sensitivity (n = 45)	
		Baseline	Mean change at 3 years	Baseline	Mean change at 3 years
9	How often do you sunbathe with the intention to tan during the summer in Sweden?	3.07	–0.28	3.07	– 0.42 **
12	If you use sunscreens, which sun protection factor do you choose?	2.92	–0.31	2.66	– 0.42 *
13e	When in the sun, without intention to tan, how often do you use trousers with long legs?	3.83	– 0.39 *	3.55	–0.19
14	How many times have you been sunburnt during the past year?	1.41	– 0.28 *	1.73	–0.09
15	How often do you use a sunbed?	1.38	– 0.24 *	1.33	–0.16
17a	Giving up sunbathing	2.68	– 0.75 *	3.07	– 0.42 *
21	How extensive do you consider the risk for you to develop skin cancer?	2.96	0.29 *	3.02	–0.18

Notes: A negative value indicates change towards lowered risk behaviour. Significant values refer to within-group differences. Only questions for which statistically significant changes occurred are displayed (paired t-test; * = $p < 0.05$, ** = $p < 0.01$, shown in bold). No significant differences occurred between the two subgroups.

Discussion

The present paper describes an attempt to evaluate the effectiveness of a preventive intervention against skin cancer, over an extended time period. Although frequently investigated worldwide, successful primary prevention of skin cancer has in many cases been shown to be difficult to achieve. Despite increased awareness of sun exposure risks, people tend to maintain their usual habits, a pattern not unique to sun habits but seen for other health risk behaviours as well [18,21–24]. A somewhat better impact has been shown for specific target groups, such as “beachgoers”, and for children in school and pre-school, but in most studies follow-up intervals are short [15,16,25–27]. To be able to have any possible preventive effect on skin carcinogenesis, achieved improvement of sun protection has to be persistent for several years. The present study demonstrates an example of preventive intervention in a primary health care situation, mediated by the GP, leading to significant change in health behaviour in terms of increased sun protection over a prolonged time period of three years, most prominently seen for sunscreen use. Since improved sun protection through large media campaigns has, with a few exceptions [28,29], proved difficult to assess [6–8], not least in the long-term perspective [30], the role of primary health care physicians appears to be crucial. Not only can they provide general or individual information on sun exposure risks, but they can also relate or adjust the information with regard to the physical findings during skin examination (e.g. skin type, presence of sun-related damage or conditions, number and characteristics of pigmented nevi, etc.), an approach that might enhance the effect of intervention. Additionally, besides actual changes in risk behaviour, there are other possible aspects of preventive advice that it is important to mention. For example Kehler et al. found, in a study on 1226 patients, that a cardiovascular preventive advisory intervention led not only to healthy lifestyle changes, but also to positive cognitive and emotional effects as reported by the patients concerned [31].

Besides evaluation of the letter/GP consultation mediated prevention, the intention was also to investigate the possibility of using a phototest in skin cancer prevention. In the previous half-year follow-up, it was suggested that the positive outcome for subjects with high UV sensitivity, demonstrated by the phototest, might point to a possible method for targeting individuals with increased skin cancer risk. In the present three-year follow-up, no proof of this could be demonstrated. In fact, although the difference between the two doctor’s consultation groups was only significant for the TTM item “Staying in the shade”, questions for which significantly improved sun protection occurred were considerably more frequent in

the group of subjects who received only a doctor’s consultation and not a phototest. This makes the possible benefit of performing a phototest more doubtful, at least in this unselected patient material. Although the time interval for the feedback and personal advice during the consultation was not affected by the phototest procedure, a relevant question on this aspect is whether the phototest performance might have taken the focus from the advisory part of the consultation, leading to a lower impact. Nevertheless, it would be of interest to further investigate whether a phototest could be of value in a more specified patient population, such as patients specifically visiting their doctor for inspection of tumorous skin lesions.

As seen in Table I, an interesting finding was that all three intervention groups display similar, in all three cases significant, reduced sunbed use, a finding not seen for any of the groups in the half-year study. This raises the question of whether this change in behaviour might be an expression of a general changing social trend rather than increased caution specifically due to the study intervention. Natural climate variation differences between the summer seasons involved during the study period may be another possible explanation, but this theory is contradicted by the fact that cumulative sun radiation during the summer seasons in Sweden prior to the follow-up occasions (i.e. 2004 and 2007), was almost equal [32]. However, the data in this study are insufficient to shed further light on the issue.

In the presentation of data we have chosen to focus on the change in behaviour and attitude-related parameters from baseline to the time of follow-up, reflected in changes in mean values of Likert scorings. Interpretation of ordinal Likert scale data as numerical values is commonly used, although often pointed out not to be, by true means, statistically accurate. However, in the case of the present study it was favourable for the group-wise comparisons, and also by illustrating a general change in risk behaviour, reflecting the compound number of subjects who had changed risk behaviour – in either direction – rather than presenting separately the total number of patients who changed from one score to another. Additionally, complementary non-parametric statistics did not differ.

Although items showing significantly lowered risk behaviour occurred most frequently in the two doctor’s consultation groups, significant difference in outcome between groups could only be demonstrated for sunscreen use and for staying in the shade. Of course, this limits the possibilities of drawing reliable conclusions from the results. Furthermore, in the present study, intervention by means of a doctor’s consultation was performed by one single GP, a fact that naturally, at least to some extent, affects the generalizability of the results. To overcome this, an extended

study involving multiple primary health care centres and GPs would of course be desirable.

Conclusion

In conclusion, the results of this study indicate that sun protection advice, mediated personally by the GP during a doctor–patient consultation, can lead to improvement in sun protection over a prolonged time period of at least three years. In return, the effectiveness of a similar, solely written sun protection advice appears to be more doubtful. Neither did the addition of a phototest to the GP consultation reinforce the effect of intervention, but the question as to whether the phototest might be more specifically used to identify, or target intervention towards, patients/individuals with heightened skin cancer risk due to skin type warrants further research.

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Conflicts of interest

None.

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