Title:

Doctors' recognition and management of melanoma patients' risk: an Australian population-based study

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Abstract

Background: Guidelines recommend that health professionals identify and manage individuals at high risk of developing melanoma, but there is limited population-based evidence demonstrating real-world practices.

Aim: To determine doctors' knowledge of melanoma patients' risk and to identify factors associated with better identification and clinical management.

Design and Setting: A population-based, observational study conducted in the state of New South Wales, Australia.

Method: Data were analysed from 1,889 people with invasive, localised melanoma from the Melanoma Patterns of Care study, which collected data on all melanoma diagnoses notified to the state's cancer registry during a 12-month period from 23 October 2006, as well as questionnaire data from the doctors involved in their care.

Results: Three-quarters (74%) of patients had doctors who were aware of their risk factor status regarding personal and family history of melanoma and the presence of many moles. Doctors working in general practice, skin cancer clinics and dermatology settings had better knowledge of patients' risk factors than plastic surgeons. Doctors were 15% more likely to know the family history for younger melanoma patients (<40 years) than those ≥ 80 years (95% confidence interval 1.04-1.26). Skin-related follow-up advice was more likely to be given to younger patients, by doctors aware of their patients' risk status, by doctors practising in plastic surgery, dermatology and skin cancer clinic settings, and by female doctors.

Conclusion: Both patient-related and doctor-related factors were associated with doctors' recognition and management of melanoma patients' risk, and could be the focus of new strategies for improving care.

Keywords

melanoma, risk factors, guideline adherence, cancer, general practice

How this fits in

Clinical practice guidelines recommend that health professionals identify patients at high risk of developing melanoma and encourage appropriate skin surveillance, to improve earlier detection and prognosis. However, there is limited population-based evidence demonstrating real-world practices. This large, population-based study provides a snapshot of melanoma care relating to doctors' knowledge of patients' melanoma risk factors and subsequent skin-related follow-up advice and recommendations. We identified patient-related and doctor-related factors associated with better identification and follow-up of high-risk patients, thus giving doctors involved in melanoma management potential avenues for improving patient care.

Introduction

Melanoma continues to be a significant health issue worldwide, particularly in Australia which has one of the highest incidence rates (1). In the most populous Australian state of New South Wales (NSW) it is the fourth most common cancer, with 3,705 new cases of invasive cutaneous melanoma reported in 2009 (2), and 5,708 new cases annually expected by 2021 (3).

Internationally, clinical practice guidelines consistently recommend that clinicians should identify individuals at high risk of developing melanoma and manage them appropriately to optimise the prognosis and health outcomes for patients (4-9). Australian guidelines published in 1999 (10), and updated in 2008 (9), outlined risk factors for melanoma, including pigmentation characteristics, personal and family history of melanoma, and number of naevi, and recommended that clinicians assess their patients for these factors. The guidelines recommended that patients classified as high risk should be encouraged to perform skin self-examination, be educated about specific changes that suggest melanoma, and be offered a skin surveillance program. This advice is particularly relevant to people already diagnosed with melanoma, who are at 5- to 10-fold increased risk of a subsequent primary melanoma (11, 12). Targeted high-risk screening and surveillance programs have been shown to assist with early diagnosis of melanoma and are deemed more cost-effective than a population-wide screening program (13-15).

Several studies have described different aspects of melanoma management in Australia (16-23), but few have compared real-world clinical practice with what is recommended in the guidelines. To address this gap, we undertook a survey to evaluate clinicians' knowledge and management of risk factors for people residing in NSW with a diagnosis of melanoma notified to the NSW Cancer Registry during a 12-month period in 2006-07. Using these data, we aimed to: 1) determine doctors' knowledge of their patients' melanoma risk; and 2) identify factors associated with doctors' recognition and subsequent management of patients' melanoma risk, particularly related to skin self-examination and surveillance for early detection of future melanomas.

Method

Study design and population

The Melanoma Patterns of Care Study was a population-based, observational study. It was based on doctors' reported clinical management of NSW residents of any age who had a pathologically-confirmed primary in situ or invasive cutaneous, or a melanoma of unknown primary site, notified to the NSW Cancer Registry between 23 October 2006 and 22 October 2007. Melanomas were classified based on ICD-O-3 (International Classification of Diseases for Oncology, 3rd edition) codes C44.0 to C44.9 or C80.9 and histology codes 8720-8790 /2 (in situ) or /3 (invasive) (24). The study was conducted at the NSW Cancer Registry located within the Cancer Institute NSW, with ethics approval from The University of Sydney Human Research Ethics Committee and the NSW Population and Health Services Research Ethics Committee.

Data collection

Information was collected from the NSW Cancer Registry on the characteristics of the patients, their lesions, and the doctors involved in their care. For each eligible patient, the primary doctor was contacted by the study team and asked to complete a questionnaire regarding the clinical management of that patient. The 'primary doctor' for this study was defined as the requesting doctor on the diagnostic pathology report on which the cancer registration was based, and was considered to be the doctor providing initial care following diagnosis. If the primary doctor referred the patient to other doctors (known as referral doctors in this study), they were then also contacted by the study team and asked to complete a questionnaire. This process was followed for all notifications of eligible invasive melanomas but for only the first 450 notifications of in situ melanomas, in order to focus the limited capacity and resources of the research team on the collection of data for invasive melanomas. For doctors with large numbers of eligible patients, if requested, trained field workers with nursing experience completed the questionnaires from patient medical records. Seventy-two

percent of patients had at least one returned questionnaire; the questionnaire completion rate was 78%; 53% completed by doctors and 25% by trained field workers.

Questions about doctors' knowledge of their patients' risk and subsequent clinical management regarding skin surveillance are shown in Table 1. We created a 'patient risk' variable based on three important risk factors: multiple primary melanomas (i.e. a previous melanoma before the study period), family history of melanoma, and having many moles. Patients without any of these risk factors were placed in the 'average-risk' category; those with at least one reported risk factor were placed in the 'high risk' category and those whose risk factors were not known were categorised as 'no knowledge'.

We used postcode to estimate the relative remoteness, accessibility and socio-economic disadvantage of patients' place of residence and doctors' practice location. Postcodes were linked to classification systems endorsed by the Australian Government, including Rural Remote and Metropolitan Areas (RRMA) (25), Accessibility/Remoteness Index of Australia (ARIA) (26), and the Socio-Economic Indexes for Areas (SEIFA) (27).

Statistical analysis

This analysis focused on patients with invasive, localised melanoma and thus excluded in situ or metastatic melanoma. We also excluded questionnaires completed by trained field workers because of the high proportion of unrecorded information in the medical records for the variables related to doctors' knowledge of the presence of risk factors and skin-related follow-up. For 1.2% of patients with more than one diagnosis of invasive melanoma during the 12-month period, we included data related to the first invasive lesion only, as associations may have been different for subsequent melanomas.

To examine the factors associated with doctors' knowledge of patients' risk factors for melanoma and doctors' management of patients regarding skin-related follow-up advice and recommendations,

probability ratios (PR) and 95% confidence intervals (CI) were estimated using log binomial regression models. Multivariate models were fitted using a forward stepwise approach with a cut-off p-value of 0.10. All statistical models included patient age and gender; and models of patient management included the patient risk variable, regardless of statistical significance, as they were considered *a priori* as important covariates. Other factors assessed for inclusion were patients' and doctors' socio-demographic characteristics, doctors' specialty and practice setting, and histopathological features of the melanoma. Questionnaires with missing values for these variables were excluded from the multivariate analysis. Analysis was conducted using SAS software version 9.4 (28).

Results

Patient and lesion characteristics

A total of 1,889 patients with invasive, localised melanoma met the criteria for analysis. Patient and melanoma characteristics are presented in Table 2. The majority (61%) were male and 69% lived in metropolitan areas. Patients tended to live in areas of relative socio-economic advantage (70% in mid to high socio-economic areas) compared to the general population. Superficial spreading melanoma was the most common melanoma subtype, and most lesions were located on the trunk (36%) and arms (27%). Two-thirds (69%) of the melanomas were ≤ 1 mm thick.

Characteristics of doctors who returned a questionnaire

Doctors completed 2,190 questionnaires for the 1,889 patients in this analysis; 86% were completed by the primary (initial) doctor. Most questionnaires were received from general practitioners (53%), dermatologists (24%) and surgeons (18%). Doctors came from the following practice settings: general practice (38%); dermatology (23%); surgery (17%); skin cancer clinic (15%); plastic surgery (6%); and melanoma unit (1%). Most doctors were male (85%), with 35% and 36% in 45-54 and 55-64 year age groups, respectively. Their practices were mainly located in capital cities (50%).

Doctors' knowledge of patients' risk factors for melanoma

Table 3 shows that 74% of patients had at least one doctor who was aware of their risk factor status regarding personal and family history of melanoma and the presence of many moles, and 1% had doctors with no knowledge of the patients' risk factor status for all three risk factors. Doctors were more aware of patients' personal history of melanoma than family history or number of moles.

Factors associated with doctors' knowledge of patients' risk factors for melanoma

In a multivariate model, patients' age, and doctors' specialty, practice setting and whether they were the primary or referral doctor, were associated with doctors' knowledge of risk factors (Table 4). Compared to general practitioners, surgeons were less likely to know their patients' personal history of melanoma.

Doctors were 15% more likely (95% CI 4-26%) to know the family history for younger melanoma patients (<40 years) than for those ≥ 80 years. Compared to doctors in a general practice setting, those practising in skin cancer clinics were 22% more likely (95% CI 15-29%) to know their patients' family history of melanoma, whereas doctors in a plastic surgery setting were 20% less likely (95% CI 7-32%) to know their patients' family history of melanoma.

Doctors were less likely to know whether or not a patient had many moles if they worked in surgery, plastic surgery or melanoma unit practice settings, compared to a general practice setting. Referral doctors were 7% less likely to know about patients' moles compared to primary doctors.

Although some of the clinician variables were correlated, the variables retained in the multivariate models were independently predictive of the outcome. In addition, we examined whether there was evidence of interaction between doctors' gender and practice setting, but found none (p-values >0.30).

Factors associated with doctors' management of patients regarding skin-related follow-up advice and recommendations

Overall, 84% of patients were given advice on specific changes that suggest melanoma, 79% were encouraged to perform skin self-examination, and 73% were recommended a skin surveillance program.

In a multivariate model, doctors were more likely to give advice on skin changes, encourage skin self-examination and recommend skin surveillance if they were aware of their patients' risk status, and if they worked in skin cancer clinics, dermatology or plastic surgery settings, compared to general practice and melanoma unit settings (Table 5). Doctors were more likely to give advice on skin changes and encourage skin self-examination if patients were younger than 80 years old compared to $\geq$ 80 years. A skin surveillance program was 8% more likely (95% CI 2-14%) to be recommended to patients by female doctors than by male doctors. There was a marginally statistically significant association between higher Breslow thickness and less encouragement for skin self-examination and skin surveillance (*P*=0.06). There was evidence suggesting that patients who lived in certain rural and remote areas may be less likely to receive a recommendation for skin surveillance from their doctor (*P*=0.10).

Discussion

Summary

This study provides population-based data on doctors' recognition and management of patients' melanoma risk. Current international and Australian clinical practice guidelines recommend the assessment of melanoma-related risk factors by clinicians (4-9). Our study showed that NSW doctors were reasonably knowledgeable about patients' personal and family history of melanoma and whether they had many moles. For 74% of patients, their doctor/s knew of all three risk factors, with family history being the least known. Doctors' knowledge of these risk factors was influenced by

patient age, doctors' specialty and practice setting, and whether it was the primary or referral doctor.

General practitioners and doctors practising within skin cancer clinics (typically staffed by general practitioners in Australia (22)) and in dermatology settings had better knowledge of patients' risk factors compared to those in plastic surgery and melanoma unit settings. Our findings may reflect the accepted role and established procedures for general practitioners and dermatologists to optimise the prevention and early detection of melanoma. Other specialists, such as those in plastic surgery and melanoma unit settings, may have a more technical or procedure-specific role, e.g. initial surgical management, in which knowledge of patients' risk factors may be less relevant.

Our findings indicate that doctors largely provided the recommended skin-related advice for patients, but adherence to the guidelines was influenced by the patients' age, doctors' knowledge of their patients' risk status, practice setting, doctors' gender, and to a lesser degree, melanoma thickness. Doctors were more likely to give appropriate skin-related follow-up advice if they knew of their patients' risk status; but curiously, there was no difference in follow-up advice by whether or not the patients had additional risk factors.

Strengths and limitations

Strengths of this study include the population-based design, large sample size, and a high questionnaire completion rate. We sought to collect information from all doctors involved in the patients' care, to give a comprehensive picture of the patterns of care. A potential limitation is the exclusion of questionnaires completed by trained field workers from our analysis, because of the missing data relating to risk factor information available from patients' medical notes. Field worker assistance was more likely to occur for doctors with a high-volume of melanoma patients, e.g.

surgeons. In addition, response bias may have been present due to the self-reported nature of the data.

Comparison with existing literature

Several studies have described aspects of melanoma care in the Australian setting (18, 19, 22, 29-32), or have measured compliance with clinical practice guidelines (21, 33-36). However, to our knowledge our study is the first to report on doctors' knowledge of patients' risk factors and its relationship with subsequent skin-related follow-up advice and recommendations for melanoma in Australia. Courtney et al examined similar issues for colorectal cancer, but based on patients' perspectives using a community survey in NSW (37). They found that only 38% of respondents had ever been asked if they had a family history of colorectal cancer and only 31% of respondents had ever received screening advice from a health care provider; which is less favourable than in our study. Langlands et al (38) conducted an audit of 300 hospital patients' medical records, and found that 74% had no details on family history of medical conditions recorded. Similar to our study, Langlands et al also reported a trend towards better family history documentation for younger patients.

Our findings add to the growing evidence that older people are less likely to receive care in accordance with recommended guidelines, and that age-related disparities in melanoma care exist for melanoma prevention and treatment (39, 40).

Our finding that female doctors were more likely than male doctors to recommend a skin surveillance program was similar to that of Markova et al, who found that female physicians were more likely to perform skin examinations and were more active in discussing skin self-examination than male physicians (41).

Implications for research and/or practice

Our findings suggest that increasing doctors' awareness of patients' risk factors for melanoma could be one way of improving adherence to clinical practice guidelines regarding skin-related advice and follow-up. Family history was the least known risk factor, and obtaining this information from patients could be improved by using a validated family history screening questionnaire (42). Various risk assessment tools have also been developed for doctors and are widely available (43, 44). Within busy practice settings, systematic routine assessment, recording, updating and electronic display of patients' risk factor information may assist this process. Risk factor information should also be routinely communicated to other treating doctors.

Future educational and training programs for doctors should address the age-related disparities in melanoma care (39) and potential barriers (45) to improving patient outcomes. Further research into age-related disparities in care from the perspectives of the doctor and the patient would be valuable.

Additional information

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Ethical approval

Ethics approval was granted by The University of Sydney Human Research Ethics Committee (#9108) and the NSW Population and Health Services Research Ethics Committee (2006/08/002).

Competing interests

None declared.

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Tables

Table 1. Questions for doctors regarding their patients' risk factors and skin-related follow-up

Questions regarding risk factors
Did the patient have a:
Personal history of melanoma? *No, Yes, Don't know*
Family history of melanoma in a blood relative? *No, Yes, Don't know*
Did this patient have lots of moles? *No, Yes, Don't know*
Questions regarding skin-related follow-up
Did you do any of the following?
Advise patient on specific changes that suggest melanoma? *Yes, No*
Encourage patient to perform skin self-examination? *Yes, No*
Recommend a skin surveillance program? *Yes, No*

Table 2. Patients' socio-demographic and melanoma characteristics

Characteristic	N[a] 1,889 patients	%
Patient characteristics		
Age at diagnosis (years)		
<40	167	9
40-59	551	29
60-79	855	45
≥ 80	316	17
Gender		
Males	1,151	61
Females	738	39
Level of socio-economic disadvantage[b]		
1st quintile (most disadvantaged)	204	11
2nd quintile	364	19
3rd quintile	505	27
4th quintile	321	17
5th quintile (least disadvantaged)	494	26
Location of residence[c]		
Capital city	953	50
Other metropolitan	359	19
Large rural	122	6
Small rural	189	10
Other rural/remote	265	15
Melanoma characteristics		
Histology		
Superficial spreading melanoma	969	51
Nodular melanoma	230	12
Lentigo maligna melanoma	191	10
Other subtype	67	4
Not otherwise specified	432	23
Site		
Head & neck	326	17
Trunk	683	36
Arms	506	27
Legs	360	19
Not otherwise specified	14	1
Breslow thickness (mm)		
0.01-1.00	1,293	69
1.01-2.00	323	17
2.01-4.00	169	9
>4.00	94	5

[a] One value was missing for level of socio-economic disadvantage and location of residence, and 10 values were missing for Breslow thickness.

[b] Level of socio-economic disadvantage was based on postcode of residence, linked to the Socio-Economic Indexes for Areas (SEIFA) (27).

[c] Location of residence was categorised according to the Rural Remote and Metropolitan Areas (RRMA) Classification (25).

Table 3. Knowledge of patients' risk factors by their treating doctor/s, grouped by patient[a]

Risk factor	N 1,889 patients	%
Personal history		
Unknown	55	3
Known[b]	1,834	97
Family history		
Unknown	402	21
Known[b]	1,487	79
Lots of moles		
Unknown	148	8
Known[b]	1,741	92
Total risk factors known		
0	27	1
1	68	4
2	388	21
3	1,406	74

[a] As patients may have had more than one doctor involved in their care, doctors' responses were combined for each patient, so that patients were classified as having a risk factor or relevant follow-up recommendations if any of the doctors involved in their care reported this on a questionnaire.

[b] Known status refers to the presence or absence of risk factors: personal history of melanoma, family history of melanoma in a blood relative and lots of moles.

Table 4. Multivariate model of factors associated with doctors' knowledge of patients' risk factors for melanoma

Factors in order of entry	Known personal history of melanoma (n=2,164 questionnaires[a])					Known family history of melanoma (n=2,190 questionnaires[a])					Known mole status (n=2,190 questionnaires[a])				
	No	Yes	PR[b]	(95% CI[b])	p-value[c]	No	Yes	PR[b]	(95% CI[b])	p-value[c]	No	Yes	PR[b]	(95% CI[b])	p-value[c]
Patient age, years[d]															
<40	4	184	1.03	(0.97-1.09)		35	154	1.15	(1.04-1.26)		26	163	0.96	(0.91-1.02)	
40-59	21	619	1.01	(0.99-1.04)		119	529	1.10	(1.02-1.19)		65	583	0.99	(0.95-1.02)	
60-79	43	927	1.00	(0.98-1.03)		263	722	1.03	(0.95-1.11)		100	885	0.97	(0.94-1.01)	
80+	18	348	Referent		0.56	114	254	Referent		0.002	40	328	Referent		0.31
Patient gender[d]															
Male	49	1,270	Referent			347	989	Referent			131	1,205	Referent		
Female	37	808	0.99	(0.98-1.01)	0.35	184	670	1.03	(0.99-1.08)	0.15	100	754	0.98	(0.95-1.01)	0.11
Doctor specialty															
General practice	26	1,115	Referent			-	-	-	-	-	-	-	-	-	-
Dermatology	18	494	0.99	(0.97-1.01)		-	-	-	-	-	-	-	-	-	-
Surgery	22	369	0.96	(0.94-0.99)		-	-	-	-	-	-	-	-	-	-
Plastic surgery	20	100	0.86	(0.79-0.93)	<0.001	-	-	-	-	-	-	-	-	-	-
Practice setting															
General Practitioner	-	-	-	-	-	213	618	Referent			66	765	Referent		
Skin cancer clinic	-	-	-	-	-	26	306	1.22	(1.15-1.29)		19	313	1.02	(0.99-1.06)	
Dermatology	-	-	-	-	-	143	354	0.97	(0.91-1.04)		30	467	1.03	(0.99-1.06)	
Surgery	-	-	-	-	-	88	294	1.04	(0.98-1.11)		60	322	0.95	(0.90-1.00)	
Plastic surgery	-	-	-	-	-	53	74	0.80	(0.68-0.93)		46	81	0.71	(0.62-0.81)	
Melanoma unit	-	-	-	-	-	8	13	0.83	(0.59-1.16)	<0.001	10	11	0.62	(0.41-0.93)	<0.001
Doctor relationship															
Primary	-	-	-	-	-	-	-	-	-	-	157	1,716	Referent		
Referral	-	-	-	-	-	-	-	-	-	-	74	243	0.93	(0.86-1.00)	0.04

[a] This anlaysis was conducted using 2,190 questionnaires from 1,889 patients in this study. Questionnaires were excluded from multivariate analysis if they were missing values for any of the variables in the regression model.

[b] PR = probability ratio; CI = confidence interval; estimated using log binomial regression models

[c] p-value for difference between proportions across the different categories

[d] Patient gender and age were included in all models regardless of statistical significance, as they were considered *a priori* as important covariates. Other variables were retained based on a cut-off p-value of 0.10, using a forward stepwise modelling approach.

Table 5. Multivariate model of factors associated with doctors' management of patients regarding skin-related follow-up advice and recommendations

Factors in order of entry	Advice on skin changes given (n=2,022 questionnaires[a])					Encouraged skin self-examination (n=1,960 questionnaires[a])					Recommended skin surveillance (n=1,861 questionnaires[a])				
	No	**Yes**	**PR[b]**	**(95% CI[b])**	**p-value[c]**	**No**	**Yes**	**PR[b]**	**(95% CI[b])**	**p-value[c]**	**No**	**Yes**	**PR[b]**	**(95% CI[b])**	**p-value[c]**
Patient age[d]															
<40	18	161	1.14	(1.05-1.22)		19	154	1.22	(1.12-1.33)		31	134	1.06	(0.96-1.17)	
40-59	64	534	1.11	(1.04-1.18)		69	508	1.19	(1.10-1.28)		106	445	1.09	(1.01-1.17)	
60-79	98	807	1.13	(1.06-1.20)		122	765	1.18	(1.10-1.27)		174	656	1.08	(1.00-1.17)	
≥ 80	75	265	Referent		<0.001	106	217	Referent		<0.001	95	220	Referent		0.18
Patient gender[d]															
Male	170	1,050	Referent			199	981	Referent			245	883	Referent		
Female	85	717	1.03	(1.00-1.06)	0.08	117	663	1.01	(0.97-1.04)	0.72	161	572	0.98	(0.94-1.03)	0.40
Patient risk[d]															
Average risk	106	885	Referent			139	817	Referent			200	712	Referent		
High risk	68	602	1.01	(0.98-1.04)		80	569	1.01	(0.98-1.04)		105	501	1.04	(1.00-1.09)	
No knowledge	81	280	0.89	(0.84-0.94)	<0.001	97	258	0.88	(0.83-0.94)	<0.001	101	242	0.94	(0.87-1.00)	0.01
Practice setting															
General practice	114	650	Referent			154	594	Referent			181	517	Referent		
Skin cancer clinic	15	300	1.09	(1.05-1.13)		21	290	1.09	(1.05-1.14)		34	272	1.15	(1.09-1.23)	
Dermatology	55	409	1.03	(0.99-1.07)		63	383	1.05	(1.00-1.10)		63	348	1.12	(1.05-1.19)	
Surgery	58	285	0.99	(0.94-1.04)		62	261	1.02	(0.97-1.08)		103	211	0.95	(0.87-1.03)	
Plastic surgery	10	109	1.07	(1.02-1.12)		13	102	1.10	(1.04-1.16)		15	99	1.15	(1.06-1.26)	
Melanoma unit	3	14	0.94	(0.76-1.16)	<0.001	3	14	1.00	(0.82-1.21)	<0.001	10	8	0.65	(0.41-1.04)	<0.001
Doctor gender															
Male	-	-	-	-	-	-	-	-	-	-	363	1,217	Referent		
Female	-	-	-	-	-	-	-	-	-	-	43	238	1.08	(1.02-1.14)	0.007
Breslow thickness (mm)															
0.01-1.00	-	-	-	-	-	184	1,185	Referent			250	1,032	Referent		
1.01-2.00	-	-	-	-	-	59	268	0.96	(0.92-1.01)		68	253	1.00	(0.94-1.06)	
2.01-4.00	-	-	-	-	-	40	135	0.96	(0.89-1.03)		59	111	0.88	(0.78-0.98)	
> 4.00	-	-	-	-	-	33	56	0.86	(0.75-0.99)	0.06	29	59	0.90	(0.78-1.04)	0.06
Location of patient residence															
Capital city	-	-	-	-	-	-	-	-	-	-	168	712	Referent		

Factors in order of entry	Advice on skin changes given (n=2,022 questionnaires[a])					Encouraged skin self-examination (n=1,960 questionnaires[a])					Recommended skin surveillance (n=1,861 questionnaires[a])				
	No	**Yes**	**PR[b]**	**(95% CI[b])**	**p-value[c]**	**No**	**Yes**	**PR[b]**	**(95% CI[b])**	**p-value[c]**	**No**	**Yes**	**PR[b]**	**(95% CI[b])**	**p-value[c]**
Other metropolitan	-	-	-	-	-	-	-	-	-	-	72	292	1.04	(0.98-1.10)	
Large rural	-	-	-	-	-	-	-	-	-	-	43	100	0.96	(0.86-1.07)	
Small rural	-	-	-	-	-	-	-	-	-	-	36	165	1.04	(0.96-1.11)	
Other rural/remote	-	-	-	-	-	-	-	-	-	-	87	186	0.92	(0.85-1.01)	0.10

[a] This anlaysis was conducted using 2,190 questionnaires from 1,889 patients in this study. Questionnaires were excluded from multivariate analysis if they were missing values for any of the variables in the regression model.

[b] PR = probability ratio; CI = confidence interval; estimated using log binomial regression models

[c] p-value for difference between proportions across the different categories

[d] Patient gender, age and patient risk were included in all models regardless of statistical significance, as they were considered *a priori* as important covariates. Other variables were retained based on a cut-off p-value of 0.10, using a forward stepwise modelling approach.