

Occupational contact dermatitis in Australia: diagnostic and management practices, and severity of worker impairment

TESSA KEEGEL^{1,2}, BIRCAN ERBAS³, JENNIFER CAHILL¹, AMANDA NOONAN¹, SHYAMALI DHARMAGE^{2,4} AND ROSEMARY NIXON¹

¹Occupational Dermatology Research and Education Centre, Skin and Cancer Foundation Inc., Melbourne,

²The McCaughey Centre, School of Population Health, The University of Melbourne, Melbourne, ³Department of Econometrics and Business Statistics, Monash University, Clayton, Victoria, Australia, and ⁴Centre for Molecular, Environmental, Genetic and Analytic Epidemiology: The University of Melbourne, Australia

The aims of this study were to compare treatment and referral practices between general practitioners (GPs) and dermatologists and to evaluate predictors for occupational contact dermatitis (OCD) disease severity measured in terms of worker impairment. Data were collected from 181 patients recruited for a larger study of OCD. Information about treatment recommendations and usual referral practices are reported for 123 patients. Data from patients, diagnosed with work-related skin disease, were modelled for severity of worker impairment. GPs were more likely to treat a patient independently, referring if the patient did not improve, whereas dermatologists were more likely to refer for patch testing on initial presentation. Dermatologists were more likely to recommend gloves and GPs were more likely to recommend soap avoidance/substitution. 2 GPs and no dermatologists reported recommending the best practice combination of moisturizers, topical corticosteroids and soap substitutes. When adjusted for all variables including age, sex, duration and diagnostic subgroup, workers with atopy as a cofactor had the most severe impairment. This study suggests that in Australia, patients with suspected OCD are initially managed within general practice, few clinicians recommend best practice treatments for OCD, and that atopy is associated with severity. These findings have implications for health resource allocation, clinician education, and the pre-employment counselling of atopic patients.

Key words: allergic; atopy; diagnostic patterns; hand dermatitis; irritant; referral. © Blackwell Munksgaard, 2007.

Accepted for publication 27 January 2007

Background

The treatment pathway of occupational contact dermatitis (OCD) involves several steps, from disease onset through to clinical presentation, diagnosis, and management. In Australia, for workers who decide to seek clinical advice, a visit to a general practitioner (GP) is usually the first step in the treatment pathway, with specialist dermatologist services predominantly accessed through GP referral. Referral to a dermatologist is the next step in the treatment pathway, with a smaller proportion of affected workers then going on to have patch testing, or more commonly in Australia being referred for specialist patch testing performed by an expert in OCD. An alternative, less commonly used pathway exists, whereby workers are referred for patch testing directly from workplace personnel.

Best practice guidelines for contact dermatitis (1, 2) and OCD (3, 4) recommend referral for patch

testing for patients with persistent eczematous eruptions and use of appropriate emollients, soap substitutes, and topical corticosteroids. Patch testing has also been recommended as an essential investigation in patients with persistent dermatitis (1). Disease prognosis for OCD is generally considered to be better for workers who receive early diagnosis and appropriate treatment (5). A worker with occupational allergic contact dermatitis (ACD) will often report many consultations with GPs or other health practitioners prior to the process of patch testing, after which the causative occupational agent may be identified and avoided (6). Lengthy duration of symptoms caused by ongoing exposure to a causative agent has been suspected to be associated with the development of persistent OCD (7, 8).

Disease severity is rarely characterized by using a standardized instrument; however, it is commonly

considered that compared to those patients examined by tertiary referral clinics, patients treated by GPs are generally those with the least severe disease. There has been much debate regarding the relative severity of ACD and irritant contact dermatitis (ICD) among workers. Some studies have suggested that ACD is associated with the most severe contact dermatitis (9–12), and that workers with ACD have a poorer prognosis than those with ICD (5). Conversely, other studies report the worst severity and poorest prognosis among workers with ICD (13–15). Other suspected influences for severity of disease include age, sex, and atopy (16).

This study used patient information provided by GP clinics, private and public general dermatology clinics, and a specialized occupational dermatology clinic, to characterize factors influencing severity of worker impairment at various stages of the OCD treatment pathway. We also described the diagnostic, treatment and referral practices of GPs and dermatologists to characterize clinical practices, and to consider how differences in these practices at various stages of the clinical pathway of OCD may impact on the outcome of worker impairment.

Methods

Study sample and description

The patient data analysed in this study were collected as part of a larger study looking at OCD and GPs entitled the Spot study (17). The Spot study recruited workers with suspected OCD (i.e. dermatitis which was suspected to be attributable to a workplace exposure) using two distinct methods. Method 1 enlisted a group of clinicians (the Spot reporters) within a defined geographic area to report each worker with suspected OCD whom they examined as part of their routine practice. The clinicians included were those practising in the settings of general practices, private dermatology practices and a dermatology outpatient clinic attached to a public hospital within the city of Dandenong, an outer suburb of Melbourne, Australia and its surrounding defined districts. According to the 2001 Australian Bureau of Statistics census data, approximately 200 000 workers live in the area (18). Through an information evening held in Dandenong and a direct letter of invitation, 700 GPs, 4 dermatologists and 1 dermatology outpatient clinic attached to a public hospital were invited to participate in the Spot Project.

Method 2 recruited workers who lived in the Spot study area and who attended a tertiary referral occupational dermatology clinic (the Occupational Dermatology Clinic at the Skin and Cancer Foundation Inc., Melbourne, Victoria). Referrals

to the clinic were received from a variety of sources including dermatologists predominantly, GPs not formally enrolled in Spot, allergists and occupational health nurses.

Workers recruited through method 1 and method 2 between 30 September 2002 and 30 September 2003 were included in the study. Workers were requested to attend an appointment for patch testing and diagnosis by a specialized occupational dermatologist. The recruitment protocols, as well as incidence and prevalence of OCD disease estimates for the Spot study have been published elsewhere (17).

Data collection methods

A reporting form was designed in collaboration with clinicians who participated in the study. Apart from recording demographic and clinical information from the reported workers, the Spot form asked clinicians to list the suspected diagnosis, the current or recommended treatment, and their normal management/referral practice for a patient with this type of illness. Information was collected from all the reporting forms received, including forms received from those workers who did not attend the assessment.

Among those workers who attended the assessment, a diagnosis of ICD or ACD, atopy defined as a personal history of asthma, eczema or hayfever, occupational causation, and level of severity were determined by a specialist occupational dermatologist through occupational history, clinical examination, and patch testing. All workers were tested according to the European standard series (Chemotechnique Diagnostics, Malmö, Sweden) and to the workers' own samples, appropriately diluted. Patch tests were applied using Finn Chambers[®] on Scanpor[®] tape (Epitest, Tuusula, Finland). Workers with contact dermatitis were classified as having substantially work-related or partially work-related (PWR) disease.

A clinician-generated measure of impairment severity (19), adapted for use in an occupational setting from the American Medical Association Impairment Classes and Percents for Skin Disorders (20) was used to classify the severity of disease at diagnosis. This measure takes into account disease course, treatment, clinical signs, and limitation of work-related activities. The original 5-level scale (1 = least severe to 5 = most severe) was modified to a 3-level scale (1 and 2 = mild, 3 = moderate, and 4 and 5 = severe).

Analyses methods

The numbers of Spot forms received from GPs and dermatologists were reported. Information

provided by the Spot reporters regarding usual treatment and referral practices was compared between GPs and dermatologists. Potential differences were assessed using the 2-sample test of independent proportions.

The protocol for the Spot study required that all workers with suspected OCD received specialized patch testing and diagnosis from an experienced occupational dermatologist (R.N.); only those workers who had a final diagnosis of work-related dermatitis were included in the analyses of predictors for severity of worker impairment. As the numbers in some categories were too small, for the purpose of modelling, we further modified severity of worker impairment into 2 categories: (i) mild and (ii) moderate/severe to form a binary outcome measure. Duration of symptoms (defined as a continuous variable), reporting source, occupational causation, atopy, ICD, and ACD were all included as potential risk factors of severity. A primary diagnosis of atopy, ICD or ACD was mutually exclusive. Although a worker may have had multiple diagnoses, only the primary diagnosis for ACD or ICD was included in the models. Age, entered as a continuous variable, and sex were both considered as potential confounders.

To investigate crude associations between severity and categories of various risk factors, we used a chi-squared test of independence. Where the expected numbers were less than 5, we combined the moderate and severe disease categories to assess the effect of low numbers on the corresponding *P*-values. We adopted a logistic regression approach to investigate the association between the severity score (binary) and various risk factors. Firstly, we investigated crude age-adjusted associations with each risk factor entered separately into a model. Using a method of forward selection, the multivariate models comprising of all possible risk factors were entered into one model.

Results from these models are presented as odds ratios (OR) with 95% confidence intervals (95% CIs). All statistical tests were 2-tailed, and a *P*-value of less than 0.05 was considered to be statistically significant. All statistical analyses were performed using STATA RELEASE 9 (21).

Ethics

The Spot Project was approved by the Human Research Ethics Committee based at St Vincent's Hospital, Melbourne (HREC 030/02).

Results

Of those invited, 9% of the GPs and all dermatologists participated as reporters. In addition, the

dermatology outpatient clinic and the tertiary referral dermatology clinic participated in the study.

Through method 1 recruitment, 123 reports of suspected OCD were received. 30 GPs, 2 dermatologists, the dermatology outpatients' clinic and the tertiary referral dermatology clinic each reported 1 or more suspected cases of OCD. 79 cases were from GPs and 44 were from the dermatologists/dermatology outpatient clinic. GPs reported between 1 and 6 patients: 13 GPs reported 1 patient, 4 GPs reported 2 patients, 5 GPs reported 3 patients, 5 GPs reported 5 patients, and 3 GPs reported 6 patients. Most of the dermatologist reports (35/44) came from 1 dermatologist. 75 of the workers reported through method 1 attended for patch testing and case confirmation. 36/75 were diagnosed with OCD. Through method 2 recruitment, 58 patients were identified as having suspected OCD, none of whom had been previously reported through Spot, 33/58 were diagnosed with OCD.

Descriptive information regarding usual treatment recommendations and referral practices was collected from each of the 123 Spot reporting forms for workers recruited through method 1. Treatment recommendations are reported in Table 1. Significant differences were observed between GPs

Table 1. Information provided by the Spot reporters (GPs and dermatologists) regarding treatment recommendations

Treatment	GP (%)	Dermatologist (%)	<i>P</i> -value*
Oral steroids/ immunosuppressive agent	3 (3.8)	24 (54.5)	<0.001
Corticosteroid cream	19 (24)	4 (9.1)	<0.05
Corticosteroid ointment	31 (39.2)	19 (43.2)	0.67
Topical corticosteroid not specified	11 (13.9)	15 (34.1)	<0.05
Moisturizing cream	7 (8.9)	4 (9.1)	0.96
Moisturizer not specified	16 (20.2)	8 (18.2)	0.78
Barrier cream	3 (3.8)	0	0.19
Avoidance/modify duties	26 (32.9)	9 (20.5)	0.14
Change of job†	2 (2.5)	2 (4.5)	0.55
Gloves	15 (18.9)	17 (38.6)	<0.05
Soap substitute/or avoid soap	14 (17.1)	0	<0.005
Antibiotics	6 (7.6)	10 (22.7)	<0.05
Antihistamines	6 (7.6)	0	0.06
No recommendations	4 (5.1)	1 (2.3)	0.45
Other tests (fungal scrapings, radioallergosorbent test)	1 (1.3)	2 (4.5)	0.26
Other (antifungal, coal tar ointment)	2 (2.5)	3 (6.8)	0.25
Total forms	79	44	

GP, general practitioners.

*2-sample test of independent proportions.

†Patients had already ceased work in some cases.

and dermatologists with the recommendation of oral steroids and topical corticosteroid creams by GPs and glove usage, soap substitutes, and antibiotics by dermatologists. 2 GPs and none of the dermatologists reported recommending all 3 of the best practice treatment recommendations; i.e. use of a soap substitute, moisturizer, and topical corticosteroid. Usual referral practices are reported in Table 2. Compared to the dermatologists, GPs were more likely to treat a patient independently only referring if a patient did not improve. Dermatologists were more likely to refer on initial presentation.

Final diagnosis of work-related dermatitis and severity score was available for 28 patients reported by GPs, 22 patients reported by the dermatologists/dermatology outpatients' clinic and 45 patients reported by the Occupational Dermatology Clinic, a total of 95 patients with significantly or PWR skin disease. 21 patients were primarily diagnosed with occupational ACD, some of these had reactions to more than 1 allergen. These patients had been exposed to epoxy-resin (5), coconut diethanolamide (2), thiurams (6), Grevillea Robyn Gordon (1), colophonium (1), potassium dichromate (2), cobalt chloride (2), Quaternium 15 (1), sodium benzoate (1), tetramethylol acetylenediurea, (1), tea tree oil (1), lime oil (1), ylang-ylang oil (1), para-phenylenediamine (1), basic red 46 (1), and reactions to their own workplace samples (3). 45 patients were primarily diagnosed with occupational ICD, 6 patients were diagnosed with psoriasis which had been aggravated by work, 4 patients were diagnosed with contact urticaria, 1 patient was diagnosed with a work-related skin infection, and the remaining 18 patients had a primary diagnosis of atopy, but with some ICD from workplace exposures. The distribution of severity score (3 categories) by age, sex, and management variables, is presented in Table 3. Occupations of affected workers are reported elsewhere (17). A chi-squared test of independence shows a significant difference between categories for ICD ($P < 0.001$) and ACD

($P < 0.001$), and severity score. None of these P -values changed when we combined the second and third columns for severity score to account for small cell numbers.

We developed logistic regression models to evaluate risk factors for moderately severe to severe OCD (Table 4). In a univariate age-adjusted logistic regression model, there was modest evidence to suggest that workers reported by dermatologists (OR = 2.23, 95% CI 0.71–6.97; $P = 0.1$) were more likely to report moderate to severe occupational dermatitis in comparison to workers reported by GPs. Workers with ACD were 10.8 times more likely to be diagnosed with moderate/severe occupational dermatitis ($P < 0.001$; 95% CI 2.79–38.64). Conversely, those with ICD were less likely to report moderate/severe occupational dermatitis (OR = 0.17, 95% CI 0.06–0.41; $P < 0.001$). Workers with atopy as a cofactor were 2.23 times as likely to report moderate/severe occupational dermatitis (95% CI 0.95–5.20; $P = 0.06$). Moderate/severe occupational dermatitis was not associated with sex ($P = 0.47$) or duration of symptoms ($P = 0.25$).

Table 5 shows results of a multivariate logistic regression model for risk factors of moderate/severe OCD. Having atopy as a cofactor remained a predictor for moderate/severe occupational dermatitis (OR = 3.1, 95% CI 1.00–9.61; $P < 0.05$). Once adjusted for all other factors in the multivariate models, the effects of ICD and ACD became non-significant. Data were stratified by reporting source to investigate possible effect modification with duration of symptoms. However, no association between duration of symptoms and a diagnosis of moderate/severe OCD became statistically significant.

Discussion

Using information provided by the Spot reporters, this study contributes to the characterization of treatment and referral practices adopted by clinicians for workers with suspected OCD in the context of general and dermatology practices in Australia. The study provides insights regarding how a worker might be treated when they first present to a medical practitioner with dermatitis, which is suspected to be work related. There were differences between GPs and dermatologists regarding treatment recommendations and usual referral practices, which have consequences for clinician education and health resource allocation. The study also suggests that among this group of patients, severity of worker impairment was associated with atopy.

The study has some weaknesses. Generalization of the OCD treatment pathway may be problematic because of international differences in referral

Table 2. Information provided by the Spot reporters (GPs and dermatologists) regarding usual referral practices

Referral	GP (%)	Dermatologist (%)	P -value*
Treat patient independently	14 (17.7)	1 (2.3)	<0.05
Refer if does not improve	59 (74.7)	0	<0.0001
Refer on initial presentation	5 (6.3)	36 (81.8)	<0.0001
Blank	1 (1.3)	7 (15.9)	<0.005
Total forms	79	44	

GP, general practitioners.

*2-sample test of independent proportions.

Table 3. Severity of worker impairment characterized by demographic, management and diagnoses variables

	Number (<i>n</i>)	Mild, <i>n</i> (%)	Moderate, <i>n</i> (%)	Severe, <i>n</i> (%)	<i>P</i> -value*
Sex†					
Men	52	24 (46)	23 (44)	5 (10)	0.4
Women	43	25 (58)	16 (37)	2 (5)	
Age (years)†					
≤30	20	12 (60)	7 (35)	1 (5)	0.9
31–40	27	12 (45)	13 (48)	2 (7)	
41–50	28	15 (54)	11 (39)	2 (7)	
≥51	20	10 (50)	8 (40)	2 (10)	
Duration†					
≤3 months	21	14 (67)	6 (29)	1 (5)	0.1
>3–12 months	32	16 (50)	16 (50)	0	
>1–2 years	22	10 (45)	10 (45)	2 (9)	
>2 years	20	9 (45)	7 (35)	4 (20)	
Reporting source†					
GPs	28	17 (61)	8 (28)	3 (11)	0.4
Dermatologists	22	9 (41)	12 (55)	1 (4)	
Dermatology clinic	45	23 (51)	19 (42)	3 (7)	
Occupational causation†					
Substantial	67	35 (52)	29 (43)	3 (4)	0.2
Partial	28	14 (50)	10 (36)	4 (14)	
Atopy‡					
No	39	25 (64)	13 (33)	1 (3)	0.1
Yes	54	24 (45)	25 (46)	5 (9)	
ICD (primary diagnosis)§					
No	47	15 (32)	25 (53)	7 (15)	<0.001
Yes	45	33 (73)	12 (27)	0	
ACD (primary diagnosis)§					
No	71	45 (63)	22 (31)	4 (6)	<0.001
Yes	21	3 (14)	15 (72)	3 (14)	

GP, general practitioners; ICD, irritant contact dermatitis; ACD, allergic contact dermatitis.

*2-sided *P*-value from a chi-squared test of independence.

†Information was available for 95 patients.

‡Information was available for 93 patients.

§Information was available for 92 patients.

Table 4. Results of a univariate (age adjusted) logistic regression analysis of severity defined as mild and moderate/severe and various risk factors

Variables	OR (95% CI)	<i>P</i> -value
Age* (<i>n</i> = 95)	1.01 (0.97–1.04)	0.4
Sex (<i>n</i> = 95)		
Men	1.00	
Women	0.61 (0.27–1.39)	0.2
Duration*	1.00 (0.99–1.00)	0.4
Reporting source (<i>n</i> = 95)		
GPs	1.00	
Dermatologists	2.23 (0.71–6.97)	0.1
Dermatology clinic	1.47 (0.56–3.85)	0.4
Occ causation (<i>n</i> = 95)		
Substantial	1.00	
Partial	1.09 (0.45–2.64)	0.8
Atopy (<i>n</i> = 93)		
No	1.00	
Yes	2.23 (0.95–5.20)	0.06
ICD (<i>n</i> = 92)		
No	1.00	
Yes	0.17 (0.06–0.41)	<0.001
ACD (<i>n</i> = 92)		
No	1.00	
Yes	10.38 (2.79–38.64)	<0.001

GP, general practitioners; ICD, irritant contact dermatitis;

ACD, allergic contact dermatitis; OR, odds ratio.

*Age and duration of symptoms are entered as continuous variables into the models.

systems. The 3 stages of the treatment pathway from which patients were drawn in this study may not be replicated in international contexts. The clinicians who participated in Spot were asked to self-report their usual treatment and referral practices for each patient. There may be some discrepancies between a clinician's treatment and referral activities as reported to the study and their actual clinical practices. This may be exacerbated by the small sample size of clinicians who participated in the Spot study. The external validity of the study is affected as only 9% of all eligible GPs participated in the study on the GPs' self-selected for participation. The representativeness of the early stages of the treatment pathway is particularly questionable. Representativeness of the severity models may also be affected by the relatively small numbers of patients included in the final analyses. There is a high likelihood of self-selection bias among workers who chose to attend the final assessment.

Many of the dermatologist reports came from the same clinician, a dermatologist who was locally recognized as the primary referral for suspected occupational cases, thus there are likely to be biases

Table 5. Results of a multivariate logistic regression analysis of severity defined as mild and moderate/severe and various risk factors

Variables (n = 92)	OR (95% CI)	P-value
Age*	1.02 (0.97–1.07)	0.2
Sex		
Men	1.00	
Women	0.48 (0.15–1.48)	0.2
Duration*	0.99 (0.99–1.00)	0.5
Reporting source		
GPs	1.00	
Dermatologists	2.18 (0.52–9.01)	0.2
Dermatology clinic	1.67 (0.49–5.69)	0.4
Occupational causation		
Substantial	1.00	
Partial	1.18 (0.23–5.82)	0.8
Atopy		
No	1.00	
Yes	3.1 (1.00–9.61)	0.04
ICD		
No	1.00	
Yes	0.33 (0.07–1.58)	0.1
ACD		
No	1.00	
Yes	4.55 (0.66–31.36)	0.1

GP, general practitioners; ICD, irritant contact dermatitis; ACD, allergic contact dermatitis; OR, odds ratio.

*Age and duration of symptoms are entered as continuous variables into the models.

in the reporting of the dermatologist's treatment recommendations. Taking this into consideration, the self-reported usual treatment recommendations varied considerably between GPs and dermatologists. Dermatologists were more likely to prescribe antibiotics and oral steroids. This may be related to dermatologists examining patients with more severe disease. Dermatologists were also more likely to recommend the use of gloves, while GPs were more likely to recommend the avoidance of soap or use of a soap substitute. Of interest, only 2 GPs and none of the dermatologists reported that they would advise a patient to adopt the recommended best practice combination of moisturizer use, topical corticosteroid, and soap substitution (1). This is in line with Moyle et al's study, which reported that only 32% of patients attending a tertiary referral OCD clinic reported using the 3-part best practice combination (4). This finding has major implications for the education of clinicians.

Differences also emerged between GPs and dermatologists when asked about usual referral practices. GPs were much more likely to treat a patient independently or to refer for specialized dermatological assessment only if a patient did not improve compared with the dermatologists, who were more likely to refer a patient with suspected OCD for patch testing on initial presentation. This may reflect the fact that dermatologists generally have more awareness about the potential advantages of

patch testing. It is interesting to note that when the univariate severity of impairment scores are compared between patients presenting to the GPs and those presenting to the dermatologists, patients reported by GPs were least likely to have severe impairment. This implies that patients with the least severe disease are those who are being treated within general practice.

The rate of atopy (defined as a history of asthma, eczema or hayfever) for workers in this study was 58%. This rate is higher than clinic-based populations in international settings, for example, Rystedt reported a clinic-based rate of 39% for atopy defined as a history of dermatitis, asthma or rhinitis (16). However, our study rate is similar to other Australian studies. A rate of 59.2% for atopy defined as a history of asthma, hayfever or dermatitis was recently reported among a group of working Australian hairdressers and hairdressing students (22). An Australian population-based study reported a prevalence of hayfever of 41.3% among adults aged 29–32 years (23). Although the sample was small and not necessarily representative, in our study after adjustment for age, sex, duration of disease, diagnosis and treatment pathway stage, atopy as a cofactor was found to be significantly associated with severity of worker impairment. An increased understanding between the role of atopy and OCD severity supports the notion of pre-employment counselling for atopics (24).

Much information on OCD arises from studies of patient populations with disease, which has been diagnosed by specialist occupational dermatologists. However, an increased understanding of the treatment pathway, particularly in the earlier stages, has the potential to improve service delivery for affected workers. This study highlights the need for better clinician education regarding best practice management recommendations for OCD and provides information about targeted health resource allocation through an enhanced understanding of the referral process.

References

1. Bourke J, Coulson I, English J. Guidelines for care of contact dermatitis. *Br J Dermatol* 2001; 145: 877–885.
2. Drake L A, Domer R W, Goltz R W et al. Guidelines of care for contact dermatitis. Committee on guidelines of care. *J Am Acad Dermatol* 1995; 32: 109–113.
3. Nixon R. Occupational skin disease: focus on contact dermatitis. *Mod Med Aust* 2001; 18: 41–51.
4. Moyle M, Keegel T, Noonan A, Nixon R. Skin care in occupational contact dermatitis of the hands. *Australas J Dermatol* 2006; 47: 97–101.
5. Cahill J, Keegel T, Nixon R. The prognosis of occupational contact dermatitis in 2004. *Contact Dermatitis* 2004; 51: 219–226.
6. Holness D L. Health care services use by workers with work-related contact dermatitis. *Dermatitis* 2004; 15: 18–24.

7. Sajjachareonpong P, Cahill J, Keegel T, Saunders H, Nixon R. Persistent post-occupational dermatitis. *Contact Dermatitis* 2004; 51: 278–283.
8. Halbert A R, Gebauer K A, Wall L M. Prognosis of occupational chromate dermatitis. *Contact Dermatitis* 1992; 27: 214–219.
9. Meding B, Swanbeck G. Consequences of having hand eczema. *Contact Dermatitis* 1990; 23: 6–14.
10. Meding B. Epidemiology of hand eczema in an industrial city. *Acta Derm Venereol Suppl* 1990; 153: 1–43.
11. Meding B, Swanbeck G. Occupational hand eczema in an industrial city. *Contact Dermatitis* 1990; 22: 13–23.
12. Adishes A, Meyer J D, Cherry N M. Prognosis and work absence due to occupational contact dermatitis. *Contact Dermatitis* 2002; 46: 273–279.
13. Holness D L, Nethercott J R. Work outcome in workers with occupational skin disease. *Am J Ind Med* 1995; 27: 807–815.
14. Coenraads P J, van der Walle D, Thestrup-Pedersen K et al. Construction and validation of a photographic guide for assessing severity of chronic hand dermatitis (see comment). *Br J Dermatol* 2005; 152: 296–301.
15. Cvetkovski R S, Rothman K J, Olsen J, Mathiesen B, Iversen L, Johansen J D, Agner T. Relation between diagnoses on severity, sick leave and loss of job among patients with occupational hand eczema. *Br J Dermatol* 2005; 152: 93–98.
16. Rystedt I. Atopic background in patients with occupational hand eczema. *Contact Dermatitis* 1985; 12: 247–254.
17. Keegel T, Cahill J, Noonan A, Dharmage S, Saunders H, Frowen K, Nixon R. Incidence and prevalence rates for occupational contact dermatitis in an Australian suburban area. *Contact Dermatitis* 2005; 52: 254–259.
18. Australian Bureau of Statistics. *Census of Population and Housing: Selected Education and Labour Force Characteristics for Statistical Local Areas, Victoria 2001*. Canberra, Australian Bureau of Statistics, 2003.
19. Cahill J, Keegel T, Dharmage S, Nugriaty D, Nixon R et al. Prognosis of contact dermatitis in epoxy resin workers. *Contact Dermatitis* 2005; 52: 147–153.
20. American Medical Association. *Guides to the Evaluation of Permanent Impairment*, 2nd edition. Chicago, IL, American Medical Association, 1984: xi, 245.
21. Stata Corp. *Stata Statistical Software: Release 7.0*. College Station, TX, Stata Corporation, 2001.
22. Roberts H, Frowen K, Sim M, Nixon R et al. Prevalence of atopy in a population of hairdressing students and practising hairdressers in Melbourne, Australia. *Australas J Dermatol* 2006; 47: 172–177.
23. Hopper J L, Jenkins M A, Carlin J B, Giles G G et al. Increase in the self-reported prevalence of asthma and hay fever in adults over the last generation: a matched parent-offspring study. *Aust J Public Health* 1995; 19: 120–124.
24. Saunders H, Keegel T, Nixon R, Frowen K et al. Career counselors and occupational contact dermatitis. *Contact Dermatitis* 2003; 48: 189–190.

Address:

Dr Rosemary Nixon

Occupational Dermatology Research and Education Centre
Skin and Cancer Foundation Inc., Melbourne, Australia

PO Box 132

Carlton South

Victoria 3053

Australia

Tel: +61 3 9639 9633

Fax: +61 3 9639 9644

e-mail: rnixon@occderm.asn.au