

General practice registrars' use of dermoscopy

Prevalence, associations and influence on diagnosis and confidence

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Background and objective

Dermoscopy increases accuracy for melanoma diagnosis by trained primary care physicians. We aimed to establish prevalence of dermatoscope use by general practice registrars, and identify factors associated with dermatoscope use and the implications of dermatoscope use for diagnosis and confidence in diagnosis.

Methods

This was a cross-sectional study nested within the Registrar Clinical Encounters in Training (ReCEnT) project, an ongoing multi-site cohort study of general practice registrars' consultations. The study was conducted during two six-monthly rounds of ReCEnT data collection in four regional training providers in 2014.

Results

Forty-nine per cent of registrars reported having dermoscopy training. Dermoscopy was used in 61% of consultations involving skin or pigmented lesion checks. Dermatoscope use changed provisional diagnosis in 22% of instances and increased diagnostic confidence in 55%.

Discussion

Dermoscopy is performed by general practice registrars in a modest proportion of skin and pigmented lesion checks. Its use influences registrars' diagnoses and increases their confidence in their diagnoses.

AUSTRALIA HAS the world's highest incidence of skin cancer,¹ which is a leading cause of death² and the most common reason for medical specialist referral.³ Worldwide, skin cancer is an increasing problem among fair-skinned populations,^{1,4,5} accounting for an increasing contribution to healthcare costs.⁶ Early diagnosis of melanoma is critical, as early excision can increase survival and is often curative.⁷ General practitioners (GPs) manage more than half of Australian skin cancer cases,⁴ making accuracy in skin lesion diagnosis an essential competency. Despite this, research has shown that GPs have difficulty diagnosing various skin lesions,^{5,8} including pigmented lesions. There is a paucity of dermatology training in undergraduate medical curricula.^{9,10} Registrars entering general practice (following university-based and hospital-based training) find diagnosis of skin problems challenging.¹¹ This is not unique to registrars – established GPs consistently seek continuing medical education in dermatology.¹²

Dermoscopy (surface microscopy, oil epiluminescence microscopy), is the examination of skin lesions with a dermatoscope, allowing better visualisation of diagnostic features.¹³ Dermoscopy increases diagnostic accuracy for melanoma in trained primary care physicians,¹⁴ decreases unnecessary excisions,^{15,16} and is the standard of care for pigmented skin lesion management.¹⁷ Consequently,

adequate training in dermoscopy is of utmost importance.

While a systematic review concluded that training GPs in dermoscopy can improve melanoma diagnosis,¹⁸ use without sufficient training may be problematic: dermatoscope proficiency follows a J-curve, with new users having reduced diagnostic accuracy for skin cancer.¹

Effective use of the dermatoscope forms part of the Royal Australian College of General Practitioners' (RACGP's) Curriculum in Dermatology. However, its use in general practice training, both in Australia and internationally, is not documented.

We sought to establish the prevalence of dermatoscope use by Australian general practice registrars when performing skin or pigmented lesion checks. We also sought to identify factors associated with dermatoscope use, and the effect of dermatoscope use on registrars' diagnoses and confidence in their diagnoses.

Methods

This study took place within the Registrar Clinical Encounters in Training (ReCEnT) project. ReCEnT is an ongoing multi-site cohort study of general practice registrars. The detailed methodology is described elsewhere.¹⁹ Four of Australia's then 17 geographically based general practice regional training providers (RTPs), across four states, participated in this sub-study. Participating RTPs' latitudes extended

from Australia's most northerly to most southerly training locations. ReCENt is an integral part of all registrars' educational programs with their RTPs, and individual reports of registrars' in-consultation clinical and educational activity guide registrar reflection on their practice and educational needs. Registrars may also provide informed written consent for their ReCENt data to be used for research purposes.

We asked registrars via questionnaire prior to in-consultation data collection:

- whether they had dermoscopy training – either as part of undergraduate or postgraduate training, via an external course, or in-practice training from the registrar's supervisor
- how confident they were in diagnosing skin lesions (four-point Likert scale responses ranging from 'not at all confident' to 'very confident')
- how confident they were in interpreting dermatoscopic features (four-point Likert scale responses ranging from, 'not at all confident' to 'very confident')

Registrars collected data from 60 consecutive consultations during each of their three six-month community-based terms during training.¹⁹ Data recording was contemporaneous via a paper-based case report form (CRF) for each consultation.

On the CRF, we asked registrars performing a skin lesion check to answer three additional questions:

- Did you use a dermatoscope?
- Did your initial provisional diagnosis change after using the dermatoscope?
- After using the dermatoscope, did the degree of confidence in your final diagnosis decrease, stay the same or increase?

Diagnoses/problems managed were coded according to the *International classification of primary care (second edition)* classification system (ICPC-2 PLUS).

Outcome factor

The primary outcome was dermatoscope use when performing a skin lesion check.

Secondary outcomes were whether the use of the dermatoscope changed the provisional diagnosis, and whether it increased registrar confidence in final diagnosis.

Independent variables

Independent variables related to the registrar (including confidence in diagnosing skin lesions and confidence interpreting dermatoscopic features of skin lesions), patient, practice and consultation. Table 1 shows the independent variables included in the analyses.

Statistical analysis

The analysis population included all registrars who were in their general practice training terms from four participating RTPs. Data were collected during 2014–2015.

The proportion of registrars with formal training in dermatoscope use who felt very, moderately and not at all/somewhat confident in diagnosing pigmented skin lesions, and who felt very, moderately and not at all/somewhat confident in interpreting dermatoscopic features of skin lesions, were calculated with 95% confidence intervals (CIs).

The proportions of encounters in which skin or pigmented lesion checks were performed, and in which a dermatoscope was used, were calculated with 95% CIs.

To test associations of a registrar using a dermatoscope in the process of performing a skin or pigmented lesion check, as well as the two secondary outcomes, simple and multiple logistic regression was used within the generalised estimating equations framework to account for repeated measures on registrars.

Covariates with a P value <0.2 in the univariate analysis were included in the multiple regression models. Covariates which were no longer significant (at $P < 0.2$) in the multivariable model were removed from the model, dependent on the covariate's removal not substantively changing the resulting model. To examine our research questions, three logistic regression models were built.

To examine the question of associations of a dermatoscope being used by registrars when performing a skin or pigmented lesion check, the patient, practice, registrar and consultation factors above were entered in a regression model with dermatoscope use as the outcome.

To examine the associations of a registrar changing their provisional

diagnosis after using a dermatoscope, the above variables were entered in a model in addition to the variable 'registrar confidence', with change in provisional diagnosis as the outcome. This analysis was restricted to encounters where a dermatoscope was used.

To examine the associations of dermatoscope use increasing registrar confidence in their final diagnosis, the same variables as for the second regression were entered into a third model, with increase in confidence as the outcome. Again, this analysis was restricted to encounters in which a dermatoscope was used.

Results from logistic regression models are presented as odds ratios (ORs) with 95% CI.

A post-hoc chi-square for trend analysis tested an association of dermoscopy use with RTP ranking by latitude of geographic footprint.

Analyses were performed using STATA 13.1 and SAS 9.4 statistical software. The significance threshold was set at the conventional 0.05 level for all analyses.

Ethics approval

This study was approved by the University of Newcastle Human Research Ethics Committee, reference H-2009-0323.

Results

Three hundred and twenty-nine registrars contributed 414 registrar-rounds of data (response rate 95.2%). Registrar and practice demographics are presented in Table 2.

Of 24,647 total consultations, in 348 (1.4%; 95% CI: 1.3, 1.6) registrars performed a skin or pigmented lesion check, of which 212 (60.9%; 95% CI: 55.7, 65.9) involved dermatoscope use.

Of registrar participants, 48.6% (95% CI: 43.6, 53.6) reported prior dermoscopy training. Training was classified as undergraduate (17.2%), RTP-led (35.5%), in-practice (60.8%), and external courses (19.9%). Of consultations involving dermoscopy, 67.0% (95% CI: 60.0, 73.4) were by registrars with dermoscopy training.

Table 1. Characteristics associated with dermatoscope use

Variable	Class	Dermatoscope use		P value
		No (n = 136)	Yes (n = 212)	
Patient age group (years)	0–14	27 (20.0%)	10 (4.9%)	<0.0001
	15–34	24 (17.8%)	36 (17.6%)	
	35–64	57 (42.2%)	102 (49.8%)	
	≥65	27 (20.0%)	57 (27.8%)	
Patient gender	Male	42 (31.8%)	96 (47.1%)	0.0216
	Female	90 (68.2%)	108 (52.9%)	
NESB	No	126 (96.2%)	187 (96.4%)	0.8841
	Yes	5 (3.8%)	7 (3.6%)	
Patient/practice status	Existing patient	52 (39.1%)	109 (54.2%)	0.1963
	New to registrar	71 (53.4%)	81 (40.3%)	
	New to practice	10 (7.5%)	11 (5.5%)	
Registrar gender	Male	38 (27.9%)	77 (36.3%)	0.4070
	Female	98 (72.1%)	135 (63.7%)	
Registrar full time* or part time	Part time	29 (21.6%)	34 (16.9%)	0.2480
	Full time	105 (78.4%)	167 (83.1%)	
Training term/post	Term 1	52 (38.2%)	62 (29.2%)	0.0412
	Term 2	67 (49.3%)	113 (53.3%)	
	Term 3	17 (12.5%)	37 (17.5%)	
Worked at practice previously	No	79 (58.5%)	102 (48.3%)	0.2381
	Yes	56 (41.5%)	109 (51.7%)	
Qualified as doctor in Australia	No	49 (36.0%)	54 (25.7%)	0.4011
	Yes	87 (64.0%)	156 (74.3%)	
Had dermatoscope training	No	78 (61.9%)	63 (33.0%)	0.0006
	Yes	48 (38.1%)	128 (67.0%)	
Practice size	Small	46 (34.8%)	84 (43.8%)	0.9956
	Large	86 (65.2%)	108 (56.3%)	
Practice routinely bulk bills [†]	No	119 (88.8%)	199 (94.3%)	0.4429
	Yes	15 (11.2%)	12 (5.7%)	
Rurality	Major city	37 (27.2%)	41 (19.3%)	0.2832
	Inner regional	51 (37.5%)	73 (34.4%)	
	Outer regional remote	48 (35.3%)	98 (46.2%)	
RTP	RTP 1	54 (39.7%)	80 (37.7%)	0.0010
	RTP 2	43 (31.6%)	20 (9.4%)	
	RTP 3	27 (19.9%)	57 (26.9%)	
	RTP 4	12 (8.8%)	55 (25.9%)	
Pathology ordered	No	102 (75.0%)	155 (73.1%)	0.4514
	Yes	34 (25.0%)	57 (26.9%)	
Sought help any source	No	77 (56.6%)	147 (69.3%)	0.8672
	Yes	59 (43.4%)	65 (30.7%)	
Referral ordered	No	118 (86.8%)	183 (86.3%)	0.7296
	Yes	18 (13.2%)	29 (13.7%)	
Registrar age (years)	Mean (SD)	32.3 (4.5)	33.4 (6.4)	0.3506
SEIFA decile	Mean (SD)	5.1 (2.4)	4.7 (2.4)	0.3857
Consultation duration (minutes)	Mean (SD)	18.6 (8.9)	20.8 (10.0)	0.0421
Number of problems	Mean (SD)	2.0 (1.0)	1.9 (0.9)	0.9597

*Full-time work was defined as eight or more sessions per week.

[†]The practice routinely bulk bills (there is no financial cost to the patient for the consultation).

NESB, non-English speaking background; RTP, regional training provider; SD, standard deviation; SEIFA, Socioeconomic Index for Areas

Of participants, 25.4% (95% CI: 20.9, 29.9) reported being moderately or very confident in their ability to diagnose skin lesions. Of registrars who used a dermatoscope, 42.7% (95% CI: 23.2, 44.3) were moderately or very confident in their ability to diagnose skin lesions, and 42.7% (95% CI: 31.2, 54.1) were moderately or very confident in interpreting dermatoscopic features of skin lesions.

Characteristics associated with dermatoscope use are presented in Table 1. The associations of a registrar using a dermatoscope estimated using logistic regression are presented in Table 3.

Registrars' use of a dermatoscope was significantly less likely with patients aged

0–14 years (OR 0.25; 95% CI: 0.09, 0.69), with females (OR 0.55; 95% CI: 0.031, 1.00) or with registrars at RTP 2 (OR 0.09; 95% CI: 0.03, 0.30). Dermatoscope use was more likely with advanced training term; for term 3 the OR was 6.98 (95% CI: 1.61, 30.2) and for term 2 the OR was 2.89 (95% CI: 1.20, 6.93).

In a post-hoc analysis, RTP latitude was not significantly associated with dermatoscope use ($P = 0.16$).

There were 205 encounters in which a skin or pigmented lesion check was performed and a dermatoscope was used, of which 46 (22.4%; 95% CI: 17.2, 28.7) resulted in a change in the registrars' provisional diagnosis. There were no

significant adjusted associations with changing diagnosis after dermatoscope use (Table 4).

Use of a dermatoscope increased registrar confidence in their final diagnosis for 114 (55.3%; 95% CI: 48.4, 62.0) of these consultations. There were no significant associations of increased confidence in univariate or multivariable analyses (Appendices 1 and 2, online only).

Discussion

This is the first report of dermatoscope use by general practice registrars – early-career GPs who will have had limited experience of dermoscopy and who may

Table 2. Participating registrar (trainee), registrar-term and practice characteristics

Variable	Class	n (%) [95% CIs]	
		All registrars (n = 329)	Registrars who did skin checks (n = 124)
Registrar variables			
Registrar gender	Male	104 (31.6) [26.8, 36.9]	42 (33.9) [26.0, 42.8]
	Female	225 (68.4) [63.1, 73.2]	82 (66.1) [57.2, 74.0]
Qualified as a doctor in Australia	Yes	254 (77.4) [72.6, 81.7]	94 (76.4) [68.0, 83.2]
Registrar-term or practice-term variables			
Registrar training term	Term 1	174 (42.0) [37.3, 46.9]	38 (28.6) [21.5, 36.9]
	Term 2	129 (31.2) [26.9, 35.8]	71 (53.4) [44.8, 61.8]
	Term 3	111 (26.8) [22.7, 31.3]	24 (18.1) [12.3, 25.6]
Registrar age (years)*		32.7 (6.4)	32.4 (5.4)
Registrar worked at the practice previously	Yes	140 (34.5) [30.0, 39.3]	62 (47.3) [38.8, 56.0]
Registrar works full time†	Yes	310 (77.5) [73.1, 81.3]	100 (80.7) [72.6, 86.7]
Practice routinely bulk bills‡	Yes	44 (10.7) [8.0, 14.1]	10 (7.6) [4.1, 13.7]
Number of GPs working at the practice	1–5	149 (37.9) [33.2, 42.8]	43 (35.3) [27.2, 44.2]
	6–10+	244 (62.1) [57.2, 66.8]	79 (64.8) [55.8, 72.8]
Rurality of practice	Major city	126 (30.4) [26.2, 35.1]	38 (28.6) [21.5, 36.9]
	Inner regional	129 (31.2) [26.9, 35.8]	41 (30.8) [23.5, 39.3]
	Outer regional, remote or very remote	159 (38.4) [33.8, 43.2]	54 (40.6) [32.5, 49.3]
SEIFA decile of practice*		4.8 (2.4)	4.7 (2.3)

*Values presented as mean (standard deviation)

†Eight or more sessions per week

‡The practice routinely bulk bills (there is no financial cost to the patient for the consultation)

CI, confidence interval; GP, general practitioner; SEIFA, Socioeconomic Index for Areas

be at the nadir of the proposed J-curve of dermoscopic diagnostic accuracy.¹

Main findings and interpretation

We found that dermoscopy is performed in a modest majority (61%) of skin or pigmented lesion checks, that it not infrequently changed the provisional diagnosis (22%) and increased confidence in final diagnosis (55%).

Patients aged under 15 years are less likely to be examined by dermatoscope than those aged 15–34 years; this is consistent with the very low prevalence of skin malignancy in the paediatric age group. The lack of association of dermoscopy with other age groups, however, suggests a lack of appropriate clinical targeting of dermatoscope use given increasing incidence of skin malignancy with age.

The strong association of dermatoscope use with registrar terms (OR 2.89 and 6.98 for terms 2 and 3, respectively) illustrates the novelty of dermoscopy for many term 1 registrars

and its rapid subsequent uptake. We have no data to evaluate accuracy of registrars' diagnoses, but these findings of rapid uptake, together with modest levels of dermoscopy training, raise concerns regarding registrars' diagnostic accuracy for skin cancer. This is especially so, as we defined dermoscopy training quite liberally.

We found significant inter-RTP variability in dermoscopy uptake. This may relate to specific training provided within these regions or to differences in clinical culture within the practices of the different RTPs.

Dermoscopy resulted in provisional diagnosis change in almost a quarter of cases. With our methodology we cannot determine how this affected diagnostic accuracy. This is an important area for further study given the possibility of a temporary decrease in diagnostic accuracy with initial dermatoscope use.¹

Registrars reported an increase in confidence in their final diagnosis following dermatoscope use in over half

of cases. This is similar to studies on qualified primary care physicians.^{15,16}

Strengths and limitations

The high response rate is a strength.²⁰ The study involved registrars across all urban/rural classifications in four states, and from most northerly to most southerly training locations, so enhancing generalisability.

A limitation is that we did not have access to 'gold standard' diagnostic information (histopathology). Thus, while we were able to ascertain that dermatoscope use changed registrars' provisional diagnoses, and increased their confidence in their final diagnoses, we cannot comment on dermoscopy's effect on accuracy of registrars' diagnoses.

A further limitation was that only 212 consultations involved dermoscopy. This limited our statistical power to establish associations of our secondary outcomes (whether dermatoscope use changed the provisional diagnosis, and whether it increased registrar confidence in final diagnosis).

Table 3. Characteristics associated with the registrar using a dermatoscope when performing a skin check: Regression model including 'patient', 'registrar' and 'practice' variables

Variable	Class	Univariate		Adjusted	
		OR (95% CI)	P value	OR (95% CI)	P value
Patient age group (years)	0–14	0.35 (0.19, 0.64)	0.0006	0.25 (0.09, 0.69)	0.0076
Referent: 15–34	35–64	0.99 (0.63, 1.56)	0.9636	0.85 (0.41, 1.78)	0.6656
	≥65	1.05 (0.56, 1.95)	0.8789	0.64 (0.22, 1.90)	0.4258
Patient gender	Female	0.67 (0.48, 0.94)	0.0216	0.55 (0.31, 1.00)	0.0483
Patient/practice status	New to practice	0.72 (0.28, 1.80)	0.4778	0.61 (0.15, 2.55)	0.5022
Referent: Existing patient	New to registrar	0.74 (0.52, 1.07)	0.1113	0.75 (0.44, 1.29)	0.2991
Training term/post	Term 2	1.91 (0.97, 3.78)	0.0619	2.89 (1.20, 6.93)	0.0176
Referent: Term 1	Term 3	2.98 (1.27, 6.96)	0.0118	6.98 (1.61, 30.2)	0.0093
	Had dermatoscope training	Yes	3.13 (1.64, 5.99)	0.0006	1.82 (0.84, 3.95)
RTP	RTP 2	0.25 (0.10, 0.64)	0.0037	0.09 (0.03, 0.30)	0.0001
Referent: RTP 1	RTP 3	1.04 (0.43, 2.52)	0.9253	0.70 (0.26, 1.89)	0.4786
	RTP 4	2.89 (0.98, 8.56)	0.0551	2.08 (0.73, 5.90)	0.1688
Consultation duration		1.02 (1.00, 1.04)	0.0421	1.00 (0.98, 1.03)	0.7000

CI, confidence interval; OR, odds ratio; RTP, regional training provider

Implications for general practice

Gerbert et al expressed concern that primary care residents may not be ready to assume a gatekeeper role for lesions suspicious of skin cancer.⁸ General practice registrars enter training inadequately prepared for the high burden of skin disease, and this learning need should be a high priority during vocational training.¹¹

While our study suggests progressive uptake of dermoscopy by registrars, this appears to be insufficient given dermoscopy is the standard of care for assessing skin lesions.¹⁷ However, dermoscopy uptake needs to be accompanied by adequate training to ensure safe decision making.

Online teaching modules are one effective way of enhancing the educational experience of the dermatology curriculum for medical students⁹ and could be applied to postgraduate training. Any such education in Australia's apprenticeship-like general practice training program model will need to be accompanied by in-practice training and support. Thus, upskilling and maintaining skills of general practice supervisors in dermoscopy may be a suitable subject for training organisation's supervisor continuing education programs.

Our finding of a quite modest frequency of skin lesion checks (1.4% of consultations) also raises the issue of how much dermoscopy in-practice experience is sufficient to attain and maintain dermoscopy competence. This is a suitable topic for further research.

Conclusion

Dermoscopy is performed by registrars at a modest proportion of skin and pigmented lesion checks. It affects diagnostic

thinking and increases confidence in diagnosis. Use varies between training providers, suggesting regional variability in teaching and opportunities for further education. Our study points to the need for dermoscopy training to be a standard element of general practice training.

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Table 4. Associations of a change in provisional diagnosis after dermatoscope use

Variable	Class	Univariate		Adjusted	
		OR (95% CI)	P value	OR (95% CI)	P value
Registrar age		0.94 (0.89, 0.98)	0.0093	0.94 (0.88, 1.02)	0.123
SEIFA decile		1.11 (0.95, 1.30)	0.1854	1.09 (0.93, 1.27)	0.272

CI, confidence interval; OR, odds ratio; SEIFA, Socioeconomic Index for Areas

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