The effect of an educational program to improve the skills of General Practitioners in diagnosing melanocytic/pigmented lesions.

Philippa H Youl, Beverly A Raasch, Monika Janda, Joanne F Aitken

Corresponding author: Philippa H Youl
Address: Viertel Centre for Research in Cancer Control
PO Box 201
Spring Hill, Queensland
Australia, 4006
Telephone: 61 7 3258 2301
Fax: 61 7 3258 2310
Email: pipyoul@qldcancer.com.au

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Summary

Background Skin cancer is major public health issue in fair-skinned populations and General Practitioners (GPs) play a major role in the diagnosis and management of this disease.

Aims To evaluate a self instructional education module together with audit and feedback designed to increase diagnostic skills of GPs in relation to melanocytic lesions and skin cancer.

Methods This study, conducted in Queensland, Australia, included 16 GPs who participated in a 6-month baseline audit of skin excisions, 6-month education program followed by a 6-month post-education audit.

Results Overall diagnostic accuracy of malignant lesions was 63.2% (95% CI 60.0-66.3) during baseline and 64.5%, (95% CI 61.1-67.7) post-education. Significant improvements were seen post-education in the proportion of melanocytic lesions confirmed as malignant (6.1% baseline and 13.5% post-education, χ^2=6.6, p=0.01). GPs with <15 years of practice recorded significantly lower levels of diagnostic accuracy at baseline compared to those with ≥ 25 years of practice (p=0.001). Post-education there were no differences in diagnostic skill according to years of practice.

Conclusions The education program improved the M:B ratio of melanocytic lesions resulting in a doubling in the number of melanomas diagnosed. We found that GPs with less experience benefited most from the program indicating tailoring of programs to individual skills and years of practice may be beneficial.

Introduction

Skin cancer continues to be a major public health issue both in Australia and in other countries with fair-skinned populations. In Australia in 2001, 8,885 new cases of melanoma were diagnosed among a population of approximately 19 million,[1] while within the United Kingdom, rates of melanoma are continuing to rise and in 2002 approximately 8,000 new cases were diagnosed among a population of approximately 59 million.[2] Those residing in the state of Queensland carry the world's highest risk for melanoma with an estimated life time risk of 1 in 16 for men and 1 in 23 for women.[3]

General Practitioners (GPs) play a major role in the diagnosis and treatment of skin cancer. Within Australia, over 46% of cancer related contacts with GPs are for skin cancer.[1] GPs working in areas with a high incidence of skin cancer correctly diagnose 70 to 80% of Basal Cell Carcinoma (BCC) and 40 to 60% of Squamous Cell Carcinoma (SCC). [4,5] However, diagnostic ability is lower for melanocytic lesions with up to 92% of all melanocytic lesions excised found to be benign upon histology.[6]

Studies examining educational programs and interventions to improve GPs differential skin cancer diagnostic abilities have had mixed results. Some reported no change in sensitivity and specificity of melanoma diagnosis, while others recorded some improvements in sensitivity and specificity and proportion of malignant lesions excised. [7-9]

The aim of this study was to evaluate the effect of an educational intervention designed to increase the diagnostic skills and performance of GPs in relation to melanocytic/pigmented lesions.

Methods

This study was conducted during the first phase of a randomised-controlled trial of melanoma screening.[10] Briefly, the trial involved 18 communities in rural and regional Queensland, Australia randomly assigned to intervention (9 communities) and control (9 communities). The nine intervention communities received a three year community-based intervention program, titled *SkinWatch*, whilst control communities received normal care.[11]

Development of the program

The program consisted of a 6-month baseline clinical self-audit of skin excisions, followed by a feedback report and provision of a self-paced educational module to study over the subsequent 6 months and a further 6-month post-education self-audit period.

Educational principles underlying the educational intervention

The principles underlying the educational intervention were assessment of needs, development of learning objectives, formulating educational strategies and evaluation. Educational needs assessment has been shown to be a key factor in the success of educational interventions in changing performance, and for this intervention multiple sources of information were used.[12] First, a global need had been established (high incidence of melanoma in Queensland), and second, interviews with 62 GPs (95% of

those approached) identified GP's needs in detail during the development of the *Skinwatch* program.

The educational package

The aim of the education package was to assist diagnosis and management of skin cancers, in particular pigmented lesions and melanoma. The main performance outcome variable was the malignant to benign (M:B) ratio of excised pigmented skin lesions, and an expected standard with respect to improved outcome was a M:B for pigmented lesions of 1:10.[13] Learning objectives, developed by one of the authors (BR), were designed to improve skills in the diagnosis and early detection of melanoma, to improve knowledge of the management and treatment of suspicious pigmented lesions, and to improve knowledge of recommended procedures and evidence-based guidelines for management and follow-up of patients with melanoma. An outline of the components of the education program is provided in Figure 1. The educational aspect was enhanced by the provision of feedback about their diagnostic accuracy on excised lesions and how this compared with their peers. Strategies to predispose, enable and reinforce change in performance were incorporated into the audit and feedback process. [14] After the first audit, GPs received the paper-based self-paced education module which contained a succinct summary of key points and actions with content based on learning objectives, as well as additional readings. GPs received Continuing Medical Education points through the Royal Australian College of General Practitioners (RACGP).

Data collected

During the self-audit periods participating doctors completed a data collection form for each patient who underwent an excision or biopsy of a skin lesion (patients gave written consent). Information collected included patient demographics (age and sex), and for each skin lesion, date of excision, reason for excision (exclude malignancy, discomfort from the lesion, removal for cosmetic reasons, other), clinical diagnosis (melanoma, benign naevus (BN), dysplastic naevus (DN), BCC, SCC, solar keratosis (SK), seborrhoeic keratosis (SebK), Hutchinson's Melanocytic Freckle (HMF), ketatoacanthoma (KA), and other), and patient pressure to excise on a scale of 1 (no patient pressure) to 5 (patient pressure only reason for excision). Doctors were also asked to record the histological diagnosis or to attach a copy of the histopathology report.

Recruitment of General Practitioners

Full time GPs (n=52) received an invitation (and reminder after 2 weeks) to participate. Of all GPs, 12 were ineligible (moved, no longer practicing, locums, or unavailable during the study period). Of those eligible (n=40), 5 (12.5%) refused, 6 (15.0%) consented but did not participate, one completed baseline audit only and 13 (32.5%) did not respond. Thus, 16 GPs (13 males and 3 females) participated in the study (response rate=40.0%). Participants and non-participants were the same in relation to sex (p=0.75), age (p=0.65) and location of training (p=0.96). The median age of GPs was 44 (range 31 to 56) and median number of years of practice was 20 (range 6 to 30).

Analysis

Descriptive analyses were used to describe the GPs and the age, sex and lesion characteristics of patients. Of a total 2,775 lesions, a clinical diagnosis was recorded for 2,549 (1,343 during the baseline period and 1,206 during the post-education period) and a histological diagnosis for 2,770 (1,451 at baseline and 1,319 post-education period). Thus the final sample for analysis consisted of 1,338 baseline and 1,206 post-education lesions.

To assess diagnostic performance, all lesions were categorised as malignant (BCC, SCC, melanoma and HMF), or benign (BN, DN, SK, KA, SebK and other benign lesions). The histopathology report was used as the "gold standard" in all calculations of accuracy. Clinical performance was assessed using diagnostic accuracy (proportion of lesions in which GPs were correct in their clinical diagnosis), positive predictive value (PPV) (proportion of clinical diagnoses correct on histology) and included 95% confidence intervals. Chi-square statistics and p-values were calculated to examine the relationship between diagnostic performance and years of practice using three broad groups: < 15 years (n=5 GPS), 15 to 24 years (n=6 GPs) and ≥ 25 years (n=5 GPs). All analyses were undertaken using SAS V9.1 (SAS Institute, Inc., Cary, North Carolina).

Results

GPs treated 1,172 patients (56.8% male) during baseline and 1,013 patients during post-education periods (55.1% male). The mean age of patients was 54.4 years and 54.6 years during baseline and post-education periods, respectively (Table 1).

The median number of lesions excised per GP was 83.6 (range 25-135) and 75.4 (range 13-227) during the baseline and post-education periods respectively. During the baseline period, 45.7% of all lesions were malignant on histology, resulting in a M:B ratio of 1 to 1.19. GPs correctly identified 66.1% of histologically malignant lesions, and 91.5% of benign lesions. Post education, 68.2% were correctly identified as malignant and 90.6% as benign lesions.

For melanocytic lesions only, GPs significantly improved the proportion of lesions confirmed as malignant (6.1% baseline and 13.5% post-education), and the M:B ratio (1:15.4 baseline, and 1:6.4 post-education) (χ^2 6.6, p=0.01) from the baseline to the post-education period (Table 1). The PPV of a diagnosis of melanoma increased from 22.0% at baseline to 34.3% post-education (χ^2 1.4, p=0.23). During the baseline period 14 excised lesions were confirmed as melanoma (2 *insitu*, 6 ≤ 1.00mm, 2 ≥ 3.00mm and 2 unknown thickness) and two as HMF. Post-education, double the number of melanomas were excised (n=24) (9 *insitu*, 8 ≤ 1.00mm, 3 1.00mm to 2.99mm and 4 ≥ 3.00mm) in addition to one HMF.

Overall diagnostic accuracy of all malignant lesions was 63.2% (95% CI 60.0-66.3) during baseline, and 64.5% (95% CI 61.1-67.7) post-education. PPV of a malignant lesion was 66.1% (95%CI 62.9-69.2) at baseline with a slight non-significant increase post-education to 68.2% (95%CI 64.8-71.4) (χ^2 0.77, p=0.39).

During the baseline period, GPs with less than 15 years of practice were significantly less likely to clinically identify malignant lesions compared to those with more than 15 years practice (χ^2 13.6, p=0.001) (Table 2). However, post-education there was no

difference in diagnostic accuracy according to years of practice (χ^2 2.0, p=0.16). GPs with less than 15 years of practice improved their accuracy rate by 8.5% (PPV pre-education 55.6% and post-education 64.4%, χ^2 2.7, p=0.10). Little change in the diagnostic accuracy of GPs with more than 15 years of practice was observed. The PPV for GPs with less than 15 years of practice at baseline was 55.6% compared to 65.9% (15 to 24 years of practice) and 77.0% (≥ 25 years of practice) (χ^2 19.2, p=< 0.001).

Patients exerted significantly more pressure to excise melanocytic compared to non-melanocytic lesions with 13.6% of melanocytic lesions excised due solely to pressure from the patient compared to only 4.7% of non-melanocytic lesions (p=<0.001). There was no difference in these results pre or post-education. Additionally, patient pressure was the only reason for excising (16%) melanomas pre-education. However, post-education, only one melanoma (4.2%) was removed due solely to patient pressure.

Discussion

This targeted intervention combined a focused educational module together with the evidence-based strategy for improved performance of clinical audit and feedback. [14] It resulted in GPs in this study improving the M:B ratio for excised melanocytic lesions from 1:15.4 to 1:6.4, despite greater patient pressure to excise melanocytic compared to non-melanocytic lesions. In addition, the PPV of a melanoma diagnosis improved by approximately 12% (the small number of melanomas diagnosed may have resulted in this difference not being statistically significant). The education package had a strong focus on the diagnosis and management of pigmented lesions, particularly

melanoma, and specific details on how to perform a whole-body skin examination. As whole-body skin examination is not usual practice for GPs in everyday practice where skin lesions are often presented as a secondary reason for consultation, the increase in whole-body exams performed is the most likely reason for the increase in the numbers of melanomas identified, assuming the prevalence in the populations pre and post audit was similar. Other studies have reported similar results [8,15] and the importance of whole-body skin examinations for the diagnosis of melanoma has been discussed previously We are confident that the increase in the number of melanomas found during the post-education period is not due to changes in the population. In the study areas there is very little in or out migration and the majority of skin cancer is treated within the local area.[20]

The M:B ratio for all lesions grouped together was close to one at baseline leaving little room for improvement and similar results have been observed before. [5] As opinion is divided whether keratoacanthoma should be considered a variant of SCC we did not include these lesions within the malignant group. [16,17] These lesions represented only a small proportion (2.2% pre and 1.8% post-education) and their inclusion in the malignant group had no significant effect on the M:B ratio.

While significant improvements in PPV were seen for melanocytic lesions, this did not hold when all lesions were taken into acount. Due to the high prevalence of skin cancer GPs in Queensland are presented with a large number of skin lesions each year. In addition, the GPs were searching for pigmented lesions and melanomas as a result of the education package, rather than focusing on NMSC. It is perhaps for these reasons that we did not find a significant change in the overall PPV during the post-

education period. One randomized trial using a similar educational intervention for GPs as this program also improved diagnosis of suspicious melanocytic lesions (increase in PPV of 5%), but achieved little change in overall diagnostic ability. [18] Mixed results for a number of measures of diagnostic accuracy have also been observed in studies using various educational interventions.[8,9,19] However, a significant improvement in this measure may be more easily achieved within populations with a lower incidence of the disease.

GPs with less than 15 years of practice benefited most from this program, particularly in their overall diagnostic accuracy and this has been shown in previous work.[19] GPs who had practiced longer did not show any significant gains, possibly indicating a threshold effect. Future studies could tailor programs to individual skill level and years of practice.

Similar to other studies of audits requesting quite extensive time commitment from GPs, [7,19] the response rate of GPs was low at 40% and our sample size was relatively small, however, we found no evidence of selective participation. Histopathology was carried out through local centralised pathology services commonly used by the GPs and this did not change during the study period. We did not seek independent confirmation of histologies for all lesions and therefore it is possible that some discrepancies may have occurred. However, within the study areas it is usual practice for histopathologists to seek a second opinion for any borderline lesions from an expert dermatopathologist. With regards to generalisability, it is unknown if such a program would be more successful in areas of lower skin cancer prevalence.

Simple targeted evidence-based educational programs can improve diagnosis of melanocytic lesions and melanoma especially amongst GPs with less experience. Clinical audits are a valuable research tool and can enable change in performance through feedback.

Table 1: Comparison of results for 6-month baseline audit and 6-month post-education audit

	6-month baseline audit period (n=1,172 patients n=1,338 lesions*)		**6-month post-education audit period** (n=1,013 patients n=1,206 lesions*)		
	n	%	n	%	χ^2 (p-value)
Patient sex					0.67 (0.41)
Male	666	56.8	558	55.1	
Patient age					1.3 (0.74)
<30	104	8.9	83	8.2	
30-49	346	29.5	293	28.9	
50-69	470	40.1	429	42.4	
70+	252	21.5	208	20.5	
All lesions					
Histologically					0.0 (0.95)
Malignant	612	45.7	553	45.8	
Benign	726	54.3	653	54.2	
Malignant: Benign ratio	1:1.19		1:1.18		
Melanocytic lesions					
Histologically					6.6 (0.01)
Malignant	14	6.1	25	13.5	
Benign	216	93.9	160	86.5	
Malignant: Benign ratio	1:15.4		1:6.4		

* number of lesions excludes lesions with no clinical diagnosis (n=226) or lesions with no histological diagnosis (n=5).

Table 2: Measures of diagnostic accuracy for melanoma and non-melanoma skin cancer according to years of practice

	6-month baseline period				6-month post-education period			
	< 15 years	15-24 years	≥ 25 years	χ^2 (p-value)	< 15 years	15-24 years	≥ 25 years	χ^2 (p-value)
Diagnostic accuracy*	54.2 (47.1-61.1)	63.1 (58.8-67.2)	68.0 (65.7-77.9)	13.6 (0.001)	62.7 (54.9-70.1)	62.7 (58.1-67.2)	69.4 (62.9-75.4)	2.0 (0.16)
PPV†	55.6 (48.4-62.6)	65.9 (61.6-70.0)	77.0 (70.7-82.6)	19.2 (< .001)	64.4 (56.5-71.8)	66.9 (62.2-71.4)	73.7 (67.2-76.9)	3.6 (0.06)

* Diagnostic accuracy: # true positives/# true positives + # false positives

† PPV (positive predictive value): # true positives/# true positives + #false positives

At the end of the program participants will be able to:

1. Outline the epidemiology of melanoma, including incidence, mortality and trends.

2. Identify risk factors for melanoma and how these factors can predict melanoma.

3. Understand how to conduct a whole-body skin examination.

4. Diagnose melanoma including the use of the ABCDE (asymmetry, border, colour, diameter, elevation) rule.

5. Understand how dermatoscopes aid in diagnosis.

6. Understand the importance of communication skills to ensure that a full history from the patient is obtained.

7. Understand the management of suspected and primary melanoma, including excision margins, re-excisions, requirements for other investigations, lymph node biopsy.

8. Implement guidelines on the follow-up of patients with melanoma.

9. Monitor and undertake surveillance of uncertain lesions and family members of patients diagnosed with melanoma, including the use of an algorithm or "decision tree" developed by Del Mar and Green.

Figure 1:Learning objectives for self-instructional Educational module for participating Primary care physicians

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