Factors influencing the number needed to excise: excision rates of pigmented lesions by general practitioners

Dallas R English, Chris Del Mar and Robert C Burton

ABSTRACT

Objective: To identify doctor and patient characteristics associated with excision of benign versus malignant pigmented skin lesions.

Design, setting and participants: Retrospective audit of data on 4741 pigmented skin lesions excised from November 1998 to February 2000 by 468 general practitioners (39% response rate) from 223 practices in Perth, WA. (The data used were from the baseline period of a randomised controlled trial of a diagnostic aid for pigmented skin lesions.)

Main outcome measure: The number needed to treat (NNT), defined as the number of pigmented lesions needed to be excised to identify one melanoma, in relation to demographic characteristics of GPs and patients.

Results: Relatively more benign lesions were excised per melanoma (NNT = 83) in the youngest patients (aged 10–19 years) compared with the oldest (aged $\geqslant$ 70) (NNT = 11) (P [trend] < 0.001), in females (NNT = 37) compared with males (NNT = 23) (P = 0.02), and in the most socioeconomically disadvantaged (NNT = 60) compared with the least disadvantaged group (NNT = 20) (P [trend] < 0.001). The most recently graduated GPs excised more benign lesions for each melanoma (NNT = 59) than the least recently graduated (NNT = 22) (P [trend] = 0.01).

Conclusions: GPs could raise their threshold for excising pigmented lesions in patients who are young, female, or from areas of low socioeconomic status, or if the GPs themselves are recent graduates.

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MANY FACTORS influence the decision of whether or not to excise a pigmented skin lesion.[1] The overriding concern is not to miss a melanoma, excisions being both diagnostic and, mostly, curative.[2] Because naevi and seborrhoeic keratoses are easily confused with melanomas,[1,3] many pigmented skin lesions are excised for every melanoma excised.[4] The number of pigmented lesions excised per melanoma can be considered as the "number needed to treat" (NNT).[5] The NNT is between 11 and 29 for Australian general practitioners when based on melanomas and naevi only, and up to 36 when seborrhoeic keratoses are included.[1,4,6,7]

What is the ideal NNT? A low NNT may mean that diagnostic criteria are too narrow and that melanomas are more likely to be missed. A high NNT may mean that the economic and personal costs of excising lesions are excessive.

How do doctors make the decision to excise? Among the factors that may influence them are the concerns of patients (or family members) about malignancy ("patient pressure to excise"),[7] medicolegal worries about "missing" a melanoma, economic benefits from performing excisions,[8] and the likelihood, from epidemiological data, that a particular pigmented skin lesion might be a melanoma. This likelihood is influenced by the prevalence of benign pigmented skin lesions (naevi among young people and seborrhoeic keratoses among elderly people) and the prevalence of melanomas (which increases with age).

Few studies have examined determinants of the NNT. We report here on data from the baseline period of a randomised controlled trial of the management of pigmented skin lesions in general practice.[9] We sought to identify doctor and patient characteristics that may affect the NNT.

METHODS

The trial is described in more detail elsewhere.[9] Briefly, the purpose of the trial was to examine the effect of an intervention (use of a diagnostic algorithm and photographic images) as a diagnostic aid for pigmented skin lesions. Data collected for intervention and control groups during a baseline period, before practices were randomised, were compared with data collected during the trial period.[9]

Participants

For the trial of the diagnostic algorithm and camera, we attempted to recruit all GPs in Perth, WA, who did not already use cameras to record images of pigmented skin lesions. We used the (somewhat incomplete) mailing lists of the Divisions of General Practice in Perth. GPs qualified to participate if they would permit their practices to be randomly allocated to an intervention or control group and would allow pathology laboratories to provide skin biopsy data. They were enrolled via a mail-out (with repeat letters and/or telephone follow-up for non-respondents) and accompanying publicity. GPs who were not on a Division mailing list but who were identified during visits to study

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1: Response by general practitioners according to their sex, year of graduation, country of initial medical education, and socioeconomic status associated with the practice's postcode

	Participants (%)	Total	P*
Total	468 (39%)	1213	
Sex			
Female	168 (40%)	421	
Male	300 (39%)	765	$P = 0.8$
Unknown	0 (0)	27	
Year of graduation from medical school			
Before 1980	207 (35%)	592	
1980–1989	194 (47%)	409	
1990–1997	55 (39%)	140	$P < 0.001$
Unknown	12 (17%)	72	
Country of medical education			
Australia or New Zealand	315 (41%)	768	
United Kingdom	89 (42%)	210	
Asia	26 (25%)	106	
Other	26 (46%)	56	$P = 0.006$
Unknown	12 (16%)	73	
Socioeconomic status of practice location†			
4th quarter	78 (28%)	276	
3rd quarter	133 (38%)	354	
2nd quarter	98 (38%)	258	
1st quarter	159 (49%)	325	$P < 0.001$

* χ^2 test comparing participants with non-participants, ignoring "unknown" category.
† Divided into four categories according to postcode of practice.[11] "4th quarter" areas are the most disadvantaged, "1st quarter" areas the least disadvantaged. When GPs worked at more than one practice, one was chosen at random.

practices were also asked to participate in the trial.

Data from pathology reports

All pathology laboratories in Perth that deal with skin lesions provided copies of pathology reports on pigmented skin lesions (invasive or in-situ melanomas, naevi, and seborrhoeic keratoses) excised by participating GPs from 1 November 1998 to 31 August 2000. Our analysis in this article is restricted to excisions performed by all participants of the larger randomised controlled trial during the baseline period before practice randomisation (ie, between November 1998 and February 2000).

GP and patient characteristics

We obtained the GPs' sex, year of graduation and country of medical education from the *Medical directory of Australia*.[10] GPs' practices were allocated to one of four socioeconomic status (SES) categories based on the postcode of the practice location.[11] Data on the patients' age, sex and SES (estimated from the postcode of their address[11]) came from pathology reports. We calculated NNTs based on the number of naevi, seborrhoeic keratoses and melanomas excised. We had no information on reasons for excision.

Statistical analysis

To examine all variables simultaneously, we used logistic regression with allowance for multiple excisions per GP.[12] The odds ratios from the model are about equal to ratios of NNT (see footnote to Box 2). In a secondary analysis, we repeated the calculations excluding six GPs who each excised more than 75 lesions, to establish whether their data skewed the results. We also tested for any interaction between the sex of the GP and the patient's sex, age and SES.

Ethics approval

The trial protocol was approved by the human research ethics committees of the Royal Australian College of General Practitioners and the University of Western Australia.

RESULTS

Participation rate

We identified 1213 GPs; five who already used cameras in their practices were excluded; 468 GPs from 223 practices participated in the trial (a response rate of 39%). Participation was lowest among graduates from Asian countries and among GPs who had graduated in the most recent or the most distant past. Higher participation was associated with higher SES of the area in which GPs practised (Box 1).

Number of lesions excised

During the baseline period, participants excised 4741 pigmented skin lesions, of which 42 (0.9%) were excluded because of missing data, leaving 4699 lesions, including 62 in-situ and 98 invasive melanomas. Two-thirds (318) of the GPs excised at least one lesion, and among these GPs the median number excised was eight (interquartile range, 3–16). The NNT was 29 (or 31, after excluding the six GPs who excised more than 75 lesions each). When seborrhoeic keratoses were excluded from the analysis, the NNT was 21.

Number needed to treat

NNT and GP characteristics. The least recent graduates had the lowest NNT. The GPs' sex, country of education and their numbers of excisions were not significantly associated with the NNT. Excluding GPs with more than 75 excisions had little effect on these associations (data not shown).

NNT and patient characteristics. The NNT ranged from 83 in the youngest patients (10–19 years) to 11 in the oldest patients (≥ 70 years) (Box 2). Patients less than 30 years old contributed about 25% of all lesions but only

2: Diagnosis of excised pigmented skin lesions by various characteristics of the patient and general practitioner

	Number and type of pigmented skin lesions (%)						
	Total	Melanoma	Naevus	Seborrhoeic keratosis	NNT*	Odds ratio (95% CI)†	P
Total	4699	160 (3%)	3124 (67%)	1415 (30%)	29		
Patient characteristics							
Age (years)							
10–19	496	6 (1%)	478 (96%)	12 (2%)	83	6.7 (2.8–16.0)	
20–29	805	9 (1%)	769 (96%)	27 (3%)	89	7.1 (3.4–15.1)	
30–39	941	20 (2%)	786 (84%)	135 (14%)	47	3.6 (2.2–6.0)	
40–49	862	26 (3%)	569 (66%)	267 (31%)	33	2.8 (1.8–4.4)	
50–59	620	26 (4%)	283 (46%)	311 (50%)	24	2.1 (1.3–3.5)	
60–69	455	25 (5%)	140 (31%)	290 (64%)	18	1.6 (0.9–2.7)	
⩾ 70	520	48 (9%)	99 (19%)	373 (72%)	11	1.0	P(trend) < 0.001
Sex							
Male	1989	86 (4%)	1217 (61%)	686 (34%)	23	1.0	
Female	2710	74 (3%)	1907 (70%)	729 (27%)	37	1.4 (1.1–1.8)	P = 0.02
Socioeconomic status‡							
4th quarter	1138	19 (2%)	806 (71%)	313 (28%)	60	2.4 (1.4–4.0)	
3rd quarter	1256	35 (3%)	846 (67%)	375 (30%)	36	1.5 (1.0–2.2)	
2nd quarter	1138	49 (4%)	720 (63%)	369 (32%)	23	1.1 (0.6–1.9)	
1st quarter	1167	57 (5%)	752 (64%)	358 (31%)	20	1.0	P(trend) < 0.001
GP characteristics§							
Sex							
Male	3930	143 (4%)	2584 (66%)	1203 (31%)	27	1.0	
Female	769	17 (2%)	540 (70%)	212 (28%)	45	1.3 (0.8–2.2)	P = 0.3
Year of graduation from medical school							
Before 1980	2164	98 (5%)	1366 (63%)	700 (32%)	22	1.0	
1980–1989	2064	54 (3%)	1409 (68%)	601 (29%)	38	1.6 (1.1–2.4)	
1990–1997	471	8 (2%)	349 (74%)	114 (24%)	59	1.6 (0.8–3.3)	P(trend) = 0.01
Country of medical education							
Australia/NZ	3293	125 (4%)	2185 (66%)	983 (30%)	26	1.0	
Other	1406	35 (2%)	939 (67%)	432 (31%)	40	1.2 (0.8–1.8)	P = 0.4
Number of lesions excised							
< 15	1198	42 (4%)	770 (64%)	386 (32%)	29	1.0	
15–24	1021	42 (4%)	665 (65%)	314 (31%)	24	1.0 (0.6–1.5)	
25–74	1285	30 (2%)	887 (69%)	368 (29%)	43	1.3 (0.8–2.2)	
⩾ 75	1195	46 (4%)	802 (67%)	347 (29%)	26	1.0 (0.5–1.9)	P(trend) = 0.6

* NNT = number needed to treat (ie, number of pigmented skin lesions that were excised for each melanoma excised).

† Odds ratios for each variable adjusted for all other variables in the table. The odds ratios are about equal to the NNT in each category divided by the NNT in the reference category (eg, NNT for the 10–19 age group is nearly seven times higher than that for the ⩾ 70 age group, after adjusting for all other variables).

‡ Divided into four categories according to postcode of patient's address.[11] "4th quarter" areas are the most disadvantaged, "1st quarter" areas the least disadvantaged.

§ The characteristics of the excising GP were assigned to each lesion. Therefore, the numbers in each category refer to the number of lesions excised by GPs in that category, not the number of GPs.

about 10% of the melanomas. Almost all lesions from young patients were naevi, while the majority of lesions from older patients were seborrhoeic keratoses. The NNT was higher in females than males and highest among patients from areas of lowest SES.

NNT and interactions between GP and patient characteristics. Testing for interactions between GP and patient characteristics, we found that the only significant interaction was between the sex of the patient and the sex of the GP ($P = 0.03$). Among patients of male GPs, the NNT for females was about 30% higher than the NNT for males (odds ratio [OR], 1.3; 95% CI, 1.0–1.7), but among patients of female GPs, the NNT for females was about three times higher than the NNT for males (OR, 3.3; 95% CI, 1.5–7.5).

DISCUSSION

The patient demographic factors that we examined — age, sex and SES — were more important than characteristics of the GP in predicting whether an excised pigmented lesion was a melanoma, with the exception that in combination with the sex of the patient, the sex of the GP was important. We have no explanation for the particularly high NNT among female patients of female GPs. It could be due to chance. Were our findings affected by inadequacies of method? Certainly, the study was retrospective, not designed to evaluate reasons for excision, and the GP response rate was suboptimal (and particularly low among GPs who graduated in the most distant past, a group that had a low NNT). Importantly, however, the NNTs were similar to figures from studies in which response rate was not an issue.[1,4,6,7] Furthermore, excluding GPs who performed many excisions had little impact.

Should we be surprised that the NNT had such large variation (eg, at different ages)? The NNT depends on the prevalence of disease and on diagnostic accuracy, which are measured by sensitivity and specificity. As the prevalence falls, increases in specificity are necessary to maintain a constant NNT, but this may result in a fall in sensitivity. Nevertheless, there is scope to increase specificity, thereby reducing the numbers of lesions excised, among groups at low risk without compromising sensitivity.

That patients from areas of lower SES had more benign lesions excised for every melanoma seems to go against past experience in other care (the "inverse care law"[13]). This finding might be partly explained by a higher incidence of melanoma among higher-SES patients,[14] and could also be influenced by the low participation rate of GPs in areas of low SES.

The differences in NNT revealed by our study suggest that GPs could increase their suspicion of pigmented skin lesions (and lower their threshold for excision) among older and male patients and, conversely, decrease suspicion (and raise the threshold to excise) among younger and female patients.

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COMPETING INTERESTS

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