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Melanoma Diagnostic Practices of French-Speaking Belgian General Practitioners and the Prospective Study of Their Pigmented Skin Lesion Diagnostic Accuracy and Management

E. Harkemanne[1,2] · C. Duyver[3] · S. Leconte[3] · C. Bugli[4] · L. Thomas[5] · M. Baeck[1,2] · I. Tromme[1,2,6]

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Abstract
General practitioners (GPs) are among the main actors involved in early melanoma diagnosis. However, melanoma diagnostic accuracy and management are reported to be insufficient among GPs in Europe. The primary aim of this observational prospective study was to shed light on melanoma diagnostic practices among French-speaking Belgian GPs. The second aim was to specifically analyse these GPs' pigmented skin lesion diagnostic accuracy and management. GPs from the five French-speaking districts of Belgium were asked to complete a questionnaire, before taking part in a melanoma diagnostic training session. First, we assessed the GPs' current melanoma diagnostic practices. Then, their pigmented skin lesion diagnostic accuracy and management were evaluated, through basic theoretical questions and clinical images. These results were subsequently analysed, according to the GPs' sociodemographic characteristics and medical practice type. In total, 89 GPs completed the questionnaire. Almost half of the GPs (43%; CI = [33;54]) were confronted with a suspicious skin lesion as the main reason for consultation once every 3 months, while 33% (CI = [24;43]) were consulted for a suspicious lesion as a secondary reason once a month. Prior to training, one-third of the GPs exhibited suboptimal diagnostic accuracy in at least one of six "life-threatening" clinical cases among two sets of 10 clinical images of pigmented skin lesions, which can lead to inadequate patient management (i.e. incorrect treatment and/or inappropriate reinsurance). This study underlines the need to train GPs in melanoma diagnosis. GPs' pigmented skin lesion diagnostic accuracy and management should be improved to increase early melanoma detection.

Keywords Observational study · Melanoma · Cancer early detection · Management · General practitioners

Introduction

In Europe, melanoma shows a consistently increasing incidence and is the cause of most skin cancer deaths. A mortality rate of 22% was recorded in 2012, before systemic treatments have become more widespread for metastatic patients [1]. However, these recently implemented targeted drugs and immunotherapies remain very expensive and are associated with high inherent adverse effects [2]. In Belgium, the most recent data (2017) revealed an estimated age-standardised melanoma incidence rate of 15.6 for males and 21.8 for females [3], as well as a melanoma mortality rate of 1.9 (per 100,000 person-years) [4].

In order to tackle the melanoma burden, a number of prevention campaigns have been launched in Western countries, which encourage sun protective behaviours and clinical skin

✉ E. Harkemanne
evelyne.harkemanne@uclouvain.be

1 Dermatology Department, Cliniques Universitaires Saint-Luc, Brussels, Belgium

2 Institute of Experimental and Clinical Research (IREC), UCLouvain, Brussels, Belgium

3 Centre Académique de Médecine Générale (CAMG), UCLouvain, Brussels, Belgium

4 Statistical Methodology and Computing Service (SMCS), Louvain-la-Neuve, Belgium

5 Dermatology Department, Lyon Cancer Research Center INSERM, Université Lyon 1, Centre Hospitalier Lyon Sud, Pierre Bénite, France

6 King Albert II Cancer and Hematology Institute, Cliniques universitaires Saint-Luc, Brussels, Belgium

self-examination. Thus, public awareness has risen, leading to increased consultation rates for suspicious skin lesions, including in general practice [5, 6].

Alongside dermatologists, GPs are first-line actors in early melanoma detection [7]. In a study conducted in the USA, more than half of melanoma patients had made at least one primary care visit in the year before their melanoma diagnosis [8]. However, only 20% of them reported having received a clinical whole-body skin examination during that visit. Another study recently conducted among 72 GPs in a rural French district, found that one-third of these GPs rarely or never performed clinical whole-body skin examination [9], while 24% of them declared that they had carried out consultations that were dedicated to clinical skin examination.

Many authors [10–15] have reported insufficient melanoma diagnostic accuracy among GPs in Europe, which results in the diagnosis of advanced (thicker) melanomas. In Belgium, a study performed in 1998 identified lower diagnostic ability among GPs, compared to that of dermatologists, when faced with pigmented skin lesions (PSL) [16]. In 2014, Koelink et al. concluded that there is a lack of validated clinical decision aids and tools for suspicious skin lesion examination in general practice [17].

Some interventions [18–21] have already been undertaken to improve GPs' early melanoma diagnostic accuracy. Among them, a campaign to train GPs in clinical melanoma diagnosis in France achieved a decrease in the incidence of advanced melanomas [21].

The primary aim of this prospective study was to determine melanoma diagnostic practices among French-speaking Belgian GPs. The second aim was to specifically analyse these GPs' PSL diagnostic accuracy and management. Data exploring both aims was analysed according to the GPs' sociodemographic characteristics and medical practice type.

Material and Methods

Study Design

This prospective study was conducted over a 6-month period from November 2015 to April 2016 and was approved by the Ethical Committee of the Université Catholique de Louvain, Belgium. "Melanoma diagnosis" was integrated into the annual mandatory medical education program of eight groups of Continuing Medical Education in General Practice from the five French-speaking districts of Belgium. The GPs took part in a 1-h training session in melanoma diagnosis, which had been specifically designed for GPs. This session included teaching about melanoma basic theory, three widely used clinical diagnostic aids (the ABCD rule [22], "pattern recognition" [23], and "ugly duckling" sign [24]), recognition of patients at risk of melanoma, and management of suspicious skin lesions.

A three-section questionnaire was distributed to the participating GPs, which needed to be completed before the training session. Section A of the questionnaire collected sociodemographic and medical practice data, section B investigated the GPs' current melanoma diagnostic practices, and section C assessed their PSL diagnostic accuracy and management. The GPs were asked to complete the third section of the questionnaire before the training session, immediately after, and 1 year after. For this third section, two sets of questions were created, and GPs were randomly subdivided into two groups, with 45 GPs in one group and 44 GPs in a second group. Each group received one of the two sets of questions, which was switched between the two groups 1 year after the training to avoid recall bias. To assess the efficacy of this melanoma training program for GPs, the outcomes immediately after and 1 year after the training session will be examined in a subsequent scientific paper.

A. Characteristics of the Study Population

Participating GPs were asked about their gender, age, workplace (urban, suburban, or rural area), work practice (solo, pair, medical group, or local network practice), and the number of patients seen per year.

B. Melanoma Diagnostic Practices

Ten multiple-choice questions about the GPs' melanoma diagnostic practices were formulated to explore the following items: average number of melanoma diagnosed during their years of practice, number of patients with a medical history of melanoma in their practice population, frequency of patients seeking medical advice for a suspicious skin lesion as the primary or secondary reason for consultation, respective frequency of referrals to dermatologists following these two latter types of consultations, frequency of specialist referral for suspicious skin lesions incidentally discovered during a clinical examination (for another medical issue), and frequency of clinical whole-body skin examinations. In addition, the GPS' use of dermoscopy, attendance to a dermoscopy course, and number of self-performed excisions of suspicious lesions were also investigated.

C. PSL Diagnostic Accuracy and Management

This section was divided into two parts.

The first part consisted of two sets (one for each group) of five multiple-choice questions that explored melanoma knowledge. GPs were asked about the preferred locations of melanoma according to sex, criteria for urgent melanoma

management, characteristics of high-risk melanoma patients, and melanoma patient follow-up.

The second part contained two sets of 10 clinical images of PSL and their clinical history. The lesions consisted of six benign cutaneous tumours (common nevi and seborrheic keratoses), two melanomas, one Spitz nevus, and one pigmented basal cell carcinoma. For each clinical case, GPs were asked to select the right diagnosis or the adequate patient management, from among five proposals. The results regarding these clinical cases were analysed as follows: When a wrong diagnosis or inadequate management could be potentially fatal to the patient, the question was considered "life-threatening"; conversely, when safe diagnosis or management could lead to an unnecessary dermatologist referral, the question was considered an "undue protective attitude".

These questions had been peer-reviewed by six dermatologists, who validated the answers to these questions. The GPs also provided their degree of certainty for each answer.

Statistical Analysis

JMP software (JMP© Pro 14.1.0, SAS Institute Inc.) was used for statistical analysis. Percentages and 95% confidence intervals (CI) were used for descriptive statistics. The chi-squared test was used to test the relationship between categorical variables in the population. All tests were considered to be significant for p value < 0.05.

Results

A. Characteristics of the Study Population

As part of their mandatory continuing medical education, 105 GPs were invited to participate in this study. Of them, 89 (sex ratio M/F 1.3/1) completed the entire questionnaire, while 16 GPs were excluded for not having answered all the questions. The overall average age of the participating GPs was 45.6 years (median = 45 years). The characteristics of the 89 GPs are shown in Table 1.

Table 1 Characteristics of the study population

Characteristics of the general practitioners	*n*	%
Total	89	100
Gender		
Female	45	51
Male	44	49
Age		
25–35 years	29	33
36–45 years	15	17
46–55 years	10	11
56–65 years	20	22
> 65 years	15	17
Workplace		
Urban area	41	46
Suburban area	29	33
Rural area	19	21
Work practice		
Solo	36	40
Pair	20	22
Medical group	31	35
Local network practice	2	2
Number of patients seen per year		
< 500 patients	3	3
500–1200 patients	9	10
1200–2500 patients	21	24
2500–4400 patients	34	40
> 4400 patients	19	22

B. Melanoma Diagnostic Practices

Table 2 presents the results of the GPs' current melanoma diagnostic practices, and Table 3 shows statistically significant data according to the GPs' sociodemographic characteristics and medical practice type.

Melanoma Diagnosis

Unsurprisingly, Table 3 illustrates a statistically significant relationship between the number of melanomas diagnosed and the GPs' age ($p < 0.001$). Indeed, 41 (93%) GPs over the age of 45 had diagnosed at least one melanoma during their practice years, compared to only 18 (41%) of their younger colleagues.

Patients with a Medical History of Melanoma

Overall, 49 (56%) GPs reported currently having one to three patients in their practice population that were being followed up for melanoma, while 12 (14%) had four to six patients and 22 (25%) had none.

Consultation for Suspicious Skin Lesion and Dermatologist Referral

In response to the question "How often are you consulted by a patient seeking medical advice for a suspicious skin lesion, as either the primary or secondary reason for consultation?," almost half (43%) of the GPs stated that they had been confronted with a suspicious skin lesion as the main reason for consultation every 3 months, while nearly one-quarter

Table 2 General practitioners' (GPs) melanoma diagnostic practices

GPs' melanoma diagnostic practices	*n*	%	CI 95%
Average number of melanoma diagnosed during their years of practice			
None	29	33	[24;43]
1–2	27	31	[22;41]
2	22	25	[17;35]
3	8	9	[4;17]
4	2	2	[0.6;8]
Number of patients with a medical history of melanoma			
0	22	25	[17;35]
1–3	49	56	[45;66]
4–6	12	14	[8;22]
7–9	3	3	[1;9]
10 or >	2	2	[0.6;8]
Frequency of patients seeking medical advice for a suspicious skin lesion as the primary reason for consultation			
Never	3	3	[1;10]
Once a year	25	28	[20;39]
Once every 3 months	38	43	[33;54]
Once a month	20	23	[15;33]
Once weekly	2	2	[0.6;8]
Frequency of patients seeking medical advice for a suspicious skin lesion as the secondary reason for consultation			
Never	2	2	[0.6;8]
Once a year	14	16	[10;25]
Once every 3 months	29	33	[24;43]
Once a month	29	33	[24;43]
Once weekly	14	16	[10;25]
Frequency of referrals to dermatologists in case of suspicious skin lesion			
Never	2	2	[0.6;8]
Yes, rarely	4	5	[2;11]
Yes, occasionally	23	26	[18;36]
Yes, often	23	26	[18;36]
Yes, always	36	41	[31;51]
Frequency of referrals to dermatologists for suspicious skin lesions incidentally discovered during a clinical examination			
Never	3	3	[1.2;10]
Once every 3 years	23	26	[18;37]
Once a year	29	33	[24;44]
Once every 3 months	28	32	[23;43]
Once a month	4	5	[2;11]
Frequency of clinical whole-body skin examinations			
Never	39	46	[36;57]
Once a year	16	19	[12;29]
Once every quarter	16	19	[12;29]
Once a month	8	10	[5;18]
Once weekly	5	6	[3;13]
Use of dermoscopy			
Yes	5	6	[2;13]
No	84	94	[87;98]
Attendance to a dermoscopy course			
Yes	3	3.5	[1;10]
No	86	96.5	[90;99]
Self-performed excisions of suspicious skin lesions			
No	74	83	[73;89]
Yes, rarely	6	6	[2;13]
Yes, occasionally	7	8	[4;16]
Yes, often	2	2	[0.6;8]
Yes, always	1	1	[0.2;6]

CI confidence interval

(23%) were presented with this situation once a month. One-third (33%) were consulted for a suspicious lesion as a secondary reason every 3 months, while another third (33%) were presented with this situation once a month. With regard to these two latter types of consultation, 36 (41%) GPs reported always referring the patient to a dermatologist for advice on

Table 3 Statistically significant melanoma diagnostic practices according to the general practitioners' (GPs) sociodemographic background and medical practice types

Age	Number (%) of GPs that diagnosed at least one melanoma during their years of practice	*p* value
< 45 years	18 (41%)	$p < 0.001$
> 45 years	41 (93%)	
Work area	Number (%) of GPs who always refer patients to dermatologists for advice on suspicious skin lesions	
Urban	33 (82%)	$p = 0.03$
Suburban	18 (62%)	
Rural	8 (42%)	
Work area	Number (%) of GPs who excise melanoma suspicious skin lesions	
Urban	2 (5%)	$p = 0.002$
Suburban	5 (18%)	
Rural	8 (42%)	

*Except in the abovementioned cases, there were no statistically significant differences between each of the sociodemographic characteristics of the study population and the studied items from the GPs' melanoma diagnostic practices

suspicious skin lesions. Moreover, referral rates were found to be lower in rural areas than in the cities, as shown in Table 3. Eight (42%) GPs in rural areas always referred patients to a dermatologist, compared to 18 (62%) GPs in suburban and 33 (82%) GPs in urban areas ($p = 0.03$).

Clinical Whole-Body Skin Examinations

Thirty-nine (46%) GPs never performed clinical whole-body skin examinations, while 16 (19%) did so once every 3 months, and 10% did so once a month.

Dermoscopy

Overall, five (6%) GPs used dermoscopy and only three (3.5%) had attended a dermoscopy course.

Suspicious Skin Lesion Excision

Seventy-four (83%) GPs never excised skin lesions that were suspected melanomas. However, GPs working in rural areas were tempted to excise melanoma-suspicious skin lesions more frequently than GPs in urban areas. Indeed, Table 3 indicates that 42% of GPs in rural areas excised suspicious skin lesions, compared to 18% of GPs in suburban and 5% of GPs in urban areas ($p = 0.002$).

C. PSL diagnostic accuracy and management

The most outstanding result from the two sets of five theoretical multiple-choice questions about melanoma basic knowledge is that 68% (CI = [52;81]) of GPs were unaware that the urgency to treat a lesion suspicious of melanoma depends on the nodular or flat characteristic of the lesion.

The findings regarding the two sets of 10 clinical images of PSL were analysed with six questions considered as "life-threatening." Figure 1 a presents a superficial spreading melanoma, which was not referred to a dermatologist within a maximum of 3 weeks by 36% (CI = [22;50]) of GPs. As another example, 45% (CI = [31;60]) of GPs did not have an adequate attitude regarding a superficial spreading melanoma with a nodular component on the back of a 66-year-old man (Fig. 1b): 32% (CI = [18;46]) of GPs referred this patient without emergency to the dermatologist and 14% (CI = [4;24]) referred him to a plastic surgeon for excision with immediate large margins, which is inadequate regarding potentially further sentinel node mapping. Only 55% (CI = [40;68]) of GPs referred the patient for urgent excision of the lesion. Ultimately, one-third (38%; CI = [28;49]) of GPs answered at least one of these six questions incorrectly.

Eight additional questions were also analysed, whose results were considered as an "undue protective attitude" that can lead to inadequate patient management and/or unnecessary dermatologist referral. For instance, 60% (CI = [45;73]) of GPs recommended unnecessary dermatologist or surgeon referral for a recently appeared red-brownish spot under the nail of the right hallux of a 44-year-old woman (Fig. 2a) and 91% (CI = [79;96]) of GPs referred a 25-year-old female patient for unnecessary excision of a congenital nevus on the left hand (Fig. 2b).

It should be noted that the GPs that had at least one "life-threatening" response or "undue protective attitude" were as certain about the answers to these questions as those GPs who had the correct diagnostic/therapeutic approach to the same questions. Furthermore, the GPs' PSL diagnostic accuracy and management was not correlated with any of the GPs' sociodemographic characteristics i.e. age and gender, nor any data collected from the melanoma diagnostic practices.

Fig. 1 "Life-threatening" attitudes. **a** Superficial spreading melanoma (SSM) in a 76-year-old female patient with a flat, pigmented lesion on her right thigh, which was first noticed by her daughter 3 months ago. **b** SSM with a nodular component on the back of a 66-year-old man

Discussion

This prospective study aimed to determine melanoma diagnostic practices among French-speaking Belgian GPs and to specifically analyse these GPs' PSL diagnostic accuracy and management. Data exploring both of these aims was analysed according to the GPs' sociodemographic characteristics and medical practice type.

Some broad features could be drawn from the studied GPs' melanoma diagnostic practices. Unsurprisingly, GPs older than 45 had diagnosed more melanomas than their younger colleagues. This is logical, since elderly GPs have been working for longer and have therefore seen more patients that are potentially affected by a melanoma. However, GPs older than 45 did not diagnose and manage the clinical cases in the third section of the pre-training questionnaire more effectively. This is surprising, as one might have expected the opposite given the greater clinical experience of older GPs. Our results indicate that, as a mean, every GP had two melanoma patients in his/her practice population. However, one-fifth of these GPs reported having none. One hypothesis for this finding is that these GPs could be unaware of the melanoma history of their patients. This lack of involvement contrasts with the situation in Australia, where skin cancer medicine is one of the top 10 conditions managed in general practice [25]. Indeed, the high melanoma incidence and the low number of dermatologists per inhabitants has led to Australian GPs becoming hyperspecialised in melanoma diagnosis. The lack of implication of our GPs might be related to a relatively high number of dermatologists per inhabitants in Belgium and could reflect current melanoma diagnostic conditions in most Western European countries.

Most GPs were infrequently confronted with a suspicious skin lesion as the main or secondary reason for consultation. This low frequency of patients seeking medical advice for a suspicious skin lesion, as the reason for consultation, might be

Fig. 2 "Undue protective" attitudes. **a** Subungual hematoma of the right hallux in a 44-year-old woman, which shows a recently appeared brownish spot under the nail of the right hallux. **b** Congenital nevus of the left hand in a 25-year-old woman with a flat but slightly domed pigmented melanocytic lesion, which has been stable since her childhood, on the first interdigital area of the dorsal surface of her left hand.

caused by these GPs' "learned helplessness" [26]. In our setting, "learned helplessness" can be described as a state of mind in which GPs do not try to manage a patient with a suspicious skin lesion because past experience has led them to believe that any effort to try and help their patient will fail, due to the GP's ignorance about skin lesion diagnosis. This state of mind may be felt by the patients that, when concerned about a suspicious skin lesion, prefer to see a dermatologist first. The fact that 41% of GPs always referred patients to dermatologists for advice on suspicious skin lesions could also partly be explained by the GPs' "learned helplessness".

GPs in urban and suburban areas also referred significantly more suspicious melanoma lesions to a dermatologist than GPs in rural areas. This is likely attributable to a much lower density of dermatologists per inhabitants in rural areas of Belgium. However, since GPs in urban areas have easier access to specialists, this ease can also lead to many unnecessary referrals. For example, in Scotland, melanoma-suspicious lesion referral was registered as the third most-common reason for cancer referral by GPs [15].

According to our findings, 46% of GPs never performed whole-body skin examination and only 6% did so at least once each week. Comparatively, a study conducted in France [9] revealed that one-third of the GPs never performed clinical whole-body skin examinations. In the USA, lack of time was found to be a major impediment to clinical whole-body skin examination by GPs, as were, to lesser extents, lack of confidence, training, and scientific evidence [27].

Only five out of 89 GPs used dermoscopy. However, only three of these five users had attended a dermoscopy course. This is to be expected, since, at the time of the study, no dermoscopy training courses were available for GPs in Belgium. Nevertheless, several studies [28–32] have demonstrated that the use of dermoscopy by GPs improved their

diagnostic accuracy regarding PSL, particularly with regard to benign lesions. This decreased the numbers of lesion excisions and unnecessary referrals. This subsequently indicates the need for available dermoscopy training for GPs in Belgium.

The majority of GPs (83%) in this study preferred to refer a patient to a dermatologist, as opposed to personally excising lesions that are suspicious of melanoma. However, studies conducted in Scotland [33] and in Ireland [34] have demonstrated that initial excision of melanoma by GPs does not increase morbidity or mortality, compared to excision in secondary care. These studies even suggested that initial melanoma excision by appropriately trained GPs can yield benefits, including earlier stage diagnosis. In the Netherlands, GPs' excision of lesions that are suspicious of melanoma were found to be largely complete but sometimes with wide margins [35]. This is consistent with our findings, where 14% of GPs referred a melanoma (Fig. 1b) to a plastic surgeon for excision with immediate large margins.

Analysis of the PSL diagnostic accuracy and management demonstrated that one-third of the GPs had a suboptimal diagnosis in at least one clinical case, which led to "life-threatening" patient management. Two other studies [10, 36] have revealed a similar lack of GPs' ability to differentiate between malignant and benign skin lesions, concluding that there is an urgent need to train GPs in the recognition of clinical tumour features. A review of published evaluated melanoma diagnostic training programs for GPs [20] has also indicated effective educational interventions as a means of improving early melanoma detection. However, there is a lack of dedicated GP melanoma diagnostic training tools and decision aids [17, 19], which should be included in ongoing training programs.

This study has some limitations. Firstly, only a small sample of GPs ($n = 89$) completed the questionnaire. Nevertheless, this study population was quite representative of the French-speaking Belgian GP population, due to their geographic distribution in the five French-speaking districts of Belgium, the distribution of ages, and the proportion of urban and rural GPs. Furthermore, although the GPs that participated in this study were all volunteers, this study was conducted in the context of their mandatory continuing medical education program. As such, it is reasonable to assume that their inclusion was not significantly informed by their interest in melanoma diagnosis. Secondly, regarding the data collected about medical practice types and melanoma diagnostic practices, the GPs had no access to their patients' medical records while answering the questionnaire. This self-assessment method may have subsequently included a level of recall bias and declarative bias. Thirdly, a subjective set of 10 clinical images was shown to each group. From one perspective, this small sample of clinical cases poorly reflects the real PSL cases that GPs encounter in daily general medical practice. Yet, conversely, the main advantage and strength of including these clinical cases was that they placed the GPs in a realistic situation, by means of photographs of PSL and an associated brief clinical history report.

This study reports a lack of involvement in melanoma diagnosis and management on the part of the French-speaking Belgian GPs. This lack of engagement might be due, for instance, to easy access to a dermatologist in urban and suburban areas, to these GPs' "learned helplessness" in melanoma matters, and/or to insufficient training in melanoma diagnostic tools, such as dermoscopy. These conclusions can be reported to other Western European countries that have a high density of dermatologists per inhabitants. Moreover, analysis of the PSL diagnostic accuracy and management demonstrated an insufficient ability among these GPs to diagnose and manage melanoma. A lack of time, from one perspective, and a lack of training and confidence among these GPs, from another perspective, appear to be two major obstacles [27].

In conclusion, this present study underlines the need to train GPs in melanoma diagnosis, since melanoma incidence is consistently increasing in Europe [3]. This subsequently indicates the need to create standardised melanoma diagnostic tools and decision aids, which are specifically designed for GPs. The costs and effectiveness of these tools and training should, ideally, be examined in real-life. This would to a cost-effectiveness analysis, which, if positive, would be a strong argument to demonstrate the need to train GPs in melanoma detection.

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Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

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