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## ORIGINAL ARTICLE

# Effectiveness of Primary Care Physicians and Dermatologists in the Diagnosis of Skin Cancer: a Comparative Study in the Same Geographic Area

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### KEYWORDS

Primary care;  
Family doctors;  
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### PALABRAS CLAVE

Atención primaria;  
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Concordancia  
diagnóstica;

### Abstract

**Background:** Skin cancer is the most common malignant tumor in white individuals. Early diagnosis and treatment are key factors in reducing morbidity. We performed a prospective observational study throughout 2008 to assess the ability of primary care physicians to diagnose nonmelanoma skin cancer.

**Methods:** The study was undertaken in a single geographic area corresponding to the region served by a primary health care center. Patients who were referred to a dermatologist were included if the primary care physician indicated skin cancer in the differential diagnosis on the referral form. Patients were also included if the dermatologist suspected skin cancer even if the referral from primary care had not indicated it.

**Results:** Primary care physicians had a sensitivity of 0.45 and a specificity of 0.16 for the diagnosis of skin cancer, whereas dermatologists had a sensitivity of 0.97 and a specificity of 0.75. The  $\kappa$  statistic as a measure of agreement was -0.56.

**Conclusions:** The ability of primary care physicians to diagnose skin cancer was appreciably lower than that of dermatologists. This may result in substantial delays in the provision of appropriate care for patients with skin cancer considering the role played by primary care physicians in screening for the disease in the Spanish national health system.

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### Estudio comparativo de la habilidad en el diagnóstico clínico del cáncer cutáneo entre el médico de familia y el dermatólogo en una misma área geográfica

### Resumen

**Introducción:** El cáncer cutáneo es la neoplasia maligna más frecuente en la población de raza blanca. El diagnóstico y tratamiento precoces son claves para disminuir su mor-

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### Cáncer cutáneo no melanoma

bilidad. Hemos realizado un estudio prospectivo observacional a lo largo del año 2008 para valorar la capacidad del médico de familia (MF) en el diagnóstico clínico del cáncer cutáneo no melanoma.

*Métodos:* Se han incluido los pacientes de una única área geográfica remitidos desde el área básica de salud (ABS) al dermatólogo, en cuyo volante de derivación el MF sugirió cáncer cutáneo en el diagnóstico diferencial. También se incluyeron todos aquellos pacientes remitidos por el MF sin sospecha de cáncer cutáneo no melanoma en los que el dermatólogo (D) sí sospechó cáncer.

*Resultados:* El MF obtuvo una sensibilidad (S) del 0,45 y una especificidad (E) del 0,16 en el diagnóstico del cáncer cutáneo, mientras que en el caso del D aquellas fueron del 0,97 y 0,75 respectivamente. El índice de concordancia Kappa fue de -0,56.

*Conclusiones:* El MF mostró habilidades sensiblemente inferiores a las del D en el diagnóstico clínico del cáncer cutáneo. Esta circunstancia puede implicar retrasos importantes en el adecuado manejo terapéutico de esta patología, teniendo en cuenta su papel de cribado en el Sistema Nacional de Salud.

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## Introduction

Skin cancer is currently the most common cancer in white individuals. In the last 20 years, its incidence has increased worldwide.<sup>1,2</sup> Early diagnosis and treatment is necessary in order to reduce the morbidity of the disease.

In the Spanish health care system, primary care is the first level of patient contact and functions as a gatekeeper. In clinical practice, primary care physicians must distinguish between conditions that are unlikely to have a significant impact on the patient and those that are potentially serious and may have long-term consequences. If primary care physicians fail to refer patients who require specialist treatment, those patients will be placed at risk, since primary care lacks the means to resolve all problems. On the other hand, when those same physicians decide to refer patients who could be appropriately treated in primary care, they fail to fulfil their gatekeeping role, whose aim is to minimize unnecessary patient visits to other centers and reduce waiting lists.<sup>3</sup>

It seems clear that a coordinated and complementary approach between primary and specialist care enhances the quality of health care.

The aim of this study was to determine the capacity of primary care physicians to assess skin cancer in clinical practice and make appropriate decisions regarding patient referral to dermatologists.

## Materials and Methods

A prospective, observational study was undertaken throughout 2008. The study included patients referred from individual health care areas to the Department of Dermatology at Hospital Comarcal de Sant Boi de Llobregat in Barcelona, Spain, which serves a population of 122 000 inhabitants.

Only patients referred by primary care physicians from the individual health care areas to a dermatologist at

the referral hospital were included in the study. Patients were included if the referral form from the primary care physician indicated suspicion of nonmelanoma skin cancer either as a primary diagnosis or as part of the differential diagnosis. Patients were also included if they were referred to the dermatologist with a suspected diagnosis that did not include carcinoma but in which the dermatologist suspected cancer in the lesion for which the referral was made. Patients were not included if cancer was identified on the basis of a secondary reason for consultation that was not mentioned on the referral form or if cancer was independently identified by the dermatologist during examination.

All treatment decisions were made by the dermatologist. Histology was performed when indicated according to the normal practice of the dermatologist and always in the best interests of the patient.

Histology was considered the gold standard for diagnosis. When no histological study was made, the gold standard was the diagnosis provided by the dermatologist. All confirmed cases of cancer were based on histological findings. In accordance with normal clinical practice, lesions that were clearly benign upon examination were not biopsied in order to reduce morbidity.

An entry was made for each patient in a Microsoft Access database to include the following data: name, patient history number, date of birth, sex, primary care center, dermatologist suspicion of skin cancer, indication of cancer in the differential diagnosis provided by the primary care physician, type of cancer suspected, nature of the referral (urgent, soon, or routine), histological confirmation of cancer, and pathologist's diagnosis.

Statistical analysis was performed to assess the degree of concordance between the suspected diagnosis provided by the primary care physician or the dermatologist and the final diagnosis confirmed by histology. The following statistical parameters were assessed: diagnostic sensitivity and specificity, positive predictive value (PPV), negative predictive value (NPV), and the Cohen  $\kappa$  coefficient as a measure of inter-rater agreement.

## Results

A total of 233 patients (120 women and 113 men) were included in the study. The mean age of the patients was 65.8 years (range, 27-99 years). Two groups of patients were analyzed: those who had been referred by the primary care physician on suspicion of nonmelanoma skin cancer and those who were referred with no suspicion of cancer but in whom the dermatologist suspected cancer.

The primary care physician suspected skin cancer in 140 patients. Skin cancer was suspected by the dermatologist in 161 patients (including those in whom cancer was suspected by both the primary care physician and the dermatologist and those in whom only the dermatologist suspected cancer). One hundred forty-two patients had a confirmed diagnosis of skin cancer.

Of the patients with a confirmed diagnosis, 119 (83.8%) had basal cell carcinoma (BCC), 18 (12.6%) had squamous cell carcinoma (SCC), 3 (2.1%) had keratoacanthoma, and 2 (1.4%) had atypical fibroxanthoma. All of the cases recorded as having a confirmed diagnosis had undergone skin biopsy with a positive histological result; no cases were recorded as confirmed based on clinical criteria alone.

The most common anatomical site was the face (179 patients, 76.8%), followed by the trunk (33 patients, 14.2%), the limbs (18 patients, 7.7%), and the oral cavity (3 patients, 1.2%).

A total of 113 referrals (57.1%) were classified as soon, 108 (46.3%) as routine, and 12 (5.2%) as urgent.

The presumptive diagnosis of skin cancer offered by the primary care physician had a sensitivity of 0.45, a specificity of 0.16, a PPV of 0.46, and an NPV of 0.16.

**Table 1** Comparison Between Dermatologists and Primary Care Physicians in the Diagnostic Suspicion of Skin Cancer

	Sensitivity	Specificity	PPV	NPV
PCP	0.45	0.16	0.46	0.16
Dermatologist	0.97	0.75	0.86	0.94

Abbreviations: NPV, negative predictive value; PCP, primary care physician; PPV, positive predictive value.

Cancer was not suspected by the primary care physician in 78 out of 142 (54.9%) confirmed cases. These correspond to patients in whom the dermatologist suspected cancer without this having been indicated in the referral.

The presumptive diagnosis offered by the dermatologist had a sensitivity of 0.97, a specificity of 0.75, a PPV of 0.86, and an NPV of 0.94 (Table 1).

The Cohen  $\kappa$  coefficient for the diagnostic suspicion of cancer between primary care physicians and dermatologists was -0.52.

Of the 116 patients who were indicated as routine referrals, 79 had cancer (63 with BCC and 12 with SCC).

The sensitivity, specificity, PPV, and NPV for dermatologists and primary care physicians were calculated according to the anatomical site of the lesion and the type of cancer (Tables 2 and 3).

The same values were also analyzed according to individual health care areas. The results were relatively homogeneous, with a sensitivity of 0.40 to 0.45 and a specificity of 0.17 to 0.26. One of the health care areas, however, obtained a notably better result, with a sensitivity of 0.57 and a specificity of 1.0.

**Table 2** Comparison Between Dermatologists and Primary Care Physicians in the Suspicion of Skin Cancer According to Anatomical Site

Anatomical Site	n		Sensitivity	Specificity	PPV	NPV
Head and neck	184	PCP	0.46	0.14	0.48	0.16
		Dermatologist	0.97	0.79	0.89	0.95
Trunk	33	PCP	0.33	0.20	0.33	0.20
		Dermatologist	1	0.67	0.78	1
Limbs	18	PCP	0.50	0.38	0.50	0.38
		Dermatologist	0.90	0.50	0.69	0.80

Abbreviations: NPV, negative predictive value; PCP, primary care physician; PPV, positive predictive value.

**Table 3** Comparison Between Dermatologists and Primary Care Physicians in the Suspicion of Skin Cancer According to the Type of Cancer

Type of Cancer	n		Sensitivity	Specificity	PPV	NPV
BCC	119	PCP	0.43	0.33	0.43	0.32
		Dermatologist	0.97	0.73	0.80	0.95
SCC	18	PCP	0.22	0.94	0.22	0.94
		Dermatologist	0.56	0.98	0.71	0.97

Abbreviations: BCC, basal cell carcinoma, NPV, negative predictive value; PCP, primary care physician; PPV, positive predictive value; SCC, squamous cell carcinoma.

## Discussion

Primary care physicians detected 45% of cases of skin cancer. Accordingly, more than half of all carcinomas were not recognized during screening in primary care. This is, undoubtedly, a disappointing observation. One explanation could be the inadequate provision of information on referral forms to allow the dermatologist to interpret whether the primary care physician suspected cancer. Primary care physicians in this study were unaware that the forms would be examined and may have provided insufficient detail on the referral forms due to work overload or the multiple presenting complaints that are often considered in a single appointment. The problem was not exclusive to a single health care area. Four of the health care areas included in the study obtained a diagnostic sensitivity of around 0.4; only 1 had a notably different result (0.57).

We observed no significant differences in the diagnostic sensitivity and specificity obtained by primary care physicians according to the site of the tumor (head and neck, trunk, or lower limbs). In contrast, notable differences were observed in the diagnostic sensitivity obtained by primary care physicians for BCC and SCC, with almost twice the diagnostic sensitivity for BCC as for SCC. This may have been due to the more easily identifiable and homogeneous morphology of BCC compared with the more variable and heterogeneous morphology of SCC.

We observed that benign pathology was confused with skin cancer by primary care physicians. The physicians suspected BCC in patients with chondrodermatitis nodularis helioides, sebaceous hyperplasia, fibrous papule of the face, and lichenoid keratosis. Viral warts were confused with SCC. Seborrheic keratosis also gave rise to diagnostic errors and was referred as suspected pigmented BCC or melanoma.

Previous studies have compared the diagnostic agreement among primary care physicians. In a retrospective study of 3164 patients in Saragossa, Spain, Porta et al<sup>4</sup> observed a very low  $\kappa$  coefficient (0.198) between primary care physicians and dermatologists for the diagnosis of diseases such as BCC.

Other studies have focused exclusively on tumors using different methods and the results have been variable. In a study of 491 patients with suspected BCC according to primary care referral forms, Rodríguez et al<sup>5</sup> used similar methods to those applied in our study and obtained a very low  $\kappa$  coefficient (0.071).

Morrison et al<sup>6</sup> also used similar methods to assess 493 cases referred to dermatologists in a year with suspicion of skin cancer by primary care physicians. Their results showed that lesions with histological confirmation of cancer were only correctly diagnosed in 22% of cases by primary care physicians compared with 87% by dermatologists.

Notably, Graells et al<sup>7</sup> undertook a study that included the same population as ours as well as 4 of the primary care physicians who participated in our study. The overall  $\kappa$  coefficient was 0.62 and the primary care physicians obtained a sensitivity of 71.42%, a specificity of 94.95%, a PPV of 67.56%, and an NPV of 95.76% for the diagnosis of skin cancer. The enormous discrepancy between those results and the results obtained in our study is striking.

In our study, we assessed all primary care physicians in the health care area. Furthermore, the physicians were unaware that the referral forms were to be evaluated and had to deal with multiple presenting complaints in a single appointment, whereas in the study by Graells et al the physicians were aware that the referrals would be evaluated and only a single complaint was evaluated in each consultation. These differences in study design may explain the notable difference in the results obtained.

We observed substantial heterogeneity of both the methodology used and the results obtained in the different studies available in the literature.<sup>8-22</sup> It is important to distinguish between studies that are experimental in nature, based on an assessment of images, and those undertaken as part of routine clinical practice. Workloads, conditions, and the multiple reasons for consultation in a single visit act as negative factors and are reflected in the results obtained in studies undertaken with real patients under normal practice conditions. We can therefore question whether, under different conditions, the physicians that participated in our study would obtain the same or better results.

The recently established rapid diagnosis units are designed to provide outpatient assessment for patients with potentially serious diseases requiring urgent diagnosis. Both the first visit and subsequent assessments and tests are treated as priority.<sup>23</sup>

Prior to the establishment of such units, plans should be made to increase the diagnostic skills of primary care physicians and to develop joint protocols. With the results obtained in this study, introduction of a rapid diagnosis unit for the detection of skin cancer in our setting could place patients at risk due to the lack of appropriate screening.

In a given health care area, both primary care clinics and their referral hospital should work together in a coordinated manner to achieve a common goal, namely the provision of an integrated health care service for the entire population. The role of primary care physicians is of the utmost importance, since they have an opportunity to screen for skin cancer in a large number of patients who attend routine examinations.

Dermatology is essentially a morphological specialty in which the same disease may have a range of clinical presentations. As a consequence dermatologists require experience and training. In our opinion, patient care depends in part on the coordinated efforts of primary care physicians and dermatologists. Accurate suspicion of skin cancer by a primary care physician facilitates diagnostic confirmation and early treatment. In contrast, failure to refer a patient with a particular disease or to appropriately assess its urgency will unfortunately lead to patients being held on waiting lists with negative consequences on morbidity. We believe that continuing professional development activities should be promoted along with the preparation of clinical practice guidelines, use of joint sessions, rotations, and especially the possibility of real and practical communication between primary and specialist care.

Finally, we feel that improvements are needed in the dermatological training of primary care physicians, in particular in relation to their ability to discriminate between neoplastic and benign disease and subsequently to

differentiate between the most dangerous forms of cancer and those that carry less risk.

## Conflict of Interest

The authors declare that they have no conflict of interest.

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