

ORIGINAL ARTICLES

Analysis of Surgical Treatment for Nonmelanoma Skin Cancer Performed by Dermatologists in a Public Hospital: Clinical-Pathological Correlation, Use of Hospital Resources, and Waiting List Time from Diagnosis

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Abstract. *Background.* Nonmelanoma skin cancer is the most common form of cancer in humans. It can be treated by a variety of specialists and using different techniques, surgical excision being the procedure associated with the lowest rates of recurrence. No studies have been published addressing differences in the management of surgical treatment for nonmelanoma skin cancer according to the specialties involved.

Objectives. To assess the preoperative diagnostic accuracy and the use of health care resources when surgical treatment of nonmelanoma skin cancer is done by dermatologists belonging to the Spanish national health service.

Methods. A prospective observational study was carried out over a period of 36 months using data corresponding to all patients diagnosed with nonmelanoma skin cancer and treated surgically in the Dermatology Department of Complejo Hospitalario de Burgos, Spain. Data were analyzed for clinical-pathological correlation, complexity of the intervention, use of health care resources, and time elapsed between clinical diagnosis and surgery.

Results. The study included 448 patients and 521 skin lesions suspected to be nonmelanoma skin cancer (basal cell carcinoma or squamous cell carcinoma). Diagnosis was exclusively clinical in 487 tumors and a clinical-pathological correlation of 84.39% was observed. Surgery was performed with local anesthesia in 96.42% of patients, although 111 (21.29 %) required complex surgical repair. In 349 patients (77.90%) the procedure was performed on an outpatient basis, 73 (16.29%) required a short stay in the surgical day care unit, and 26 (5.80%) required hospital admission. The mean (SD) delay from clinical diagnosis to surgery was 68.44 (42.22) days, with a median delay of 60 days.

Conclusions. Dermatology specialists are highly qualified to diagnose malignant skin tumors and accurately identify those patients requiring surgery. Dermatological surgeons use minimal health care resources, shorten the overall length of the process, and help to control overall health care costs for cancer.

Key words: nonmelanoma skin cancer, dermatological surgery, episode of care.

ANÁLISIS DEL TRATAMIENTO QUIRÚRGICO DEL CÁNCER CUTÁNEO NO MELANOMA CUANDO ES REALIZADO POR DERMATÓLOGOS EN UN HOSPITAL PÚBLICO: CORRELACIÓN ANATOMOCLÍNICA, EMPLEO DE RECURSOS HOSPITALARIOS Y TIEMPO DE ESPERA DESDE EL DIAGNÓSTICO

Resumen. *Antecedentes.* El cáncer cutáneo no melanoma (CCNM) es la malignidad más frecuente en humanos. Puede ser tratado por distintos especialistas y mediante diferentes técnicas, siendo la extirpación quirúrgica el procedimiento con menor tasa de recurrencia. No hay estudios que analicen las diferencias en el

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manejo del tratamiento quirúrgico del CCNM en función de las especialidades involucradas.

Objetivos. Evaluar la agudeza diagnóstica preoperatoria y el uso de recursos sanitarios cuando el tratamiento quirúrgico del CCNM es realizado por dermatólogos pertenecientes al Sistema Nacional de Salud.

Metodología. Estudio prospectivo observacional a lo largo de 36 meses con los datos correspondientes a todos los pacientes diagnosticados y tratados quirúrgicamente de CCNM durante ese periodo en la Unidad de Dermatología del Complejo Hospitalario de Burgos. Los datos analizados fueron la correlación clínico-patológica (CCP), la complejidad de la intervención, el régimen de hospitalización y el tiempo transcurrido entre el diagnóstico clínico y la intervención quirúrgica.

Resultados. En el análisis se incluyeron 448 pacientes, a los que se extirparon 521 lesiones cutáneas sospechosas de CCNM de tipo carcinoma basocelular (CBC) o carcinoma espinocelular (CEC). El diagnóstico fue exclusivamente clínico en 487 tumores, confirmando una correlación clínico-patológica del 84,39 %. El 96,42 % de los pacientes fue intervenido bajo anestesia local, aunque 111 (21,29 %) precisaron una reparación quirúrgica compleja. Trescientos cuarenta y nueve pacientes (77,90 %) fueron intervenidos ambulatoriamente, 73 (16,29 %) requirieron una estancia corta en el hospital de día quirúrgico y otros 26 (5,80 %) precisaron ingreso hospitalario. El tiempo medio de espera desde el diagnóstico clínico hasta la intervención fue de $68,44 \pm 42,22$ días, con una mediana de 60 días.

Conclusiones. Los dermatólogos son especialistas muy cualificados para diagnosticar tumores cutáneos malignos, y distinguen con precisión los pacientes que requieren tratamiento quirúrgico. Los dermatólogos quirúrgicos consumen un mínimo de recursos sanitarios, acortan la duración global del proceso y ayudan a controlar el gasto sanitario oncológico global.

Palabras clave: cáncer cutáneo no melanoma, cirugía dermatológica, proceso sanitario.

Introduction

Nonmelanoma skin cancer is the most common malignant tumor in humans, with an estimated incidence in the United States of America in the year 2000 of 1.3 million cases.¹ It has an enormous impact on overall cancer expenditure, accounting for about \$650 million annually during the period 1992-1995.² The main cause of nonmelanoma skin cancer is solar radiation,³ and the majority of lesions therefore appear in exposed areas in elderly individuals, principally in those who, for professional or leisure reasons, have a history of intense exposure to sunlight. The large rural population and Mediterranean geographical situation mean that skin cancer has a high prevalence in Spain. The treatment of nonmelanoma skin cancer consists of the total eradication of the tumor with methods such as surgery, cryosurgery, electrodesiccation, radiotherapy, photodynamic therapy, intralesional treatments, or the topical application of imiquimod.^{4,5} Although there are very few studies that compare the efficacy of these treatments, surgery and radiotherapy appear to be the most effective, and surgery is the procedure with the lowest rate of recurrence.⁶

Dermatologists are the specialists with greatest experience in skin cancer and have the technical and legal capacity to treat nonmelanoma skin cancer surgically. The situation in which the dermatologists' surgical activity is performed depends on the type of center, and is determined mainly

by the characteristics of the patient and the size and site of the tumor requiring excision. Although the majority of the surgical interventions can be performed under local anesthesia and do not require strict postoperative monitoring, there are cases in which general anesthesia is required or in which the patient must be closely monitored in the hours after the operation, either in a surgical day care unit or as a routine hospital admission.

Objectives

The principal objective of this study was to quantify the clinical-pathological correlation, type of operation, use of health care resources, and time elapsed between the diagnosis and the surgical treatment when this is performed by dermatologists belonging to the Spanish national health service.

Methods

We performed a 3-year, prospective, observational study from January 1, 2003, through December 31, 2005. Data were analyzed from all patients with a preoperative diagnosis of nonmelanoma skin cancer of the basal cell carcinoma or squamous cell carcinoma types (International Classification of Diseases, Ninth Revision [ICD-9] codes 173.x and 232.x)

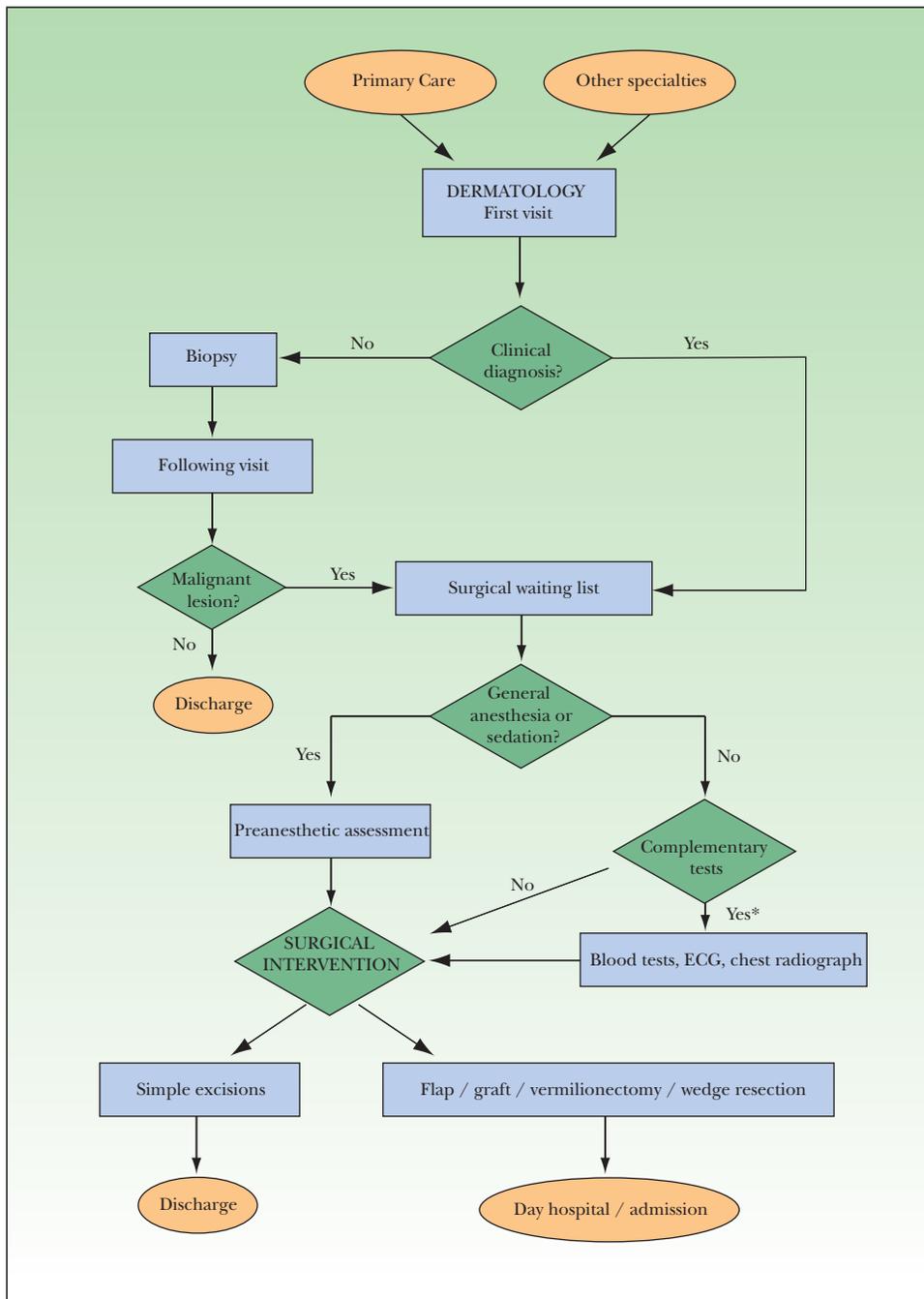


Figure 1. Episode of care for the surgical treatment of nonmelanoma skin cancer. The ellipses indicate process entry or exit and the diamonds indicate decision points.⁸ ECG indicates electrocardiogram. *The complementary studies were performed based on the individual criteria established by Roizen et al.⁹

who underwent surgery in the Dermatology Unit of Complejo Hospitalario de Burgos during this period. The patients were referred by 5 independent dermatologists who established the diagnosis clinically or by preoperative histological study. The histological diagnosis was made in the Pathology Department of this hospital. The objective of surgery was radical excision of the tumor, independently of the surgical technique used, and biopsy procedures (ICD-9 code 86.11) were therefore excluded.

In order to perform a homogeneous and structured data collection, we defined the episode of care leading to the surgical treatment of the nonmelanoma skin cancer (Figure 1). Our definition of the episode of care, based on extensive clinical and surgical experience, coincides in many aspects with the definitions proposed by other authors,^{7,8} and takes in each of the care activities required for the diagnosis and surgical treatment of nonmelanoma skin cancer, including outpatient visits, presurgical and postsurgical

histological analyses, the preoperative studies required (complementary examinations including blood tests, electrocardiogram, and chest radiograph, with or without preanesthetic assessment), the type of surgical treatment performed (simple excision [ICD-9 code 86.4]; flap [ICD-9 code 86.70]; graft [ICD-9 code 86.63]; operations involving the lip [ICD-9 codes 27.42 and 27.43]), and postoperative care requirements (immediate discharge, short stay in the surgical day care unit, or routine hospital admission). The preoperative study varied for each patient and was based on established criteria for preanesthetic assessment.⁹ A software tool consisting of a relational database and a web application running on the intranet of Complejo Hospitalario de Burgos made it possible to collect data sequentially in the different sites at which the successive activities involved in the process were performed. With the sole aim of establishing a limit for the study, we considered the episode of care to have been completed at the follow-up visit at which the results were presented; however, all patients continue to be followed up periodically in our unit.

The clinical-pathological correlation, type of operation, use of hospital resources, and time elapsed between clinical diagnosis and the surgical intervention were analyzed in order to evaluate the process. The clinical-pathological correlation was evaluated using the postsurgical histological analysis as the gold standard. The clinical-pathological correlation was only considered positive when the histological diagnosis coincided with the primary clinical diagnosis.

Results

During the study period, 1088 patients underwent surgery and 1306 lesions were excised. All the lesions were subsequently analyzed histologically, independently of their clinical appearance. Prior to the operation, 448 of the 1088 patients had been diagnosed with nonmelanoma skin cancer of the basal cell or squamous cell carcinoma types. Preoperative biopsy was performed in 34 of the 521 suspected nonmelanoma skin cancer lesions (6.52%), in 34 patients, and the diagnosis was purely clinical in the remaining 487 lesions (93.47%). The patients were added to the surgical waiting list at the time of the first visit to the dermatologist. The clinical-pathological correlation was positive in 445 lesions (85.41%) and negative in 76 (14.59%). If the 34 tumors in which a biopsy had been performed are excluded, the clinical-pathological correlation was positive in 411 tumors, ie, in 84.39% of the lesions with an exclusively clinical diagnosis. Of the 76 cases in which concordance was not found, 46 lesions were of another type of skin cancer different from the one diagnosed, and the remaining 30 (5.75% of all lesions excised) were benign conditions (Tables

Table 1. Results of Our Study

No. of patients operated from January 1, 2003, through December 31, 2005	1088
No. of lesions of any type excised	1306
No. of patients operated for suspected NMSC	448
No. of suspected NMSC lesions excised	521
No. of tumors (patients) with presurgical histological study	34
No. of tumors with positive CPC	445 (85.41%)
– Different type of NMSC from proposed type	42 (8.06%)
– Other type of skin cancer	4 (0.76%)
– Benign tumor	30 (5.75%)
No. of tumors with positive CPC with exclusively clinical diagnosis	411 (84.39%)
Type of surgical procedure	
– Simple excision	407 (78.11%)
– Complex repair	111 (21.30%)
– Flap/graft	90 (17.27%)
– Operation to the lip	21 (4.02%)
– Electrodesiccation	3 (0.57%)
Type of anesthesia	
– Local	432 (96.42%)
– Local + sedation	12 (2.67%)
– General	4 (0.89%)
Postoperative care	
– Outpatient operations	349 (77.90%)
– Short stay in a surgical day care unit	73 (16.29%)
– Hospital admission	26 (5.80%)
Time on surgical waiting list after diagnosis, d	
– Mean (SD) time	68.44 (42.22)
– Median	60

Abbreviations: NMSC, nonmelanoma skin cancer (basal cell and squamous cell carcinoma types); CPC, clinical-pathological correlation.

1 and 2). Overall, after the postsurgical histological study, 376 basal cell carcinomas, 111 squamous cell carcinomas, 4 other malignant skin tumors, and 30 benign tumors were excised.

With regard to the type of operation, there were 407 simple excisions (78.11%), 90 flaps or skin grafts (17.27%), 21 operations to the lip (4.02%), and 3 electrodesiccations (0.57%). Local anesthesia was used in 432 patients (96.42% of cases), and the continuous presence of an anesthetist was only required in 12 cases of sedation and 4 of general anesthesia (3.56% of the operations). The operations were performed on an outpatient basis in 349 patients (77.90%), with a short stay in the surgical day care unit (same-day

discharge) in 73 cases (16.29%), and with hospital admission in 26 cases (5.80%).

The mean (SD) time elapsed between diagnosis of the nonmelanoma skin cancer and its excision was 68.44 (42.22)

days, with a median of 60 days. Using cumulative percentages, 6.92% of patients were operated within a maximum of 2 weeks, 15.85% within 1 month, and 78.79% within 90 days (Figure 2).

Table 2. Histological Diagnosis in Cases with Negative Clinical-Pathological Correlation

Malignant Pathology	46 Cases
BCC or SCC	42
Kaposi sarcoma	1
Merkel cell carcinoma	1
Melanoma	1
Lymphoepithelioma-like carcinoma	1
Benign Pathology	30 Cases
Melanocytic nevus	2
Fibrous papule	1
Angioma	2
Actinic keratosis	6
Actinic cheilitis	1
Inverted follicular keratosis	2
Bone metaplasia	1
Nodular hidradenoma	1
Papillary eccrine adenoma	1
Syringocystadenoma	2
Seborrheic keratosis	5
Dermal cicatricial fibrosis	5
Chondrodermatitis helioides	1

Abbreviations: BCC, basal cell carcinoma; SCC, squamous cell carcinoma.

Discussion

Our study analyzed a number of aspects of the surgical treatment of nonmelanoma skin cancer when this is performed by dermatologists belonging to the Spanish national health service. We found that this process is performed in the majority of cases in suitable patients, with a minimal use of health care resources, and within a reasonable period of time. This is the first prospective study that has analyzed the clinical-pathological correlation of the tumors diagnosed as nonmelanoma skin cancer, and we have used a very restrictive criterion, as the clinical-pathological correlation was only considered positive when the histological result coincided with the primary clinical diagnosis. This enabled us to evaluate the diagnostic reliability of dermatologists in neoplastic skin disorders. Other authors have evaluated this same issue retrospectively but using less strict criteria, as the clinical-pathological correlation was considered positive whenever the clinical diagnosis was included in the list of suspected diagnoses.¹⁰ Despite this, dermatologists showed a much higher level of diagnostic accuracy for malignant skin tumors than other specialties, such as plastic surgery or primary care.

The data obtained in our study showed that a significant part of dermatological surgical activity was dedicated to the treatment of malignant tumors, and these had been diagnosed preoperatively in a large majority of cases. There is no doubt that dermatologists are the most qualified specialists for diagnosing skin disorders of any nature, as their years of training and daily experience provide them with a high level of clinical competence.¹⁰⁻¹² It has also been shown that the treatment of nonmelanoma skin cancer by

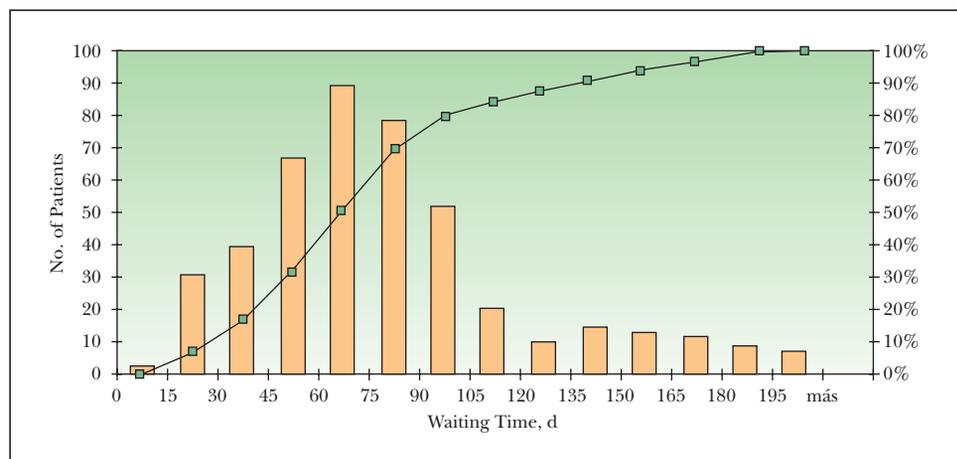


Figure 2. Time on surgical waiting list after diagnosis (cumulative percentage).

other surgical specialties can lead to unnecessary surgical procedures for any “unknown” skin disorder, such as benign tumors that do not require radical surgical excision (for example, seborrheic keratoses).¹³ Although 34 of our patients had a biopsy prior to surgery and the clinical-pathological correlation was therefore inevitable, this hardly affected the good overall result. In addition, it is interesting to note that in 46 of the cases in which the clinical-pathological correlation was negative, the lesion belonged to another type of nonmelanoma skin cancer and was included in the surgical waiting list as a suspected cutaneous malignancy, thus being given priority. Overall, less than 6% of all lesions excised for suspicion of nonmelanoma skin cancer were benign tumors, demonstrating the extraordinary capacity of dermatologists to evaluate the surgical indication of cutaneous lesions.

Concerning the type of operation and the use of health care resources, it was found that although more than 20% of patients required a complex surgical repair, almost all underwent surgery under local anesthesia, and only about 5% required hospital admission. These data agree with the findings of other studies, in which dermatological surgeons were found to perform almost all operations under local anesthesia.¹⁴ However, it is difficult to compare the complexity of the operations performed in Complejo Hospitalario de Burgos with those of other centers as the studies published only evaluate the setting in which the operations were performed (in the clinic, surgical day care unit, or as a hospital admission), and not the type of operation. Assuming that these authors performed simple excisions in an outpatient setting and complex repairs in short stay surgical centers or hospitals, our proportion of complexity in the surgical interventions was similar. In our study, 78.11% of our operations were simple excisions and 21.30% were complex repairs (flaps, grafts, operations to the lip); other authors report 76% and 24%, respectively, for operations in clinics and short stay units or hospitals,² and 78.39% and 21.60%, respectively, for the same concepts.⁷

With regard to the time on the surgical waiting list, the great majority of patients were operated within 90 days. The delay was longer in some cases, principally due to external factors such as the patient not attending the appointment or the unavailability of theatre, and was less than 2 weeks in those cases in which the individual patient characteristics suggested that this was necessary. There are a number of publications that emphasize the importance of early diagnosis and treatment of nonmelanoma skin cancer, as the tumor size affects treatment-related morbidity¹⁵ and acceleration of growth is unpredictable.¹⁶ Maintaining the waiting time within reasonable limits is necessary not only in the case of squamous cell carcinoma, which has metastatic capacity, but also for basal cell carcinoma, in which the size can increase rapidly and unexpectedly¹⁵; however, this is a difficult task in public hospitals, in which

patients face long waiting lists. The surgical treatment of nonmelanoma skin cancer by dermatologists therefore not only reduces the overall duration of the process by avoiding the need to include patients in other waiting lists when referred to other specialties, but also enables criteria of priority to be established (risk sites, rapid tumor progression, etc).^{4,5}

The results obtained in our study are particularly relevant to public health systems similar to the Spanish system, in which the use of health care resources (theatre availability, time used, direct costs of materials, and use and maintenance of the facilities, for example) does not depend on the diagnosis of the disorder under consideration for surgery, but only on the surgical intervention itself. The excision of a benign lesion with no strict indication thus costs the same as an operation for skin cancer. The correct initial selection of patients suitable for surgical treatment would therefore help to unburden the waiting lists, speed up the process in priority cases, and contribute to the control of health expenditure.

The majority of studies on the cost of treatment of nonmelanoma skin cancer have been performed in the United States of America, where Medicare bears the majority of this cost,^{2,7,17,18} whereas it has hardly been quantified in Europe, a region in which most countries, including Spain, have a public health service.⁸ Some studies have attempted to compare certain variables as a function of the specialist who performs the excision of the nonmelanoma skin cancer, such as, for example, the percentage of recurrences or involvement of the surgical margins.¹⁹⁻²¹ However, there are no studies that have analyzed the differences arising in the episode of care and the impact of these differences on the cost and quality of care. Interestingly, a study performed recently, between 1999 and 2000, with data provided by Medicare revealed marked differences in the cost per episode depending on the place in which the dermatological surgery was done, varying between a mean (SD) cost of \$500 (\$487) when it was performed on an outpatient basis and \$935 (\$456) and \$4345 (\$4839), respectively, in a surgical day care unit and with hospital admission.¹⁸ These results agree with those of other studies,^{2,7,8,17} including one performed in Spain with data from invoices to third parties of public hospitals,⁸ and indicate that the overall cost of the process is lower the fewer health care resources are used. As we have seen, dermatological surgeons perform the majority of procedures under local anesthesia, without the need for hospital admission, leading to low health care expenditure.

Unfortunately, in the majority of hospitals of the Spanish public health network there is no information system that provides reliable data on the episodes of care occurring in each process or the true cost attributed to these episodes; it is thus difficult to calculate and compare the cost per episode per specialty and, in consequence, we cannot calculate the efficiency or cost-effectiveness of our surgical

procedures. In order to validate and compare the data, it would be essential to harmonize the episodes of care and create effective information systems that reflect different indices of medical and surgical care activity,²²⁻²⁴ such as, for example, the clinical-pathological correlation achieved by each specialty, or the resources used as a function of the ICD-9 diagnosis and complexity of the surgical intervention (disposable material, human resources, occupancy of the surgical facilities, etc).

The present study may be considered a first step in the analysis and comparison of certain indicators in the surgical treatment process of nonmelanoma skin cancer according to the specialty involved. We are aware of the bias that may arise from the small number of specialists involved in the study, and it would therefore be appropriate to perform further studies with a larger number of participants in order to confirm the good results obtained in the analysis of the surgical treatment of nonmelanoma skin cancer performed by dermatologists.

Conclusions

Our study demonstrates that dermatologists have a high diagnostic accuracy in nonmelanoma skin cancer and that their surgical indications are therefore very reliable. The management of the surgical treatment of nonmelanoma skin cancer by dermatologists achieves a minimal use of health care resources, reduces the overall duration of the process, and contributes to controlling health expenditure.

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Dedication

This study is dedicated to Professor Miguel Armijo Moreno, a great master and tireless defender of dermatological surgery.

Conflicts of Interest

The authors declare no conflicts of interest.

References

1. Miller DL, Weinstock MA. Nonmelanoma skin cancer in the United States: incidence. *J Am Acad Dermatol.* 2000; 30:774-78.
2. Chen JG, Fleischer AB Jr, Smith ED, Kancler C, Goldman ND, Williford PM, et al. Cost of nonmelanoma skin cancer treatment in the United States. *Dermatol Surg.* 2001;27:1035-8.
3. Hussein MR. Ultraviolet radiation and skin cancer: molecular mechanisms. *J Cutan Pathol.* 2005;32:191-205.
4. Telfer NR, Colver GB, Bowers PW. Guidelines for the management of basal cell carcinoma. *Br J Dermatol.* 1999;141:415-23.
5. Motley R, Kersey P, Lawrence C. Multiprofessional guidelines for the management of the patient with primary cutaneous squamous cell carcinoma. *Br J Dermatol.* 2002;146:18-25.
6. Bath-Hextall F, Bong J, Perkins W, Williams H. Interventions for basal cell carcinoma of the skin: systematic review. *BMJ.* 2004;329:705.
7. Housman TS, Williford PM, Feldman SR, Teuschler HV, Fleischer AB Jr, Goldman ND, et al. Nonmelanoma skin cancer: an episode of care management approach. *Dermatol Surg.* 2003;29:700-11.
8. Hernández-Martín A, Nunez Reiz A, Saiz Martínez M, Roviroso I, Juncosa J. Cost per episode of care in the surgical treatment of skin cancer. *Gac Sanit.* 2006;20:273-7.
9. Roizen MF, Fross JF, Fischer SP. Preoperative evaluation. In: Miller RD, editor. *Anesthesia.* 5th ed. Philadelphia: Churchill-Livingstone; 2000. p.824-83.
10. Sellheyer K, Bergfeld WF. A retrospective biopsy study of the clinical diagnostic accuracy of common skin diseases by different specialties compared with dermatology. *J Am Acad Dermatol.* 2005;52:823-30.
11. Smith ES, Feldman SR, Fleischer AB Jr, Leshin B, McMichael A. Characteristics of office-based visits for skin cancer. Dermatologists have more experience than other physicians in managing malignant and premalignant skin conditions. *Dermatol Surg.* 1998;24:981-5.
12. Feldman SR, Coates ML. Comparing the diagnostic accuracy of dermatologists and nondermatologists. *Arch Dermatol.* 2001;137:1645-6.
13. Duque MI, Jordan JR, Fleischer AB Jr, Williford PM, Feldman SR, Teuschler H, et al. Frequency of seborrheic keratosis biopsies in the United States: a benchmark of skin lesion care quality and cost effectiveness. *Dermatol Surg.* 2003;29:796-801.
14. Larson MJ, Taylor RS. Monitoring vital signs during outpatient Mohs and post-Mohs reconstructive surgery performed under local anesthesia. *Dermatol Surg.* 2005;30: 777-83.
15. Eide MJ, Weinstock MA, Dufresne RG Jr, Neelagaru S, Risica P, Burkholder GJ, et al. Relationship of treatment delay with surgical defect size from keratinocyte carcinoma (basal cell carcinoma and squamous cell carcinoma of the skin). *J Invest Dermatol.* 2005;124:308-14.
16. Franchimont C, Pierard GE, Van Cauwenberge D, Damseaux M, Lapiere CH. Episodic progression and regression of basal cell carcinomas. *Br J Dermatol.* 1982;106:305-10.
17. Manternach T, Housman TS, Williford PM, Teuschler H, Fleischer AB Jr, Feldman SR, et al. Surgical treatment of nonmelanoma skin cancer in the Medicare population. *Dermatol Surg.* 2003;29:1167-9.
18. John Chen G, Yelberton CB, Polissety SS, Housman TS, Williford PM, Teuschler HV, et al. Treatment patterns and cost of nonmelanoma skin cancer management. *Dermatol Surg.* 2006;32:1266-71.

19. García-Solano J, López-Ávila A, Acosta A, Montalbán S, Sánchez-Sánchez C, Benito A, et al. Cánceres cutáneos de estirpe no melanocítica con márgenes quirúrgicos histológicos afectados. Estudio comparativo entre los servicios implicados en su extirpación quirúrgica. *Actas Dermosifiliogr.* 2004;95: 358-61.
20. De Argila D, Rodríguez-Nevado IM, Chaves A. Sobre la variabilidad de la práctica médica en los cánceres de piel. *Actas Dermosifiliogr.* 2005;96:66-7.
21. Fleischer AB Jr, Feldman SR, Barlow JO, Zheng B, Hahn HB, Chuang TY, et al. The specialty of the treating physician affects the likelihood of tumor-free resection margins for basal cell carcinoma: results from a multi-institutional retrospective study. *J Am Acad Dermatol.* 2001;44:224-30.
22. Johansen K. Comparison of information: a way to improve the quality of health care. *Qual Assur Health Care.* 1992;4:329-36.
23. Rosser LH Jr, Kleiner BH. Using management information systems to enhance health care quality assurance. *J Manag Med.* 1995; 9:27-36.
24. Bodart C, Sapirie S. Defining essential information needs and indicators. *World Health Forum.* 1998;19:303-9.