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ORIGINAL ARTICLE

Analysis of nonmelanoma skin cancers treated with conventional surgery at the Hospital de Clínicas de Uberlândia

Análise dos cânceres de pele não melanoma tratados com cirurgia convencional no Hospital de Clínicas de Uberlândia

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ABSTRACT

Introduction: Nonmelanoma skin cancer (NMSC) is the most prevalent malignant neoplasm in Brazil, accounting for approximately 31.3% of all tumors. NMSC corresponds to basal cell carcinoma (BCC) and squamous cell carcinoma (SCC) and is frequently associated with cumulative radiation due to sun exposure. Its standard treatment is surgical excision with free margins. **Objectives:** To evaluate demographic and clinical characteristics, location, types, tumor margins, and efficacy of surgical management of NMSCs treated at the Hospital de Clínicas de Uberlândia (HCU) between 2019 and 2022. **Methods:** Retrospective observation study analyzing 990 patients identified with NMSC of a public tertiary hospital in southeastern Brazil (HCU). **Results**: NMSC prevailed on the face and scalp, being 2.3 times more frequent. BCC is the most common histological subtype (72.2%), followed by SCC (27.1%). Elderly patients (≥71 years) showed greater susceptibility (63.4% and OR 1.704) to NMSC. Compromised margins occurred in 31% of cases; 18.2% required reintervention and 11.4% received clinical treatment. There were no significant differences between surgical teams regarding management in risk areas or aggressive subtypes. **Conclusions:** Advanced age represents an important risk factor for NMSC. BCC was the most prevalent type, especially in the H-zone of the face (nasal unit and chin). Continuous training and advanced diagnostic strategies are recommended to improve oncological outcomes. Future directions include longitudinal evaluation of the impact of interventions on health care delivery.

Keywords: Skin tumors; Surgical oncology; Treatment efficacy.

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RESUMO

Introdução: O câncer de pele não melanoma (CPNM) é a neoplasia maligna mais prevalente no Brasil, representando cerca de 31,3% de todos os tumores. O CPNM corresponde ao carcinoma basocelular (CBC) e ao carcinoma de células escamosas (CCE) e está frequentemente associado à radiação cumulativa devido à exposição solar. Seu tratamento padrão é a excisão cirúrgica com margens livres. **Objetivos:** Avaliar características demográficas e clínicas, localização, tipos, margens tumorais e eficácia do manejo cirúrgico de CPNMs tratados no Hospital de Clínicas de Uberlândia (HCU) entre 2019 e 2022. **Métodos:** Estudo retrospectivo observacional no qual foram analisados 990 pacientes com CPNM de um hospital público terciário do Sudeste do Brasil (HCU). **Resultados:** Os CPNM prevaleceram em face e couro cabeludo, sendo 2,3 vezes mais frequentes. O CBC é o subtipo histológico mais comum (72,2%), seguido pelo CCE (27,1%). Idosos (≥71 anos) mostraram maior susceptibilidade (63,4% e OR 1,704) ao CPNM. Margens comprometidas ocorreram em 31% dos casos; 18,2% necessitaram de reintervenção, e 11,4% receberam tratamento clínico. Não houve diferenças significativas entre equipes cirúrgicas quanto ao manejo em áreas de risco ou subtipos agressivos. **Conclusões:** A idade avançada representa fator de risco importante ao CPNM. O CBC foi o tipo mais prevalente, especialmente na zona H da face (unidade nasal e mento). Treinamento contínuo e estratégias diagnósticas avançadas são recomendados para melhorar os desfechos oncológicos. Direções futuras incluem avaliação longitudinal do impacto das intervenções na prestação do cuidado em Saúde.

Palavras-chave: Tumores cutâneos; Oncologia cirúrgica; Eficácia de tratamento.

Introduction

Nonmelanoma skin cancers (NMSC) are the most prevalent malignant neoplasm in Brazil, accounting for 31.3% of all tumors and ranking as the fifth most common worldwide. NMSC generally arises from the uncontrolled growth of skin cells, with a multifactorial etiology, and represents 95% of all skin cancer cases. According to the National Cancer Institute, an estimated 220,490 new cases of this pathology are expected annually for the period from 2023 to 2025, corresponding to an estimated risk of 101.95 cases per 100,000 inhabitants[1].

Basal cell carcinoma (BCC) is the most common form, representing 80% of skin tumors, and is usually slow-growing and locally invasive. Squamous cell carcinoma (SCC) is the second most common form, accounting for 20-30% of cases[2]. In Brazil, 2,653 deaths from nonmelanoma skin cancer were recorded in 2020, of which 1,534 were men, with a mortality rate of 1.48 per 100,000 men; and 1,119 were women, with a mortality rate of 1.03 per 100,000 women[3].

The primary risk factors for NMSC include sun exposure, light skin, personal and family history of skin cancer, and precancerous lesions. Prolonged sunlight exposure results in the harmful accumulation of ultraviolet radiation in the skin, causing irreversible DNA damage. Regarding cumulative damage, increased NMSC risk is observed in elderly individuals, phototypes I and II, in photo-exposed areas, and related to occupation, such as glass manufacturing, electronics industry, untreated mineral oil production and handling, metallurgy, coal tar production and handling, petroleum refining, chimney cleaning, firefighting, and medication use, including immunosuppressants (cyclosporine and azathioprine), antifungals (voriconazole), and diuretics (hydrochlorothiazide)[4,5].

NMSC varies significantly in appearance, but the diagnosis should be considered in fair-skinned individuals over 40 years old with growing, bleeding, and/or non-healing lesions on sun-exposed areas, especially on the head and neck. Clinical suspicion can be further supported by polarized contact dermoscopy and biopsy

with histopathologic confirmation, which is required for definitive diagnosis[2].

BCC originates from the basal layer of the epidermis and its appendages, most commonly arising in sun-exposed areas but potentially occurring in any part of the body. The estimated risk of developing BCC is approximately 30%, with a 5-year probability of 40% of developing a new lesion[6]. Furthermore, BCC has several histological subtypes: superficial, nodular, micronodular, infiltrative, sclerodermiform, and metatypical, which can be categorized according to tumor aggressiveness into low-risk (nodular and superficial) and high-risk (micronodular, infiltrative, sclerodermiform, and metatypical). High-risk BCCs have a greater risk of recurrence, particularly when not properly treated. Differentiating between subtypes is essential, even though 40% of tumors may display more than one histopathological pattern[7].

Cutaneous SCC arises from the malignant, uncontrolled proliferation of epidermal keratinocytes. Like BCC, SCC's primary risk factor is ultraviolet radiation. Bowen disease is the intraepithelial form of SCC, also known as SCC in situ, and can be associated with human papillomavirus, along with other typical skin cancer risk factors[2]. SCC can be classified as in situ when tumor cells are confined to intraepidermal layers, and invasive when tumor cells penetrate the basal membrane of the dermoepidermal junction into the dermis[8].

Furthermore, it is more invasive than BCC and has a greater capacity for metastasis and recurrence. It is categorized into three degrees of aggressiveness: well-differentiated, moderately differentiated, and poorly differentiated, which depend on the atypia of keratinocytes and the presence of keratinization. Other variants include acantholytic, spindle cell, verrucous, adenosquamous, clear cell, sarcomatoid, lymphoepithelioma-like, pseudovascular, and giant cell-like osteoclasts[9].

Both BCC and SCC treatment is primarily guided by the risk of local recurrence and/or disease progression. Additionally, the histological subtype is a critical prognostic factor and should be included in all biopsy reports, as it correlates with increased recurrence and metastasis risk. Additional histopathologic features with poor prognostic implications include depth of invasion, desmoplastic reaction around infiltrating keratinocyte islands, and perineural or intravascular invasion[10].

Superficial BCC on the trunk and limbs, along with Bowen disease, considered low-risk cancers, can be treated non-invasively with photodynamic therapy, imiquimod, or 5-fluorouracil, in addition to electrocauterization and curettage. For high-risk BCC (without metastatic evidence), the National Comprehensive Cancer Network (NCCN) guidelines recommend management using Mohs micrographic surgery, resection with complete circumferential margin assessment, standard excision with wide margins (4–6 mm) and postoperative margin assessment, or radiotherapy for non-surgical candidates[11,12].

Thus, this study aimed to analyze surgically treated NMSC cases at the Hospital de Clínicas de Uberlândia (HCU) between 2019 and 2022, focusing on the evaluation of tumor margins to assess the effectiveness of treatment provided by physicians from different specialties, aiming to achieve surgical excision with free margins.

Based on these considerations, the purpose of this study is to identify the demographic and clinical characteristics of patients with NMSCs surgically treated at the Hospital de Clínicas de Uberlândia (HCU) between 2019 and 2022; identify the prevalence of NMSC involvement in anatomical sites and its types; verify the likelihood of BCC affecting certain areas or compromising margins in relation to SCC and compare the odds of free margins in relation to compromised margins for high-risk areas or histological subtypes and for surgical teams.

Methods

Study design

This is an observational, epidemiological, retrospective study of patients with NMSC, conducted using a database from a tertiary public university hospital in the southeastern region of Brazil. The study protocol was approved by the Research Ethics Committee of the institution (approval no. 6.087.650).

Data were collected through a specific form for patients with NMSC treated between 2019 and 2022, using information available in electronic medical records within the institutional information systems of HCU. The data obtained were analyzed anonymously, and the results were presented in an aggregated manner, preventing the identification of research participants, justifying the absence of the Informed Consent Form (ICF).

Initially, the medical records were to be selected from a list of patients with the following International Classification of Diseases (ICD-10) code: C44 (malignant neoplasm of skin, unspecified). However, due to hospital management changes, with the HCU transitioning from the Federal University of Uberlândia administration to the state-owned Brazilian Hospital Services Company (EBSERH), this filter could not be used due to operational constraints.

As a solution, the standardized procedure code under the Brazilian Unified Health System (SUS) was used: 0401010074 - excision of skin tumor and appendages/sebaceous cyst/lipoma, for inclusion of medical records in the sample. Subsequently, as exclusion criteria, the following were disregarded: patients surgically treated for other types of lesions not classified as BCC or SCC, medical records without anatomopathological reports, and/or lesions treated with surgical techniques other than conventional excision.

Lastly, the risks associated with the research involved breaches of confidentiality. To mitigate this, researchers committed to maintaining the confidentiality of patients' identities, including data that could allow their identification, ensuring anonymity. At no time were the patients identified.

Data collection

A total of 2,925 medical records of patients who underwent skin and appendage lesion excision were identified based on the procedure code within the pre-established time frame. After considering the exclusion criteria, information was collected from 990 medical records, which comprised the final sample.

The following data were considered: patient identification record, age, clinical diagnosis, location, dermoscopy, histological type, margins, reintervention, histological type in reintervention, and the surgical team performing the procedure. Afterward, certain variables were stratified as follows: age group ≤70 years (≤40 years, 41–50 years, 51–60 years, and 61–70 years) versus >70 years (71–80 years and >80 years). High-risk areas included the H-zone of the face (nasal, periorbital, oral, frontal, auricular, and zygomatic units), while low-risk areas included all others (scalp, maxillary/malar, chin, mandibular, cervical, clavicular, anterior chest, back, upper limbs, lower limbs, and abdomen).

Histopathological types originating from the spinous layer were grouped as SCC, including keratoacanthoma and Bowen disease, besides the BCC/SCC fusion tumor. High-risk subtypes were defined as micronodular, sclerodermiform, infiltrative, basosquamous, high-risk mixed pattern, fusion, and non-specified patterns for BCC, and well-, moderately, and poorly differentiated, verrucous, metaplastic, and non-specified patterns for SCC. Low-risk subtypes included macronodular, superficial, adenoid, low-risk mixed pattern BCC, keratoacanthoma, and SCC in situ, including Bowen disease. Histopathologic margins were classified as free or compromised, with "narrow tumor-free margins" considered compromised. Reinterventions were classified as unnecessary, performed, or clinically treated with topical antitumor agents and were grouped as performed and not performed for comparative purposes. Finally, surgical teams performing the excisions were analyzed separately or grouped into dermatologists and non-dermatologists.

Statistical analysis

Clinical data are presented as frequency, correlating the frequency rate between NMSC and anatomical sites. The normality of quantitative variables was verified using the Shapiro-Wilk test. Pearson's chi-square test or Fisher's exact test was used for age group analysis concerning the risk of developing NMSC and resection margins in high-risk areas. Multinomial logistic regression analysis was performed to estimate the statistical significance of the correlation between BCC/SCC and anatomical sites. All statistical analyses were performed using SPSS for Windows, version 21.0 (Statistical Package for Social Sciences, IBM-SPSS Inc, Armonk, NY).

Results

Among the 990 patients included in the study, 63.4% were over 71 years old, with the highest prevalence observed between 71 and 80 years (34.3%) and the lowest frequency among those under 40 years (2.5%). The face and scalp were the most affected areas (2.3 times more frequently than the rest of the body). Among nonmelanoma skin cancers, BCC showed the highest frequency rates (72.2%), followed by SCC (27.1%). In most cases, the tumor surgeries resulted in free surgical margins (69.0%). Surgical reintervention was unnecessary in 70.4%, performed in 18.2%, and managed clinically in 11.4% of cases. Regarding the teams responsible for surgical interventions, dermatology accounted for the highest surgical volume (44.2%), followed by plastic surgery (35.6%), other surgical teams from various specialties (12.1%), and general surgery (8.1%). The results are illustrated in Graph 1.

Regarding the phototype, 96.6% of the patients had this information unspecified, with only 2.9% identified as mixed-race and 0.6% as white. Furthermore, 91.8% of the records did not specify the patients' occupation, and among those with recorded professions, 5.1% had sun exposure (Graph 1).

Basal cell carcinoma (BCC) was the most frequent clinical diagnosis, representing 57.42% of cases, followed by squamous cell carcinoma (SCC).

The most common anatomical sites for NMSC were areas with greater sun exposure, such as the H-zone of the face (57.07%), upper limbs (12.32%), and maxillary/malar region (10.51%). Among the high-risk areas of the face (H-zone), the nasal unit (20.30%), auricular unit (8.99%), and periorbital unit (7.67%) had the highest frequencies. Additionally, a higher prevalence of BCC was observed in the nasal unit compared to other BCC sites, while SCC was more prevalent in the upper limbs compared to other SCC sites (Graph 2).

Patients aged ≥71 years had a higher risk of developing BCC compared to SCC, with a statistically significant difference (OR [*odds ratio*] 1.704 [95%CI 1.259-2.307]; p=0.001).

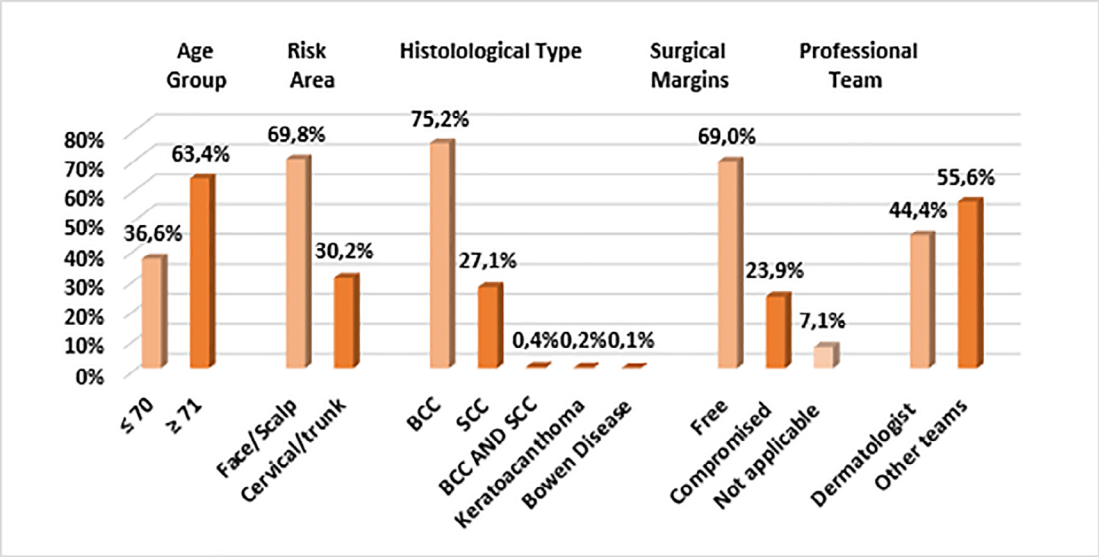
Table 1 compares the odds of BCC versus SCC according to high-risk areas, facial units, scalp, back, and limbs, and the risk of presenting compromised margins. This analysis showed significant differences for BCC compared to SCC, except for the malar unit, scalp, and limbs. Multinomial logistic regression analysis confirmed the significance of these differences.

No statistical differences were found for high-risk areas and surgical teams when comparing free versus compromised margins of resected tumors. However, high-risk histological subtype tumors and lesions located in the malar unit showed significant differences (Table 2).

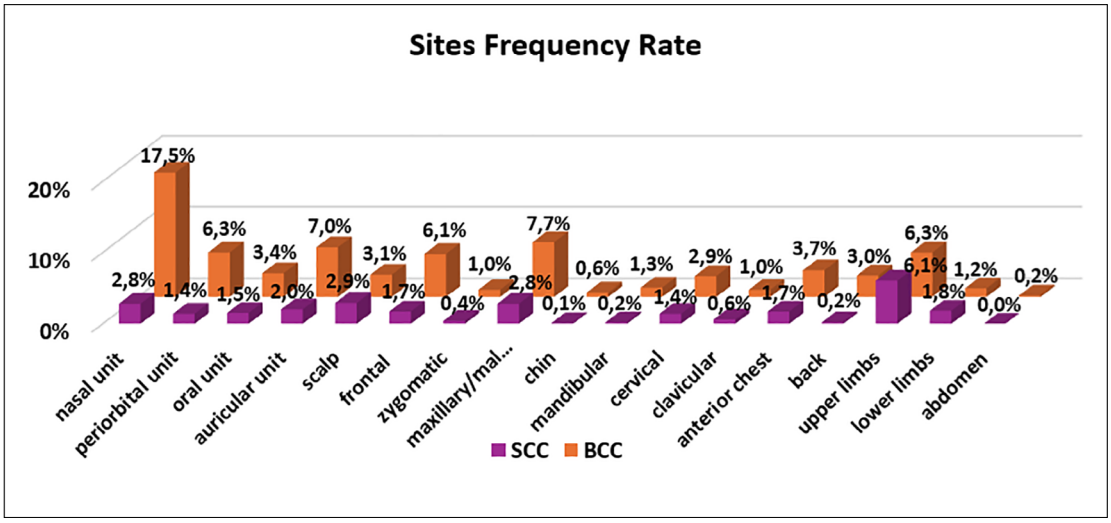
To assess the accuracy of free margins among surgical teams, comparisons were made regarding challenges such as high-risk areas (H-zone of the face) and histological subtypes with more invasive growth patterns (high-risk BCCs and SCCs). The results revealed no statistically significant differences between the groups.

Discussion

NMSC is a serious public health issue, particularly in populations exposed to ultraviolet (UV) radiation



Graph 1. Frequency rates of demographic and clinical characteristics of NMSC patients.



Graphic 2. Prevalence of NMSC and its types according to anatomical sites.

Table 1. Analysis of the high-risk probability of BCC in relation to SCC.

Variables	BCC [N (%)]	SCC [N (%)]	Bivariate		Multinomial	
N total number of patients	715 (72.2%)	275 (27.8%)	**OR (IC 95%)**	test significance	**OR (IC 95%)**	***p***
Age group ≥ 71 years	430 (68.5%)	98 (31.5%)	1.704 (1.259-2.307)	**<0.001**	1.779 (1.303-2.429)	**<0.001**
High-risk areas	407 (80.6%)	98 (19.4%)	2.387 (1.790-3.183)	**<0.001**	2.084 (1.499-2.898)	**<0.001**
Nasal unit	173 (86.1%)	28 (13.9%)	2.816 (1.838-4.314)	**<0.001**	1.877 (1.158-3.042)	**0.011**
Malar unit	76 (73.1%)	28 (26.9%)	1.049 (0.664-1.658)	0.837	-	-
Scalp	31 (51.7%)	29 (48.3%)	0.384 (0.227-0.651)	<0.001	-	-
Back	30 (93.8%)	2 (6.3%)	5.978 (1.419-25.187)	**0.002**	10.847 (2.552-46.105)	**0.001**
Upper limbs	62 (50.8%)	60 (49.2%)	0.340 (0.231-0.501)	<0.001	-	-
Lower limbs	12 (40.0%)	18 (60.0%)	0.244 (0.116-0.513)	<0.001	-	-
Compromised margins	251 (69.7%)	109 (30.3%)	1.214 (0.912-1.616)	0.105	-	-

Caption: N = Number of patients; OR = *Odds Ratio*; 95% CI = Confidence interval; *p* = Significance of the test; High-risk area = H-zone of the face.

Table 2. Analysis of NMSC resection margins in high-risk areas.

Variables	Free margins [N (%)]	Compromised margins [N (%)]	Bivariate	
N Total number of patients	630 (63.6%)	360 (36.4%)	**OR (IC 95%)**	***p***
High-risk area (H-zone of the face)	306 (60.6%)	199 (39.4%)	0.764 (0.589-0.991)	0.025
High-risk histological subtype	542 (62.6%)	324 (37.4%)	1.461 (0.968-2.205)	**0.042**
Malar unit	83 (79.8%)	21 (20.2%)	1.884 (1.144-3.103)	**0.012**
Surgical team (Dermatology)	279 (63.4%)	161 (36.6%)	0.982 (0.757-1.275)	0.539

Caption: N = Number of patients; OR = *Odds Ratio*, 95%; CI = Confidence interval; *p* = Significance of the test.

in regions with high solar incidence[2,13]. The literature identifies BCC as the most prevalent skin cancer (68-84%), followed by SCC (14-30%) and other neoplasms (2%)[14,15]. This study corroborates the literature, showing that BCC was identified in 72.1% of cases.

Advanced age is a significant risk factor for NMSC, especially among individuals over 61 years old, reflecting the importance of cumulative sun exposure in the development of NMSC[16]. Rezende Filho et al. (2020)[15] reported a mean age of 68 years (range 1 to 102 years). Similarly, this study observed the highest prevalence among those aged 71 to 80 years (34.3%), with the lowest prevalence among those under 40 years (2.5%). These findings highlight the disease's relevance in the elderly population, thereby contributing to morbidity and healthcare costs. Regarding the relationship between age and histopathological type, BCC was more prevalent across all age groups, particularly in individuals ≥71 years, with a statistically significant probability (p=0.001) compared to those <71 years. The epidemiological profile observed aligns with the literature regarding age, NMSC histopathological type, and lesion location.

Chronic sun exposure is a key factor in BCC development, especially in sun-exposed sites such as the head and neck[17,18]. Consistent with the literature, this study identified a statistically significant difference in the odds of BCC occurring in high-risk anatomical sites.

Dermoscopy plays a crucial role in diagnosing and defining surgical margins for NMSC, as it allows for detailed lesion assessment, contributing to the differentiation between malignant and benign lesions, especially when performed by trained professionals[19]. Rodriguez Pino et al (2022)[20] highlighted the agreement between dermoscopic diagnostic hypotheses and histopathological results, reinforcing the importance of specialist use of dermoscopy. Chen et al. (2020)[21] reported that dermoscopy improves BCC margin definition, with a radical resection rate of 98.1% for a 4 mm margin and 92.3% for a 2 mm margin, emphasizing its importance for effective excisions. Therefore, its systematic incorporation into clinical practice is essential for the management of NMSC. In this study, dermoscopy was used by 100% of dermatologists. However, no statistically significant difference was found in tumor-free histopathologic margins between surgical teams, since it was not possible to compare the surgical margins applied by these teams.

Regarding the detection of free margins by dermatologists versus non-dermatologists, the retrospective study by Bassas et al. (2013)[22], with 921 cases, demonstrated that dermatologists presented significantly lower rates of compromised margins (6.7%) compared to other specialists (21.5%). This result is attributed to the greater experience of dermatologists in accurate macroscopic identification of tumor margins and familiarity with the natural history of BCC. Ramdas et al. (2018)[23], in a study of 2,986 excisions, reported the highest complete excision rates among dermatologists (93%), followed by plastic surgeons (83%) and general practitioners (70%). Despite the findings, no statistically significant difference was observed between surgical teams regarding tumor-free margins in this study. The detection of tumor-free margins in high-risk histological subtypes and areas such as the malar region confirmed appropriate surgical management by all teams, with no statistically significant differences between them.

Conclusions

Advanced age was a relevant factor in the occurrence of surgically treated NMSC at the HCU, particularly in sun-exposed areas and cumulative photodamage, such as the face. BCC was the most prevalent NMSC, with a high probability of affecting patients aged ≥71 years, especially in high-risk areas like the H-zone of the face, particularly the nasal unit, and in low-risk areas such as the back. Surgical margin analysis revealed that while most excisions were successful, a significant number of cases required reintervention, with no differences observed between surgical teams.

Future directions for this research include longitudinal studies evaluating the impact of these interventions on health care delivery to NMSC patients.

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