

An estimate of the cost of treating non-melanoma skin cancer in the state of São Paulo, Brazil *

Estimativa do custo do tratamento do câncer de pele tipo não-melanoma no Estado de São Paulo - Brasil

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Abstract: BACKGROUND: The most common form of cancer in Brazil is non-melanoma skin cancer, which affects approximately 0.06% of the population. There are no public policies for its prevention and the economic impact of its diagnosis has yet to be established. Objectives: To estimate the costs of the diagnosis and treatment of non-melanoma skin cancer in the state of São Paulo between 2000 and 2007 and to compare them with the costs associated with skin melanoma in the same period. Methods: The Clinical Practice Guidelines in Oncology (National Comprehensive Cancer Network) was used as a procedure model, adapted to the procedures at the SOBECCan Foundation at the Ribeirão Preto Cancer Hospital in São Paulo. The estimated costs were based on the costs of medical treatment in the public and private sectors in 2007. Results: The mean annual costs of each individual treatment of non-melanoma skin cancer were much lower than those estimated for the treatment of skin melanoma. Nevertheless, when the total costs of the treatment of non-melanoma skin cancer were taken into consideration, it was found that the total cost of the 42,184 cases of this type of cancer in São Paulo within the study period was 14% higher than the costs of the 2,740 cases of skin melanoma registered in the same period within the Brazilian National Health Service (SUS). However, in the private sector, the total cost was approximately 34% less for the treatment of non-melanoma skin cancer compared to melanoma. Conclusion: The high number of cases of non-melanoma skin cancer in Brazil, with 114,000 new cases predicted for 2010, 95% of which are diagnosed at early stages, represents a financial burden to the public and private healthcare systems of around R\$37 million and R\$26 million annually, respectively.

Keywords: Carcinoma, basal cell; Carcinoma, squamous cell; Cost-effectiveness evaluation; Health care costs; Neoplasms, basal cell; Neoplasms, squamous cell; Skin neoplasms; Ultraviolet rays

Resumo: FUNDAMENTOS: O câncer de maior incidência no Brasil é o de pele não-melanoma, que afeta aproximadamente 0,06% da população. Não existem políticas públicas para sua prevenção e o impacto econômico do seu diagnóstico não tem sido avaliado. OBJETIVOS: Estimar os custos do diagnóstico e tratamento do câncer de pele não-melanoma no Estado de São Paulo entre 2000 a 2007 e compará-los com os do melanoma cutâneo no mesmo período.

MÉTODOS: Foi utilizado como modelo de procedimento o projeto diretriz *Clinical Practice Guidelines in Oncology*, (*National Comprehensive Cancer Network*), adequado aos procedimentos da Fundação SOBECCan - Hospital do Câncer de Ribeirão Preto - SP. Os custos estimados baseiam-se nos valores do tratamento médico pagos pelos setores público e privado em 2007.

RESULTADOS: Os valores médios de custo individual do tratamento anual do câncer de pele não-melanoma são muito mais baixos do que os estimados para o tratamento do melanoma cutâneo. Entretanto, observados os gastos totais no tratamento do câncer de pele não-melanoma, percebe-se que os 42.184 casos deste câncer em São Paulo, no período estudado, fazem com que o custo total do seu tratamento seja 14% superior ao dos 2.740 casos de melanoma cutâneo registrados no mesmo período para o SUS. Porém, para o sistema privado, o gasto total é, aproximadamente, 34% menor para o tratamento do câncer de pele não-melanoma. CONCLUSÃO: O elevado número de casos de câncer de pele não-melanoma no Brasil - com 114 mil novos casos previstos para 2010, sendo 95% diagnosticados em estágios precoces - representa um impacto financeiro ao sistema público e aos sistemas privados de saúde de cerca de R\$ 37 milhões e R\$ 26 milhões ao ano, respectivamente.

Palavras-chave: Avaliação de custo-efetividade; Carcinoma basocelular; Carcinoma de células escamosas; Custos de cuidados de saúde; Neoplasia de células basais; Neoplasias cutâneas; Neoplasias de células escamosas; Raios ultravioleta

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INTRODUCTION

Skin cancer occurs when skin cells divide in an uncontrolled manner. According to Dergham et al. (2004), these cells are arranged in layers and, depending on the layer affected, different types of cancer may develop.¹ Basically, these may be classified into non melanoma skin cancer (NMSC) and melanoma.

The most common types of NMSC are basal cell carcinoma (BCC) and squamous cell carcinoma (SCC). According to the National Cancer Institute (INCA), these types of cancer constitute 70% and 25% of all cases of skin cancer in Brazil, respectively.² Prognosis is good with both types, particularly when detected at an early stage. Rocha et al. (2002) affirmed that since the skin "is easily accessible for self-examination and medical inspection, it serves as an ideal model for implementing mechanisms that permit the diagnosis of tumors at early stages".³

The treatment options for NMSC include both surgical and nonsurgical procedures. Irrespective of the treatment approach used, the final objectives are: complete resection of the tumor, preservation of the greatest possible amount of normal tissue surrounding the lesion, minimal cosmetic damage and, consequently, a high cure rate. The choice of treatment depends on the site of the cancer, the patient's age and health status and the risk factors involved in the recurrence of the disease.⁴

Of the two types of NMSC mentioned, BCC is the least aggressive. Although this tumor rarely develops metastases, it is locally invasive and may cause significant destruction to surrounding tissue, including cartilage and bone.⁵⁻⁷ Characteristically, BCC develops in areas exposed to the sun, with 30% of lesions affecting the nose. Nevertheless, it may occur in any part of the body, even areas that are not exposed to solar radiation.⁷ BCC progresses slowly and its diagnosis is usually made by the presence of a lesion that initially appears as a papule and then progresses to a nodule, later developing central ulceration.⁶

Unlike BCC, SCC is characterized by rapid growth, greater local invasion and a potential to metastasize.^{2,6} Its diagnosis is usually made by the finding of a red, slightly elevated plaque or papule in areas exposed to the sun. However, it may also appear in any other region of the body.

In a case-control study, Berwick et al. (1996) showed that self-examination of the skin is capable of reducing deaths from skin cancer when cases are identified early.⁸ It should also be emphasized that, although mortality rates for BCC and SCC are low, these types of cancer may result in considerable physical deformity if not treated early. Furthermore, a recent study showed that individuals with a history of NMSC may be at a greater risk of going on to develop

other types of cancer.⁹

The principal cause of skin cancer is excessive exposure to ultraviolet radiation (UVR), solar radiation being the principal source. Other risk factors that appear to be involved with the development of NMSC include mutations in regulatory genes, exposure to ionizing radiation, arsenic, polyaromatic hydrocarbons and changes in the immune system, among others.^{4,6,10}

Between 2001 and 2006, NMSC increased 114%, with a relative growth in women of 135% and 96% in men. It should be emphasized that the 2004 data were not available for this survey and are not, therefore, included in this analysis. It is estimated that in 2020 the number of new cases of skin cancer will be around 15 million worldwide. In addition, INCA estimates that NMSC will continue to be the most common type of cancer in both men and women in Brazil, and predicted that 113,850 new cases would occur in 2010.¹¹

The present study forms part of a wider study aimed at evaluating the effect of the cost of diagnosis and treatment of skin cancer. The first part was designed to evaluate melanoma in the state of São Paulo, while the objective of the present study was to determine and analyze the direct per patient costs associated with the treatment of NMSC.⁵

MATERIAL AND METHODS

To enable comparison between the studies, the same methodology used in the preceding study was adopted in the current one.⁵ Therefore, the perspective of two different payment sources was maintained: the public healthcare system through the Brazilian National Health Service (SUS) and the private healthcare system through the health insurance companies and health maintenance organizations. The data used in this analysis refer to the state of São Paulo between 2000 and 2007.

In this study, the financial data for the public healthcare system were obtained from the SIA/SUS and the SIH/SUS (outpatient and inpatient data services, respectively).^{12,15} For the private healthcare system, the table of costs of procedures published by the Brazilian Medical Association in 1992 (AMB 92) was used, in which the CH (coefficient of medical fees) is used as a reference to calculate the cost of each medical procedure paid.¹⁴ In a preliminary part, the costs referring to each disease stage were calculated using the product of the unit cost multiplied by the quantity of each item used in the treatment. Next, the total values were calculated for each stage of the disease taking the number of cases classified in each different group into consideration. The data are expressed in

Brazilian *reais* (R\$) at 2007 values, both for payment by the National Health Service and by the healthcare insurance companies. In this study, the CH value is R\$0.28. This value corresponds to the mean amount paid by the insurance companies for the medical procedures performed at the SOBECCan Foundation (Cancer Hospital of Ribeirão Preto, São Paulo) and is the same as that used as a reference in the melanoma study.

As in the melanoma study, the analysis of the treatments was standardized, assuming that all new patients with suspected skin cancer were submitted to a diagnostic phase involving costs with: a) consultation with a clinician; b) excisional biopsy; and c) pathology report. Following this procedure, the cases were then classified by staging: 0, I, II, III and IV in accordance with the criteria of the American Joint Committee on Cancer (AJCC).¹⁵

To determine the sequence of treatment according to disease staging, the database of the São Paulo Oncocentro Foundation (FOSP) was used. This database shows the treatment carried out for each case, together with the procedures performed at the SOBECCan Foundation. According to the FOSP data, surgery is the most common form of treatment for both BCC and SCC. Nevertheless, depending on the size of the lesion, patients may be treated with topical drugs or radiotherapy or, in some cases, surgery and radiotherapy. Table 1 shows the number of cases at each stage of the disease according to the type of treatment carried out. Cases for which the type of treatment indicated was given as “no treatment” (2,444 cases), “other combinations of treatment” (1,324 cases) or “no information available regarding treatment” (26 cases) were not included in the calculation of costs.

To calculate the cost of each form of treatment, procedures considered standard for the diagnosis, treatment and follow-up of patients with NMSC were taken into consideration. Costs with medical consultations, laboratory tests, excisional biopsy, anatomo-

pathology, supplementary surgical procedures and tests, chemotherapy and radiotherapy were included in these calculations. Alternative therapies and a variety of drugs not directly used in the treatment of NMSC were excluded from the calculation of costs, as were indirect costs such as the time spent by the patient in treatment or time lost from work, for example. In addition, costs with suspect lesions that were not diagnosed as NMSC were not counted. Considering that the objective of the present study was to calculate the direct cost of the treatment of the various stages of NMSC, the costs incurred by each patient over one year of treatment and/or follow-up were used. It should be emphasized that the occurrence of death during this period was not taken into consideration.

RESULTS

A total of 42,184 cases diagnosed in the state of São Paulo between January 2000 and December 2007 were included in this study, 70% of which consisted of BCC and 30% of SCC. The majority of cases were stage I (85%) or stage II (approximately 11%). Table 2 shows the number of cases per stage and the respective cost per patient and total costs of the treatment of BCC and SCC.

As occurred in the melanoma study, the individual cost of treatment rose as the level of staging increased. Nevertheless, in the treatment of NMSC, the rate of growth of the individual cost between the stages increased to a lesser extent and more homogeneously than was found with melanoma. For example, in the public healthcare system (SUS) the cost per patient of the treatment of stage III NMSC was approximately 30% higher than the cost of treatment at stage II of the disease, whereas with melanoma, this ratio exceeds 2,600%. In the private healthcare system, this discrepancy is even greater, with differences in the costs of treatment of 66% between stages II and III of NMSC compared to over 10,000% in cases of melanoma.

TABLE 1: Types of treatment of NMSC according to the stage of the disease (data supplied by FOSP)

Type of treatment	Staging					Total
	0	I	II	III	IV	
Surgery	1,045	33,497	3,849	399	25	38,815
Surgery + radio + chemotherapy	-	11	61	6	4	82
Surgery + chemotherapy	-	20	7	12	2	41
Surgery + radiotherapy	1	294	123	83	18	519
Chemotherapy	-	7	4	6	2	19
Chemotherapy + radiotherapy	1	4	4	22	6	37
Radiotherapy	37	2,109	403	107	15	2,671
Total	1,084	35,942	4,451	635	72	42,184

TABLE 2: Cost per patient and total cost of treatment (in Brazilian reais) of cases of BCC and SCC according to the stage of the disease. Data for the state of São Paulo, January 2000 – December, 2007

Stage of the disease	N	Cost per patient R\$		Total cost R\$	
		Public	Private	Public	Private
Stage 0	1,084	867.87	559.69	940,775.94	606,702.46
Stage I	35,942	878.59	581.29	31,578,458.54	20,892,801.72
Stage II	4,451	968.94	724.03	4,312,739.19	3,222,640.96
Stage III	635	1,270.37	1,204.96	806,683.15	765,149.56
Stage IV	72	1,872.13	2,134.39	134,793.10	153,676.04
Total	42,184			37,773,449.92	25,640,970.74

The mean annual cost of the treatment of NMSC per patient was R\$1,172 ± 424 in the public healthcare system and R\$1,040 ± 664 in the private system. These values are very much lower than those found for the treatment of melanoma: R\$13,062 ± 16,848 and R\$26,668 ± 42,750, respectively.⁵ Nevertheless, when the total costs of the treatment of NMSC are taken into consideration: R\$37,773,449.92 (public) and R\$25,640,970.74 (private), it was found that the greater number of cases of NMSC (42,184 cases) renders the cost of treatment in the public healthcare system higher than that of melanomas, the total cost of treatment for the 2,740 cases of melanoma being R\$33,012,725.10 in the public healthcare system.⁵ In the private healthcare system, the total cost of melanoma treatment (R\$76,133,662.80) is three-fold that incurred in the treatment of NMSC, principally as a result of the drugs used in melanoma stages III and IV.

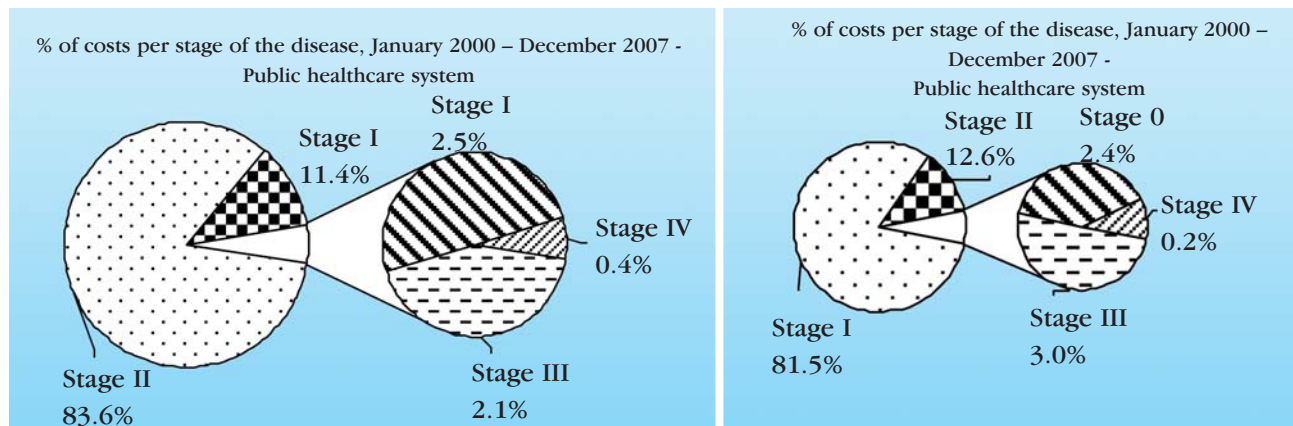
Figure 1 shows the proportion of the total costs of treatment, according to the various stages, for the public and private healthcare systems. Despite the high costs of treatment of the more advanced stages, in view of the greater number of cases of stage I and II of the disease, approximately 95% of the total costs

of the treatment of NMSC in the state of São Paulo correspond to these phases of the disease.

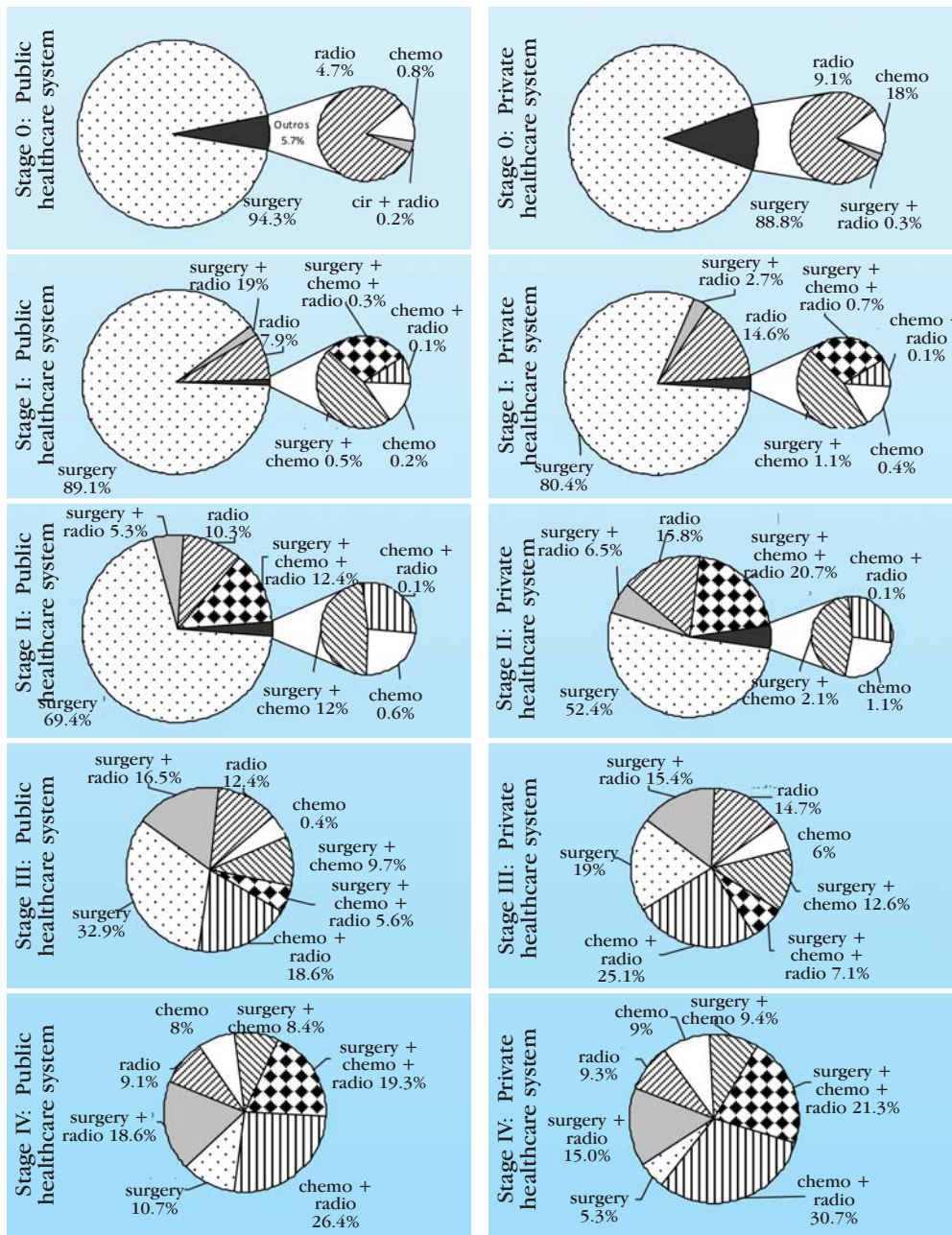
Figure 2 shows the proportion of the costs of the types of treatment for each stage of the disease in the two healthcare systems evaluated in this study, the public and the private systems. As mentioned, the costs were found to increase as the stage of NMSC increased. In the initial stages of the disease, the costs with surgical treatment predominate in the overall picture. Approximately 90% of the costs of treatment at stages 0 and I refer to surgery, falling to around 60% at stage II. On the other hand, at the most advanced stages (III and IV), the costs are more evenly distributed among the various types of treatment and drug-based treatments begin to represent a greater financial burden.

DISCUSSION

The results of this study show that the mean direct costs of NMSC treatment per patient (R\$1,172 in the public healthcare system and R\$1,040 in the private system) are much lower than those calculated for the treatment of melanoma (R\$13,062.40 in the public healthcare system and R\$26,668.30 in the private system). This results from the fact that melanoma



GRAPH 1: Proportion of cases per stage of the disease in the public and private healthcare systems, São Paulo, January 2000 – December 2007



GRAPH 2: Proportion of the costs of treatment at each stage of the disease in the public and private healthcare systems (2007 values)

requires more intensive and more sophisticated treatment given its greater severity, principally at more advanced stages.

Nevertheless, despite the lesser severity of the disease in comparison with melanoma, since the number of cases of NMSC is higher (over 1,400% higher than melanoma), the impact of the total cost of treatment on the public healthcare system is equivalent to that of melanoma. In the NMSC group, approximately 98% of the patients were diagnosed at an early stage (0, I or II) and the costs involved with these cases constitute around 97% of the total costs of the treatment of NMSC. On the other hand, 63% of the cases of

melanoma were diagnosed at stages 0, I and II and these constitute approximately 3% of the total cost of the treatment of melanoma.

In the private system, the total cost of the treatment of melanoma is much higher than the cost of the treatment of NMSC (practically three times higher). This is because of the cost of the drugs used in melanoma stages III and IV. A considerable proportion of the resources used for the treatment of melanoma (97%) is used in cases diagnosed at these stages (approximately 37% of cases), which require adjuvant treatment in addition to surgery (chemotherapy and/or radiotherapy), increasing the final cost of

treatment.⁵ In this case, the table of fees in the public healthcare system limits these costs. The difference between the values in the public and private healthcare services is the result of the different tables of fees used to calculate costs by the two payment sources.

Melanomas are aggressive and highly likely to metastasize when diagnosis is made at a late stage. This explains the data reported by Souza et al. (2009), showing that the great majority of cases are diagnosed when already at an advanced stage (III or IV). Unlike melanoma, NMSC is less aggressive, grows more slowly and, even when diagnosed later, may still be at an early stage (0, I or II). Since there is no official program of continued and systematic education for the prevention of skin cancer and/or early diagnosis, we attribute this finding to the difference in the biological behavior between melanoma and NMSC.

CONCLUSION

According to the various studies, excessive exposure to ultraviolet radiation is considered the principal cause of the majority of cases of skin cancer. For this reason, prevention remains the most effective way of saving lives and reducing costs to the public and private healthcare systems. This immediate need to improve prevention strategies is corroborated by the statistics showing the high incidence and growing rates of cases of skin cancer and the financial and personal costs associated with NMSC and melanoma. For these reasons, public policies with a stronger emphasis

on prevention are required to make the public aware of the risks associated with inappropriate exposure to ultraviolet radiation.

It should be emphasized that skin cancer is a disease that results from the cumulative effects of exposure to risk factors. For this reason, it is important to stress that educational campaigns should focus on specific sectors of the public such as children, adolescents and their parents, as well as campaigns aimed at specific types of workers who are constantly exposed to the sun. These campaigns should deal with extreme situations such as summer vacations as well as routine daily life.

In the present study, the figures presented serve to underline the need for strategies to increase awareness. The high number of cases of NMSC in Brazil, although the majority of these cases (95%) are diagnosed at early stages, represents a heavy financial burden on public resources and to the private healthcare system. Furthermore, despite the limited number of cases diagnosed at more advanced stages, it should be emphasized that, irrespective of the financial impact, prevention can avoid mutilating surgeries and undesirable and unsightly esthetic results. Again, it should be stressed that the figures reported in this study do not necessarily reflect all the costs involved, since they encompass only those charged for services provided by a part of the healthcare system. For this reason, the values presented in this study may underestimate the true financial impact of this disease. □

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