



## ORIGINAL RESEARCH

### Analysis of a decade of skin cancer prevention using a mobile unit in Brazil

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#### PUBLISHED

15 May 2019 Volume 19 Issue 2

#### HISTORY

RECEIVED: 26 September 2017

REVISED: 5 November 2018

ACCEPTED: 8 March 2019

#### CITATION

Silveira CG, Mauad EC. Analysis of a decade of skin cancer prevention using a mobile unit in Brazil. Rural and Remote Health 2019; 19: 4599. <https://doi.org/10.22605/RRH4599>

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## ABSTRACT:

**Introduction:** For the past 10 years, skin cancer has been the most frequent malignant neoplasm in Brazil and worldwide. Each year, there are more new cases of skin cancer than the combined incidence of cancers of the breast, prostate, lung and colon. There were an estimated 188 000 new cases of skin cancer in Brazil in 2016. The prevention department of Barretos Cancer Hospital (BCH) runs some prevention programs for cancer such as breast, prostate, cervical, oral, colon and skin cancers. The skin cancer prevention program comprises educational activities and medical assistance conducted at the hospital and at a mobile unit (MU). The objective of this study is to evaluate the use of the MU as part of a skin cancer prevention program, 10 years after the

implementation of this prevention program, using an MU in remote areas of Brazil.

**Methods:** The database of the BCH was used. These data refer to data collected by the BCH Prevention MU. A total of 45 872 patients with suspected skin cancer were evaluated at the MU from 2004 to 2013. Of these, 8954 surgical procedures (excisions and/or biopsy) were performed.

**Results:** This study demonstrated a significant number of skin cancer cases diagnosed and treated by the MU.

**Conclusions:** This study showed that the MU positively contributes to the early diagnosis and treatment of skin cancer among populations residing in remote areas of Brazil.

### Keywords:

Brazil, remote areas, screening, skin cancer.

## FULL ARTICLE:

### Introduction

For the past 10 years, skin cancer has been the most frequent malignant neoplasm in Brazil and worldwide. Each year, there are more new cases of skin cancer than the combined incidence of cancers of the breast, prostate, lung and colon<sup>1,2</sup>. There were an estimated 188 000 new cases of skin cancer in Brazil in 2016<sup>3</sup>.

In the USA, on average, one person dies from melanoma every hour<sup>4</sup>. Non-melanoma skin cancer (NMSC), despite having low mortality, may cause physical and psychological damage to patients because these cancers mainly affect regions of the face, disfiguring the patients<sup>5</sup>.

Skin cancer prevention consists of raising awareness in the population through educational programs and evaluation by a health professional. Skin cancer prevention and screening programs have been implemented by several health facilities, although the costs/benefits of this practice are still under discussion<sup>6</sup>.

BCH is a tertiary hospital located in the city of Barretos in the state of São Paulo, 430 km away from the capital city, São Paulo. The prevention department of BCH runs some prevention programs for cancers such as breast, prostate, cervical, oral, colon and skin cancers. The skin cancer prevention program comprises educational activities and medical assistance conducted at the hospital and at a mobile unit (MU).

In the literature, there are few reports of the use of MUs in skin cancer prevention programs. There is one MU in Switzerland, which only performs medical evaluations<sup>7</sup>, and one in Australia, where primary prevention activities are conducted<sup>8</sup>.

The BCH MU has visited more than 700 cities in nine states in Brazil in the past 10 years. The BCH MU includes a medical outpatient module and a small surgical center. In addition to skin cancer screening, the MU also offers care for the prevention of cervical and prostate cancers. It has the potential to provide

medical assistance and minor skin surgeries. The medical assistance is provided by a general practitioner specialising in skin cancer, and an oncological surgeon. The MU's methodology has previously been published<sup>9</sup>.

The objective of the present study is to evaluate the use of the MU as part of a skin cancer prevention program, 10 years after the implementation of this prevention program using an MU in remote areas of Brazil.

### Methods

The database of BCH was used. These data refer to data collected by the BCH Prevention MU.

The data relate to patients who were seen at the MU from 2004 to 2013. The data for 2004–2007 have already been published, and were complemented with data from 2008 to 2013<sup>9</sup>.

The collected data consist of the total number of appointments, the number of procedures performed (biopsy, excision, cryotherapy), and the number of referrals made (in some cases, due to the size of the lesion or the clinical condition of the patients, they were referred directly to the regular Barretos unit, and the procedure was not performed at the MU). Age, sex and staging of the malignant lesions were other variables for which data were collected. The data are described as absolute and relative frequencies.

### Ethics approval

All the informed consent terms were signed by each patients and are currently archived in the prevention department under supervision of the local ethics committee (approval number 377/2010).

### Results

A total of 45 872 patients with suspected skin cancer were evaluated at the MU from 2004 to 2013, with an average of 4587

patients seen per year at the MU. Of these, 8954 surgical procedures (excision and/or biopsy) were performed. These patients had a mean age of 64 years, and 50.3% were men and 49.7% were women from nine Brazilian states (São Paulo, Minas Gerais, Goiás, Mato Grosso, Mato Grosso do Sul, Tocantins, Pará, Rondônia, Santa Catarina) (Table 1). The youngest patient was a 21-year-old man, from the state of Rondônia, with a diagnosis of squamous cell carcinoma. The oldest patient was a 99-year-old woman, from the state of Minas Gerais, with a diagnosis of basal cell carcinoma. Among the patients undergoing surgical procedures, 7098 (15.5%) received pathological confirmation of the malignancy. The other 38 774 (84.5%) patients without suspected skin cancer lesions were instructed to continue follow-

up with their general practitioner. In relation to malignant lesions, 81.5% had basal cell subtype, 14.5% squamous cell, 1.7% melanoma, 0.7% metatypical, 1.2% Bowen disease, and 0.4% had two other subtypes (dermatofibrosarcoma and Merkel cell) (Table 2). Among the nonmelanoma cancers, 85.7% were diagnosed at stage 0 or 1, whereas 85.9% of the melanomas were diagnosed at stage 0 or 1 (Table 3). Two cases of Merkel cell carcinoma were diagnosed, one patient at stage 2; the other patient chose to continue treatment at a different hospital unit, and hence the BCH do not have follow-up data. Two cases of dermatofibrosarcoma were diagnosed, one at stage 3; the other patient also preferred to continue treatment at another hospital unit.

**Table 1: Gender, age and state of origin for patients evaluated at Barretos Cancer Hospital mobile unit, 2004–2013**

Variable	n	%
Gender		
Male	3572	50.3
Female	3526	49.7
Age (years)		
<40	280	3.9
40–59	2201	31.0
60–69	2028	28.6
70–79	1756	24.7
≥80	833	11.8
State of origin		
Mato Grosso	2254	31.7
São Paulo	2098	29.6
Goiás	836	11.8
Rondônia	750	10.5
Minas Gerais	476	6.8
Santa Catarina	346	4.9
Mato Grosso do Sul	287	4.0
Pará	41	0.6
Tocantins	10	0.1

**Table 2: Skin cancer subtype for patients evaluated at Barretos Cancer Hospital mobile unit, 2004–2013**

Diagnosis	n	%
Basal cell carcinoma	5782	81.5
Squamous cell carcinoma	1025	14.5
Metatypical	53	0.7
Bowen disease	86	1.2
Melanoma	120	1.7
Other	32	0.4

**Table 3: Clinical stage for skin cancer of patients evaluated at Barretos Cancer Hospital mobile unit, 2004–2013**

Diagnosis	Clinical stage (n(%))					
	0	1	2	3	4	X
Non-melanoma	86 (1.2)	5903 (84.5)	352 (5.0)	19 (0.3)	0 (0.0)	618 (8.8)
Melanoma	51 (42.5)	52 (43.4)	7 (5.8)	4 (3.3)	0 (0.0)	6 (5.0)

## Discussion

Brazil, a developing country with a large territory and significant social inequality, has an insufficient health system designated the universal health system (sistema universal de saúde, SUS). The SUS, whose pillars are equity, universality, comprehensiveness, decentralization and social monitoring, cannot provide quality assistance to the entire Brazilian population for several reasons. One of the reasons may be the difficulty in retaining physicians in regions far from large urban centers. For example, in the state of

Amazônia, there is one dermatologist for every 90 000 residents<sup>10</sup>. There is an unequal distribution of physicians in Brazil, with the majority preferring to live in large cities<sup>11</sup>. Several policies have been attempted to retain physicians in peripheral regions; the most recent was the More Doctors Program adopted in 2014, a program highly criticized by clinicians and that still awaits effectiveness data<sup>12</sup>.

In Brazil, in the 1970s, some federal incentive programs for the colonization of the northernmost regions of Brazil were carried out

by the federal government through tax incentives and facilitated credit. This led to migration of European descendants, who lived in southern Brazil, to colonize the northern region, whose main labor market in this region was and is still agriculture<sup>13</sup>.

In addition to the scarcity of physicians in remote areas, which can delay an early diagnosis of skin cancer, is the important factor of tropical climate. A high incidence of UV radiation and an annual mean temperature of approximately 24°C<sup>14</sup> promote the development of skin cancer. In addition, 17% of the Brazilian population works and lives in rural regions<sup>15</sup>.

The hottest regions of Brazil (north and central eastern) were colonized mainly by European descendants, with type I and II Fitzpatrick skin types<sup>16</sup>, and these people work in agriculture. These factors have accentuated the incidence of skin cancer in this region<sup>17,18</sup>.

BCH receives patients from all over Brazil, and every appointment and treatment is free of charge. Approximately 4000 appointments each day are held at the hospital, which has a medical team of 350 specialized health professionals. The hospital has been conducting work on prevention, diagnosis, treatment and research in oncology and is recognized at national and international levels<sup>19,20</sup>.

The skin cancer prevention program implemented by BCH comprises educational and care components. In addition to several lectures targeting the general population, it also trains health professionals from several cities in Brazil. These health professionals receive training for 3 days on the prevention, diagnosis and treatment of skin, oral, breast, prostate and cervical cancers.

The patients seen at the MU are screened by the city's nurse, who received prior training at BCH. During the training conducted at BCH, these health professionals learn how to conduct screening of the population in their cities. When a patient with a complaint of a skin lesion comes to the city's health unit, the health professional, usually a nurse, initiates the screening, and if the nurse suspects the skin lesion to be a malignancy, the patient is referred for assistance at the MU, whenever it is at the patient's city. There was a significant improvement in the screening conducted by the nurses after the 3-day training was implemented at BCH. The percentage of patients with skin cancer detected by the nurses after the training increased from 12% to 30%.

The MU visits the Brazilian cities once a year. There is the option for the local nurse to refer a patient with a suspected lesion to another oncology department, which is routine for places where MU does not visit. However, the operation of these services at the places visited by the MU is difficult, due to either the absence of specialists near these cities or difficulties in transportation to the nearest referral center. Therefore, the majority of the patients identified by the nurse prefer to wait for the MU.

The MU has been well received by the population in these cities, mainly due to the convenience of the unit – the MU is capable of training, and diagnosing and treating skin cancer in a patient's

own city, without the need for travel and, consequently, without unnecessary patient costs. A total of 92% of the lesions diagnosed at the MU are treated at the MU itself. Only 8% of the patients must be referred to the BCH, mainly due to lesion size. These patients immediately receive a date for their appointment at the BCH, and the Health Bureau of their own city is responsible for their transportation. At present, the BCH has 17 MUs, but only one performs skin cancer surgeries.

With the implementation of this prevention program by the BCH through the MU, it was observed that, during the 10 years of operation, a flow of referrals to the MU and expectation for arrival of the MU to the cities was generated. All of the assistance provided at the MU is free of charge.

BCH prevention department staging data (Table 3) were compared with the general BCH data (Table 4) – cases that are referred to BCH by basic health units, not through the skin cancer prevention program from BCH. In these referrals, the patient already has a biopsy with a positive result, with the diagnosis made by the health team of the municipality. This may have generated some delay, both in diagnosis (because there are not enough specialists in Brazil)<sup>10</sup>, and in delays due to the bureaucracy of the Brazilian health system. Connecting a patient with a specialist physician begins with a request from the general practitioner to the municipal health department, and this requests the state health department to look for a vacancy for the patient in an oncological hospital. These requests are time consuming.

Through these data, it was observed that the patients diagnosed by the prevention department, whose objective is to offer the opportunity of a specialized treatment in their municipality, not requiring referrals to other referral centers, presented 0.3% staging 3 and 4 in relation to NMSCs and 3.3% for melanomas. For patients referred to the BCH by a local doctor in their city, 1.4% of patients with staging 3 and 4 were NMSCs and 27.3% staging 3 and 4 for melanomas, a significant difference. For 505 patients with these NMSCs, lesions were larger than 5.0 cm in the skin – that is, they should have been easy to diagnose, rather than have a late-stage diagnosis with consequent increased mortality. In relation to melanoma, there was a very important difference in the number of late diagnoses (27.3% v 3.3%).

Skin cancer prevention initiatives are highly cost effective and may also be cost-saving. There is a significant cost burden of skin cancer for many countries, and health expenditure for this disease will grow as incidence increases. Public investment in skin cancer prevention and early detection programs show strong potential for health and economic benefits<sup>21</sup>. A cost-effectiveness evaluation of the Australian SunSmart program demonstrated a reduced burden of disease and high cost-effectiveness<sup>22</sup>.

Opportunistic screening for skin cancer for the general population has insufficient evidence to support its practice since it does not provide a reduction in the overall mortality of the screened population<sup>6</sup>. It is indicated for the high risk population: Fitzpatrick I and II skin type men and women older than 65 years, atypical moles, more than 50 moles, a personal history of melanoma or a

strong family history of melanoma<sup>23,24</sup>. The MU provides assistance to remote communities of patients previously selected by a local health team, while performing a punctual actions like small surgeries, and some longitudinal actions, such as cancer

education training for health professionals in these communities.

With the aim to improve this prevention program, the BCH initiated a skin cancer screening modality through teledermatology in 2014. Its methodology and results will be published soon.

**Table 4: Clinical stage of skin cancer, Barretos Cancer Hospital Registry, 2004–2013**

Diagnosis	Clinical stage (n(%))					
	0	1	2	3	4	X
Non-melanoma	1570 (4.6)	28.120 (82.7)	1858 (5.5)	452 (1.3)	53 (0.1)	1945 (5.7)
Melanoma	204 (12.7)	421 (26.1)	270 (16.8)	198 (12.3)	242 (15.0)	275 (17.0)

## Conclusions

This study demonstrated a significant number of skin cancer cases

diagnosed and treated by the MU, showing that the MU positively contributes to the early diagnosis and treatment of skin cancer among populations residing in remote areas of Brazil.

## REFERENCES:

- Rogers HW, Weinstock MA, Feldman SR, Coldiron BM. Incidence estimate of nonmelanoma skin cancer (keratinocyte carcinomas) in the U.S. population, 2012. *JAMA Dermatology* 2015; **151(10)**: 1081-1086. <https://doi.org/10.1001/jamadermatol.2015.1187> PMID:25928283
- American Cancer Society. *Cancer facts and figures*. 2016. Available: <https://www.cancer.org/research/cancer-facts-statistics/all-cancer-facts-figures/cancer-facts-figures-2016.html> (Accessed 17 March 2016).
- National Cancer Institute. *Skin cancer*. [in Portuguese]. 2016. Available: <http://www.inca.gov.br/estimativa/2016/estimativa-2016-v11> (Accessed 20 March 2016).
- National Cancer Institute. *Cancer stat facts: melanoma of the skin*. 2018. Available: <https://seer.cancer.gov/statfacts/html/melan.html> (Accessed 29 July 2018).
- Mohan SV, Chang AL. Advanced basal cell carcinoma: epidemiology and therapeutic innovations. *Current Dermatology Reports* 2014; **3**: 40-45. Available: <https://doi.org/10.1007/s13671-014-0069-y> (Accessed 24587976).
- U.S. Preventive Services Task Force. *Screening for skin cancer*. 2016. Available: <https://www.uspreventiveservicestaskforce.org/Home/GetFileByID/2778> (Accessed 25 March 2017).
- Bulliard JL, Levi F, Panizzon RG. The 2003 'Solmobile' prevention campaign for skin cancers of the Swiss League against cancer: results and stakes. [in French]. *Revue Médicale Suisse* 2004; **124(4)**: 237-240.
- Lions Cancer Institute. *The Lions Cancer Institute's screening program*. 2016. Available: <http://www.lionscancerinstitute.org.au> (Accessed 17 March 2016).
- Mauad EC, Silva TB, Latorre MR, Vieira RA, Haikel RL, Jr, Vazquez VL, et al. Opportunistic screening for skin cancer using a mobile unit in Brazil. *BMC Dermatology* 2011; **11**: 12. <https://doi.org/10.1186/1471-5945-11-12> PMID:21645347
- Ramos MC. *Profile of dermatologists in Brazil: final report*. [in Portuguese]. Rio de Janeiro: Brazilian Dermatology Society, 2003.
- Regional Council of Medicine of the State of São Paulo. *The concentration of physicians in the State of São Paulo increased*. [in Portuguese]. 2010. Available: [http://www.cremesp.org.br/pdfs/medico\\_por\\_habitantes.pdf](http://www.cremesp.org.br/pdfs/medico_por_habitantes.pdf) (Accessed 26 May 2012).
- Scheffer M. Beyond the Mais Medicos (More Doctors) Program. *Ciência & Saúde Coletiva* 2016; **21(9)**: 2664-2666. <https://doi.org/10.1590/1413-81232015219.07582016> PMID:27653049
- Galvão JAC. Notes on colonization in Mato Grosso from 1940 to 1980. [in Portuguese]. Thesis. Cuiabá, Brazil: University of Mato Grosso State, 2012.
- Silva FDS, Salvador MA. *Analysis of temperature anomalies in the year 2015*. [in Portuguese]. 2016. Available: [http://www.inmet.gov.br/portal/notas\\_tecnicas/nota\\_tecnica\\_temperaturas\\_2015.pdf](http://www.inmet.gov.br/portal/notas_tecnicas/nota_tecnica_temperaturas_2015.pdf) (Accessed 5 May 2016).
- Brazilian Institute of Geography and Statistics. *Population distribution map 2000*. [in Portuguese]. 2016. Available: [http://www.ibge.gov.br/home/geociencias/geografia/mapas\\_doc1.shtm](http://www.ibge.gov.br/home/geociencias/geografia/mapas_doc1.shtm) (Accessed 5 May 2016).
- Fitzpatrick TB. The validity and practicality of sun-reactive skin types I through VI. *Archives of Dermatology* 1988; **124(6)**: 869-871. <https://doi.org/10.1001/archderm.1988.01670060015008> PMID:3377516
- Courrege ML. Sun exposure and skin cancer are important issues in agricultural health. *North Carolina Medical Journal* 2012; **73(6)**: 516.
- Rushton L, Hutchings SJ. The burden of occupationally-related cutaneous malignant melanoma in Britain due to solar radiation. *British Journal of Cancer* 2017; **116(4)**: 536-539. <https://doi.org/10.1038/bjc.2016.437> PMID:28095395
- Santos MIG. Health tourism in Barretos: a consequence of inequality in the distribution of equipment for the treatment of cancer in Brazil. [in Portuguese]. Thesis. Brasília: University of Brasília, 2014.
- Sullivan R, Alatisse OI, Anderson BO, Audisio R, Autier P, Aggarwal A, et al. Global cancer surgery: delivering safe,

affordable, and timely cancer surgery. *Lancet Oncology* 2015;

**16(11)**: 1193-1224. <https://doi.org/10.1016>

/S1470-2045(15)00223-5

**21** Gordon LG, Rowell D. Health system costs of skin cancer and cost-effectiveness of skin cancer prevention and screening: a systematic review. *European Journal of Cancer Prevention* 2015;

**24(2)**: 141-149. <https://doi.org/10.1097/CEJ.0000000000000056>

PMid:25089375

**22** Shih ST, Carter R, Sinclair C, Mihalopoulos C, Vos T. Economic evaluation of skin cancer prevention in Australia. *Preventive Medicine* 2009;

**49(5)**: 449-453. <https://doi.org/10.1016>

[/j.jpmed.2009.09.008](https://doi.org/10.1016/j.jpmed.2009.09.008) PMid:19747936

**23** Fears TR, Gerry D, 4th, Pfeiffer RM, Sagebiel RW, Elder DE, Halpern A, et al. Identifying individuals at high risk of melanoma: a practical predictor of absolute risk. *Journal of Clinical Oncology* 2006;

**24(22)**: 3590-3596. <https://doi.org/10.1200>

/JCO.2005.04.1277 PMid:16728488

**24** Banky JP, Kelly JW, English DR, Yeatman JM, Dowling JP.

Incidence of new and changed nevi and melanomas detected using baseline images and dermoscopy in patients at high risk for melanoma. *Archives of Dermatology* 2005;

**141(8)**: 998-1006.

<https://doi.org/10.1001/archderm.141.8.998> PMid:16103329

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