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Impact of COVID-19 Pandemic on Cancer-Related Hospitalizations in Brazil

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Abstract

Background: Alongside the SARS-CoV-2 (COVID-19) pandemic, Brazil also faces an ongoing rise in cancer burden. In 2020, there were approximately 592 000 new cancer cases and 260 000 cancer deaths. Considering the heterogeneities across Brazil, this study aimed to estimate the impact of the COVID-19 pandemic on cancer-related hospital admissions at a national and regional level.

Methods: The national, regional, and state-specific monthly average of cancer-related hospital admission rates per 100 000 inhabitants and 95% confidence intervals (95% CIs) were calculated from March to July (2019: pre-COVID-19; and 2020: COVID-19 period). Thematic maps were constructed to compare the rates between periods and regions.

Results: Cancer-related hospital admissions were reduced by 26% and 28% for clinical and surgical purposes, respectively. In Brazil, the average hospitalization rates decreased from 13.9 in 2019 to 10.2 in 2020 per 100,000 inhabitants, representing a rate difference of −3.7 (per 100,000 inhabitants; 95% CI: −3.9 to −3.5) for cancer-related (clinical) hospital admissions. Surgical hospital admissions showed a rate decline of −5.8 per 100,000 (95% CI: −6.0 to −5.5). The reduction in cancer-related admissions for the surgical procedure varies across regions ranging between −2.2 and −10.8 per 100 000 inhabitants, with the most significant decrease observed in the south and southeastern Brazil.

Conclusions: We observed a substantial decrease in cancer-related hospital admissions during the COVID-19 pandemic with marked differences across regions. Delays in treatment may negatively impact cancer survival in the future; hence, cancer control strategies to mitigate the impact are needed.

Keywords

coronavirus, COVID-19, cancer, Brazil, SUS, hospital admission

Background

The first case of SARS-CoV-2 (COVID-19) in Latin America was confirmed on February 26, 2020 in São Paulo, Brazil.[1-4] Since then, the number of COVID-19 cases and deaths remained high, which has made the country an epicenter of the pandemic; until March 2021, more than 12 million cases and 300 000 deaths were reported (https://covid.saude.gov.br/). In addition to the concerns about the COVID-19 pandemic, Brazil continues to face an epidemic from the rising cancer burden estimated to cause 592 000 new cases and 260 000 cancer deaths in 2020.[5]

Brazil is a country with a continental proportion covering 211 million inhabitants or 3% of the global population. The

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heterogeneity of socioeconomic and health care resources across the country leads to a differential impact of the COVID-19 pandemic in many dimensions from disease transmission,[6] the impact or control of COVID-19, and measures on cancer. A recent global collaborative study comprising 356 oncological institutions from 54 countries, including 13 Brazilian institutions, showed a reduction of the usual cancer care level in 88% of these institutions. More than half declared COVID-19 control measure as the cause for the disruption, while 20% indicated that it was due to an overwhelmed system, 19% to lack of personal protective equipment, 18% to staff shortage, and 10% to lack access to medications.[7]

Population-based data have shown increasing evidence on the negative impact of COVID-19 in cancer diagnosis and management, especially from high-income countries.[8-10] Yet, such information is lacking in low- and middle-income countries. In such settings, a more considerable impact on cancer care services is expected due to the already overwhelmed health care system and significant shortages of resources and health care personnel.[11] Considering the heterogeneities in population size and resources across Brazil, this study aimed to estimate the impact of the COVID-19 pandemic in cancer-related hospital admissions at a national and regional level in Brazil.

Methods

This retrospective population-based study evaluated cancer-related hospital admissions recorded by Brazil's National Public Health System (Sistema Único de Saúde - SUS). Created in 1990, the SUS have as key ethical principles: universality of access, equity, and comprehensive care. Hospital Admission Authorization (Autorização de Internação Hospitalar - AIH) is a nation-wide database recording the hospital admission to monitor the health's system productivity that is publicly published by the Department of Informatics at the Public Health System website (DATASUS, http://tabnet.datasus.gov.br).[12] The aggregated data were extracted from the AIH for the same period in 2019 and 2020 (March to July), pre- and COVID-19 period. SUS classify hospital admission as the health care provided to an individual for clinical or surgical reasons that require hospital admission and utilization of a hospital bed for a period equal to or greater than 24 hours. Data on cancer-related hospital admissions, at any treatment or disease phase, were available for clinical purposes, for example, chemotherapy or radiotherapy and for surgical procedures excluding biopsy. We also reported COVID-19-related hospital admission from the same database. The estimated population data were obtained from the Brazilian Institute of Geography and Statistics (IBGE, Supplementary Table 1).[13] All data are available by five Brazilian regions: north, northeast, midwest, southeast, and south, and by 26 states and one Federal District (Distrito Federal, Supplementary Table 1).[13]

The monthly average hospital admission rates per 100 000 inhabitants were calculated by period (pre-COVID-19 and COVID-19 period) and for the country, region, and Brazilian state. The 95% confidence intervals (95% CIs) were computed for rates and rate differences (RD).[14,15] The geographical comparison of hospital admission rates was made by thematic maps built-in QGIS software version 3 × 10.[16] The cartographic base was obtained from the IBGE.[13]

Results

In Brazil, from March to July 2019 (pre-COVID-19), there were 145 684 clinical oncology hospital admissions recorded and 212 459 surgical cancer-related hospital admissions. In the COVID-19 period (March to July 2020), the number of hospitalizations was 108 017 and 153 119 for clinical and cancer-related surgical hospital admissions, respectively, and 246 881 COVID-19-related hospital admissions (Table 1). These estimates represented a hospital admissions reduction of 26% for clinical cancer treatment and 28% for surgical cancer treatment. As for COVID-19-related hospital admissions, 246 881 admissions were reported with a rate of 23.3 per 100,000 inhabitants, ranging from 31.4 in the northern region to 14.7 per 100 000 inhabitants in the southern region.

Figure 1 shows the monthly average rate (per 100.000) of COVID-19-related and cancer-related hospital admissions in the pre- and COVID-19 period. For the nation-wide comparison between 2019 and 2020, the average hospitalization rates for clinical oncology purposes decreased from 13.9 (95% CI: 13.7 to 14.0) to 10.2 (95% CI: 10.1 to 10.3) per 100,000 inhabitants, respectively, representing a rate difference of −3.7 (per 100,000 inhabitants; 95% CI: −3.9 to −3.5). The rate differences were higher in the south, declining from 24.4 to 17.5 per 100,000 (RD: −7.0, 95% CI: −7.7 to −6.2) and the southeast declining from 15.0 to 11.0 per 100,000 (RD: −4.1, 95% CI: −4.1 to −3.7). Cancer-related surgical hospital admissions showed a rate decline by −5.8 point (95% CI: −6.0 to −5.5), where a rate of 20.2 per 100,000 was observed during the pre-pandemic period decreasing to 14.5 per 100 000 during the COVID-19 period. Similar to clinical hospital admission, a larger decrease was observed in the south region with a rate difference of −10.8 (95% CI: −11.7 to −10.0), followed by the southeast region with a RD of −5.9 (95% CI: −6.3 to −5.5).

In general, comparing the pre- and COVID-19 period, we observed a reduction in cancer-related hospital admissions in all states (Figure 2). However, the decline in cancer-related hospital admissions between 2019 and 2020 was slightly more pronounced for surgical treatment, ranging from −.3 to −13.1 monthly hospitalizations per 100 000 across the states in Brazil (Figure 2, Supplementary Table 2).

Table 1. Numbers and rates (per 100 000 inhabitants) of cancer-related hospitalizations in pre- (March to July 2019) and COVID-19 period (March to July 2020) by regions and type of hospital admissions.

	March–July 2019			March–July 2020			
	Pre-COVID-19			COVID-19 period			
	N	Average monthly	Rate per 100.000 (95% CI)	N	Average monthly	Rate per 100.000 (95% CI)	Rate difference (95%CI)
Clinical cancer-related hospital admissions							
Brazil	145 684	29 137	13.9 (13.7,14.0)	108 017	21 603	10.2 (10.1,10.3)	−3.7 (−3.9,-3.5)
North region	5379	1076	5.8 (5.5,6.2)	4069	814	4.4 (4.1,4.7)	−1.5 (−1.9,-1.0)
Northeast region	28 761	5752	10.1 (9.8,10.3)	21 494	4299	7.5 (7.3,7.7)	−2.6 (−2.9,-2.2)
Southeast region	66 432	13 286	15.0 (14.8,15.3)	48 812	9762	11.0 (10.8,11.2)	−4.1 (−4.4,-3.7)
South region	36 636	7327	24.4 (23.9,25.0)	26 395	5279	17.5 (17.0,18.0)	−7.0 (−7.7,-6.2)
Midwest region	8476	1695	10.4 (9.9,10.9)	7247	1449	8.8 (8.3,9.2)	−1.6 (−2.3,-1.0)
Surgical cancer-related hospital admissions							
Brazil	212 459	42 492	20.2 (20.0,20.4)	153 119	30 624	14.5 (14.3,14.6)	−5.8 (−6.0,-5.5)
North region	7379	1476	8.0 (7.6,8.4)	5391	1078	5.8 (5.4,-6.1)	−2.2 (−2.8,-1.7)
Northeast region	42 689	8538	15.0 (14.6,15.3)	29 277	5855	10.2 (9.9,-10.5)	−4.8 (−5.2,-4.3)
Southeast region	95 230	19 046	21.6 (21.2,21.9)	69 567	13 913	15.6 (15.4,-15.9)	−5.9 (−6.3,-5.5)
South region	54 408	10 882	36.3 (35.6,37.0)	38 438	7688	25.5 (24.9,-26)	−10.8 (−11.7,-10.0)
Midwest region	12 753	2551	15.7 (15.1,16.3)	10 446	2089	2.7 (12.1,-13.2)	−3.0 (−3.8,-2.2)
COVID-19-related hospital admissions							
Brazil	—	—	—	246 881	49 376	23.3 (23.1,23.5)	—
North region	—	—	—	29 323	5865	31.4 (30.6,32.2)	—
Northeast region	—	—	—	75 896	15 179	26.5 (26.0,26.9)	—
Southeast region	—	—	—	103 169	20 664	23.2 (22.9,23.5)	—
South region	—	—	—	22 219	4444	14.7 (14.3,15.2)	—
Midwest region	—	—	—	16 274	3255	19.7 (19.1,20.4)	—

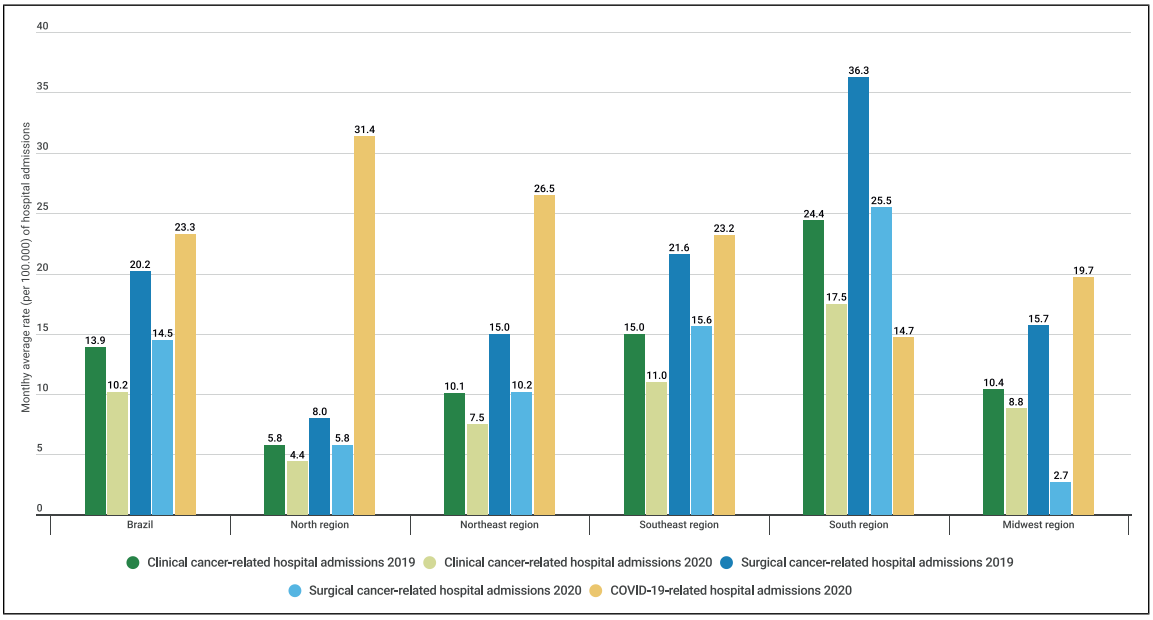

Figure 1. Monthly average rate (per 100.000) of cancer-related and COVID-19-related hospital admissions in pre- (March to July 2019) and COVID-19 period (March to July 2020).

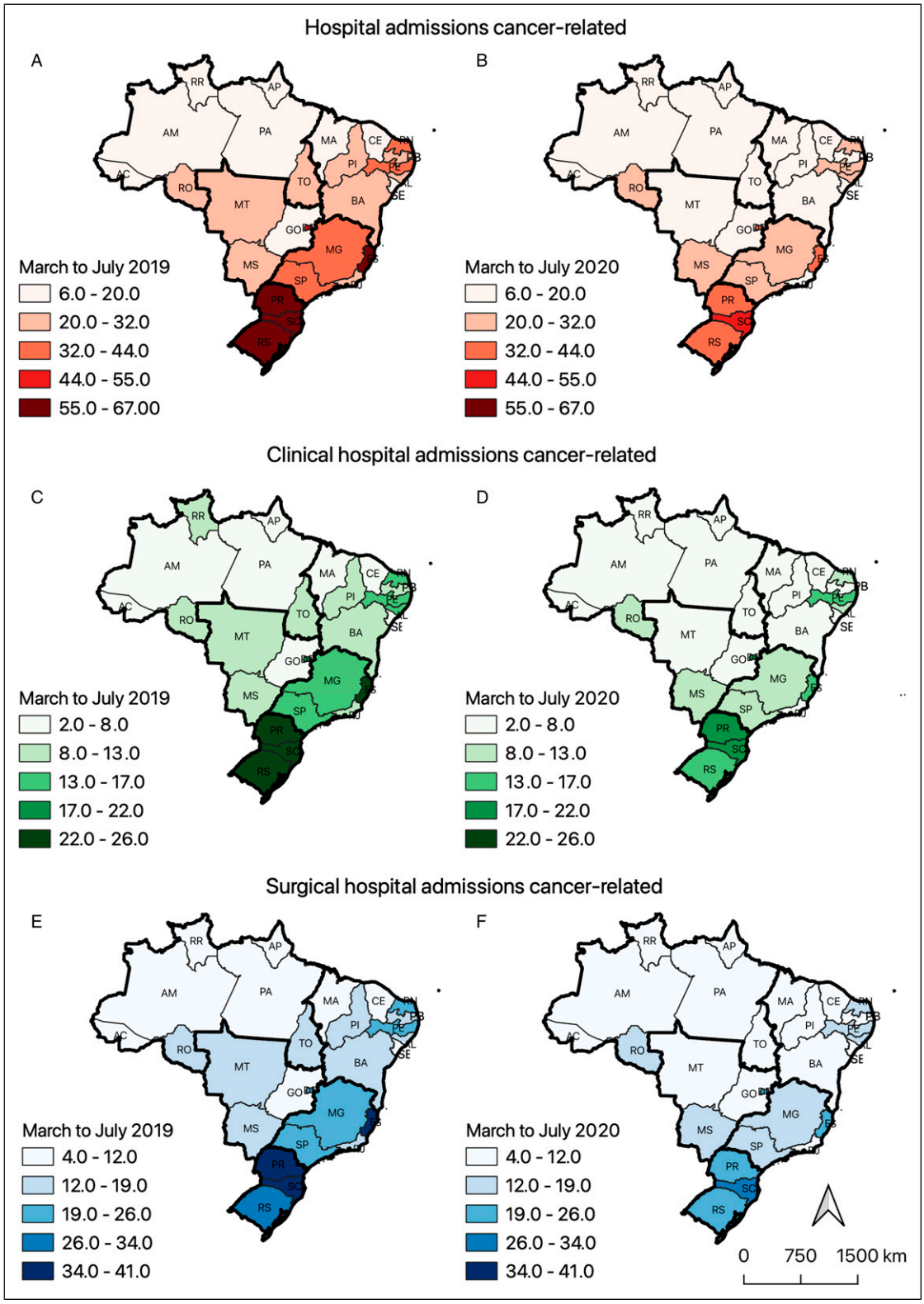

Figure 2. Cancer-related hospital admission rate (per 100 000 inhabitants) from March to July 2019 and 2020 for cancer-related hospital admission rates (A, B), clinical cancer-related hospital admission rates (C, D), and surgical cancer-related hospital admission rates (E, F). Bold black lines show the limits of the regions in Brazil.

Discussion

Like other countries, Brazil has witnessed unprecedented challenges in consequence of the COVID-19 pandemic. Due to the country's dimension and socioeconomic inequalities, a non-uniform peak of the virus incidence was observed, with the Brazilian regions going through different stages of the pandemic simultaneously. In 2020, Brazil became an epicenter of the pandemic, resulting to immediate implementation of various virus control strategies, including social distancing measures and health care prioritization plans.[17] Restrictive measures were imposed by the authorities at the municipal or state level,[18-22] regulating various establishments. There was no official regulation concerning cancer diagnosis, screening, and management during the pandemic in Brazil.

This study set out to assess the impact of the COVID-19 pandemic on cancer-related hospital admissions in Brazil. We found a marked decrease in the hospital admission rates in March–July 2020 (during COVID-19 pandemic) compared to the same period in 2019 (pre-COVID-19). The reduction was slightly more pronounced for cancer-related surgical hospital admissions than for clinical treatment purposes. This reduction was observed in all Brazilian regions; however, a larger decline in cancer-related hospital admissions was found in the south and southeast regions. This is in contrast to the larger hospital admission related to COVID-19, which was relatively smaller in these two regions than the other Brazilian regions. The decrease in hospital admissions can be explained by several factors such as social isolation, reduced public transport, the patient's fear of being contaminated with the virus, postponement of appointments, cancellation of elective procedures, the risk of interruption of the drug supply chain, deviation of health professionals specialized in oncology to work on the front line against the virus, and resources redirected to support the care of infected patients to avoid a complete health system collapse, among others.[7,23]

In other Latin American countries, the COVID-19 pandemic and its consequences, such as social distancing measures and economic crisis, have also affected all phases of the cancer continuum. Vazquez Rosas and colleagues[24] found a significant reduction in the number of first-time visits to oncology services in 2020 as compared to 2019, which ranged from −28% to −38%, and cancer surgery, which ranged from −28% to −70% across Latin American countries. Similarly, other cancer services such pathology evaluations, chemotherapy, and cancer screening tests have also showed a decrease.

A recent review has shown a marked impact on cancer treatment delay resulting in increased mortality; for example, each 4-week delay in surgical treatment increases mortality risk by 1.06 to 1.08.[25] Another study based on a modeling approach in Canada suggested that as many as 13 000 people could be affected by a delay in access to cancer surgery over the first three months of the pandemic, impacting patients' long-term outcomes.[26] It is also possible that the delay in cancer surgery by diverting surgical-related resources to COVID-19, without considering its implications, may ultimately cost more lives.[26] The need for reallocation of financial resources, equipment, and health care providers, in addition to the social distancing concerns, led to the suspension of elective and surgical procedures worldwide, including from the oncological routine.[27] As such, Brazilian oncologists had to balance cancer care with precautionary measures to minimize patients' risk of exposure to a life-threatening infection.[17,28]

We also observed a marked difference in the cancer-related hospital admission rates by regions comparing the pre- and COVID-19 period. Brazil's southern and southeastern regions had markedly higher rates of cancer-related hospital admissions (both for clinical and surgical purposes) than the north and northeast regions. The north region was one of the first regions to have a peak incidence of COVID-19 and experienced a collapse of the health system. Essentially, the north and northeast regions have fewer economic resources than other regions. Even before the pandemic, inequality in many aspects of health across regions in Brazil was already observed. For example, the number of physicians per inhabitants varies by states ranging from a reported 4.4 per 1000 inhabitants in the federal capital of Brazil compared to .87 per 10 000 inhabitants in Maranhão in north of Brazil.[29] This gap can be severely aggravated by the unprecedented health crisis caused by the COVID-19 pandemic.[30-32] Taking the Brazilian context into a wider perspective, low- and middle-income countries (as compared to high income countries) are likely to have higher negative impacts on cancer care services due to a significant shortage of resources and health care personnel.[11,33]

Moreover, there is long-standing evidence of the inequality in hospital capacity across the regions in Brazil in terms of health infrastructure. A recent analysis reported that the median number of hospital beds in Brazil is 19 per 10 000, but 5% of the north's micro-regions have only six beds per 10 000.[32] The COVID-19 pandemic has also raised concerns on socioeconomic inequality in cancer outcome.[34,35] This pandemic may further widen the inequality in cancer outcomes unless policies at the local, state and national levels are implemented to promote equitable access to a high quality of health care.

This population-based study used nationwide and established datasets, showing a representative description of cancer-related hospital admissions in Brazil. Yet, due to the nature of the study design, it is impossible to assume a causal effect with the COVID-19 pandemic. It is also not possible to estimate the impact on cancer outcome. However, the negative impact of the pandemic on cancer care has been reported before.[36] Brazilian national health system has 2 branches, SUS and supplementary health sector, that include private health plans, insurance, and private health professionals. In this study was unable to access hospitalization from supplementary health sector. Thirty percent of Brazil's population is covered by supplemental health sector, and the proportion varied between 15% and 37% in the north and south region of Brazil,

respectively.[13] Furthermore, we also could not adjust the rates by age which is an important determinant of cancer-related hospitalization and also COVID-19 hospitalization.[37] Although our study is based on a single country for a short period and does not warrant age-adjustment, the age structure between Brazilian regions varies substantially, with a life expectancy of 78 years at birth in the south to 73 years in the north of Brazil.[13] Finally, it is also important to note that the present study was performed using data from the early phase of the COVID-19 pandemic, before the introduction of population-wide testing and vaccination. From April 2021 (the second wave of COVID-19 in Brazil) more than 4000 daily deaths were recorded[38] with crowded intensive care units and major shortage of basic supplies to treat patients with COVID-19. Studies to assess the disruptions on cancer services and impact on patient with cancer are therefore needed.

In conclusion, we observed a quarter decrease in cancer-related hospital admissions during the COVID-19 pandemic. This decrease may have negative effects on cancer survival and cancer mortality in a near future. Considering that the peak of the virus incidence remains high in all Brazilian regions beyond the end of this study period, the impact on cancer care is likely to be more pronounced today and should therefore be studied preferably using population-based data. As such, urgent health policy and strategies are needed to ensure continuity of cancer care, during and after the pandemic, to recover from the impact of the COVID-19 on cancer care across all Brazil.

Declaration of conflicting interests

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Informed Consent

This is a low-risk study, and there is no possibility of breach of data confidentiality and privacy of participants since the data are aggregated in their nature.

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Supplemental Material

Supplemental material for this article is available online.

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