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The potential of telemedicine in alleviating out-of-pocket costs for oncological patients in the Brazilian public healthcare system

O potencial da telemedicina em aliviar custos indiretos para pacientes oncológicos no sistema público de saúde brasileiro

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ABSTRACT

Despite the absence of data regarding direct costs for healthcare, oncological patients from the Brazilian Unified Public Healthcare System often face significant financial burden due to out-of-pocket costs associated with their treatment. These costs include expenses for transportation, meals, non-covered medications, and the time spent on medical visits, tests, and treatments. This paper used data previously collected from two studies conducted with oncological patients in different regions of Brazil. These studies evaluated out-of-pocket costs incurred by the patients when receiving care through the Brazilian Unified Public Healthcare System. We estimated that by removing transportation-related costs, OPC would be reduced by 62% (95%CI: 57%-67%) in the southeast region and 60% (95%CI: 56%-64%) in the northeast region. This reduction was statistically significant in both regions (p<0.0001). We conclude that substituting regular face-to-face visits with telemedicine, whenever possible, can significantly decrease OPC for patients and potentially contribute to higher treatment adherence among underserved populations.

Keywords: Telemedicine; Cancer care facilities; Health expenditures; Unified health system; Economics, Pharmaceutical.

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RESUMO

Apesar da ausência de dados sobre custos diretos para a saúde, os pacientes oncológicos do Sistema Único de Saúde do Brasil muitas vezes enfrentam encargos financeiros significativos devido aos custos indiretos associados ao seu tratamento. Esses custos incluem despesas com transporte, alimentação, medicamentos não cobertos e tempo gasto em consultas médicas, exames e tratamentos. Este artigo utilizou dados previamente coletados de dois estudos realizados com pacientes oncológicos em diferentes regiões do Brasil. Esses estudos avaliaram os custos indiretos incorridos pelos pacientes ao serem atendidos pelo Sistema Único de Saúde. Estimamos que, ao eliminar os custos relacionados ao transporte, o custo indireto seria reduzido em 62% (IC95%: 57%-67%) na região Sudeste e em 60% (IC95%: 56%-64%) na região Nordeste. Essa redução foi estatisticamente significativa em ambas as regiões (p<0,0001). Concluímos que a substituição de visitas presenciais regulares pela telemedicina, sempre que possível, pode diminuir significativamente o custo indireto para os pacientes e potencialmente contribuir para uma maior adesão ao tratamento entre as populações carentes.

Descritores: Telemedicina; Instalações de tratamento do câncer; Despesas com saúde; Sistema único de saúde; Economia, Farmacêutica.

INTRODUCTION

In Brazil, before the 1990s, access to healthcare was only guaranteed to individuals with private insurance or social security. In this regard, the Unified Public Healthcare System (SUS) was implemented based on the first principle of universal care for the entire population.[1] It is estimated that the SUS serves three-quarters of the Brazilian population.[2] However, only direct costs of treatments are covered by the SUS.

Out-of-pocket costs (OPC) are non-reimbursable expenses such as medications uncovered by insurance, transportation, and meals as well as time spent on medical visits, tests, and procedures.[3] Oncological patients receiving treatment through SUS face significant financial burden due to the OPC they must bear, considering the need for recurring consultations, examinations and procedures. These costs can consume a substantial portion of their income, with reports suggesting that patients may spend as much as 78% of the minimum wage to cover OPC.[4] Recent data indicates that approximately two-thirds of workers in Brazil earn an income of up to one minimum wage.[5] Furthermore, OPC can contribute to increased patient distress.[6]

The emergence of the COVID-19 pandemic has accelerated the adoption of telemedicine,[7] and has presented an opportunity to indirectly address these challenges. A recent study demonstrated the minimal impact of physical examination on changing oncological management. This finding further reinforces recommendations from international oncological societies that support the use of telemedicine for patients in follow-up and for those who are clinically asymptomatic.[8] The aim of this study is to explore the potential benefits of telemedicine in reducing OPC for oncological patients, thereby alleviating financial strain and potentially improving treatment compliance.

MATERIAL AND METHODS

We previously conducted two separate prospective studies to evaluate OPC incurred by oncological patients receiving treatment through the SUS at different time points and regions in Brazil.[2,5] To calculate the potential savings resulting from the adoption of telemedicine, we deducted transportation-related costs from the total monthly OPC incurred by each patient. The value of the time spent by patients was estimated based on the minimum wage and a standard 40-hour working week. Each hour spent by patients on transportation was considered as 1/40th of the minimum wage in value. This study considered all patients potentially eligible for telemedicine.

Consequently, we deducted the direct costs associated with transportation and the time spent commuting from the total OPC. To avoid confounding factors such as inflation, due to the different timing of both studies, and the diverse cost of living expenses in both areas of the country, we calculated the percentages of total costs without transportation-related expenses in relation to total costs including commuting expenses for both studies.

We used paired t-tests to evaluate the significance of the difference between total OPC and OPC without transportation-related costs. All statistical calculations were performed using Graph Prism software.

RESULTS

The clinical and pathological characteristics of the patients were previously reported in both studies.[4,9] One study evaluated 57 patients in the ABC region near São Paulo[9] while the other included 112 patients from the northeastern state of Maranhão.[4] Both studies encompassed a diverse range of adult patients with solid tumors from both genders who were treated under the Unified Health System (SUS). The average age was 57 years for the study conducted in ABC and 55 years for the study conducted in Maranhão.[4,9]

We estimated that by deducting transportation costs, out-of-pocket expenses (OPC) would decrease by 62% (95%CI: 57%-67%) in the ABC region and 60% (95%CI: 56%-64%) in the Maranhão region. These differences were highly statistically significant (p<0.0001 for both). These findings suggest potential cost savings of approximately 40% for patients receiving SUS treatment.

Clinical characteristics of the two populations included in the papers by Araújo et al. (2020)[4] and Zaremba et al. (2016)[9] as well as a summary of the outpatient costs involved in both are found in Table 1.

We conducted a very simple sensitivity analysis to estimate the difference of the percentage of savings of OPC costs for both regions with various telemedicine uptakes. We assumed that the increase of telemedicine uptake would linearly increase the savings up to the limits of calculated savings for each region and that would vary in proportion to the hours saved, i.e., 100% of transportation and 50% in consultation times.

For the Maranhão region,[4] the current OPC decrease due to telemedicine uptake was 60% (95%CI: 56%-64%) and current transportation time and consultation time: 9.89 hours. Whereas for the ABC region,[9] the OPC decrease was 62% (95%CI: 57%-67%) and current transportation time and consultation time: 8,94 hours. Parameters from Araújo et al. (2020)[4] and Zaremba et al. (2016)[9] show an average total cost (calculated by summing time and money spent) of R$747.92 and R$470,03, respectively, both of which represent more than 50% of the minimum wage in the country.

The OPC savings calculated for each telemedicine uptake percentage are found in Table 2.

Table 1. Summary of the results obtained by Araujo *et al* [4] and Zaremba *et al* [9].

Parameter:	Araujo *et al* [4]	Zaremba *et al* [9]
Number of patients	110	57
Gender (percentage of females)	62.73%	61.4%
Mean age (years)	55.45	57.54
Most common neoplasia types	GI[a] (42.73%) GU[b] (20.91%)	GI (31.91%) Breast (27.66%)
Stage 4 patients (percentage)	58.19%	37.21%
Average time spent on:		
Transportation (hours/month)	7.62	7,60
Consultations (hours/month)	2.64	2.87
Average total costc	R$ 747.92	R$ 470.03
Percentage of minimum wage (Brazil)	78.40%	59,64%

[a] GU: Genitourinary
[b] GI: Gastrointestinal
[c] Calculated by the sum of time and money spent.

Table 2. Differences in Out-of-Pocket Costs (OPC) savings outcomes in ABC and Maranhão regions associated with increased use of telemedicine.

Telemedicine Uptake (%)	ABC Region (OPC Savings)	Maranhão Region (OPC Savings)
0%	0.0%	0.0%
25%	15.5%	15.0%
50%	31.0%	30.0%
75%	46.5%	45.0%
100%	62.0%	60.0%

OPC: Out-of-Pocket Costs.

DISCUSSION

Telemedicine allows cancer patients living in remote areas access to specialists even if they are physically distant from oncology centers of excellence. This is particularly beneficial in a country as vast as Brazil, characterized by continental dimensions and a heterogeneous distribution of population. Furthermore, telemedicine has the potential to save time and, consequently, money on travel and also on indirect costs associated with lost workdays.[10]

In addition to benefiting individual oncological patients, telemedicine can also alleviate costs for the public healthcare system as a whole. By reducing the need for in-person visits, tests, and hospitalizations, telemedicine can optimize the use of limited resources. This is particularly relevant in public healthcare systems where resources are often scarce. By reducing the burden on hospitals and clinics, telemedicine can direct these resources towards patients with more urgent needs, improving overall efficiency and quality of care.[11]

In this study, we estimated the potential benefits of integrating telemedicine into the oncological care provided by the SUS. By using telemedicine, patients can avoid direct costs associated with transportation and the time lost in commuting, leading to substantial savings. Our findings align with Patel et al. (2023)[12] who evaluated 25,496 telehealth visits and calculated the cost savings for patients related to direct expenses associated with transportation and time spent commuting, ranging from US$141.10 to US$178.10 per visit. For many patients, physical examinations by oncologists do not significantly alter treatment management,[8] thus making virtual encounters an effective and efficient alternative to face-to-face visits. Moreover, the potential savings can be further increased if we include transportation costs incurred by caregivers.

However, it must be taken into account that this study's result for the estimated savings produced by telemedicine overestimates the real value obtained as the uptake of Telemedicine can never be 100% as assumed for the analysis. Furthermore, our study has an important limitation as it relies on cost data from two past studies, albeit with highly comparable estimates. To validate our estimates, a prospective study is needed to compare the costs incurred by patients using telemedicine simultaneously with those who do not. Additionally, we need to assess whether the costs of the implementation and continuous use of telemedicine will lead to overall cost savings for the SUS.

A prospective study can also evaluate the role of telemedicine in remote monitoring and symptom management of oncological patients. Through portable devices and health applications, patients can report their symptoms and receive guidance from healthcare professionals without the need for frequent hospital visits. This not only increases convenience for patients but also reduces costs associated with in-person consultations. Additionally, remote monitoring can detect complications or treatment side effects early, enabling prompt intervention and avoiding unnecessary hospitalizations.[13]

Despite the advantages of telemedicine, its implementation also presents challenges and limitations. One critical aspect to consider is the security of data, particularly when dealing with sensitive medical information of oncology patients. It is imperative to establish and enforce appropriate security measures to ensure data privacy and confidentiality, ensuring that the transmission and storage of information are conducted securely.[14] In addition, the implementation and maintenance of a telemedicine platform come with associated costs which should be deducted from the amount saved by reducing in-person visits. Our study did not account for this amendment.

For the ABC region[9] we only found significant correlations between OPC costs with younger age and the former with active treatment, whereas only in Maranhão region,[4] we found that patients from other locations besides the capital had higher costs. This might reflect that most of the patients treated at ABC Medical Foundation affiliated Hospitals live in the ABC region. We believe that these differences may preclude obtaining a generalizable conclusion regarding common factors related to higher OPC costs for both regions.

In conclusion, we found that telemedicine offers a promising solution to significantly reduce OPC for oncological patients receiving treatment through the SUS. By eliminating transportation costs and time, patients can experience significant financial relief, potentially improving treatment adherence and overall outcomes. The integration of telemedicine into the healthcare system can improve access to care, particularly for vulnerable populations. Further research and implementation efforts are needed to maximize the benefits of telemedicine and ensure its widespread adoption in the public health system.

AUTHORS' CONTRIBUTIONS

JFN	Conception and design, Data analysis and interpretation, Final approval of manuscript, Manuscript writing
PAJ	Conception and design, Data analysis and interpretation, Final approval of manuscript, Manuscript writing
JKLA	Collection and assembly of data, Data analysis and interpretation, Provision of study materials or patient
AG	Conception and design, Data analysis and interpretation, Final approval of manuscript, Manuscript writing, Provision of study materials or patient

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