Original Research
Oral Pathology

Delay in head and neck cancer care during the COVID-19 pandemic and its impact on health outcomes

Claudiane MAHL[a]
Luís Ricardo Santos de MELO[b]
Maria Helena Andrade ALMEIDA[b]
Catarina Sampaio CARVALHO[b]
Lois Lene Silva SANTOS[b]
Paula Santos NUNES[a]
Lucindo José QUINTANS-JÚNIOR[a]
Adriano Antunes de Souza ARAÚJO[a]
Victor Santana SANTOS[c]
Paulo Ricardo MARTINS-FILHO[a]

[a]Universidade Federal de Sergipe – UFS, Health Sciences Graduate Program, Aracaju, Sergipe, Brazil.

[b]Universidade Federal de Sergipe – UFS, Department of Nursing, Sergipe, Brazil.

[c]Universidade Federal de Alagoas, Centre for Epidemiology and Public Health, Arapiraca, Alagoas, Brazil.

Declaration of Interests: The authors certify that they have no commercial or associative interest that represents a conflict of interest in connection with the manuscript.

Corresponding Author:
Paulo Ricardo Martins-Filho
E-mail: martins-filho@ufs.br

https://doi.org/10.1590/1807-3107bor-2020.vol34.0126

Abstract: The coronavirus disease 2019 (COVID-19) outbreak has created unprecedent challenges for healthcare systems worldwide. Oncology services have been reorganized to decrease the risk of nosocomial acquisition of SARS-CoV-2, but changes in treatment pathways and follow-up cancer care can result in patients receiving suboptimal or delayed care. Herein, we describe a cross-sectional nested cohort study conducted to evaluate delays in care for patients with head and neck cancer (HNC) in post-treatment follow-up or palliative care during the COVID-19 pandemic in Northeast Brazil and its impact on health outcomes. Information was extracted from medical records and supplemented by telephone interviews. We compared the following health outcomes: self-perception of anxiety or sadness, fear of COVID-19 infection, cancer-related complications during social isolation, self-medication, diagnosis of COVID-19, and death between patients with and without delayed cancer care. The Mann-Whitney U test was used to compare distributions of continuous variables and the Fisher exact test was used for categorical variables. Thirty-one HNC patients were included in the study, and no case of confirmed SARS-CoV-2 was found. Delayed cancer care due to restriction in health services was reported in 58.1% of cases, and there was no report of telemedicine use during the COVID-19 outbreak. Cancer-related complications during the COVID-19 pandemic were described for most patients (67.7%) and included pain or discomfort, swelling, and dyspnea. Eight (25.8%) patients reported use of prescribed morphine or codeine to manage pain and six (19.4%) patients reported self-medication with over-the-counter (OTC) non-steroidal anti-inflammatory drugs (NSAIDs). We found an association between delayed HNC care and the use of self-medication ($p = 0.028$). This study indicated that patients with delayed HNC care during the COVID-19 outbreak are more likely to use self-medication with NSAIDs for pain management. Better strategies to follow HNC patients in socioeconomically disadvantaged communities need to be discussed and implemented.

Keywords: Head and Neck Neoplasms; Self Medication; COVID-19; SARS-CoV-2 Infection.

Submitted: August 27, 2020
Accepted for publication: November 4, 2020
Last revision: November 5, 2020

Introduction

The coronavirus disease 2019 (COVID-19) pandemic has created new challenges for healthcare systems worldwide. COVID-19 was first reported in Wuhan, China, in late December 2019 and rapidly spread worldwide resulting in unprecedented changes to clinical practice. These included the interruption of non-essential or elective in-hospital treatments, increasing the risk of potential adverse health complications.[1] During the COVID-19 pandemic, studies have discussed the management of routine cancer follow-up, especially among patients with head and neck cancer (HNC), due to the risk of the spread of SARS-CoV-2 during the daily trips to the hospital for radiation therapy and the increased susceptibility to infection associated with chemotherapy-induced immunosuppression.[2] Moreover, most patients with HNC are older adults and may have other underlying medical conditions associated with morbidity and mortality for COVID-19.[3]

Recent studies have indicated that the continuation of in-hospital treatment for patients with HNC can be performed safely with the use of appropriate workflow, personal protective equipment (PPE), cleaning measures to sanitize patient exam and treatment rooms, and pre-operative screening for SARS-CoV-2 infection for those undergoing surgery.[2,4,5,6] Delivering timely HNC care is increasingly recognized as critical to achieving optimal oncologic outcomes and delayed treatment may increase the risk of disease progression and death for these patients.[7]

It has been suggested that patients receiving post-treatment follow-up or palliative care should stay at home to avoid any visits to the hospital that are not strictly necessary. Remote follow-up using telemedicine to support post-treatment surveillance is to be preferred for non-essential medical visits whenever possible.[8] However, teleconsultation technologies are not widely available, especially in limited-resource settings, and provide a limited examination for cancer patients needing evaluation. Moreover, there is a paucity of observational studies regarding delays in follow-up consultations for HNC patients and potential outcomes during the COVID-19 pandemic, especially in respect of communities with large disparities in health provision. We hypothesized that delayed cancer care during the COVID-19 outbreak would be associated with worse outcomes. In this study, we evaluated the delay in care for HNC patients in post-treatment follow-up or palliative care during the COVID-19 pandemic in Sergipe state, Northeast Brazil, and its impact on health outcomes.

Sergipe is the smallest state (21 925 square kilometers) in Brazil with approximately 2.3 million residents and a Human Development Index (HDI) of 0.665. The first case of COVID-19 was reported on March 14, 2020 and by October 27, 2020 more than 83,000 cases of disease and 2184 deaths had been registered.[9] In addition, Sergipe has the highest incidence rate of oral cancer among women (5.89 cases per 100,000 women) and the seventh highest incidence among men (11.55 cases per 100,000 men) in the country.[10]

Methodology

This was a cross-sectional study nested in a cohort of patients with HNC treated in the Hospital de Urgência de Sergipe, which is the public hospital of reference for the treatment of cancer in Sergipe state, Northeast Brazil. Our cohort comprises patients who were diagnosed with HNC including oral cavity, pharynx, larynx and salivary gland cancers between August 2017 and August 2019 and were referred for oncologic treatment (surgery, radiotherapy, and/or chemotherapy) in this hospital. Of the 88 patients enrolled in this cohort, 33 were alive on January 1, 2020 and were followed until July 30, 2020. During this period, two were lost to follow-up. All the remaining patients were receiving post-treatment follow-up or palliative care at home. Information on all the patients included in this cross-sectional study were extracted from medical records and supplemented by telephone interviews.

In this study, we included data on demographic and socioeconomic characteristics, cancer staging according to the TNM classification (from early [I-II] to advanced tumor stage [III-IV]),[11] oncological treatment previous to the COVID-19 outbreak, underlying

medical conditions, number of household members, adherence to COVID-19 prevention and control measures, household contact with people tested positive for SARS-CoV-2 infection, use of telemedicine (defined as the provision of health care remotely via information and communications technology),[12] and delayed cancer care during the COVID-19 outbreak. Health outcomes included self-perception of anxiety and sadness, fear of COVID-19 infection, cancer-related complications during social isolation, self-medication, diagnosis of COVID-19, and death. Self-reported anxiety and sadness were assessed, respectively, using the following questions: "Are you nervous, uneasy, or anxious?" and "Are you sad or angry?". Self-medication was defined as the selection and individual use of medicines to alleviate symptoms related to cancer.[13]

Continuous variables were expressed as medians and interquartile range (Q1 - Q3). For the categorical variables, counts (n) and percentages (%) were used. We compared health outcomes between patients with and without delayed cancer care. Comparisons were also performed according to age, sex, marital status, income, and use of telemedicine for cancer care. The Mann-Whitney U test was used to compare distributions of continuous variables and the Fisher exact test for categorical variables. The significance level was set at 5%. Analyses were performed using JASP software version 0.13 (JASP Team, Amsterdam, Netherlands). This study was approved by the ethics committee of the Federal University of Sergipe, Brazil (reference number 68035317.3.0000.5546).

Results

Of the 31 HNC patients evaluated in this study, 24 (77.4%) were men, the median age was 55.0 years (44.5 – 69.5), most were not married (n = 17, 54.8%), had less than nine years of schooling (n = 26, 83.9%), and received a monthly income less than one Brazilian minimum wage (~192 USD) (n = 23, 74.2%). The median of household members was 3.0 (2.0–4.0). Patients had advanced-stage (III-IV) cancer and were treated with surgical resection plus radiotherapy (n = 1, 3.2%), or radiotherapy plus chemotherapy with (n = 14, 45.2%) or without (n = 16, 51.6%) surgical resection. Most cases were diagnosed in the oral cavity (n = 15, 48.4%) and pharynx (n = 8, 25.8%) and eight (25.8%) patients had underlying medical conditions including hypertension, diabetes, and heart disease. Delayed cancer care due to restrictions in the provision of health services was registered in 58.1% of cases (18 out of 31). There was no report of telemedicine use during the COVID-19 outbreak.

Cancer-related complications during the COVID-19 pandemic were described for most patients enrolled in this study (n = 21, 67.7%) and included pain or discomfort (n = 14), swelling (n = 9), and dyspnea (n = 5). Eight (25.8%) patients reported use of prescribed morphine or codeine to manage pain, and six (19.4%) patients reported use of self-medication with over-the-counter (OTC) non-steroidal anti-inflammatory drugs (NSAIDs). Twelve patients reported not wearing a face mask, 33.3% (4 out of 12) due to local pain or discomfort.

Three (9.7%) HNC patients reported household contact with people tested positive for SARS-CoV-2, but only one patient described symptoms suggestive of COVID-19 including cough and musculoskeletal pain. These symptoms lasted for seven days and laboratory tests for SARS-CoV-2 infection were not performed. Fear of COVID-19 infection and feelings of anxiety and sadness were, respectively, described by 41.9% (n =13), 71.0% (n = 22), and 45.2% (n = 14) of patients. Six (19.4%) patients died from cancer within the follow-up period. Characteristics of the study population are summarized in Table 1. We found an association between delayed HNC care and the use of self-medication (p = 0.028) (Table 2).

Discussion

In response to the COVID-19 pandemic, oncology services have been reorganized worldwide to ensure that patients continue to receive essential care while minimizing the risk of nosocomial acquisition of SARS-CoV-2. However, cancer-diagnostic facilities and treatment pathways have been altered, and follow-up cancer care has been deprioritized in some countries in favor of supporting health systems to react to the COVID-19 pandemic, which can result in patients receiving suboptimal or delayed care.[14]

Table 1. Demographic, socioeconomic, clinical characteristics, and behavior of HNC patients during COVID-19 pandemic.

Variable	Patients (n = 31)
Age (years), median (Q1 – Q3)	55.0 (44.5–69.5)
Sex	
Male	24 (77.4%)
Female	7 (22.6%)
Level of education	
≤ 9 years of schooling	26 (83.9%)
> 9 years of schooling	5 (16.1%)
Marital status	
Married	14 (45.2%)
Not married	17 (54.8%)
Income less than one minimum wage	23 (74.2%)
Comorbidities	8 (25.8%)
Cancer stage	
I–II	0 (0)
III–IV	31 (100.0%)
HNC sites	
Oral cavity	15 (48.4%)
Pharynx	8 (25.8%)
Larynx	6 (19.4%)
Salivary glands	2 (6.4%)
Household members, median (Q1 – Q3)	3 (2 – 4)
Facemask adherence	
Yes	19 (61.3%)
No	12 (38.7%)
Household contact with people tested positive for SARS-CoV-2	
Yes	3 (9.7%)
No	28 (90.3%)
Delayed cancer care during COVID-19 outbreak	
Yes	18 (58.1%)
No	13 (41.9%)
Use of telemedicine for follow-up cancer care during COVID-19 outbreak	0 (0)
Cancer-related complications during COVID-19 outbreak	
Yes	21 (67.7%)
No	10 (32.3%)
Self-medication	
Yes	6 (19.4%)
No	25 (80.6%)
Fear of COVID-19 pandemic	
Yes	13 (41.9%)
No	18 (58.1%)

Continue...

...Continuation	
Self-reported anxiety	
Yes	22 (71.0%)
No	9 (29.0%)
Self-reported sadness	
Yes	14 (45.2%)
No	17 (54.8%)
Deaths	6 (19.4%)

Table 2. Characteristics of HNC patients with delayed follow-up consultation or palliative care during COVID-19 pandemic.

Variable	Delayed cancer care		p-value*
	Yes (n = 18)	No (n = 13)	
Age (years), median (Q1 – Q3)	51.0 (39.0–70.3)	56.0 (45.5–64.5)	0.535
Male	12 (66.7%)	12 (92.3%)	0.191
≤ 9 years of schooling	14 (77.8%)	12 (92.3%)	0.368
Not married	11 (61.1%)	6 (46.2%)	0.481
Income less than one minimum wage	12 (66.7%)	11 (84.6%)	0.412
Cancer-related complications during isolation	13 (72.2%)	8 (61.5%)	0.701
Self-medication	6 (33.3%)	0 (0)	0.028*
Fear of COVID-19 pandemic	10 (55.6%)	3 (23.1%)	0.139
Self-perception of anxiety	15 (83.3%)	7 (53.8%)	0.114
Self-perception of sadness	9 (50.0%)	5 (38.5%)	0.717
Death	4 (22.2%)	2 (15.4%)	1.000

*p-values less than 0.05 were considered statistically significant.

Our study highlights the large proportion of HNC patients with delayed cancer care due to restrictions in health services and impacts on health outcomes, especially related to pain management.

Ensuring the continuum of care in cancer patients is vital and should be considered a major priority during this time.[15] Deciding to delay or suspend medical care for a period based on clinical judgments, taking into consideration the balance between decreasing the risk of nosocomial SARS-CoV-2 infection and worsening cancer outcomes due to the absence of sufficient cancer care, is a health care ethical dilemma.[15,16] However, maintaining the routine of care for patients with chronic diseases during the COVID-19 outbreak in settings with limited resources has been an even greater challenge.

Interestingly, no patient was diagnosed with COVID-19, even among those who continued to have their regular face-to-face consultations at the hospital. The major problem found in this study was the large number of advanced-stage HNC patients reporting cancer-related complications including pain and edema, and the use of self-medication with NSAIDs, especially in cases of delayed cancer care. Unfortunately, most people in limited-resource regions are diagnosed in a late stage of disease and the prognosis is poor. In addition, patients with advanced-stage cancer commonly report pain during and after oncological treatment which is an important predictor of disability with significant implications for physical and psychological functioning.[17] The synergistic effects of cancer and the COVID-19 pandemic can have a devasting impact on the mental health of these people, especially for those who are not under regular medical care.

Chronic pain has been described in up to 50% of HNC patients at 1-year after treatment,[18,19,20] and 40% of patients receiving pain medication report inadequate relief.[21] The pain and discomfort described by the patients in this study contributed to the low adherence to the use of facemasks, which is an important physical intervention against SARS-CoV-2 transmission. Management of pain for patients with HNC cancer is complex and should be based on the World Health Organization (WHO) 'pain ladder'. Moreover, counseling sessions and honest communication are important parts of managing psychological symptoms, while drugs play a role in pain relief.[22,23] Recognizing that changes in cancer services during the current COVID-19 outbreak increase the possibility of chronic pain, strategies to follow HNC patients receiving post-treatment follow-up or palliative care should be prioritized.

Patients reporting delays in cancer care during the COVID-19 outbreak were more likely to use self-medication with a risk of duplicate prescribing, medication overdoses and adverse interactions. In this respect, remote consultations may have an important role in surveillance and clinical case management. It has been suggested that post-cancer treatment face-to-face consultations during the COVID-19 outbreak should kept to a minimum and reserved for patients with concerning symptoms. Monitoring should be performed through video calls or phone consultations, and the cessation of follow up of any kind should not be considered acceptable.[16,24,25,26]

Although switching outpatient consultations online or to phone rather than face-to-face consultations is being universally adopted by oncology services,[27] no use of telemedicine was described by the patients in this report. Poverty and lack of education have been shown to be the biggest barriers to the practice of telemedicine in low- and middle- income countries, especially in rural areas.[28,29] In addition, in Brazil, despite telehealth becoming more common in the delivery of health care, there remain institutional and professional barriers that need to be overcome to facilitate the process of telemedicine dissemination and consolidation.[30]

This study has some limitations. First, delayed cancer care was not evaluated before the COVID-19 outbreak and a longitudinal evaluation was not performed, thereby restricting the inferences that can be made from a cross-sectional analysis. Second, the interviews to collect data were conducted by phone due to the COVID-19 outbreak and were of short duration, making assessing the health status of patients, rapport development, and the use of long questionnaires difficult. However, this method enhanced safety, reduced the need to travel and decreased the risk of SARS-CoV-2 infections inherent in a face-to-face approach. Finally, this study was also limited by sample size, since most of the patients included in the cohort died in a short time.

Conclusion

This study indicated that patients with delayed HNC care during the COVID-19 outbreak are more likely to use self-medication with NSAIDs for pain management. Better strategies to address and monitor HNC patients in socioeconomically disadvantaged communities need to be developed with funding prioritizing the use of new technologies to improve access to remote care and to ensure essential medicines for cancer pain relief during the current pandemic.

Acknowledgments

To all health professionals who are facing the COVID-19 pandemic. We would like to thank the National Council for Scientific and Technological Development (CNPq) and Coordination for the Improvement of Higher Education Personnel (CAPES). This study is part of the EpiSERGIPE project.

References

1. Al-Omar K, Bakkar S, Khasawneh L, Donatini G, Miccoli P. Resuming elective surgery in the time of COVID-19: a safe and comprehensive strategy. Updates Surg. 2020 Jun;72(2):291-5. https://doi.org/10.1007/s13304-020-00822-6

2. Weinstein GS, Cohen R, Lin A, O'Malley BW Jr, Lukens J, Swisher-McClure S, et al. Penn medicine head and neck cancer service line COVID-19 management guidelines. Head Neck. 2020 Jul;42(7):1507-15. https://doi.org/10.1002/hed.26318
3. Martins-Filho PR, Tavares CS, Santos VS. Factors associated with mortality in patients with COVID-19: a quantitative evidence synthesis of clinical and laboratory data. Eur J Intern Med. 2020 Jun;76:97-9. https://doi.org/10.1016/j.ejim.2020.04.043
4. Brar S., Ofo E., Hyde N., Kim D., Odutoye T., Allin D., et al. Outcomes of elective head and neck confirmed or suspected cancer surgery during the COVID-19 pandemic. Eur Arch Oto-Rhino-Laryngology. 2020 Jul. https://doi.org/10.1007/s00405-020-06194-2
5. Chen G, Wu Q, Jiang H, Zhong Y. The impact of the COVID-19 pandemic on head and neck cancer patients. Oral Oncol. 2020 Nov;110:104881. https://doi.org/10.1016/j.oraloncology.2020.104881
6. Wu V, Noel CW, Forner D, Zhang ZJ, Higgins KM, Enepekides DJ, et al. Considerations for head and neck oncology practices during the coronavirus disease 2019 (COVID-19) pandemic: wuhan and Toronto experience. Head Neck. 2020 Jun;42(6):1202-8. https://doi.org/10.1002/hed.26205
7. Graboyes EM, Kompelli AR, Neskey DM, Brennan E, Nguyen S, Sterba KR, et al. Association of treatment delays with survival for patients with head and neck cancer: a systematic review. JAMA Otolaryngol Head Neck Surg. 2019 Feb;145(2):166-77. https://doi.org/10.1001/jamaoto.2018.2716
8. Raymond E, Thieblemont C, Alran S, Faivre S. Impact of the COVID-19 outbreak on the management of patients with cancer. Target Oncol. 2020 Jun;15(3):249-59. https://doi.org/10.1007/s11523-020-00721-1
9. Secretaria de Estado da Saúde (Sergipe). Boletins. 2020 [cited 2020 Oct 27]. Available from: https://todoscontraocorona.net.br/boletim-covid-19-27-10-2020/
10. Ministério da Saúde (BR). Instituto Nacional de Câncer. Neoplasia maligna da cavidade oral (taxas ajustadas). 2020 [cited 2020 Oct 27]. Available from: https://www.inca.gov.br/estimativa/taxas-ajustadas/neoplasia-maligna-da-cavidade-oral
11. Brierley J, Gospodarowicz MK, Wittekind C. TNM classification of malignant tumours. Chichester: Wiley; 2017.
12. Kim T, Zuckerman JE. Realizing the potential of telemedicine in global health. J Glob Health. 2019 Dec;9(2):020307. https://doi.org/10.7189/jogh.09.020307
13. World Health Organization – WHO. The role of the pharmacist in self-care and self-medication. The Hague: World Health Organization; 1998.
14. Richards M, Anderson M, Carter P, Ebert B, Mossialos E. The impact of the COVID-19 pandemic on cancer care. Nat Can. 2020;1(6):565-7. https://doi.org/10.1038/s43018-020-0074-y
15. Al-Quteimat OM, Amer AM. The impact of the COVID-19 pandemic on cancer patients. Am J Clin Oncol. 2020 Jun;43(6):452-5. https://doi.org/10.1097/COC.0000000000000712
16. Brunetti O, Derakhshani A, Baradaran B, Galvano A, Russo A, Silvestris N. COVID-19 infection in cancer patients: how can oncologists deal with these patients? Front Oncol. 2020 Apr;10:734. https://doi.org/10.3389/fonc.2020.00734
17. Taylor JC, Terrell JE, Ronis DL, Fowler KE, Bishop C, Lambert MT, et al. Disability in patients with head and neck cancer. Arch Otolaryngol Head Neck Surg. 2004 Jun;130(6):764-9. https://doi.org/10.1001/archotol.130.6.764
18. Gellrich NC, Schimming R, Schramm A, Schmalohr D, Bremerich A, Kugler J. Pain, function, and psychologic outcome before, during, and after intraoral tumor resection. J Oral Maxillofac Surg. 2002 Jul;60(7):772-7. https://doi.org/10.1053/joms.2002.33244
19. Epstein JB, Wilkie DJ, Fischer DJ, Kim YO, Villines D. Neuropathic and nociceptive pain in head and neck cancer patients receiving radiation therapy. Head Neck Oncol. 2009 Jul;1(1):26. https://doi.org/10.1186/1758-3284-1-26
20. Burton AW, Fanciullo GJ, Beasley RD, Fisch MJ. Chronic pain in the cancer survivor: a new frontier. Pain Med. 2007 Mar;8(2):189-98. https://doi.org/10.1111/j.1526-4637.2006.00220.x
21. Whelan TJ, Mohide EA, Willan AR, Arnold A, Tew M, Sellick S, et al. The supportive care needs of newly diagnosed cancer patients attending a regional cancer center. Cancer. 1997 Oct;80(8):1518-24. https://doi.org/10.1002/(SICI)1097-0142(19971015)80:8<1518::AID-CNCR21>3.0.CO;2-7
22. Cocks H, Ah-See K, Capel M, Taylor P. Palliative and supportive care in head and neck cancer: United Kingdom National Multidisciplinary Guidelines. J Laryngol Otol. 2016 May;130 S2:S198-207. https://doi.org/10.1017/S0022215116000633
23. Joga S, Sahi MS, Koyyala VP, Medisetty P, Jajodia A, Chaudhari K, et al. Application of multi-modal approach to palliation in end of life head and neck cancer pain. Ann Oncol. 2019 Nov;30:ix119. https://doi.org/10.1093/annonc/mdz430.006
24. Royce TJ, Sanoff HK, Rewari A. Telemedicine for cancer care in the time of COVID-19. JAMA Oncol. 2020 Jul 16. https://doi.org/10.1001/jamaoncol.2020.2684
25. Mehanna H, Hardman JC, Shenson JA, Abou-Foul AK, Topf MC, AlFalasi M, et al. Recommendations for head and neck surgical oncology practice in a setting of acute severe resource constraint during the COVID-19 pandemic: an international consensus. Lancet Oncol. 2020 Jul;21(7):e350-9. https://doi.org/10.1016/S1470-2045(20)30334-X
26. Fakhry N, Schultz P, Morinière S, Breuskin I, Bozec A, Vergez S, et al. French consensus on management of head and neck cancer surgery during COVID-19 pandemic. Eur Ann Otorhinolaryngol Head Neck Dis. 2020 May;137(3):159-60. https://doi.org/10.1016/j.anorl.2020.04.008

27. Mayor S. COVID-19: impact on cancer workforce and delivery of care. Lancet Oncol. 2020 May;21(5):633. https://doi.org/10.1016/S1470-2045(20)30240-0
28. Ashfaq A, Memon SF, Zehra A, Barry S, Jawed H, Akhtar M, et al. Knowledge and Attitude Regarding Telemedicine Among Doctors in Karachi. Cureus. 2020 Feb;12(2):e6927. https://doi.org/10.7759/cureus.6927
29. Call VR, Erickson LD, Dailey NK, Hicken BL, Rupper R, Yorgason JB, et al. Attitudes Toward Telemedicine in Urban, Rural, and Highly Rural Communities. Telemed J E Health. 2015 Aug;21(8):644-51. https://doi.org/10.1089/tmj.2014.0125
30. Maldonado JM, Marques AB, Cruz A. Telemedicine: challenges to dissemination in Brazil. Cad Saude Publica. 2016 Nov;32(32 Suppl 2):e00155615. https://doi.org/10.1590/0102-311X00155615