
THE USE OF TELECONSULTATIONS BY NURSES IN PRIMARY CARE IN MINAS GERAIS, BRAZIL

Julia Pereira Afonso dos Santos^{1,2}, Izabella de Oliveira Antunes², Camila Gonçalves Ferreira², Maria Beatriz Moreira Alkmim MD, MSc², Milena Soriano Marcolino MD, MSc, PhD^{1,2}

¹ Medical School, Universidade Federal de Minas Gerais, Belo Horizonte, Brazil

² Telehealth Network of Minas Gerais, University Hospital, Universidade Federal de Minas Gerais, Belo Horizonte, Brazil

Abstract

Primary care is the doorway into the Brazilian public health system. On that level of care, nurses have a main role. As such, they can benefit from telehealth initiatives that bring them closer to specialists of other levels of care. This study aims to evaluate the use, by nurses, of a large scale Brazilian teleconsultation service. **Methods:** Teleconsultations requested by nurses from April 2007 to February 2014 were analysed to identify: the time of the day they were sent; the specialties they were directed to; and the main socioeconomic features of the cities from which they originated. In addition, a sample of teleconsultations from January to February 2014 was examined for the most common types of queries. **Results:** A total of 30,258 teleconsultations were analysed. They were mainly directed to medical subspecialties (76.5%). Nursing categories received 20.7% of the queries. Of all teleconsultations, 66.5% were performed during the working hours of the Primary Care units (8 am to 5 pm Monday to Friday). Most of the 632 cities that sent queries during this period had worse socioeconomic indices than the state's average. Concerning teleconsultations performed from January to February 2014, most queries were about aetiology (29.0%) and pharmacological treatment (18.5%). **Conclusion:** This study from a large scale Brazilian teleconsultation service showed that nurses direct their requests mostly to medical subspecialties. The cities from where most teleconsultations were originated are notably more underserved. The main queries were about aetiology and pharmacological treatment.

Keywords: telemedicine; nursing; primary care; teleconsultation; Brazil

Introduction

The Brazilian public healthcare system (“*Sistema Único de Saúde*”, SUS) was implemented in 1988 with the goal of assuring the constitutional principles of universality of access, equity and comprehensive care.¹ The main organizational features are decentralisation, with emphasis on the municipal level, and regionalisation of health services, in a way that in a defined area the services are built in a network of growing complexity.²

Primary care is the doorway into the system and contains the basic specialties; family medicine, internal medicine, paediatrics, gynaecology and obstetrics. The secondary or medium complexity healthcare level offers more specialised professionals and more technological resources to support diagnosis and treatment. Tertiary or high complexity care includes hospitals and executes procedures involving high technology and high cost, aiming to provide the population access to qualified services.³

Primary care is responsible for promotion of health, preventive services, diagnosis, treatment, rehabilitation and health maintenance. Additionally, it coordinates the referrals for more complex levels of care if needed (e.g. consultations with specialists and hospitalisation). To achieve this goal, many strategies were developed, including the development of the Family Health Program (FHP).

The FHP works with teams of one physician, one nurse, one nurse technician, four to six community health workers and oral health professionals.² They represent the first contact of a mainly economically disfavoured population to health assistance. Nurses perform nursing consultations and procedures and contribute to, and participate in, patient counselling and education. They also perform sanitary and epidemiological surveillance of children, adolescents,

women, workers and elders, act as instructors supervising community health agents, and manage nursing services.⁴

Although the Brazilian public health system is an important initiative that has improved Brazilian socioeconomic indices, it still faces significant challenges.² The share of the federal budget invested on SUS has not changed in many years. Given the rising medical costs, it is becoming difficult for the system to achieve its goals. Moreover, these resources are often concentrated in large urban centres, leaving rural and remote areas underserved, and usually staffed with younger, less experienced workers. As it is now, these professionals often feel isolated and unable to coordinate assistance in all its complexity.^{5,6}

In this scenario, nurses take up an essential role in the system, especially in underserved areas where their expertise is essential to assist the population. Therefore, it is important for them to be able to communicate with more experienced professionals and specialists. Telehealth is a resource that improves communication between primary care practitioners and specialists in reference centres and facilitates access to specialised care. It also has the potential of providing them with continuing education, helping to strengthen their training.⁵

Internationally the term 'teleconsultation' refers to synchronous or asynchronous exchange between clinicians or between clinician(s) and a patient, but in Brazil the latter practice is not permitted by the Federal Council of Medicine. The terms 'teleconsulting' and teleconsultation are used here to refer to primary healthcare professionals asking questions and seeking advice from other health professionals either synchronously or asynchronously.

The Telehealth Network of Minas Gerais (TNMG) is a public telehealth service, formed by a partnership between seven public universities in Minas Gerais, Brazil, coordinated by the University Hospital of Universidade Federal de Minas Gerais. It provided telediagnosis and teleconsultation services to 182 cities in 2007, 279 in 2009, 660 in 2012, 722 in 2014 and 780 in 2016 of the 853 cities of the state. The teleconsultation service is asynchronous. The healthcare practitioner sends queries to the TNMG physicians on call for internal medicine, family medicine, paediatrics, gynaecology/obstetrics and other basic specialties, which must be answered within 24 hours. Queries to other specialties must be answered within 48 hours.

The objective of this study is to evaluate the use of a large scale teleconsultation service by nurses and to draw a socioeconomic profile of the cities from which the teleconsultations originated.

Methods

This retrospective and observational study included all consecutive teleconsultations requested by nurses to the Telehealth Network of Minas Gerais from the beginning of the service in April 2007 to February 2014. The teleconsultations were analysed to identify: 1) the time of the day when the teleconsultations were requested; 2) the specialties to which the queries were directed; and 3) socioeconomic data of the cities from which the teleconsultations originated. This included the total population; distance from Belo Horizonte (the provincial capital); average Human Development Index (HDI), which is the geometric mean between the indices of life expectancy, education and per capita income; per capita income; percentage of people living in poverty; life expectancy; and infant mortality (number of children who die before the age of 1 year old per 1,000 births). Per capita income was converted to USD (1 USD : 1.796 Brazilian reais, the conversion rate in 01/07/2010, the year in which all the socioeconomic data were collected).⁷

Additionally, a sample of valid teleconsultations from January 1st 2014 to February 28th 2014 was analysed separately to assess the types of queries in each teleconsultation. The types were classified as: aetiology (cause or origin of a disease), pharmacological treatment, medical workup, non-pharmacological treatment, patient follow-up (questions about patient referral and about how long can the patient wait until a next appointment), medical or nurse advice, surgical treatment, pregnancy assistance, prognosis, vaccination, cervical cytology, child growth and development, or doubts not classifiable in the above categories (unespecific).

When the teleconsultation request was to a nurse, these queries were also classified as wound care, sterilisation, health centre management, hospital infection control/hospital cleaning, adult health, child health, public health, women's health, professional ethics, maternal and obstetric health, emergency, adolescent health, nutrition, mental health, hospital cleaning, elderly health. Each teleconsultation could have more than one query.

Results

A total of 30,258 teleconsultations requested by nurses were analysed from June 2007 to February 28th 2014. Of all teleconsultations, 66.5% were performed during the working hours of the Primary Care units (8 am to 5 pm Monday to Friday), the others were at night or over weekends.

The most requested specialties are shown in Table 1. The teleconsultations were mainly directed to medical subspecialties (69.5%), especially dermatology (20.2% of the total), gynaecology/obstetrics (12.9%) and internal medicine (5.2%). Nursing categories received 20.7% of the queries, which were mostly directed to general nursing (10.6%), wound care (7.1%), and paediatric nursing (1.3%).

Table 1. Total teleconsultations requested by nurses by required specialties (N=30,258).

Specialty	n (%)
Medicine	21041 (69.5)
Dermatology	6109 (20.2)
Gynaecology/Obstetrics	3914 (12.9)
Internal Medicine	1583 (5.2)
Paediatrics	1472 (4.9)
Family & Community Medicine	1114 (3.7)
Cardiology	998 (3.3)
Endocrinology	669 (2.2)
Neurology	522 (1.7)
Infectious diseases	519 (1.7)
Gastroenterology	422 (1.4)
Angiology	384 (1.3)
Orthopaedics	380 (1.3)
Urology	365 (1.2)
Pneumonology	347 (1.1)
Others	2243 (7.4)
Nursing	6278 (20.7)
Nursing – General	3219 (10.6)
Wound Care	2142 (7.1)
Paediatric Nursing	382 (1.3)
Emergency care	245 (0.8)
Surgical nursing	199 (0.7)
Geriatric Nursing	91 (0.3)
Nutrition	528 (1.7)
Dentistry	297 (1.0)
Pharmacy / Biochemistry	299 (1.0)
Physiotherapy	169 (0.6)
Audiology	67 (0.2)
Empty	1579 (5.2)

The state of Minas Gerais has 853 cities, and 632 of them sent queries during the study period. The analysis of socioeconomic indicators of the cities from which the teleconsultations originated showed that they had a median population of 6,906 inhabitants (IQR 4,456 - 11,114). (Figure 1) Their median HDI, distance from Belo Horizonte, per capita income, percentage of poor life expectancy and infant mortality were, respectively: 0.655 (IQR 0.620 - 0.680); 383 km (IQR 270 - 556); R\$ 390.33 or US\$ 217.33 (IQR 173.60 - 291.55); 20.52% (IQR 10,89 - 31,55); 73.8 years (IQR 72.7 - 75.0); 17.30 per 1000 (IQR 15.30 - 19.00).

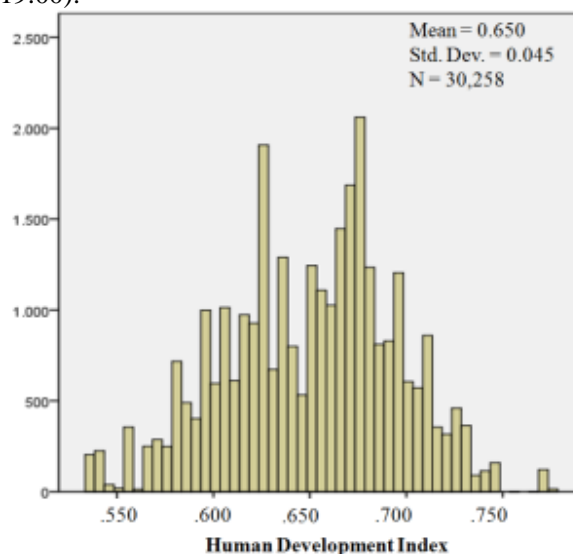


Figure 1A.

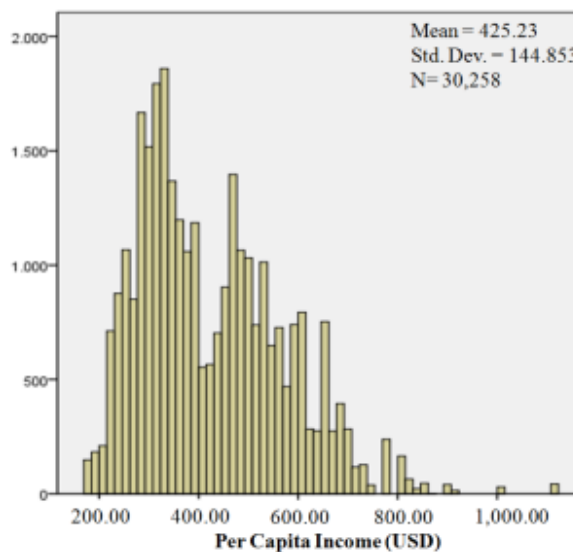


Figure 1B.

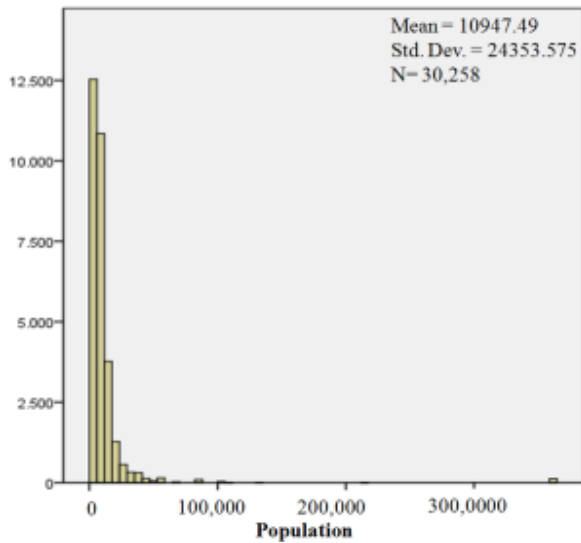


Figure 1C

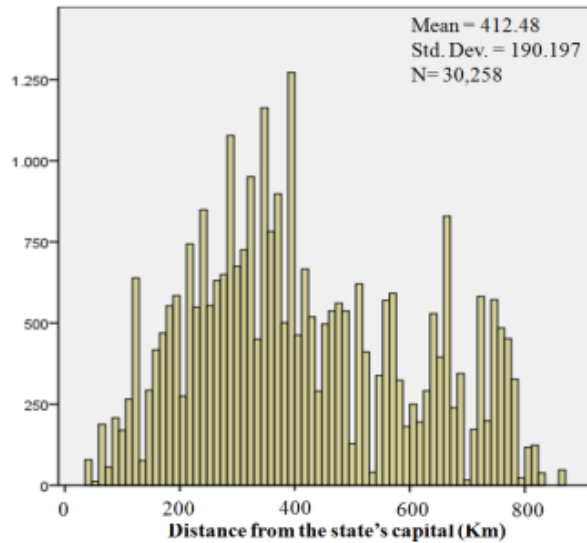


Figure 1D

Figure 1. Histograms for the 3,0285 teleconsultations showing (A) HDI; (B) distance (km) from Belo Horizonte, the state’s capital; (C) population (D) per capita income in USD of the 632 cities analysed.

Cities with less than 10,000 inhabitants requested 69.1% of the teleconsultations while cities with more than 20,000 inhabitants accounted for only 7.2% of them. The 10 cities that requested the highest number of teleconsultations were responsible for 11.9% of the queries. An analysis of these 10 locations regarding their population, distance from the state capital (Belo Horizonte), HDI, per capita income, percentage of people living in poverty, life expectancy at birth and infant mortality is shown in Table 2.

Analysis of the 723 teleconsultations performed

from January to February of 2014 is shown in Table 3. During this period, nurses sent 723 teleconsultations to the service and most queries were about aetiology (29.0%), pharmacological treatment (18.5%), non-pharmacological treatment (13.8%), patient follow-up (9.2%) and nurse advice (9.1%) and 171 of these teleconsultations were specifically directed to nursing.

The classification of these teleconsultations is shown in Table 4. Mostly, they were about wound care (35.1%), adult health (17.6%), women’s health (15.8%).

Table 2. Number of teleconsultations required, population, distance from the state capital, HDI, per capita income, percentage of poor, life expectancy at birth and infant mortality of the 10 cities that requested most teleconsultations compared to Minas Gerais’ average. (Pop = population, Dist = distance from Belo Horizonte, HDI = Human Development Index.)

City	Tele-consults	Pop.	Dist (Km)	HDI	Per Capita Income (USD)	% Poor	Infant Mortality / 1,000
Minas Gerais	-	-	-	0.731	417.4	10.9	75.3
Alterosa	757	13,714	390	0.668	265.0	12.4	75.8
Cipotânea	502	6,547	176	0.579	176.9	33.5	70.0
Presidente Kubitschek	388	2,959	255	0.595	157.5	29.9	72.2
Grão Mogol	324	15,026	570	0.604	163.6	32.4	72.4
Engenheiro Navarro	320	7,125	355	0.655	185.1	22.7	72.4
Itacarambi	291	17,739	654	0.641	178.9	31.2	72.2
Conceição de Ipanema	273	4,467	357	0.676	277.0	20.4	47.5

Table 3. Types of queries sent to the service by nurses from January to February 2014 (n=723).

Type of query	%*
Aetiology	29.0
Pharmacological treatment	18.5
Non-pharmacological treatment	13.8
Patient follow-up	9.2
Medical or nurse advice	9.1
Medical workup	8.3
Pregnancy assistance	8.3
Prognosis	4.9
Preparation/ storage of medicines	4.3
Surgical treatment	3.6
Vaccination	2.7
Growth and development	2.7
Cervical cytology	2.0
No specific doubt	17.4

*The sum is higher than 100%, as a teleconsultation could contain more than one query.

Table 4. Classification of queries sent from nurses to nurses from January to February 2014 (n= 171).

Type of query	Number	%
Wound care	60	35.1
Adult health	30	17.6
Women's health	27	15.8
Child health	13	7.6
Public health	12	7.1
Emergency	11	6.4
Health centre management	6	3.5
Elderly health	4	2.3
Maternal and obstetric health	5	3.0
Others	3	1.8

Discussion

This study, from a large scale telehealth service that currently provides support for primary care practitioners of 780 cities in Minas Gerais, Brazil, showed that the majority of the teleconsultations requested by nurses were directed to medical subspecialties (69.5%), mainly Dermatology and Gynaecology/Obstetrics. Almost 70% of the queries originated from cities with less than 10,000 inhabitants and 92.8% originated from cities with less than 20,000. The median HDI of all 632 requesting sites of 0.655 is lower than the states' average (0.731). A significant number of teleconsultations (33.5%) were sent outside primary care working hours (from 5 pm to

8 am or during the weekends), which indicates that the activity was incorporated by users and that it is truly needed for both immediate advice in a certain case and for continuous education of the primary care nurses.⁸

Analyses of the 632 cities that sent queries showed that on average they had a median HDI of 0.655, a median per capita income of R\$ 390,33 (or USD 217.33), a median percentage of poor of 20,5%, median life expectancy of 74.0 years and median infant mortality of 17.3 per 1,000. All these figures are worse than the state's. These findings endorse the literature in this field, that smaller, more underdeveloped cities need the teleconsultation service the most.^{9,10} They usually experience more barriers to attract and to retain workforce and more difficulty in gathering appropriate resources for healthcare. They also must provide a wide range of general medical services and supervise a population further from secondary health assistance and spread over large geographical territories.¹¹ Furthermore, it is well established that telehealth services tend to suit better the needs of more remote locations, because it brings specialised and qualified health assistance closer to them.¹² In our study, the 10 cities that requested most teleconsultations were at least 140 km from Belo Horizonte. Most of them were over 300 kilometres from the provincial capital. Minas Gerais state has a territorial area of 586,520 km² larger than France and many cities of the state are really far from a large centre.¹³ This feature makes teleconsultation an interesting alternative to broaden access to healthcare in these sites.

The socioeconomic analysis of the 10 cities that requested most nursing teleconsultations indicated they sent between 240 and 757 queries, had a population from 2,959 to 17,739 inhabitants and were over 140 km from Belo Horizonte - the most resourceful centre regarding healthcare on the state. When compared to Minas Gerais' socioeconomic data, these 10 also had worse figures in almost all indices, including their HDI.

Between January and February of 2014, nurses asked mostly about aetiology (29.0%), pharmacological treatment (18.5%) and non-pharmacological treatment (13.8%). When the teleconsultation was from a nurse to a nurse, they were mostly about wound care (35.1%), adult's health (17.6%), women's health (15.8%), emergency (6.4%), public health (7.1%) and health centre management (3.5%). Many primary care units are coordinated by a

nurse as a manager, so it is understandable that there were a considerable number of teleconsultations about centre management (3.5%). In Brazil nurses are usually responsible for performing routine cervical cytology exam, which probably explains the prevalence of 15.8% of women's health queries.

Another interesting finding is that nurses asked significantly more about medical subspecialties (76.5%) than about nursing areas (20.7%). This may be due to the main role of nurses in Brazil, a country where the maldistribution of physicians is marked. In Belo Horizonte there are 6.7 doctors per 1,000 inhabitants while in Minas Gerais as a whole there are 2.04 doctors per 1,000 inhabitants. Medical doctors tend to be concentrated in larger centres and the government has been experiencing difficulties in getting them to work in remote areas.¹⁴ The federal government has recently launched a program called "*Mais Médicos*", usually translated to "More Doctors for Brazil" with the alleged aim of taking physicians to suburbs of the largest cities and to remote and rural locations.⁶ Yet when this analysis was performed, the situation was of pronounced maldistribution of medical doctors, and so, in many locations, nurses took up an important role of trying to address the problem.

Additionally, doctors sometimes request nurses to use their own login on the system to write the teleconsultations for them so we see it as a nursing query but it can actually be a doctor asking. Every time the service catches it happening (when the nurse explicitly says he or she was asked by the physician to write the teleconsultation) the system coordinator explains the requirement for the doctor to enter his own login in the software. Even so, we can infer from these data that the teleconsultation service had an important role of contributing to the continuing education of nurses as they asked and learned about signs, symptoms, diagnosis and treatment of diseases, information that they either had not learnt or that changed over time since they have graduated.

Throughout Brazil, there have been initiatives using telehealth resources in nursing. The telehealth service in Rio Grande do Sul (RS) state, south Brazil, analysed teleconsultations sent by nurses between 2007 and 2008 using a similar methodology. In this case, nursing queries were sent by email and answered in 72 hours. Of all the 498 teleconsultations, 111 (22.2%) were related to the nursing field, a figure very similar to the found in the present study (20.7%).¹⁵ The

potential of telemedicine to promote continuing education of nurses in Brazil, especially in underserved areas, should be better explored since it is an interesting alternative to face to face training for those who are far from a better resourced centre.

In Pernambuco state, between 2009 and 2010, a very similar intervention was studied. The teleconsultations were performed by RedeNUTES (Telehealth Centre Network of Pernambuco). Health professionals wrote electronic forms and/or scheduled teleconferences with nurses of the programme asking for second opinions on patient's cases. There were 1,003 interactions in 2009 and 2,637 in 2010. The queries were analysed and found to be mostly about obstetrics (15.7%), paediatrics (14.6%), gynaecology (11.2%), and dermatology (5.1%) in 2010. This result is very similar to the one found in the present study, in which the most requested medical specialties were dermatology, obstetrics/gynaecology, internal medicine and paediatrics.¹⁶

The most common topic of the teleconsultation sent to nurses in the study by the RS telehealth service was wound care, similar to our results. The analysis of the most common topics shown to be more frequent in the teleconsultations is very relevant to the choice of topics of tele-education activities.

In Canada, interviews were carried out with nurses about a tele-assistance service in wound care. Many benefits were reported by nurses: a positive influence on the quality of care, specially accessibility, interdisciplinary work and patient-nurse relations. In terms of accessibility, nurses affirmed that it was increased both by the ease of accessing the health service and by the shorter waiting time to get any kind of treatment. Other influences were found on the professional development of nurses through knowledge transfer, the decreased feeling of isolation of the professionals and the increase in job satisfaction.¹⁷

The main limitation of the present study was the absence of follow up of the patients assisted by the teleconsultations. There is no way of knowing precisely if the service helped to solve patients' issues without them having to be referred to more complex levels of care.

Conclusion

In conclusion, this study suggests that while using the teleconsultation service, nurses direct their requests

mostly to medical subspecialties, especially dermatology. The cities from which most teleconsultations originated are notably impoverished and underdeveloped. The main queries were about aetiology and non-pharmacological treatment. Further studies are needed to ascertain the impact of nursing telemedicine initiatives on the recruitment and the retention of nurses and to evaluate the effectiveness of this initiative on improving clinical outcomes.

Corresponding author:

Milena S. Marcolino
 Avenida Professor Alfredo Balena, 190. Room 246
 CEP 30130-100
 Belo Horizonte – Brazil
 Email: milenamarc@gmail.com

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