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## DESCRIPTION OF FACTORS RELATED TO THE USE OF THE TELECONSULTATION SYSTEM OF A LARGE TELEHEALTH SERVICE IN BRAZIL – THE TELEHEALTH NETWORK OF MINAS GERAIS

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### Abstract

**Introduction:** The teleconsultation service of Telehealth Network of Minas Gerais (TNMG), Brazil, has expanded gradually since its implementation in 2007. However, since 2013, there has been a decline in the number of teleconsultations. The objective of this study was to compare features of user and non-user cities and healthcare practitioners, in order to investigate the factors related to non-use of the TNMG teleconsultation service and assess users' satisfaction with the service. **Methods:** Cities were classified as users and non-users according to the utilization of the service from June 2013 to May 2014; 160 healthcare practitioners were interviewed in each group. Among the user cities, 80 user healthcare practitioners (UHP-UC) and 80 non-user healthcare practitioners (NUHP-UC) were selected. **Results:** There was a significant difference in support and motivation by the local healthcare manager to use the teleconsultation service (67.5% in UHP-UC vs. 34.4% in health practitioners in non-user cities (HP-NUC),  $p < 0.0001$ ; and 53.8 % in NUHP-UC vs. 34.4%:  $p = 0.013$ ), and with respect to training, (67.5% in UHP-UC vs. 45.8% in HP-NUC:  $p = 0,002$ ). In multinomial logistic regression, (i) male gender, (ii) training and (iii) support and motivation from the local healthcare manager were independently associated with teleconsultation use. **Conclusion:** This study showed that training, and support and motivation from the local healthcare manager were the most important factors related to the teleconsultation use. This is an important finding that will assist in future development of approaches

to increase the use and quality of teleconsultation services.

**Keywords:** telemedicine; telehealth; teleconsultation; primary healthcare; satisfaction; Brazil.

### Introduction

Healthcare is a right enshrined in the Brazilian constitution, with the principles of universality, equity and integrality of health access.<sup>1</sup> However, there is great inequality in access to specialised health services, with a large concentration of these services and professionals in the largest cities. In order to improve the access of all citizens to healthcare, primary care has received special attention from the government in recent years, with the implementation of the Family Health Strategy (FHS). This is an approach to providing primary care for defined populations by deploying interdisciplinary healthcare teams.<sup>2,3</sup> The teams are formed by a physician, a nurse, a nurse assistant and four to six community health agents.<sup>3</sup> Some factors, such as professional isolation and poor access to continuing education programmes are barriers to these professionals in remote cities.<sup>4-6</sup>

To overcome this, Brazil is following the global trend in the development and dissemination of telehealth, and is a leader in the implementation of large-scale projects.<sup>7</sup> In recent years, the Brazilian government invested in telehealth with the development and implementation of projects at national, state and municipal levels. The telehealth model adopted in Brazil is based on the connection of universities to primary care in remote cities through tele-education and tele-assistance activities, aimed

mainly at strengthening the FHS.<sup>2,8</sup>

Minas Gerais is a Brazilian state of over 580 km<sup>2</sup>, approximately the same size as France, with diverse climatic, cultural and economic characteristics, and the third largest gross domestic product. It has 853 cities, a population of nearly 20 million people and an urbanization rate of 85.3%.<sup>9</sup> The state of Minas Gerais holds a prominent place on the national scene for its telehealth activities. In 2005, the Telehealth Network of Minas Gerais (TNMG) was created as a partnership of six public universities in the state, coordinated by the University Hospital of the Universidade Federal de Minas Gerais. The TNMG is a public telehealth service that provides health assistance and it is also a research network. It currently provides asynchronous teleconsultation services in different medical and nonmedical specialties and telediagnosis to 739 cities in Minas Gerais, in 1,000 telehealth sites.<sup>2</sup> Its main objective is to provide assistance and educational support to primary care practitioners and, hence, to reduce unnecessary referral of patients for specialist consultation and to provide continuing education, to support and promote primary care and to reduce of the sense of professional isolation.<sup>2,5</sup>

The asynchronous teleconsultation service of the TNMG began in 2007 and expanded gradually. The service focuses primarily on the support of primary care practitioners. Professionals in the remote cities access the TNMG system via Internet and present the case, attaching a photo or other files as needed. One of the specialists on duty in the universities receives the request, analyses it and responds within 24 hours.<sup>2,5</sup> The highest usage rate of this service occurred between 2011 and 2012, with an average of 1,600 teleconsultations per month, that corresponded to an average of 4.5 teleconsultations per city per month. Since 2013, there has been a decline in the number of teleconsultations performed. From January 2013 to May 2014, 700 teleconsultations were performed per month (on average, 2.0 teleconsultations per city per month), and only 27% of the cities used the teleconsultation service each month, (unpublished data).

Knowing the importance of telehealth services in a state with the dimensions and characteristics of Minas Gerais, the objective of this study was to compare features of user and non-user cities and healthcare practitioners, in order to investigate factors related to the non-use of the teleconsultation service of the TNMG, and assess users' satisfaction.

## Methods

### *Population*

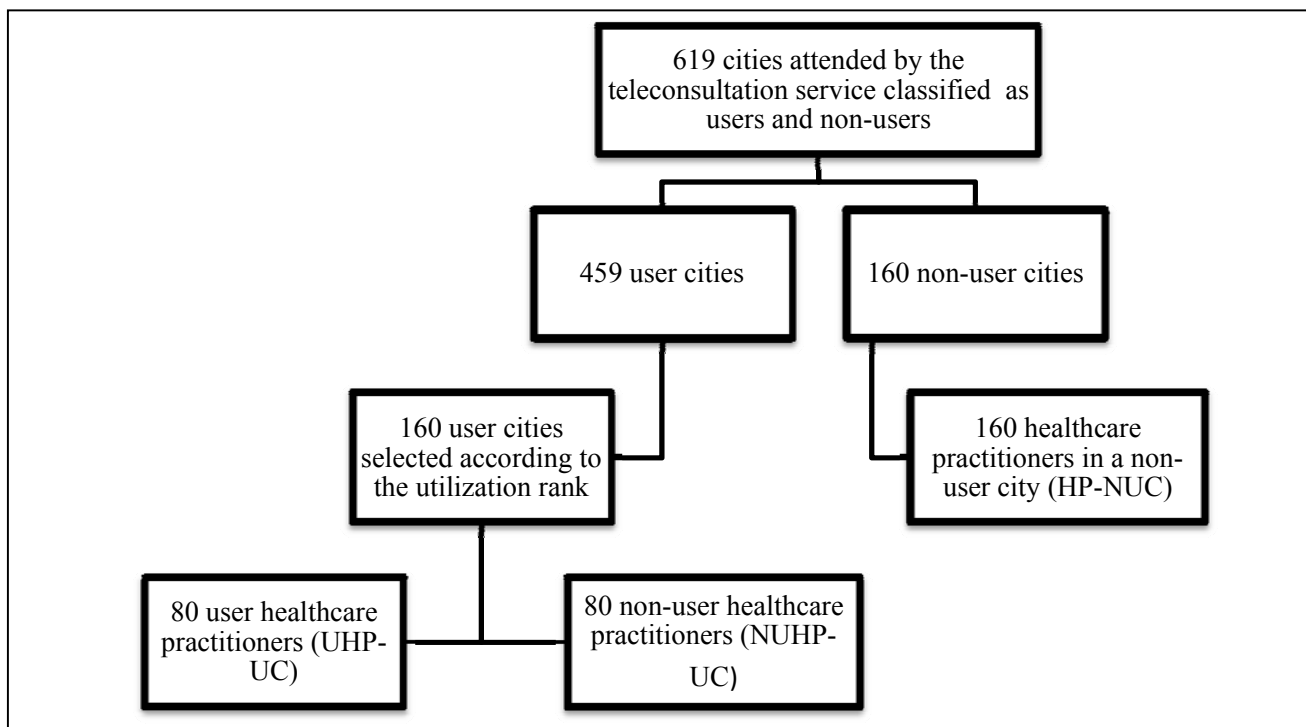
This was an observational study. The 619 cities attended by the teleconsultation service of the TNMG from June 2013 to May 2014 were classified as users or non-users according to utilisation during that period. Users were defined as cities that sent at least one teleconsultation during the study period, and non-users those that did not send any teleconsultations in that time. It was observed that 160 cities were 'non-users', therefore a sample size of 160 'user' cities were selected for comparison. The user cities and healthcare practitioners were ranked from the highest to the lowest number of teleconsultations performed in the time period and those cities with the highest number of teleconsultations requested were selected for this study. In 50% of those cities, one healthcare practitioner who used the teleconsultation service during the study period was selected ("user healthcare practitioner", UHP-UC) and in the other 50%, a healthcare practitioner who did not use the teleconsultation service during the study period was selected ("non-user healthcare practitioner" NUHP-UC, in a user city). (Figure 1)

The purpose of the selection of UHP-UC and NUHP-UC in user cities was to investigate personal factors related to the use of the teleconsultation service, excluding factors related to municipal conditions. If the selected practitioner refused to participate, the following healthcare practitioner in the utilization rank was included. In non-user cities, the selection of the healthcare practitioner was random.

### *Procedures*

A standardised questionnaire was developed with open and closed ended questions. The questionnaire included: (i) Questions to investigate factors related to the use of the teleconsultation service. This instrument was based on previous study;<sup>8</sup> (ii) A satisfaction survey, including queries about: (a) level of satisfaction using a 5 point Likert scale, (b) whether they would recommend the service to other colleagues, and (c) whether they would use it again in the future.

Interviews were conducted by telephone calls to the selected 320 primary care practitioners. All answers were transcribed and later analysed. A pilot project was performed in 20 cities with 10 users and 10 professionals in a non user city to assess if it would be necessary to perform any modifications in the ques-



**Figure 1.** Allocation of participants in user and non-user cities.

tionnaire. There was no need for modifications, so the healthcare practitioners of the other selected cities were contacted. As there were no modifications in the questionnaire, we choose to include in the analysis responses of practitioners contacted in the pilot project as well.

All contacts with healthcare practitioners were preceded by the authorization of the coordinator of the Municipal Health Department. The study was approved by the Research Ethics Committee of the *Universidade Federal de Minas Gerais*. Verbal informed consent was obtained from all practitioners.

**Statistical analysis**

IBM SPSS Statistics for Windows version 20.0 (IBM Corp., Released 2011, Armonk, NY, USA) was used for statistical analysis. Categorical data were reported as counts and percentages; continuous variables were reported as mean and one standard deviation (SD) or median (25th, 75th percentiles), as appropriate. Chi-square test was used to examine differences with categorical variables. To assess the relation between independent variables and teleconsultation usage, adjusted and adjusted odds ratios were estimated by polynomial logistic regression. A two-tailed p-value of 0.05 was considered statistically significant.

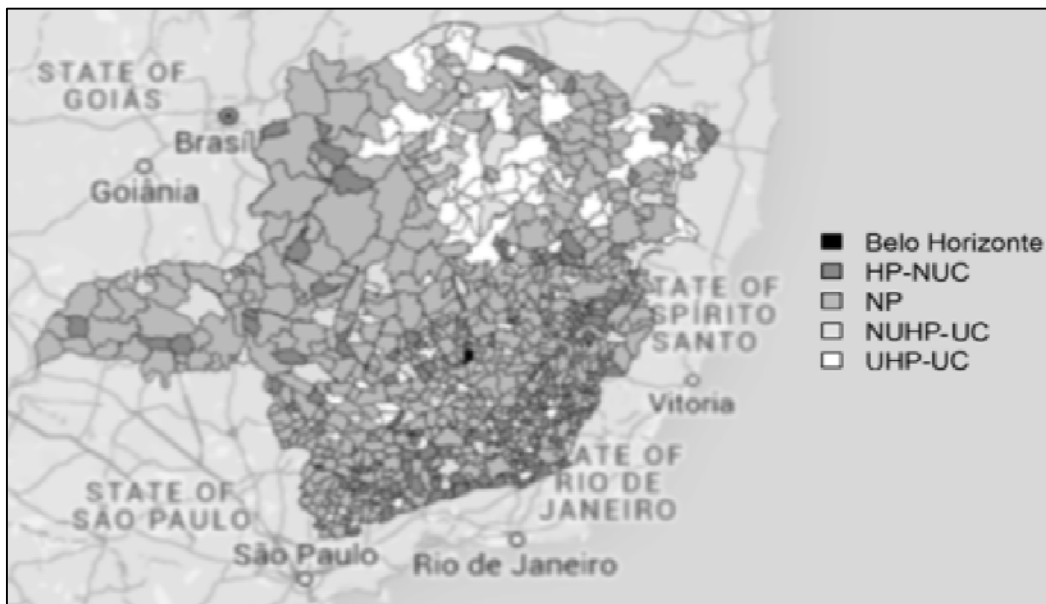
**Results**

A study of the location of the cities showed that most non-user healthcare practitioners were located in the south-east (Human Development Index [HDI] 0.6733) and south (HDI 0.6997) macro-regions of Minas Gerais. On the other hand, user healthcare practitioners were located mainly in the north (HDI 0.6250) and the northeast (HDI 0.6073) macro-regions. (Figure 2)

A general descriptive analysis showed that 69.7% of the study respondents were women, and the majority were nurses (60.6%) and physicians (20.0%). The median age of respondents was 32 y (28-36 y), the median time since graduation was 6.0 ys (4.0-9.0 y) and the median time in primary health practice was 4.3 y (2.0-8.0 y).

The characteristics of each group are shown in Table 1. There was a difference among the groups in relation to the distribution of gender: the proportion of women was higher among non-users, and the difference was statistically significant when comparing the UHP-UC and health professionals in non-user city (HP-NUC) groups (66.3% vs 85.0% p = 0.001). There was no statistically significant difference between the proportion of women NUHP-UC and HP-NU.

The responses to the questionnaire are shown in



**Figure 2.** Distribution of the cities throughout the state of Minas Gerais. Belo Horizonte is the state’s capital. HP-NUC: healthcare practitioners in a non-user city; NP: non participant cities; NUHP-UC: non-user healthcare practitioners; UHP-UC: user healthcare practitioner.

**Table 1.** Demographics of each group.

Healthcare practitioner characteristics	User city		Non-user city
	UHP-UC (n=80)	NUHP-UC (n=80)	HP-NUC (n=160)
Age (years)	32	33.5	31
Age range	27-35	28.3-38.8	29-36
Female	66.3%	77.5%	85.0%
Years since graduation			
0 – 4	42.5%	22.8%	30.6%
4 – 14	50.0%	65.8%	58.1%
> 14	7.5%	12.9%	11.2%
Profession			
Nurse	57.5%	62.5%	76.3%
Physician	27.5%	3.8%	4.4%
Nutritionist	7.5%	7.5%	5.0%
Pharmacy	2.5%	3.8%	5.0%
Physiotherapist	2.5%	6.3%	3.1%
Dentist	1.3%	6.3%	5.0%
Speech Therap	1.3%	5.0%	0%
Psychologist	0%	5.0%	0%
Social worker	0%	0%	0.6%
Occup Therap	0%	0%	0.6%
Experience in 1° Care (years)	5.0 (4-9)	6.0 (5-10)	6.0(4-9)

Table 2. There was a significant difference in training to use the teleconsultation system between UHP-UC compared to HP-NUC (67.1% vs. 45.8%,  $p = 0.03$ ), however, this difference was not significant between NUHP-UC and HP-NUC (51.9% vs. 45.8%,  $p = 0.39$ ). Furthermore, the proportion of "adequate training" was also lower among non-users, but this difference did not reach statistical significance between UHP-UC and HP-NUC (86.8% vs. 77.0%,  $p = 0.18$ ) and between UHP-UC and NUHP-UC (86.8 vs 78.0%,  $p = 0.123$ ).

Among non-users (especially among HP-NUC), a lower proportion of healthcare practitioners reported support and motivation from the local healthcare manager to use the teleconsultation service. A significant difference existed between UHP-UC and HP-NUC (67.1% vs. 34.4%,  $p < 0.001$ ) and NUHP-UC and HP-NUC (53.8 % vs. 34.4 %,  $p = 0.004$ ). There was a difference when comparing UHP-UC and NUHP-UC (67.5 vs 53.8%), but it did not reach statistical significance ( $p = 0.054$ ).

Most respondents in this study reported having knowledge of the teleconsultation system. As expected, there was a significant difference between the UHP-UC and HP-NUC (100% vs. 90.0%,  $p = 0.001$ ).

**Table 2.** Responses to the questionnaire.

Variable	User city		Non-user city
	UHP-UC (n=80)	NUHP-UC (n=80)	HP-NUC (n=160)
<b>Awareness of the teleconsultation service</b>	100.0%	98.8%	90.0%
<b>Source of information about the teleconsultation service</b>			
Municipal Health Department	68.8%	60.36%	59.3%
Co-workers	10.0%	19.2%	11.0%
State Health Department	6.3%	11.5%	7.6%
TNMG website	3.8%	0.0%	11.0%
Other	11.3%	9.0%	11.0%
No response	0.0%	2.6%	9.4%
<b>Previous training</b>	67.1%	51.9%	45.8%
<b>Enough training to use the teleconsultation system</b>	86.8%	78.0%	77.0%
<b>Support and motivation of the local coordinator to use the teleconsultation service</b>	67.5%	53.8%	34.4%
<b>Availability of time available during the working hours to perform teleconsultations</b>			
Sufficient time	42.3%	31.3%	28.3%
Short time	47.4%	57.5%	62.3%
No time	10.3%	11.3%	9.4%
No response	2.5%	0.0%	0.0%
<b>Infrastructure of the primary care unit</b>			
<b>Quality of Internet connection</b>			
Excellent	20.6%	12.2 %	6.9 %
Good	41.2%	43.2 %	41.7 %
Satisfactory	16.2%	17.6 %	25.7 %
Deficient	14.7%	18.9 %	17.4 %
Very bad	7.4 %	8.1 %	8.3 %
<b>Computers available in the workplace for teleconsultations</b>	86.8%	87.3%	86.3%
<b>Workplace satisfactory to perform teleconsultations</b>	91.3%	91.9%	91.2%
<b>Perception of benefits in professional isolation</b>			
Feeling of professional isolation	35%	30%	36.9%
Teleconsultation attenuates professional isolation	89.3%	82.6%	91.4%
<b>Influence of technology in the human relationships and in the professional role in the society</b>			
<i>Requesting a teleconsultation second opinion does not interfere in their professional role with:</i>			
Patients	93.7%	94.9%	93.8%
the community	97.5%	94.9%	94.3%
their colleagues	96.2%	97.5%	95.0%
<b>Perception of benefits and usefulness of telehealth</b>			
Benefits of teleconsultation for the patient	100.0%	97.5%	96.8%
Benefits of teleconsultation service for daily clinical practice	93.8%	91.9%	93.1%

**Table 3.** Polynomial logistic regression.

Comparison	Variable	Univariate OR (95% CI)	P	Multivariate OR (95% CI)	P
UHP-UC vs. NUHP-UC	Male gender	1.75 (0.87-3.53)	0.115	1.42 (0.68-2.96)	0.345
	Training	1.89 (0.99-3.60)	0.053	2.08 (1.07-4.06)	<b>0.031</b>
	Motivation	1.76 (0.92-3.36)	0.090	1.81 (0.93-3.54)	0.081
UHP-UC vs. HP-NUC	Male gender	2.89 (1.53-5.45)	<b>0.001</b>	2.12 (1.04-4.30)	<b>0.038</b>
	Training	2.41 (1.36-4.27)	<b>0.003</b>	2.61 (1.41-4.86)	<b>0.002</b>
	Motivation	3.89 (2.18-6.96)	<b>&lt;0.001</b>	3.73 (2.02-6.90)	<b>&lt;0.001</b>

CI: confidence interval; HP-NUC: healthcare practitioners in a non-user city; NUHP-UC: non-user health-care practitioners OR: odds ratio; UHP-UC: user healthcare practitioner.

There was no difference between UHP-UC and NUHP-UC (100% vs. 98.8%) The Municipal Health Department was highlighted by the professionals (62.0%) as the main source of service information.

With respect to the quality of the Internet connection in the workplace, there were no differences between the groups. However, there was a trend of higher proportion of "excellent" Internet connection among users when comparing the UHP-UC vs. HP-NUC (20.6% vs. 6.9%,  $p = 0.072$ ), and UHP-UC vs. NUHP-UC (20.6% vs. 12.2%  $p = 0.731$ ).

When questioned regarding the availability of computers in the workplace, working conditions for using the system, availability of time in the workplace for the use of the teleconsultations and feeling of professional isolation based on the city’s working conditions, there was no significant difference among the groups. Most healthcare practitioners (57.4%) said they had little time during the working hours to use the teleconsultation service. Although this proportion was higher among non-users, this difference did not reach statistical significance.

As is shown in Table 2, for the vast majority of respondents, requesting a second opinion by teleconsultation does not interfere in their professional role with the patient, the community or co-workers. In addition, 97.8% of respondents considered that the system can bring benefits to patient care and 93.0% highlighted its usefulness in everyday working practice.

The results of multinomial logistic regression analysis are shown in Table 3. Male gender, training, and support and motivation by the local healthcare

manager were selected for multivariate analysis based on the results of univariate analysis. When comparing UHP-UC and NUHP-UC, multivariate analysis showed that training was independently associated with teleconsultation use. When comparing UHP-UC and HP-NUC, male gender, training and “support and motivation” by the local healthcare manager were independently associated with teleconsultation use.

Analysis of the satisfaction survey showed positive results: 23.8% of users were very satisfied and 66.3% were satisfied with the teleconsultation service. Most of these professionals (98.7%) would recommend the service to other colleagues and 100% would to use it again in another situation. (Table 4)

**Table 4.** Results of the satisfaction survey performed with user practitioners (n=80).

Variable	n	%
<b>What is your level of satisfaction with the telehealth service?</b>	Very dissatisfied	1 1.3
	Unsatisfied	3 3.8
	Indifferent	4 5.0
	Satisfied	53 66.3
	Very satisfied	19 23.8
<b>Would you use again this telehealth service in another need?</b>	Yes	80 100
	Indifferent	0 0
	No	0 0
<b>Would you recommend this telehealth service to a colleague?</b>	Yes	78 98.7
	Indifferent	1 1.3
	No	1 1.3

## Discussion

The diffusion of telehealth to become an integral component of the health system represents a major challenge. This study, from a large scale teleconsultation service, showed that personal and organizational factors were determinants of the use of a teleconsultation service: gender, training, support and motivation to use the teleconsultation service by the local healthcare manager.

The highest rate of user healthcare practitioners was found in the north and northeast regions of the state. These are the poorest regions, with lowest HDI and distant from the major centres. According to Marcolino *et al*, it is difficult to recruit and keep healthcare practitioners in rural or isolated areas or in small and medium-sized cities.<sup>5</sup> It is believed that the teleconsultation system can be an important tool to help support these professionals in remote cities, reducing the feeling of professional isolation imposed by geography and distance. In addition, previous studies have indicated that healthcare practitioners working in these cities have little working experience in primary care and limited access to continuing education programmes in health.<sup>8</sup> The findings of this study disagree with that idea. The healthcare practitioners had a median experience of six years, with no difference between users and non-users of the teleconsultation service. There was, however, great variability in the years of work of these professionals in the primary care setting.

There were more females in all three groups, with a higher proportion in the HP-NUC group. These results differ from previous studies but may be explained by the fact that the sample consisted mostly of nurses the majority of whom are women.<sup>10</sup> However, this does not explain the higher proportion of women in the HP-NUC group.

With respect to training, different studies corroborate the results presented.<sup>8,11-13</sup> This study showed training to be a very important requirement and a relevant factor for the use of the teleconsultation service. Training involves presentation of the service, practical exercise in system utilisation, discussion of the benefits and difficulties, explanation of legal aspects of performing teleconsultation and the need for change in work process to incorporate this service in their work routine.<sup>8,14</sup> Training should not be limited to new cities at the time of joining the programme,

but must be continuously offered to maintain skill and offset the impact of rotation of personnel.<sup>13</sup>

Similar to Ruas, the study showed that support and motivation to use teleconsultation are associated with greater use.<sup>14</sup> In this study, fewer non-users, especially those in cities not using the service, reported support and motivation from the local healthcare manager to use the teleconsultation service. Support and motivation from the local healthcare managers represents their interest in telehealth, and creates favourable conditions for teleconsultation use. On the other hand, if the local healthcare manager is not convinced of the benefits of telehealth, this may have a negative influence. Consequently, demonstrating the positive impact on healthcare and teleconsultation's cost-effectiveness may convince healthcare managers of its benefits leading them to motivate other healthcare practitioners. Cost-effectiveness indicators may be particularly important in convincing the manager.<sup>13,15-19</sup>

The majority of respondents in this study reported having prior knowledge of the teleconsultation system, demonstrating that lack of knowledge was not the main reason for not using the service. There was a significant difference between UHP-UC and HP-NUC, as expected. The Municipal Health Department was highlighted by most healthcare practitioners (62.0%) as the main source of service information.

In developing countries and in remote and poor areas where telehealth has direct application in improving the access to specialized services, the quality of the Internet connection is sometimes a limiting factor to the implementation of virtual services.<sup>2</sup> Local Internet connection conditions have been described in the literature as factors associated with the use of the system.<sup>14</sup> Another relevant factor is the availability of computers for teleconsultation in primary care units. Although these factors did not show significant statistical association with the use of the system in the present study, 30% of respondents indicated problems with Internet connectivity and a 15% reported lack of available of computers in their workplaces to use the teleconsultation service.

The effect of second opinion teleconsultation service on professional esteem and status with patients and within the community has been reported in the literature, but the results and opinions differ.<sup>12,20-22</sup> In this study, most of the respondents considered that "it does not interfere", and there was no difference among

the groups, so this factor does not seem to be a problem for those professionals. Additionally, the majority of respondents agreed that the system was beneficial for the patient, as well as useful for their daily work practice.

Satisfaction indicators have been shown to be essential for assessing the quality of service.<sup>5</sup> This study showed that most professionals were satisfied with the service, and that they would recommend it to other colleagues as well as reuse it themselves for other needs.

## Conclusion

This study provides important information to assist in the future development of strategies to increase the use, and to improve the quality and results of teleconsultation services. Training, support and motivation to use the service were the most important factors related to the teleconsultation use.

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