

---

## TELEMEDICINE IN GRADUATE MEDICAL EDUCATION: A VISION OF THE MEDICAL COURSES IN A DEVELOPING COUNTRY

Ezio De Martino Neto<sup>1</sup>, George Lucas F Castro<sup>1</sup>, Mateus Felipe V Soares<sup>1</sup>, Mariana R Cunha<sup>1</sup>, Giovana B Laterza<sup>1</sup>, Caroline P Santos<sup>1</sup>, Ana Paula O Bóscolo<sup>1</sup>, Thaynara T Lima<sup>1</sup>, Rodrigo A Tubelo DDS, MSc<sup>2</sup>

<sup>1</sup> Medical School, University of Uberaba, Uberaba, Brazil

<sup>2</sup> Dentistry School, Federal University of Rio Grande do Sul, Porto Alegre, Brazil

---

### Abstract

**This study mapped those Brazilian medical schools that could have a possible discipline related to telemedicine and/or telehealth, and analysed the curriculum of each. A survey was completed of the medical schools in Brazil (n=272) and a curriculum analysis performed to identify those disciplines with some relation to telemedicine and/or telehealth. A total of 71 medical schools were found within the inclusion criterion. These schools were distributed in the following regions of the country: Southeast (39.4%), Northeast (28.2%), South (15.5%), North (11.3%) and Midwest (5.6%). The highest number of public schools was found in the Northeast region (21.1%). Approximately 27.9% of medical schools have potential subjects related to telemedicine and telehealth in their curriculum, being similar its source of support. Greater attention should be given to training in telemedicine and/or telehealth.**

**Keywords:** telemedicine; training; disciplines; curriculum; medical education

### Introduction

Brazil is a large developing country characterised by its socio-economic and cultural contrasts, a heterogeneous distribution of infrastructure, and differences in the level of qualifications of professionals. These factors, along with geographical challenges, has led to variations in the quality of health services throughout the country's different regions. As a consequence, one of the main objectives of the Brazilian Ministry of Health (MS) is to improve the quality of basic care services offered by the Unified Health System (SUS). It intends to do so by promoting e-learning and telehealth which, in turn, would have a positive impact on the successful resolution of cases at

the primary care level and the general health of the population.<sup>1</sup>

There are two main public initiatives in the health area that use information and communication technologies (ICT): the Brazilian National Telehealth Network Program ("Telessaúde Brasil Redes"; TBR) and the Telemedicine University Network (RUTE). Launched in 2006, the TBR is a program by the MS which aims to improve quality of service and primary care in the SUS. The program is present throughout Brazil and allows the qualification of Family Health professionals and the exchange of information via the Internet between SUS doctors and experts. This is achieved through tele-diagnosis and tele-consultation on clinical cases, work processes, health education, planning, and monitoring of actions in primary healthcare.<sup>2</sup> Despite the rapid application of ICT, which has changed many aspects of medical practice, medical training in Brazil is still mostly based on the traditional model, i.e., focused on disease and hospital-based care.<sup>3,4</sup>

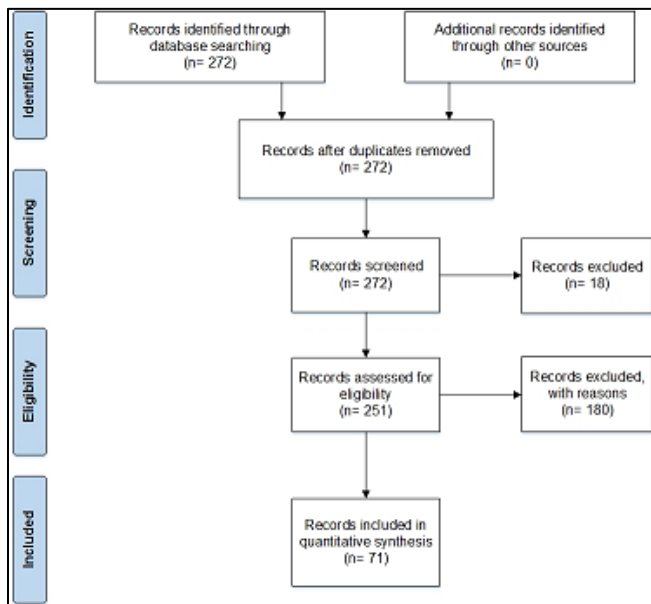
Some medical schools, understanding the complexity and breadth of medical education content, have recognised e-learning technologies as the most reasonable solutions for education. They allow learning to be individualised (adaptive learning), enhancing learners' interactions with each other (collaborative learning), and transform the role of the teacher (from disseminator to facilitator). In 2013, the Brazilian Ministry of Education (MEC) expanded the medical schools at the country's federal universities and provided incentives for the creation of new undergraduate courses at private establishments.<sup>5</sup>

The need for telemedicine education at the university-level is being emphasised and experiences in this field should be exchanged. The rapid uptake of ICTs is changing many aspects of medical practice and education. Medical schools should re-evaluate their curriculum and prepare the students to use the new

telehealth (telemedicine and telecare) techniques.<sup>3</sup> To facilitate this process, this study mapped Brazilian medical schools and analysed their curriculum to determine those with disciplines related to telehealth.

## Methods

An observational study of the websites of the 272 Brazilian medical schools was performed. The list of all Brazilian medical schools was obtained from the MEC and updated with other universities recently created.<sup>6,7</sup> Eight independent researchers evaluated the websites in search of the curriculum matrix (CM) and/or pedagogical project (PP) of each educational institution. The design of the study is described on Figure 1.



**Figure 1.** Description of the study design.

Of the 272 schools identified, 18 (6.6%) medical schools, did not have the CM and/or PP of the medical course available on their websites and did not provide it after contact via e-mail. Topics, which could in any way relate to telemedicine (telemedicine, telehealth, innovation, technology, informatics, bioinformatics, information, communication, robotics, and computation) were searched in the title of each discipline listed on the CM and/or PP of the medical schools.

The collection of data took place between the 25-29<sup>th</sup> November 2016, with each researcher responsible for the search of 34 medical schools. A chart was created to organise all the information collected (e.g.

name of the institution, location (city, state), the financial source of support, name of the discipline related to telehealth, and keywords presented in the title of the discipline linking it to telehealth. Based on this chart a map of Brazil was created (Microsoft 3D Maps for Excel) that included the location of the medical schools with a telehealth related curriculum, as well as the location of all the other medical schools in Brazil (Figure 2).

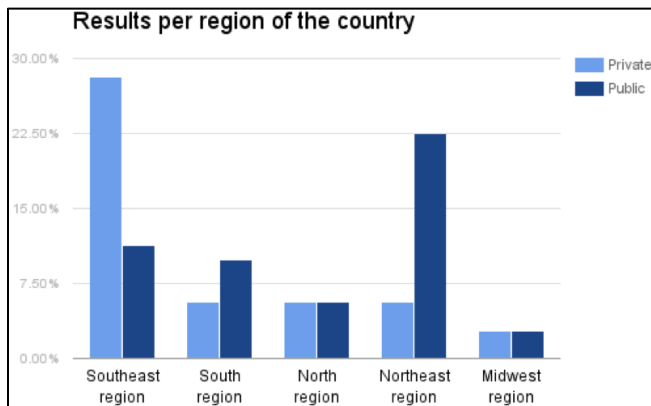


**Figure 2.** Map of Brazil that represents in green all the Brazilian medical schools and in red the medical schools that included in their curriculum any discipline related to telemedicine.

## Results

Of the 254 (93.4%) medical schools that had a list of disciplines available on their websites, only 71 (28.0%) institutions were selected by the eligibility criteria. In total 72 disciplines were found. The Pontifical Catholic University of Minas Gerais had two different disciplines that were included in this study in accordance with the eligibility criteria. Of the disciplines identified, 40 (55.5%) cited in their curriculum the topic informatics and/or bioinformatics, 11 (15.3%) the topic ICT, 8 (11.2%) information technology (IT), 4 (5.5%) telemedicine and/or telehealth, 4 (5.5%) technology, 3 (4.2%) innovation, 1 (1.4%) computation, and 1 (1.4%) the topic robotics.

Of the institutions selected, 27 (38.0%) were federal, 3 (4.2%) municipal, 8 (11.3%) state and 33 (46.5%) private. Of these, 28 (39.4%) were located in the Southeast region of Brazil, 11 (15.5%) in the South, 8 (11.3%) in the North region, 20 (28.2%) in the Northeast region, and 4 (5.6%) in the Midwest (Figure 2; Figure 3).



**Figure 3.** Distribution per region of the country of the Brazilian medical schools that included in their curriculum any discipline related to telemedicine.

## Discussion

This study showed that only a relatively small number (27.9%) of medical schools have a discipline related to telehealth / telemedicine, with the Southeast region of Brazil having the highest number of these medical schools, followed by the Northeast, South, North and Midwest regions. This distribution could be related to the evolution of telehealth / telemedicine and the type of services that are provided by different states, since the most developed states in the telehealth / telemedicine area are Minas Gerais, Rio de Janeiro, Rio Grande do Sul, Santa Catarina and São Paulo, all located in the Southeast and South region of Brazil.<sup>8</sup>

In Brazil, the high costs of diagnostic and therapeutic procedures, the lack of control over service usage, the growth in and aging of the population, the large concentration of health services in urban areas, the lack of specialists in more remote areas, and the low number of professionals trained in family medicine, have collectively made health delivery less accessible to poor people, which is contrary to the intention of the SUS to be universal, comprehensive and equalitarian. Telehealth / telemedicine has the potential of solving major current health challenges, and Brazil has the necessary characteristics for its full utilisation as the government has taken stock of this situation and has started to invest in pilot projects to evaluate telemedicine usage as a complementary tool to health services by considering both national and international experiences.<sup>8,9</sup>

There were some difficulties and limitations during the identification and collection of data for this study,

since it was not possible to analyse the curriculum of 18 medical schools (6.6% of medical schools in Brazil), as well as the lack of a common descriptors of the disciplines related to telemedicine.

## Conclusions

By analysis of all the available curricula it was shown that only a few medical schools actually provide their students with information about telehealth / telemedicine and its impact on medical practice and their future work. The results should alert graduate medical education course coordinators to think about reformulating the curricula of their courses.

### Corresponding author:

Ezio De Martino Neto  
 Universidade de Uberaba  
 Minas Gerais, Brazil  
 Telephone: +5534991907676  
 eMail: [eziodemartino@edu.uniube.br](mailto:eziodemartino@edu.uniube.br)

**Conflict of interest.** The authors declare no conflicts of interest.

## References

1. Campos FE, Haddad AE, Wen CL, Alkmin MBM, Cury PM. The National Telehealth Program in Brazil: an instrument of support for primary health care. *Lat Am J Telehealth* 2009;1(1):39-66.
2. Brazilian National Research and Educational Network. Telemedicine and telehealth actions change the reality of health in Brazil. Available at: <https://www.rnp.br/en/destaques/telemedicina-e-teleatendimento-mudam-a-realidade-da-saude-no-brasil> accessed 11 January 2017.
3. Wen CL, Silveira PS, Bohm GM. Telemedicine and Education: A Brazilian Experience. Discipline of Telemedicine, Faculty of Medicine of the University of São Paulo, Brazil 1998. Available at: <http://www2.fm.usp.br/dim/telemed/postelem.php> accessed 11 January 2017.
4. Souza PA, Zeferino AMB, Ros MDA. Changes in medicine course curricula in Brazil encouraged

- by the Program for the Promotion of Medical School Curricula (PROMED). *BMC Med Educ* 2008;54(8):1-7.
5. Scheffer MC, Dal Poz MR. The privatization of medical education in Brazil: trends and challenges. *Human Resourc Health* 2015;96(13):1-7.
  6. Ministry of Education (MEC). (2017). Higher Education Institutions and Registered Courses 2017. Available at: <http://emec.mec.gov.br> accessed 15 January 2017.
  7. Nassif ACN. Medical Schools from Brazil. List of all the schools 2017. Available at: <http://www.escolasmedicas.com.br/escolas.php> accessed 16 January 2017.
  8. Maldonado JMSV, Marques AB, Cruz A. Telemedicine: challenges to dissemination in Brazil. *Cadernos de Saúde Pública* 2016;32(2):1-9.
  9. Barbosa AKP, de A. Novaes M, de Vasconcelos AML. A Web Application to support telemedicine services in Brazil. In: *AMIA Ann Symp Proc*2003;2003:56-60.