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THEMATIC ARTICLE

The use of Information and Communication Technologies in Primary Health Care in Brazil - the period of 2014 to 2018

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Abstract *Information and Communication Technologies in Health allow the storage and processing of digital data, access to information and remote communications. The objective of this article was to describe the use of these Technologies to support clinical practice and continuing education by primary health care teams in Brazil the period of 2014 to 2018, within the scope of the Access and Quality Improvement Program Basic, according to characteristics of the geopolitical context. It's a cross-sectional study that analyzed the data collected from the teams of the Basic Health Units. A growing use by the teams of Telehealth resources, the Telemedicine University Network and the Open University of the Unified Health System was observed to aid clinical practice and permanent health education. In the North and Northeast regions, the use of these Technologies doubled, from cycle II to cycle III. The need for investments in infrastructure, human resources in Primary Health Care, qualification and professional training is a way to strengthen the Unified Health System and its Health Care Network, contributing to a continuous flow of care, with quality and access universal.*

Key words *Primary Health Care, Information and Communication Technology, Telehealth, Permanent education*

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Introduction

Health Information and Communication Technologies (ICTs) are resources capable of producing, storing, transmitting and ensuring security and access to information[1-3]. In 2005, the World Health Assembly defined e-health as the safe and cost-effective use of ICTs to support health-related materials in the provision, surveillance, literature and education of health care[4,5]. Therefore, the use of ICTs seeks to assist and optimize decision-making both in clinical practice and in the monitoring and evaluation of actions and Permanent Health Education (PHE).

In Brazil, the support of the use of ICTs is continuous due to developments in telecommunications. In the 2000s, the information and informatics policy of the Unified Health System (SUS) leveraged the use of ICT in the sector to maintain the coordinated, compatible and updated operation of information systems. Thus, strategies and programs were starting to be established, such as the University Telemedicine Network (RUTE) in 2006, the *Telessaúde Brasil Redes* in 2007 and the Open University System of the Unified Health System (UNA-SUS) in 2010. These programs encourage the use of ICTs together with the Ministry of Health, which aims to digitize the health care network with the computerization of Primary Health Care (PHC)[3,6-10].

In 2017, 27% of all health facilities had an Information Technology (IT) area, of which 35% were private and 17% were public. When comparing the Basic Health Units (BHU) (11%) and institutions with hospitalizations with more than 50 beds (78%), the difference becomes even greater. The degree of computerization can be observed as the need for qualified human resources increases[11]. Distance education activities in health related to Telehealth are also observed, as they are available in 27% of health units with internet access, and distance research activities are available in 20% of them, where public establishments surpass private ones[12,13].

However, PHC is the gateway to the health system, as it is the organizer of the Health Care Network (RAS) and care coordinator. Given the complexity and importance of this policy, monitoring and evaluation mechanisms are necessary so that actions can meet the needs of the population[14]. The implementation of ICTs in PHC brings about a transformation in the work process, allowing users to be reached in a more effective manner and facilitating the teaching-learning process, clinical decision-making and the collective construction of diagnoses within the health territory[15].

To evaluate the services in PHC, the National Program for the Improvement of Access and Quality (PMAQ-AB) was established as an initiative of the Federal Government in 2011; the program is composed of four complementary and continuous phases: adhesion and contractualization; development; external evaluation and re-contracting. The program sought to induce and expand access to improve the quality of PHC through financial transfers to municipalities based on performance. Throughout the three cycles of the Program, continuous improvements were made in the infrastructure and availability of inputs in the UBS throughout the national territory between 2012 and 2018[16].

The lack of IT equipment such as a computer, internet access, telephone and television in the country's health services is a major barrier to the applicability of Telehealth, RUTE and UNA-SUS. Less than 50% of the UBS have ICT equipment available. The lack of access to a computer with internet at the UBS is a limiting factor for the use of the main information systems in PHC. Therefore, the PMAQ-AB notes the need for investments in infrastructure and availability of ICT equipment in PHC services from cycle I of the Program onwards, allowing us to observe the insufficiency of ICT equipment and the need for investments in telecommunications infrastructure capable of ensuring interoperability, systems, services, human and organizational resources[17-20].

The objective of this article was to describe the use of ICTs to support clinical practice and continuing education by health teams in the Brazilian primary care network from 2014 to 2018; the article is written within the scope of the PMAQ-AB, and according to the characteristics of the geopolitical context.

Methods

This is a cross-sectional study with a quantitative approach. The selection of participants was based on the voluntary adherence of the PHC health teams to the PMAQ-AB during cycles II and III of the program.

The responsibility for data collection was given to the Federal Institutions of Higher Education (IFES) under the leadership of the Department of Primary Care of the Ministry of Health. The distribution of municipalities in the territory was shared among the IFES, which were responsible for the lo-

gistics of moving the interviewers. Soon after the mapping of the intercity routes and operational planning, teams of supervisors and interviewers collected data at the UBS.

The instruments for data collection were digital, organized into modules and applied via tablets by health care professionals (nurses, physicians or dentists) in primary health care services. After collection, the information was transferred to a database on a national server. Each IFES was responsible for the initial consistency analysis of the databases.

For this study, module II "Interview with a Professional of the Primary Care Team and Document Verification at the Health Unit" was used with the blocks "Continuing Education of the Qualification Process of Developed Actions" of cycles II and III and "Telehealth in Primary Care and the Relationship between Primary Care and Other Points of the Health Care Network" of cycle III. Information on support for clinical practice and EPS related to Telehealth, RUTE and UNASUS were used. Regarding Telehealth, the type of platform used, the purpose of Telehealth use (Formative Second Opinion; Telediagnosis; Teleconsultation; Tele-education) and the way in which the Teleconsultation was received were characterized.

Thus, the variables used in cycles II and III of the PMAQ-AB were as follows:

• Does the team participate in continuing education actions organized by the municipal administration? (Yes/No).

• If yes. Do these continuing education actions address the demands and needs of the teams? (Consider a lot/Consider/Consider reasonably/Do not consider).

• Which of these action(s) does the team participate in? (Telehealth/RUTE/UNASUS).

• Which platform does the team use for Telehealth? (From the Ministry of Health/Other platform).

• Does the team use the Telehealth toll-free number? (Yes/No)

• How does the team evaluate the assistance received on the 0800 number? (Very good/Good/Fair/Bad/Very bad).

• The team uses Telehealth for: (Formative Second Opinion/Telediagnosis/Tele-education/Teleconsultation)

• Why does the team not use Telehealth? (Difficulty access-connectivity/There is no possibility of access during working hours/No one answers when I try to call/No response received/The team does not need to access it/The program does not exist in the municipality).

Some variables were analysed separately per cycle, namely:

▶ Cycle II variables:

• If yes, for the use of 0800 numbers: How often does the team use the Telehealth 0800 number? (Daily/Weekly/Less than weekly).

• If Telehealth was used for Teleconsultation: How is Teleconsultation performed? (Asynchronous-via platform with return in 72 hours/Synchronous-Skype in real time).

▶ Cycle III variables:

• Is there an institutionalized flow of communication between your team and Specialized Care? (Yes/No).

• If yes, what is the institutional flow of communication? (Technical meetings with network experts/Teleconference/Telehealth/Electronic medical records/Electronic communication (email, WhatsApp, etc.)/Reference sheet-counter-reference with detailed history and suggestions for conduct/Phone contact).

• Is there a regulation centre available for referring users to other points of care? (Yes/No).

In addition to the year of collection (2014 and 2018), the geopolitical region (North, Northeast, Midwest, Southeast and South) was used for stratification. Descriptive statistics were used to characterize the distribution of responses and calculate the difference in percentage points between the two assessment cycles. This analysis was performed using the statistical software STATA version 15.1.

The studies were submitted and approved by the Research Ethics Committee (CEP). In cycle II, it was approved by the CEP of the Federal University of Goiás under opinion No. 487055 on 12/02/2013. In cycle III, it was approved by the CEP of the Federal University of Pelotas under opinion No. 2,453,320 on 12/27/2017.

Results

The external evaluation of the PMAQ-AB included, nationwide, a total of 29,778 family health teams in cycle II (2014) and 37,350 in cycle III (2018). These teams worked in 24,055 and 28,939 UBS, respectively, from more than 5,000 Brazilian municipalities. In cycles II and III, 89.2% participated in EPS actions organized by municipal management, 20.8% in cycle II and 37.0% in cycle III with reporting that the EPS actions addressed the demands and needs of the team.

Among the PHE activities that required the use of ICTs, Telehealth between the two cycles

showed greater use in the South region (66.5%) in cycle III (Figure 1).

The prevalence of Telehealth use in clinical practice was 32.7% in 2014 and increased to 54.6% in 2018. In cycle III, 66.5% of the teams in the South region used Telehealth in clinical practice. Of these Telehealth practices, Teleeducation was the most used between the two cycles, 69.5% and 73.8%. In cycle II, the North region had a prevalence of 88.2% in terms of the use of tele-education, while in cycle III, the Midwest region stood out with 80.0%. Teleconsulting was also on the rise, especially in the South region (77.3%), being performed most often asynchronously (78.9%), with 83.2% access through the Ministry of Health platform. For the teams that did not use Telehealth, the main reason was that Telehealth was not offered in the municipality or UBS 55.0% and 50.5%, respectively, especially in the North and South (Table 1).

The 0800 telephone resource of Telessaúde was used by 31.1% of a total of 26,463 teams in cycle II and 55.0% of a total of 36,268 teams in cycle III. Of the 2,854 and 11,191 teams from cycles II and III that evaluated the care received, 34.8% and 43.3% reported it to be very good, respectively. In cycle II, out of 29,778 teams, 48.5% reported using this resource weekly.

Considering the use of ICTs in the institutionalized communication flow between the PHC and Specialized Care teams, in cycle III (n = 37,350), 89.4% presented this possibility, of which 93.4% in the Southeast region followed by 91.5% in the South region. Of a total of 33,383 teams, 73.8% used telephone contact, 61.5% used electronic communication (e-mail, WhatsApp, etc.), 24.9% used Telehealth, 21.5% used electronic medical records and 12.8% used conference calls, with the southern region making the most use of these technologies. For referrals of users to other points of care, 94.9% said that there is a regulation centre available for this, and the Midwest and Southeast regions were the ones that had most referred users to other health care points, with 97.2% and 97.5%, respectively.

Discussion

Brazil advanced in the use of ICTs between 2014 and 2018, but problems related to infrastructure, access and use of programs in municipalities per-

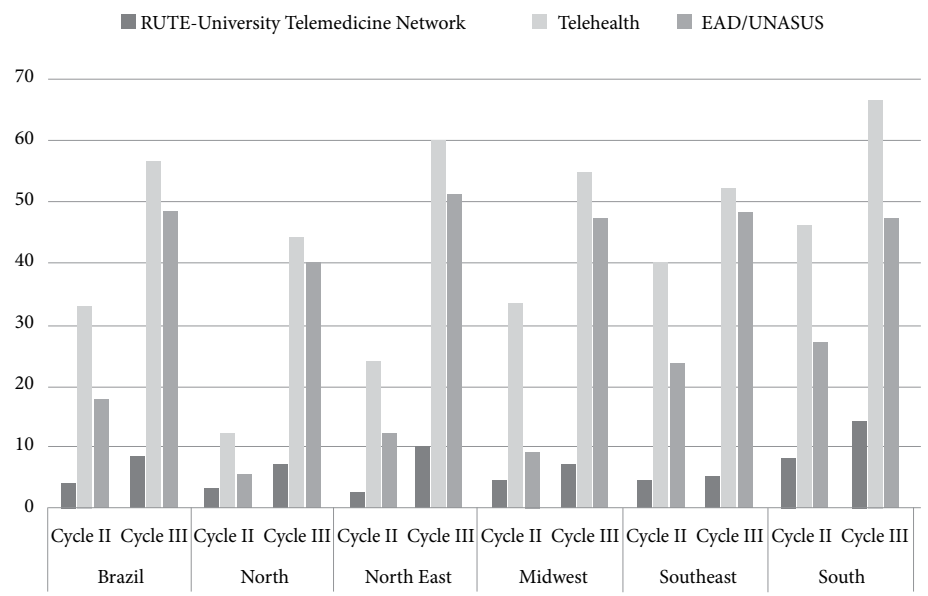

Figure 1. Continuing education activities in which the team participated. Cycle II 2014-Cycle III (2018), PMAQ-AB, Brazil.

Source: Authors.

Table 1. Uses of Telehealth by UBS teams. PMAQ-AB, 2014-2018.

	Brazil			North		Northeast	
	Cycle II (%)	Cycle III (%)	Difference (p.p.)	Cycle II (%)	Cycle III (%)	Cycle II (%)	Cycle III (%)
	(n) 29,778	**(n) 37,350**		**(n) 1,799**	**(n) 2,467**	**(n) 10,768**	**(n) 13,433**
Team uses Telehealth	32.7	54.6	21.9	12.1	43.8	23.7	60.0
Uses of Telehealth:	(n) 9,181	(n) 20,390		(n) 211	(n) 962	(n) 2,434	(n) 7,494
Second Formative Opinion	43.4	57.5	14.1	26.1	57.0	52.6	62.0
Telediagnosis	39.8	55.5	15.7	36.5	50.5	49.0	52.3
Teleconsulting	54.5	66.5	12.0	20.0	51.0	65.3	67.2
Tele-education	69.5	73.8	4.3	88.2	73.3	60.0	79.0
Why does the team not use Telehealth?	(n) 20,039	(n) 16,960		(n) 1,582	(n) 1,620	(n) 8,213	(n) 6,342
Infrastructure and Connectivity	37.0	49.6	12.6	30.2	66.0	39.6	60.5
Access difficulties	8.7	35.8	27.1	3.4	32.4	5.9	24.7
The team does not need to access	4.1	2.4	-1.7	1.3	2.0	2.3	1.2
The program does not exist	55.0	50.5	-4.5	67.5	50.2	56.6	52.0

	Midwest		Southeast		South	
	Cycle II (%)	Cycle III (%)	Cycle II (%)	Cycle III (%)	Cycle II (%)	Cycle III (%)
	(n) 2,602	**(n) 3,035**	**(n) 10,100**	**(n) 11,996**	**(n) 4,509**	**(n) 5,337**
Team uses Telehealth	33.1	54.7	40.0	52.0	45.8	66.5
Uses of Telehealth:	(n) 785	(n) 1,646	(n) 3,845	(n) 6,511	(n) 1,906	(n) 3,777
Second Formative Opinion	43.0	51.4	39.2	50.3	42.3	64.5
Telediagnosis	33.6	48.1	36.8	51.0	37.5	74.6
Teleconsulting	34.8	59.0	52.0	63.8	58.0	77.3
Tele-education	74.6	80.0	72.0	68.0	72.8	72.0
Why does the team not use Telehealth?	(n) 1,742	(n) 1,467	(n) 6,059	(n) 5,835	(n) 2,443	(n) 1,696
Infrastructure and Connectivity	47.6	55.0	35.1	39.5	29.2	25.6
Access difficulties	13.4	45.1	12.0	43.7	10.5	49.2
The team does not need to access	4.0	2.0	7.0	3.3	5.4	4.3
The program does not exist	42.5	49.0	51.0	47.3	60.6	57.5

Source: Authors.

sist. When observing the ICTs in health practices in primary care, it is possible to reflect on the management interfaces between the user and the supply of health databases[11,15,18,21]. According to Vieira *et al.*[14] the organization of the UBS should be improved by implementing new technologies. However, it is noteworthy that the initiative of the Ministry of Health to computerize the system is facilitating communication between the teams, improving the flow, matrix support, EPS and Telehealth[14].

During the pandemic period, through RUTE and Telehealth, more than 600 meetings were held by videoconferences, bringing together health professionals from Brazil and other countries to exchange experiences, share results, perform collaborative research and preventive actions. For example, in Recife, *drones* with infrared cameras and thermal sensitivity identified possible cases of COVID-19 in real time and sent information to a regulation centre triggering teams to carry out preventive actions in the population. UNA-SUS conducted several distance courses for actions that involved access to official information and various protocols, offering guidance to health professionals, the population and educational resources on various subjects, especially COVID-19[18,22].

ICTs can improve education and communication in public health, and EPS is a political-pedagogical strategy that relates teaching, health care, system management, and participation in social

control with respect to the problems and needs arising from the health work process. The National Policy for Continuing Education in Health (PNEPS) is framed by Ordinance GM/MS No. 198, of February 13, 2004. Based on this, the programming of actions includes the definition of EPS activities, which are part of RUTE, UNA-SUS and Telehealth[23,24].

With an initiative of the Ministry of Health coordinated by the National Education and Research Network (RNP), RUTE in 2006 had the initial objective of interconnecting university hospitals and teaching health units through videoconferences or webconferences. According to the study by Oliveira *et al.*[24] in 2013, RUTE was used by only 1.3% (n=475) of the UBS teams in Brazil, with greater demand in the southeast and south of the country, corroborating our study. The aforementioned authors consider the discontinuity of the work process, through the replacement of managers and health workers, a factor of disruption in terms of actions for qualification of the service. Public policies are the basis for the quality results of health services; when professional turnover rates exceed 26%, there is a high cost and financial impact, and above 50%, the risk compromises productivity and quality of services[25,24].

Another EPS action came from *Telessaúde Brasil Redes*, created in 2007 in partnership with the Ministry of Science and Technology and the Ministry of Health, which through RNP and RUTE synchronized, expanded and leveraged the actions with the National *Telessaúde Brasil Redes* Program, making an EPS tool for the practical and clinical SUS for the work process and increasing problem-solving capacity in PHC.

The Telehealth resource in EPS was used in UBS in Brazil in 2013 by 9.49% (n=1,754) teams, with greater access in the Southeast region[26] and according to our study, this resource is growing. For Sarti and Almeida[27] the use of Telehealth resources in certain regions indicates the need for positive induction by local, state and national governments to qualify services and empower health teams[27], corroborating our study by identifying the nonexistence of the program in municipalities, making Telehealth in these spaces unusable.

Additionally, in the EPS, we have the UNA-SUS system, created in 2010 to meet the training and EPS needs of professionals working in the SUS. Coordinated by the Ministry of Health together with the Department of Labour Management and Health Education (SGTES/MS) and the Oswaldo Cruz Foundation (Fiocruz), UNA-SUS has a collaborative network formed by 35 higher education institutions that offer distance course payments[28].

The educational offerings cover the entire country, and 50% of the trained professionals are from PHC. However, in 2013, the Southeast region stood out for the use of UNA-SUS, with a demand of 6.83% (n=1,261)[24]. For Oliveira *et al.*[24] and Sarti and Almeida[27] the main challenges are management and demand for services due to the lack of professionals and the need for qualification of services[24,27].

The EPS is still in the process of being built with professionals. For many authors, the understanding of the EPS policy, the elaboration of the EPS plan, and the technical, economic, infrastructure and government support dimensions are obstacles to be overcome[23-25,27,28].

In addition to the use of Telehealth in EPS, this tool is available in clinical practice through Telediagnosis, Second Formative Opinion and Teleconsultation. Telehealth aims to overcome socioeconomic, cultural and geographical barriers to improve health services and information[18]. In 2020, 85.2% of Brazilian states offered telehealth services[29].

In the state of Santa Catarina, in 2015, there were approximately 72 accesses for Second Formative Opinions in 2016, 231,113 reports on telediagnosis exams and approximately 17,242 teleconsultations in 2017[26]. In São Tomé and Príncipe, Central Africa, according to the Portuguese health service, from 2011 to 2019, 4,966 teleconsultations were performed in real time, and 137,976 exams and clinical processes were performed through Telehealth platforms[30]. These studies are in line with our results, emphasizing the growing demand for the use of Telehealth by UBS teams.

The 0800 telephone service was used by approximately 55.0% of the teams in 2018. According to the study by Thumé *et al.*[31] in PHC, this resource supports the guidelines of dermatological diseases, for example, providing aid in diagnosis and treatment[31]. In the United Kingdom, the telephone is used to streamline the health care process, with active search, follow-up and monitoring of users, as well as the Electronic Medical Records in PHC across the country that allows for an organized and vigilant work process. In spontaneous demand, there is an online communication route to facilitate access to some services, contributing to the flow of care and quality of services[32].

These technological initiatives, such as Telehealth, the Electronic Health Record, telephone, and e-mail, contribute to the institutional flow between PHC and specialized care[33]. Corroborating our findings, the ICT study (2018)[11] shows that the Northeast, Southeast and South regions concentrated the largest number of UBSs; however, the South (87%), Midwest (74%) and Southeast (57%) had greater implementation of Electronic Medical Records, which facilitated the flow of care and referral[11]. As in Porto Alegre, 80% of the queues had waiting times that varied between 30 and 90 days, with regulation made through Telehealth in some specialties, the waiting time for consultation decreased to an average of four to eight days. Other studies report that ICTs are a means of facilitating institutional flow; however, government initiatives are needed to encourage the computerization strategy of PHC[14,31,33].

Therefore, the limitations of this study were the choice of variables that spoke only about ICTs, excluding variables such as classroom courses; seminars, exhibitions, workshops, discussion groups; exchange of experience, tutoring/preceptorship, variables that were not included in both cycles, such as: distance education course; the basic unit as a space for training, teaching and learning with undergraduate students, specialization students, residents, among others. The limitations found in the literature were related to the debate within the 2014-2018 period, as ICTs gained strength during the 2020-2022 pandemic period.

Conclusion

This study made it possible to describe the potential of ICTs in supporting clinical practice and EPS by health teams in the Brazilian Primary Care Network from 2014 to 2018. The results reflect the evolution and need for ICTs for services in the PHC network. In EPS and clinical practice, ICTs contribute to the learning and work process and help in the resolution of UBS demands and in the flow of users to specialized care, strengthening PHC. However, government strategies and policies are still necessary because in many places, there are still no programs and information technologies that support the reality of public health services and health professionals.

Collaborations

All authors participated in the interpretation of the data, writing of the article, relevant critical review of the intellectual content, final approval of the version to be published and declare that they are responsible for all aspects of the work, ensuring its accuracy and integrity.

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