English

Profile of tele-diagnosis examinations of the Pernambuco Telehealth Center Network

Lilian Aragão	Multiprofessional Residency Program in Collective Health of the Health Department of Recife/PE, Resident. Postgraduate in Primary Care and Family Health by the Multiprofessional Residency Program in Primary Care and Family Health of the Health Department of Jaboatão dos Guararapes/PE. E-mail: lilian_aragao@outlook.com. Lattes: http://lattes.cnpq.br/3155327945834515. ORCID: https://orcid.org/0000-0003-2324-1512. Rua Alfredo de Medeiros, nº 71, Espinheiro, Recife/PE, CEP: 52021030. Telephone: (81)99162-8564
Keilla Taciane Martins de Mélo	Pernambuco Telehealth Center (NUTES- Núcleo de Telessaúde de Pernambuco), Teleassistance Coordinator at the Telehealth Center at Hospital das Clínicas at UFPE. Master in Telemedicine and Telehealth from UERJ. E-mail: keilla.melo@nutes.ufpe.br. Lattes: http://lattes.cnpq.br/5015416946582437
Karolina de Cássia Lima da Silva Duarte	Executive Secretariat for Work Management and Health Education, Multiprofessional Residency Program in Collective Health of the Health Secretariat of Recife/PE, Coordinator. Master in Public Health by the Academic Master in Public Health at Fundação Oswaldo Cruz - Instituto Aggeu Magalhães. E-mail: karolina@recife.pe.gov.br. Lattes: http://lattes.cnpq.br/4544485687046225

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Abstract

Objective: To analyze the profile of telediagnostic exams of the Network of Telehealth Centers of Pernambuco from 2018 to 2020. Methods: Cross-sectional, retrospective, descriptive and exploratory study, with a quantitative approach, whose sample was constituted by the telediagnostic exams of RedeNUTES in the period from 2018 to 2020. The exams produced in the areas of radiology, ophthalmology, cardiology and dermatology were included. Procedures requested outside the State of Pernambuco were excluded. Data storage and tabulation were performed in Microsoft Office Excel 2013, and the analysis was performed using simple descriptive statistics. Results: 16523 procedures were observed according to the inclusion criteria, distributed unevenly over time. Of this total, 4 procedures were not considered for analysis purposes. 66% of the sample was female. The mean age of the patients varied, with the actively productive age group predominating. As for the spatial distribution, there was decentralization in relation to the request for exams. Conclusions: Telehealth added an important role in the qualification of Primary Health Care (PHC). The use of Information and Communication Technologies (ICT) in health reinforces the greater coverage and access to health, helping to comply with the basic principles of the SUS.

Keywords: Telemedicine; Telediagnostics; Unified Health System.

Resumen

Perfil de los exámenes de telediagnóstico de la Red de Centros de Telesalud de Pernambuco.

Objetivo: Analizar el perfil de los exámenes de telediagnóstico de la Red de Centros de Telesalud de Pernambuco de 2018 a 2020. Métodos: Estudio transversal, retrospectivo, descriptivo y exploratorio, con enfoque cuantitativo, cuya muestra estuvo constituida por los exámenes de telediagnóstico de RedeNUTES en el período de 2018 a 2020. Se incluyeron los exámenes producidos en las áreas de radiología, oftalmología, cardiología y dermatología. Se excluyeron los trámites solicitados fuera del Estado de Pernambuco. El almacenamiento y la tabulación de los datos se realizaron en Microsoft Office Excel 2013, y el análisis se realizó mediante estadística descriptiva simple. Resultados: Se observaron 16523 procedimientos según los criterios de inclusión, distribuidos de manera desigual en el tiempo. De este total, 4 procedimientos no fueron considerados para el análisis. El 66% de la muestra eran mujeres. La edad media de los pacientes varió, predominando el grupo de edad activamente productivo. En cuanto a la distribución espacial, hubo descentralización en relación a la solicitud de exámenes. Conclusiones: La Telesalud agregó un papel importante en la calificación de la Atención Primaria de Salud (APS). El uso de las Tecnologías de Información y Comunicación (TIC) en salud refuerza la mayor cobertura y acceso a la salud, ayudando a cumplir con los principios básicos del SUS.

Palabras clave: Telemedicina; Telediagnóstico; Sistema Único de Salud.

Resumo

Perfil dos exames de telediagnóstico da Rede de Núcleos de Telessaúde de Pernambuco.

Objetivo: Analisar o perfil dos exames de telediagnóstico da Rede de Núcleos de Telessaúde de Pernambuco no período de 2018 a 2020. Métodos: Estudo transversal, retrospectivo, descritivo e exploratório, com abordagem quantitativa, cuja amostra foi constituída pelos exames de telediagnóstico da RedeNUTES no período de 2018 a 2020. Incluiu-se os exames produzidos nas áreas de radiologia, oftalmologia, cardiologia e dermatologia. Excluiu-se os procedimentos solicitados fora do Estado de Pernambuco. O armazenamento e tabulação dos dados foram realizados no Microsoft Office Excel 2013, e a análise executada por meio de estatística descritiva simples. Resultados: Foram observados 16523 procedimentos de acordo com os critérios de inclusão, distribuídos de forma não igualitária no decorrer do tempo. Deste total, 4 procedimentos não foram considerados para fins de análise. 66% da amostra correspondeu ao sexo feminino. A média de idade dos pacientes variou, predominando a faixa etária ativamente produtiva. Quanto à distribuição espacial, houve descentralização em relação à solicitação dos exames. Conclusões: A telessaúde agregou um importante papel na qualificação da Atenção Primária à Saúde (APS). O uso de Tecnologias da Informação e Comunicação (TIC) em saúde reforça a maior abrangência e acesso à saúde, auxiliando no cumprimento dos princípios básicos do SUS.

Palavras-chave: Telemedicina; Telediagnóstico; Sistema Único de Saúde.

Introduction

Telehealth, a term commonly used as a synonym for telemedicine, is the use of Information and Communication Technologies (ICT) applied to different health processes and services.[1] The use of these technologies in medical activities conceptualizes telemedicine, becoming a telehealth modality. Recently, the World Health Organization (WHO) used the terminology digital health to address telehealth, having it as a propitious in the provision of services related to health care, especially in situations where distance is a determining factor.[2]

Telehealth is constantly evolving, as it absorbs technological advances, responds, and adapts to the needs, changes, and contexts of society.[2] Its application in Primary Health Care (PHC) strengthens universality, integrality, and equity, constitutional principles of the Unified Health System (SUS- Sistema Único de Saúde) advancing the improvement of the population's health and reduction of social inequalities.[1]

It emerged in Brazil as a strategy to support PHC health professionals in remote municipalities, where there was difficulty in offering more specialized services to the population, as well as obstacles to users' access, low professional fixation in the territory, and insufficient provision of continued education, becoming setbacks that affected the quality and resolution of the care provided to society.[3]

In 2007, the Ministry of Health (MH) instituted the Telehealth Brazil Program, redefined and expanded in 2011, through Ordinance 2546/GM/MS, for the National Telehealth Brazil Redes Program (Programa Nacional Telessaúde Brasil Redes).[4] This program offered professionals and workers in Health Care Networks (RAS- Redes de Atenção à Saúde) the services of Teleconsultation, Telediagnosis, Second Opinion Formation, and Teleeducation as a potential for improving the quality of life and health of the population in different locations.[6]

In Pernambuco, the Telehealth Center of the Medical Sciences Center of the Federal University of Pernambuco (NUTES-CCM/UFPE) was established through Normative Ordinance 17, of September 29, 2003. Since then, it has been dedicated to teaching, research, and development of projects and actions for the application of ICT in the health area, contributing to the strengthening of the health system through research and development of innovative technological solutions.[7]

The Telehealth Centers Network in Pernambuco (RedeNUTES), was implemented in 2003 as part of the Telehealth Project in the Family Health Strategy (ESF- Estratégia de Saúde da Família) of the Health Information Technologies Group (TIS- Tecnologias da Informação em Saúde) at UFPE1,[8], and a member of the National Program Telehealth Brasil Networks [9] Programa Nacional Telessaúde Brasil Redes) of MS, is coordinated by NUTES, and consists of telehealth centers and units. It offers teleassistance services (teleconsulting and telediagnosis), teleeducation (seminars, courses), and Telemanagement in the most diverse specialties, to expand and improve access to health for the population to health services.[7]

In general, telehealth assists in expanding and improving the ability to meet public health demands, in resolving and making decisions through interaction, training, and continuous and permanent education of professionals, diagnosis on time, integration with communication technologies, and approximation with other knowledge production sectors. Also, it can improve the population's access to specialized health services, as well as qualify referrals to secondary and tertiary levels, reducing the number of people in reference units and health care costs.[3, 8-10]

The telediagnosis service refers to the service that uses ICT to perform diagnostic support services across geographic and temporal distances.[5] Its application expands access to health care and services, and contributes to the strengthening of the integrated network, maximizing the professionals' time and productivity, improving the quality of care, increasing access and equity, and reducing costs.[11] At RedeNUTES, the telediagnosis service provides health professionals with the TeleECG (Tele-Electrocardiogram), Teleradiology, and other exams, which makes it possible to issue reports remotely.[7]

This study aims to analyze the profile of telediagnosis exams of the Telehealth Centers Network of Pernambuco from 2018 to 2020.

Method

This is a cross-sectional, retrospective, descriptive and exploratory study with a quantitative approach, approved by the Research Ethics Committee under CAAE nº: 43458420.9.0000.5569.

The study sample consisted of examinations of the telediagnosis production contained in the RedeNUTES

Database. For this, as inclusion criteria, we considered the data from the exams produced from 2018 to 2020 in the areas of radiology, ophthalmology, cardiology and dermatology. The exclusion criterion was determined by requests outside the State of Pernambuco.

After collection, data storage and tabulation were performed using Microsoft Office Excel 2013 software, which obtained and displayed the percentage of responses and the construction of graphs and tables. The analysis was performed using simple descriptive statistics, whose variables analyzed were: teleconsulting area, procedures performed, months of reports, gender, age group, and spatial distribution of requests.

Results

A total of 16523 telediagnosis procedures from RedeNUTES were observed from 2018 to 2020, distributed in the areas of radiology, ophthalmology, cardiology and dermatology. According to the exclusion criteria, 4 procedures were not considered for analysis purposes, resulting in a total of 16519 exams.

In absolute numbers, telecardiology corresponded to the majority of procedures, 15,224 in the aforementioned period, which represents 92.2% of the total number of exams. This scenario reflects most of the area over the first two years, falling behind teleradiology only in 2020 (Table 1).

The telecardiology procedure corresponds to the electrocardiogram, performed using the electrocardiograph. Retinography refers to the examination of teleophthalmology, which uses the retinograph as a resource to perform the ophthalmic investigation. For the teleradiography report, with and without tracings, the x-ray was the equipment used to determine the images.

Table 1. Distribution of RedeNUTES telediagnostic procedures by year and teleconsulting area. Recife, 2021.

Teleconsulting Area	2018		2019		2020		Total	
		%		%		%		%
Radiology	101	1%	83	1.5%	496	46.6%	680	4.1%
Ophthalmology	220	2.3%	174	3%	221	20.8%	220	3.7%
Cardiology	9397	96.7%	5480	95.5%	347	32.6%	15224	92.2%
Total	9718	100%	5737	100%	1064	100%	16519	100%

Source: RedeNUTES telediagnostic production database from 2018 to 2020.

We observed that the procedures are distributed unevenly over the months, showing a variation over time and by telediagnosis area (Table 2). In 2018, the radiology and ophthalmology reports started in September and October, respectively, while the exams in the cardiology area took place throughout the year, highlighting March and October with more than a thousand reports completed.

In 2019, all telediagnosis areas studied started the year in activity. However, some months did not have notifications, such as September, which did not indicate a finalized report in any analyzed area.

In 2020, there was a sharp drop in the number of reports in the areas of radiology, ophthalmology, and cardiology. As of September, there were notifications in all areas.

Of the universe of procedures performed, 10906 (66%) were performed in female patients, while 5613 (34%) corresponded to male patients. (Graphic 1)

The mean age of patients varied between years and areas of telediagnosis. In teleradiology, the mean ranged from 43.9 to 45.3 years. In teleophthalmology, the variation was between 48.5 to 60.3 years. Telecardiology obtained means of 49.2 to 52.5 years. (Graph 2).

Regarding the spatial distribution of requests for telediagnosis procedures from RedeNUTES, by the Regional Health Management (GERES) (Table 3), teleradiology is predominantly required by GERES VIII, especially driven by the municipality of Afrânio. Teleophthalmology, in 2018 and 2019, was requested only at GERES I, exclusively by the city of Recife. In 2020, there was a considerable decrease in requests from this Management, with GERES II, III, and IV appearing as the majority components of the requests, especially in the municipalities of Lagoa do Carro, Rio Formoso, and Barra de Guabiraba.

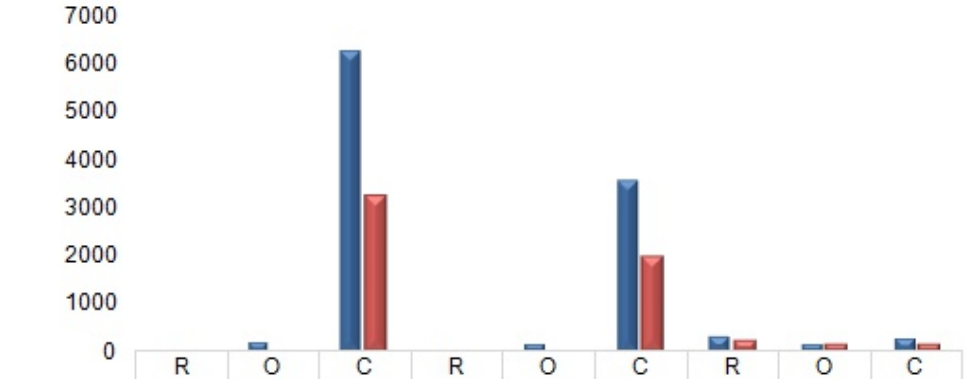
Considering telecardiology, in 2018 and 2019, GERES II, VI, and I, respectively, corresponded to the management with the highest number of requests. The municipalities of Limoeiro, Petrolândia, and Igarassu stand out as the greatest representatives of these

Table 2. Distribution of RedeNUTES telediagnosis procedures by month and year of the report. Recife, 2021.

Report month	2018			2019			2020		
	R	O	C	R	O	C	R	O	C
January	0	0	676	17	125	389	0	0	0
February	0	0	580	4	49	520	0	0	0
March	0	0	1099	10	0	476	7	0	23
April	0	0	839	15	0	744	0	0	0
May	0	0	952	10	0	834	0	0	0
June	0	0	701	14	0	624	0	0	0
July	0	0	649	9	0	774	0	0	0
August	0	0	933	4	0	836	58	0	0
September	22	0	905	0	0	0	88	21	20
October	17	3	1074	0	0	19	116	71	44
November	22	121	629	0	0	225	145	123	166
December	40	96	360	0	0	39	82	6	94
Total	101	220	9397	83	174	5480	496	221	347

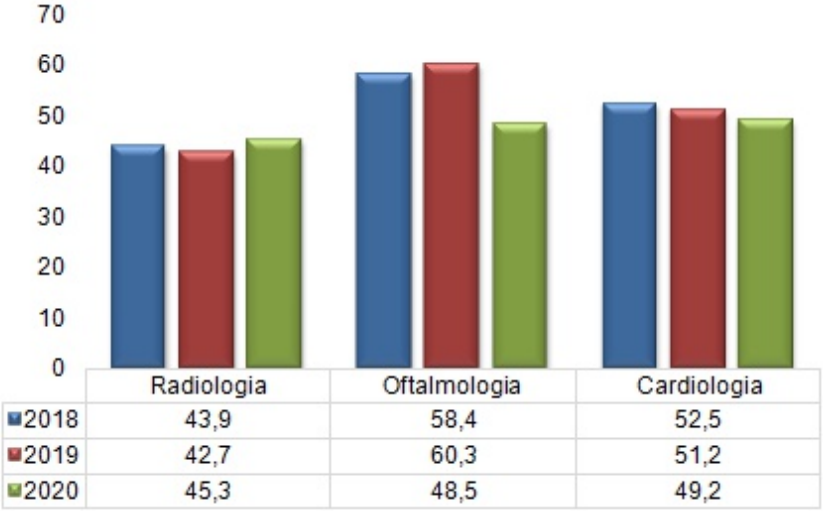
Caption: R = Radiology; O = Ophthalmology; C = Cardiology.
Source: RedeNUTES telediagnostic production database from 2018 to 2020.

Graph 1. Distribution of RedeNUTES telediagnostic procedures by sex, year, and teleconsulting area. Recife, 2021.



Caption: R = Radiology; O = Ophthalmology; C = Cardiology.
Source: RedeNUTES telediagnostic production database from 2018 to 2020.

Graph 2. Mean age among patients who underwent telediagnostic procedures at RedeNUTES per year and teleconsulting area. Recife, 2021.



Source: RedeNUTES telediagnostic production database from 2018 to 2020.

requirements, the result of joint efforts carried out in partnership with these locations in the State of Pernambuco. In 2020, the scenario changes with the decrease in requests from GERES II and I, while VI, X, and XII stand out, with the municipalities of Petrolândia, Afogados da Ingazeira, and Aliança as the largest requesters.

Table 3: Distribution of RedeNUTES telediagnosis procedures by year of occurrence, telediagnosis area, and Regional Health Management. Recife, 2021.

GERES	2018			2019			2020		
	R	O	C	R	O	C	R	O	C
GERES I	1	220	1460	0	174	781	42	2	1
GERES II	0	0	1983	0	0	1634	169	75	1
GERES III	0	0	1159	0	0	239	22	54	10
GERES IV	0	0	855	0	0	409	0	90	0
GERES V	0	0	1019	0	0	235	0	0	0
GERES VI	0	0	1746	0	0	866	8	0	200
GERES VII	0	0	108	0	0	0	0	0	0
GERES VIII	100	0	67	83	0	126	252	0	0
GERES IX	0	0	0	0	0	0	0	0	0
GERES X	0	0	669	0	0	414	0	0	80
GERES XI	0	0	0	0	0	0	0	0	0
GERES XII	0	0	331	0	0	776	3	0	55

Caption: R = Radiology; O = Ophthalmology; C = Cardiology.
Source: RedeNUTES telediagnostic production database from 2018 to 2020.

Discussion and Conclusion

The demographic transition and the consequent population aging are an evident phenomenon in Brazil, as is the change in the epidemiological profile. Therefore, there is a population with a considerable portion of elderly people, in a scenario in which Chronic Non-Communicable Diseases (NCDs) are expanding. This scenario points to a consequent need to plan and offer efficient and effective health services that meet society's demands, promoting universality and comprehensiveness of care.[12,13]

Telediagnosis and clinical management services, considered valid in the management of patients with chronic diseases, are routinely performed in more developed countries.14 Issued on time, up to 72 hours after receiving the consultation5, telediagnosis reports reduce the risk of complications, support the diagnosis of diseases in early stages, contributing to the saving of costs and time for the patient and the health system, improving the continuity of clinical care and, consequently, the quality of life.[13]

Cardiovascular diseases are one of the major causes of morbidity and mortality at a global level.[13,15] In this sense, telecardiology, one of the most developed specialties in telehealth, can be considered an important ally of the SUS, since it has the potential to be useful in the control and monitoring of risk factors for various diseases. This represents a significant cost reduction by reducing specialist consultations, hospitalizations due to clinical complications, and admissions to emergency units.[13,16]

A significant portion of cardiology and cardiac surgery services are grouped in large urban centers, making it difficult the access people from more remote areas to diagnostic methods and simple treatment, such as the electrocardiogram.[15] This procedure represents the most frequent activity in telecardiology. It has an established diagnostic value, easy execution, low cost, and great clinical utility.[13,15]

The study showed that in 2018 and 2019, cardiology remained the area with the highest prevalence of tests performed. In 2020, radiology assumed this position, however, it is not appropriate to minimize the number of electrocardiogram reports performed. These data corroborate the study by Pedro et al.[17], who conducted an analysis of the telediagnosis service in 25 hospitals in Paraguay, including electrocardiography, tomography, and ultrasound procedures. The largest number among patients with a medical request for diagnostic imaging studies corresponded to electrocardiography.

The same was observed in the study by Galván et al.[18], who carried out a descriptive observational study including patients with a medical request for diagnostic imaging tests and biological electrical signals in 56 healthcare facilities in Paraguay. Most of the tests

by tomography, electroencephalography, and ultrasound.

Therefore, the demand for teleassistance in the cardiology area is quite consolidated, which makes telediagnosis a tool for the investigation and control of diseases that affect the heart, and demonstrates the importance of focusing on non-pharmacological measures, which includes health promotion in the intervention of modifiable risk factors, as well as prevention through constant investigation of cardiovascular diseases in the population.[19]

A condition associated with the increase in mortality from such diseases is Diabetes, since the aging of the population, added to rising risk factors, such as obesity, results in the growth of chronic diseases.[20] Diabetes implies a series of secondary complications, including eye diseases, especially diabetic retinopathy, one of the leading causes of blindness in the world.[21]

Ophthalmology, like other medical areas, was introduced to telemedicine and continues on an upward trend, since technological advances have allowed for an increase in the quality and accuracy of images and the development of devices to assist in the detection of ophthalmic diseases, which makes the specialty more accessible within telehealth. Although challenging, as it is an area that requires a greater level of detail, teleophthalmology is an efficient tool for serving the population.[22]

The main use in the area is related to the screening and referral of diabetic retinopathy since the accuracy of the digital image is considered as evident as that performed by ophthalmologists in person. In addition, the cost-effectiveness of the procedure is high, which allows for increased screening for diabetic retinopathy, reduces unnecessary referrals, and contributes to the prevention of diabetes-related eye complications.[21,22]

The data analysis also allowed the observance of a very widespread and also consolidated area in telehealth: radiology. Teleradiology, part of telemedicine that deals with imaging exams, consists of transmitting radiographic figures remotely. This promotes the reduction of service time, and allows for resource savings, favoring access to differentiated medical care and better diagnostic quality, as well as the prevention of various diseases.[23] It must be qualified as part of the radiology service, and the same quality criteria need to be met to ensure safe and effective imaging diagnosis.[24]

Regarding the number of procedures reduced during 2020, when the COVID-19 pandemic was decreed, health systems around the world were bombarded by numerous challenges, in addition to the impact of the presence of the virus on society's routine. Social distancing was one of the strategies used for the contingency of the disease, having a fundamental role in this change of habits. In addition, isolation compromised access to health services and, consequently, the continuity of care provided to individuals, as there was a reorganization or discontinuation of routine services, and even interruption of assistance to people undergoing treatment for certain diseases for some time.[25]

Another important factor for reducing the number of procedures is the suspension of RedeNUTES' telehealth services in August 2019, due to the interruption of financial transfers by the MH. The reduction in the number of employees and pending payments to suppliers made it difficult to provide activities, which also justifies the initial scenario of 2020.[7]

As for the distribution of telediagnosis tests by sex, the results of the study indicated a prevalence of the female population in the composition of the procedures. Such data support the studies by Pedro et al.[17] and Galván et al.[18], who observed in their conclusions the higher frequency of females in the telediagnosis exams performed. This shows that women represent the most frequent public in the search for health services, especially preventive ones when compared to the male population, which confirms the tendency to be more concerned with health and its care.[26,27]

Furthermore, social behaviors linked to gender issues may be closely associated with this factor. Historically, the male population is more exposed to risky situations, whether at work or in social life, while they do not add the habit of taking care of their routine.[27,28] Therefore, the need for strategies that envision the increase in men's access to health services, especially preventive ones.[26]

Regarding the mean age of the study, which in general permeated the people considered actively productive, there is a more discreet demand among the age group over 60 years old. This fact represents a negative point for the health of the elderly people since when they seek health services in a preventive way have a better quality of life.[26]

The study also demonstrated a decentralization in the performance of exams by GERES. The city of Recife, the capital of Pernambuco has the largest

technological and health center in the State, and the distance from the municipality makes it difficult for people who live in more remote areas to access specialized health services, making telehealth an ally in overcoming this obstacle. It is a fundamental instrument in monitoring health for distant populations and in planning health policies, to provide efficiency to the health system as a whole.[16]

For Primary Health Care, which is the basis for achieving universal health, the pandemic has added to the historic obstacles to be overcome to achieve efficient, integrated, organized, and patient-centered care. In this sense, telehealth added an important role in the qualification of PHC, with clinical, human, organizational, educational, administrative, technical, and social benefits.[13] In addition, the use of information and communication technologies in health reinforces the greater coverage and access to health, helping to comply with the basic principles of the SUS.

The study pointed out some relevant limitations for the characterization of the analysis. The pandemic undoubtedly added an impact on the continuity of the service, as well as the interruption of funding by the MS. It was not also possible to assess the factor of underutilization of the telediagnostic service. However, the magnitude of the theme is certain and the need for new research to help in the dissemination and expansion of the vision of telehealth is certain, whether due to the long path in the incorporation of ICT in PHC[29] or due to recent changes that directly impact the progress of digital health in the country.

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