English

Rio Grande do Norte Telehealth Technical-Scientific Center: a history of technical cooperation

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Abstract

Introduction: *Telehealth, as a tool for technical cooperation, can enhance health services, exemplified by initiatives in Rio Grande do Norte.* ***Objective:*** *To share experiences of the Technical-Scientific Telehealth Center of Rio Grande do Norte in state and national cooperation efforts.* ***Methods:*** *Data were collected from the Telehealth Center's database, academic publications, and historical contexts. The results were categorized into tele-regulation, teleconsultations, telediagnosis, and national initiatives.* ***Results:*** *Telehealth services of tele-regulations were performed (n>140,000); for teleconsultations in pediatrics (n>20,000), audiology (n>1,500), psychology (n>400), and multidisciplinary sessions for Amyotrophic Lateral Sclerosis (n>1,000); and for telediagnoses (n>3,000) in audiology, bone densitometry, and spirometry. Nationally, the Center developed the Sistema de Monitoramento e Avaliação dos Resultados do Telessaúde, integrating production data from telehealth centers and optimizing the management of the national telehealth policy. The Plataforma Nacional de Telediagnóstico expanded diagnostic coverage across the country and facilitated the regulation of the national waiting list.* ***Conclusion:*** *The Center has significantly contributed to the digital transformation of health services in Rio Grande do Norte and the advancement of telehealth on a national scale.*

Keywords: *Digital Health; Technical Cooperation; Telemedicine; eHealth Strategies.*

Resumen

Centro técnico científico de telesalud de de Rio Grande do Norte: una historia de cooperación técnica

Introducción*: La Telesalud, como instrumento de cooperación técnica, puede mejorar los servicios de salud, como ocurre en Rio Grande do Norte.* ***Objetivo****: Relatar experiencias del Núcleo Técnico-Científico de Telesalud de Rio Grande do Norte en cooperación técnica a nivel estatal y nacional.* ***Métodos****: Se recopilaron resultados de la base de datos del Núcleo de Telesalud, producciones académicas y contextos históricos. Los datos se categorizaron en: teleregulación, teleconsultas, telediagnósticos y actuación nacional.* ***Resultados****: Se realizaron servicios de telesalud para teleregulaciones (n>140,000); para teleconsultas en pediatría (n>20,000), audiología (n>1,500), psicología (n>400) y consultas multiprofesionales en Esclerosis Lateral Amiotrófica (n>1,000); para telediagnósticos (n>3,000) en audiología, densitometría ósea y espirometría. A nivel nacional, el Núcleo desarrolló el Sistema de Monitoramento e Avaliação dos Resultados do Telessaúde, integrando datos de producción de los núcleos de telesalud y optimizando la gestión de la política nacional. La Plataforma Nacional de Telediagnóstico amplió la cobertura diagnóstica y facilitó la regulación de la lista de espera nacional.* ***Conclusión****: El Núcleo ha contribuido a la transformación digital en salud en Rio Grande do Norte y a la evolución de la Telesalud a nivel nacional.*

Palabras-clave*: Salud Digital; Cooperación Técnica; Telemedicina; Estrategias de eSalud.*

Resumo

Núcleo Técnico-científico de Telessaúde do Rio Grande do Norte: uma história de cooperação técnica

Introdução: *A Telessaúde enquanto instrumento de cooperações técnicas pode ser utilizada para melhoria dos serviços de saúde, a exemplo do que ocorre no Rio Grande do Norte.* ***Objetivo****: Relatar experiências em cooperações técnicas do Núcleo Técnico-científico de Telessaúde do Rio Grande do Norte e sua atuação no âmbito estadual e nacional.* ***Métodos****: Foi realizado levantamento dos resultados na base de dados do Núcleo de Telessaúde, produções acadêmicas e contextos históricos no qual esteve inserido. Para apresentação dos resultados os dados foram categorizados em: telerregulação, teleconsultas, telediagnósticos e atuação nacional.* ***Resultados****: Foram realizados serviços de telessaúde para telerregulações (n>140.000); para teleconsultas em pediatria (n>20.000), audiologia (n>1.500), psicologia (n>400) e multiprofissionais na Esclerose Lateral Amiotrófica (n>1.000); para telediagnósticos (n>3.000) em audiologia, densitometria óssea e espirometria. Nacionalmente, o Núcleo desenvolveu o Sistema de Monitoramento e Avaliação dos Resultados do Telessaúde integrando os dados de produção dos núcleos de telessaúde e otimizando a gestão da política nacional em Telessaúde. A Plataforma Nacional de Telediagnóstico ampliou a cobertura nacional de diagnósticos e viabilizou a regulação da fila nacional.* ***Conclusão****: O Núcleo tem contribuído para a transformação digital em saúde no Rio Grande do Norte e a evolução da Telessaúde em âmbito nacional.*

Palavras-chave: *Saúde Digital; Cooperação técnica entre Instituições; Telemedicina; Estratégias de eSaúde*

INTRODUCTION

The Technical-Scientific Center for Telehealth in Rio Grande do Norte (NT-RN-*Núcleo Técnico-científico de Telessaúde do Rio Grande do Norte*) was created due to the growing demand for health services and the need to expand access to medical care in remote and underserved areas. It was founded in 2011, as part of broadening telehealth in Brazil, through ordinance 2,546 of October 27, 2011, issued by the Office of the Minister of the Ministry of Health. This ordinance redefined and expanded the Telehealth Brazil Program, known as the National Telehealth Brazil Networks Program. Since then, NT-RN has played a crucial role in promoting health and supporting professionals throughout Rio Grande do Norte state, working to strengthen, qualify, resolve problems, and expand Primary Health Care (PHC).

Since its foundation, NT-RN has opted to develop its digital health solutions. This has led the center to specialize in developing digital health solutions that meet the program's requirements and enable the creation of new solutions according to the needs and reality of its territory. In addition, it has allowed for increased participation of undergraduate and graduate students in the research development.

This article aims to report the results of experiences in technical cooperation of the Technical-Scientific Center for Telehealth in Rio Grande do Norte and its performance at the state and national levels.

METHOD

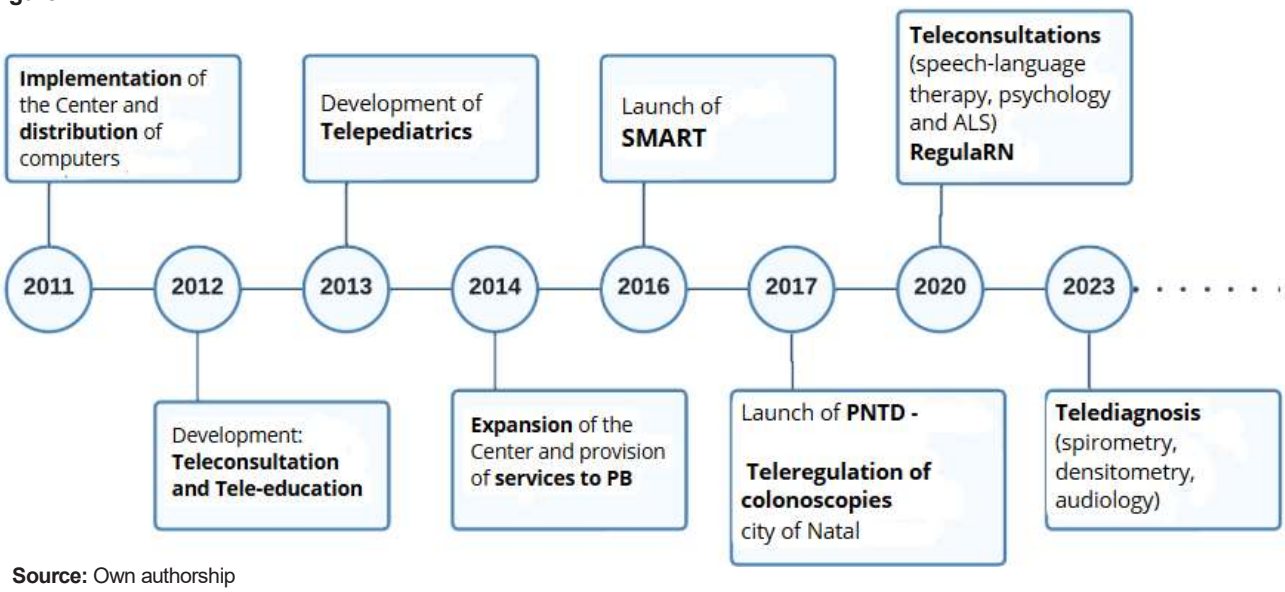
This article consists of an experience report, which includes a survey of the NT-RN systems database of teleregulation, teleconsultations, and telediagnosis actions, with a focus on pediatrics, audiology, psychology, and multidisciplinary care in Amyotrophic Lateral Sclerosis (ALS). In addition, research was carried out describing the technical cooperation between the NT-RN and several health departments linked to the State of RN and Municipalities, their academic productions and historical contexts in which they were inserted. The period of the investigation was from January 2012 to 2024.

To present the results, the data were categorized into: teleregulation, teleconsultations, telediagnosis, and local-regional and national performance. The analysis of the results was carried out quantitatively and qualitatively, seeking to identify the main success factors, as well as its obstacles.

RESULTS AND DISCUSSION

Over the years, NT-RN has based its activities on horizontal technical cooperation with the state and municipalities, always seeking to expand the range of services offered and the coverage of PHC and to increase its resolution. Figure 1 shows some of the milestones in the development and activities of NT-RN.

Figure 1- Historical milestones of NT-RN



Source: Own authorship

The year after NT-RN was founded, its first two digital health solutions for teleconsultation and tele-education were launched, which enabled the center to be promoted and expanded to municipalities. In 2013, a telepediatrics solution was developed and works as an electronic medical record for diabetic patients specifically aimed at diabetic children. This solution was a systematic monitoring by specialists and counter-referral to PHC professionals. The following year, the Ministry of Health invited NT-RN to take over coverage of telehealth services in the state of Paraíba, which at the time had only one municipal telehealth center in João Pessoa. Between 2014 and 2016, there was an intense national debate, involving all active telehealth centers at that time and the technical team of the Ministry of Health, to change the way data from the telehealth centers' productions was sent to the Ministry.

These discussions culminated in the launch of the Telehealth Results Monitoring and Assessment System (SMART-*Sistema de Monitoramento e Avaliação dos Resultados do Telessaúde*) in March 2016. Before SMART, these data were sent to the Ministry of Health through electronic spreadsheets sent by email, which were compiled and subsequently evaluated by the Ministry's technical team. In 2017, the National Telediagnosis Platform (PNTD-*Plataforma Nacional de Telediagnóstico*) was launched, aimed to enable the implementation of the National Telediagnosis Offer (ONTD-*Oferta Nacional de Telediagnóstico*). The year 2020 was marked by the resilience of the NT-RN, given the context of the COVID-19 pandemic and the initial progress in the regulation of teleconsultation and teleinterconsultation services by the Ministry of Health, which were subsequently regulated by the respective federal health councils. More recently, in 2023, NT-RN launched its telediagnosis platform, offeringservices in three areas of health: speech-language therapy (audiology specialty), bone densitometry and physiotherapy through spirometry.

In this context, technical cooperation between NT-RN, municipalities and the state of RN was of great importance for the consolidation and implementation of telehealth services, which will be demonstrated below.

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Teleregulation

Teleregulation in healthcare is emerging as a crucial component in the digital transformation of healthcare services, especially in the context of the Unified Health System (SUS-*Sistema Único de Saúde*) in Brazil. This technological advancement not only enhances the efficiency of services but plays a fundamental role in promoting equity and access to healthcare for the entire population.

The first teleregulation action in health promoted by NT-RN took place in November 2017 in the city of Natal/RN, to qualify colonoscopy requests and reduce the waiting list in the city, which contained approximately 20,000 people[1,2]. As a result of this partnership, the city of Natal/RN issued a technical note that included NT-RN as part of the regulation process for colonoscopy exam requests, qualifying the service.

The COVID-19 pandemic has caused losses and suffering to the Brazilian people. Healthcare systems have been stretched to their limits, requiring meticulous and agile resource management. Healthcare professionals and managers have faced one of the most challenging times in recent decades. In this context, hospital beds were one of the most resources in demand during the pandemic (general and ICU)[3]. Rio Grande do Norte state did not have an efficient bed regulation system or comprehensive management. As a result, health secretaries (municipal and state) did not have an accurate view of bed occupancy in real time. In this scenario, the NT-RN, together with researchers from the Laboratory of Technological Innovation in Health at the Federal University of Rio Grande do Norte (LAIS-UFRN), were invited to discuss and devise telehealth solutions to combat the COVID-19 pandemic[4]. As a result of this cooperation, a solution called RegulaRN emerged to regulate access to beds, from the request in the PHC to the patient's access and subsequent release (discharge, transfer, or death)[5], in line with the Digital Health Strategy for Brazil 2020-20286. In addition, a robust and efficient ecosystem to combat COVID-197,8 was built to meet the various demands of the period in collaboration with other partners.

This was an important step for the SUS in RN, as it transformed the way health regulation is carried out in the state. By bringing health regulation into the digital transformation, the backbone of the health data and systems network was strengthened for the implementation and incorporation of digital health in an organic way by health professionals and managers.

Healthcare regulatory systems allow patients to view their needs, classify them in a list according to their priorities, direct them to the reference center for their pathology, and ensure that they are treated as soon as possible. In this sense, the RegulaRN[5] platform is currently responsible for regulating all beds in the state healthcare network, as well as other outpatient services and procedures, such as: computed tomography; PET-CT; magnetic resonance imaging; scintigraphy; lithotripsy; catheterization; bone densitometry; and renal replacement therapies. As of June 2024, the RegulaRN platform has already been responsible for regulating more than 140,000 procedures.

Teleconsultations

The NT-RN[9] Teleconsultation System has been playing an important role in pediatrics, audiology, psychology, and rare diseases, such as Amyotrophic Lateral Sclerosis (ALS). Below, we will discuss the NT-RN's performance with this service in these areas.

Telepediatrics[10], especially in the care of diabetic pediatric endocrine patients, is an innovation that transforms pediatric care. Through a specific telepediatric platform, it is possible to monitor and follow up on these patients in a continuous and effective manner. Thus, it functions as an outpatient tool for effective control and monitoring patients and allows for the recording of consultations. The telepediatrics system has been operating in NT-RN since 2013[11] and has already enabled the recording of more than 20,000 consultations.

For audiology, the teleconsultation system acts as an instrument to operationalize technical cooperation with SUVAG RN - *Centro de Saúde Auditiva* (Hearing Health Center). As a hearing rehabilitation center, SUVAG RN receives pediatric patients from several cities and the state capital. In this regard, the teleconsultation system works to carry out two types of teleconsultations: a teleconsultation for parental training and monitoring of treatment and hearing rehabilitation with cochlear implants; and an asynchronous teleconsultation based on televideofeedback, through videos recorded and sent by the mothers of these children to the NT-RN[12] teleconsultants. Thus, the tool allows the monitoring and rehabilitation of children without the need to travel to the metropolitan region of the state capital. Since June 2020, more than 1,500 teleconsultations have been carried out. Speech Therapy also worked on monitoring infants with risk indicators during the first years of life, applying validated instruments to identify possible delays in child development in the areas of motor, auditory, language, and cognition, contributing to qualifying the demand for face-to-face care, as well as a moment of parental training.

Teleconsultations, through the NT-RN solution, offer an effective and accessible alternative to in-person psychological care, as they offer support, therapeutic management, and monitoring to patients remotely. In this way, individuals who face geographical, physical, or financial barriers, or some stigma that hinder access to traditional services benefit. During the COVID-19 pandemic, teleconsultations were especially important for serving health professionals who were overwhelmed by the context of the pandemic and the exorbitant workload, resulting in conditions that generated suicidal ideation and behavior, and other mental health problems, such as post-traumatic stress disorder. In addition, telepsychology was vital for the general population, offering psychological support in a time of social isolation and uncertainty. In addition to this service, the teleconsultation Psychologists of Sleep also emerged, in partnership with AMBSONO (*Ambulatório de Sono*-Sleep Outpatient Clinic) at UFRN, to meet the demands of the exponential increase in sleep disorders. Initially demanded by health professionals and later by the population throughout the country, teleconsultations allowed more people to access mental health and sleep services, contributing to mitigating the biopsychosocial impacts of the pandemic. Since the pandemic period until now, more than 400 teleconsultations have been carried out. The Sleep Psychologists teleconsultation continues to be

active, serving patients from all over Brazil.

Since 2014, NT-RN has worked cooperatively with the team of professionals from the Multidisciplinary Outpatient Clinic for Amyotrophic Lateral Sclerosis at the Onofre Lopes University Hospital of UFRN, providing both the technological solution for monitoring patients and the work of teleconsultants. The care for ALS patients follows a flow in which a professional from the multidisciplinary group makes the first contact with the patient and their caregiver for remote training using the tool. This is a methodology that has a positive effect on the performance of the multidisciplinary teleconsultation, carried out by professionals from neurology, physiotherapy (motor and cardio-respiratory), nutrition, psychology and speech-language therapy. Thus, before each teleconsultation, the psychologist presents the patient's case and her initial perceptions so that the other professionals use the best approach strategy throughout the teleconsultation. The tool allows the recording of the assessments and referrals of each professional during the teleconsultation. Derived from this work, a study on the feasibility of telehealth for the provision of multidisciplinary care in ALS was published in 2023[13].

Since March 2020, more than 200 completed teleconsultations have been recorded, each with the participation of at least 5 professionals, totaling more than 1,000 teleconsultations.

Telediagnostics

Telediagnosis is a fundamental strategy to expand access to health services and reduce waiting lists in several health areas, including audiology, bone densitometry, and spirometry.

Hearing screening using audiometry, tympanometry, transient evoked otoacoustic emissions, and distortion product otoacoustic emissions are vital for detecting hearing problems in different age groups. However, these procedures do not yet have technologies that can safely replace them for telediagnosis in audiology. Thus, the NT-RN has been carrying out strategic actions with educational institutions, sending teleconsultants to perform in-person data collection and procedures associated with the Digit Test in Noise (TDR-*Teste de Dígitos no Ruído*) via smartphone, inserting the data into the Telediagnosis System, proving to be an effective strategy in the context of this population. TDR is a test proposed by the WHO (2019) and validated for Brazilian Portuguese in partnership between LAIS/UFRN, UFPB, and FOB/USP, as well as international researchers. In the school context, hearing screening in children is especially important, as hearing plays a crucial role in the development of language, social skills, and academic development. Identifying and treating hearing problems early can prevent learning difficulties and promote healthy development. As a next step, flows and processes for insertion and connectivity with Health Care Networks are being studied to contribute to referral and counter-referral and qualify the demand from PHC to specialized care.

The OSSEUS device has been used to qualify the bone densitometry exam queue[14,15,16]. This device is based on the emission of non-ionizing signals, allowing exams to be performed repeatedly in short periods without risk to the patient. Bone densitometry is crucial for the diagnosis and monitoring of bone diseases, such as osteoporosis, especially in vulnerable populations, such as the elderly and patients with chronic conditions.

The use of OSSEUS in telediagnosis campaigns for bone densitometry helps identify patients who require more urgent interventions, prioritizing care and improving regulation, aiming to strengthen local health services and reduce waiting lists for diagnostic tests. This approach optimizes the use of health resources and ensures that patients receive the necessary care in a timely manner.

Another area of focus in telediagnosis is spirometry, used to assess patients' lung and respiratory capacity. Spirometry is essential for diagnosing and monitoring respiratory diseases, such as asthma and chronic obstructive pulmonary disease (COPD). In the local context, the development of telediagnosis actions in spirometry has contributed to strengthening the SUS and monitoring patients with respiratory conditions. Since January 2022, more than 3,000 services have been performed, including the three areas of activity of NT-RN.

National action: SMART and PNTD

The expansion of telehealth centers in Brazil occurred with Ordinance 2,546 of October 27, 2011 of the Ministry of Health and consolidated telehealth in the national scenario. This was a correct attitude of the Ministry and it also demonstrated the need for a tool to monitor and evaluate the production of telehealth services in Brazil through the Telehealth Brazil Networks Program (Programa *Telessaúde Brasil Redes*).

Discussions for the creation of the Monitoring and Evaluation System for the Telehealth Brazil Networks Program (SMART-*Sistema de Monitoramento e Avaliação do Programa Telessaúde Brasil Redes*) began in 2014 and culminated in its launch in 2016. The importance of SMART lies in its ability to provide a dynamic and detailed visualization of telehealth indicators, allowing for an evaluation at different levels: state, regional, national, and by telehealth center. This visualization allows for the identification of trends, measurement of the efficiency of interventions, and adjustment of strategies according to the specific needs of each region.

SMART implemented Technical Note 50/2015, a joint initiative of the Ministry of Health through the Department of Health Education Management (DEGES/SGTES/MS) and the Department of Primary Care (DAB/SAS/MS). After the launch of SMART, all centers had to integrate their platforms to send production data to the new system. This increased reliability and security in the analysis of data entered into SMART, as the quality of the data sent was validated, such as: validity of the CPF; registration of the professional's employment relationship in CNES (National Registry of Health Establishments); date of response of a teleconsultation no later than the date of creation, etc. Since its launch,
here have been 59 integrated telehealth centers, more than 742,700 teleconsultations, more than 7,189,300 telediagnoses, more than 8,600 tele-education activities and more than 559,000 participations in tele-education activities.

The NT-RN also contributed to the expansion of telediagnostic health services through the National Telediagnosis Platform[17] (PNTD-*Plataforma Nacional de Telediagnóstico*), launched in 2017. The PNTD is responsible for operationalizing the National

Telediagnosis Offer (ONTD-*Oferta Nacional de Telediagnóstico*) and regulating the national telediagnosis queue, expanding access to specialized services in regions where there is a shortage of professionals and resources. With the PNTD, the inclusion of telehealth centers in the national offer is independent of their local platforms, and it is only necessary to comply with the ONTD requirements and admissibility by the Ministry of Health. These services allow exams and diagnoses to be performed remotely, connecting patients to specialists in reference centers. In this way, queues and waiting times for diagnoses are reduced, contributing to treatment effectiveness without the need for patient travel.

Currently, the PNTD offers telediagnosis services in three main areas: teledermatology (dermatoscopy), teleophthalmology (retinography) and telecardiology (electrocardiogram). Since its launch, more than 28,200 retinography telediagnoses, more than 246,800 dermatoscopy telediagnoses and more than 2,025,700 electrocardiogram telediagnoses have been recorded.

Discussions and future perspectives

Digital transformation in healthcare has been a crucial driver for the incorporation of technological innovations and the improvement of services offered by the SUS. In this context, the NT-RN stands out for its national presence, providing essential tools for management, monitoring and decision-making support in public health policies, as well as the expansion of telediagnosis services. Technical cooperation between the NT-RN and state and municipal institutions has generated a positive impact in several areas of healthcare, including teleregulation, teleconsultations and telediagnosis.

The changes brought about by teleregulation in healthcare represent a significant advance for the SUS in RN, promoting the qualification of services, expanding access and equity in care. The ability to manage and optimize the flow of patients between different levels of care ensures that each patient receives appropriate care in a timely manner. This improves the efficiency of healthcare services and reduces the overload of specific units, promoting a rational use of available resources. These changes were especially noticeable during the COVID-19 pandemic, aided by the high degree of transparency offered by the platforms of the technological ecosystem, especially RegulaRN, which presented information on queues and average response times at each stage of the regulation process, from the request, regulation and until acceptance by the service provider.

Teleconsultations, a tool for bringing healthcare professionals and the general public closer together, have proven to be essential in the context of the SUS, especially in areas such as telepsychology, teleaudiology, and telepediatrics. During the COVID-19 pandemic, teleconsultations were essential to ensure the continuity of psychological care, offering support to both the general population and healthcare professionals under extreme stress. Teleconsultations for sleep and mental health remain active to this day, assisting all population strata in different regions of Brazil. Teleconsultations in audiology and pediatrics have expanded access to specialized care, improving child development and the management of chronic conditions, such as diabetes.

Telediagnosis is another crucial area of activity for NT-RN that has been expanded and improved since 2023, both locally and nationally. In the local context, audiology, bone densitometry, and spirometry services have been essential for screening and monitoring conditions that affect the population's quality of life. Campaigns and partnerships with municipalities have strengthened these services, reducing waiting lists and improving the quality of care. In addition, NT-RN cooperates with the Ministry of Health to expand the national offering.

The national performance of NT-RN, through SMART, has provided valuable instruments for the management of the Telehealth Brazil Networks Program, allowing the dynamic and reliable evaluation of telehealth indicators at state, regional, and national levels, enabling the formulation of public health policies based on evidence.

CONCLUSION

In Brazil, digital transformation has been significantly accentuated in the last 5 years. This article presents a report of experiences, bringing together success stories and contributions from NT-RN based on technical cooperation and digital health solutions developed to promote Telehealth in the State and in Brazil. Brazil still has unsolved challenges, such as interoperability and integration of public and supplementary health systems, but initiatives have already been initiated to overcome them. Thus, digital transformation in health in Brazil should not be just a technological evolution but a commitment by the SUS to a healthier and fairer future for all.

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