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**TELEHEALTH SERVICE MATURITY MODEL FOR THE BRAZILIAN SCENARIO (TMSMM.BR)
MODELO DE MATURIDADE DE SERVIÇOS DE TELESSAÚDE PARA O CENÁRIO BRASILEIRO
([TMSMM.BR](#))**

**MODELO DE MADUREZ DE SERVICIOS DE TELEMEDICINA PARA EL ESCENARIO BRASILEÑO
(TMSMM.BR)**

Credit

Authorship Contribution: Conceptualization, Data curation, Funding acquisition, Investigation, Methodology, Validation, Writing – original draft, Writing – review & editing – Angélica Baptista Silva; Conceptualization, Data curation, Investigation, Software, Validation, Writing – original draft, Writing – review & editing – Ivan Torres Pisa; Conceptualization, Funding acquisition, Methodology, Validation, Writing – original draft, Writing – review & editing – Paulo Roberto de Lima Lopes; Data curation, Funding acquisition, Validation, Methodology, Writing – original draft, Writing – review & editing – Luiz Ary Messina.

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ABSTRACT

The COVID-19 pandemic accelerated the expansion of telehealth services, including digital health and e-health activities such as teleconsultations. In 2024, the SUS Digital Program was launched in Brazil aiming to ensure the effective integration and evolution of these services within the Unified Health System (SUS). The program is not limited to the adoption of technology; the maturity of health services is a critical factor for its implementation. This study presents the results of the "Expansion and Standardization of Telehealth Centers" project, led by DESD/SEIDIGI/Ministry of Health and National Education and Research Network, and researchers from Fiocruz and UNIFESP. The focus is on diagnosing telehealth center services, assessing their maturity, and proposing a Telehealth Service Maturity Model (TMSMM.br) adapted to the Brazilian context. The project was structured in three phases: diagnostic (2021-2022), involving a literature review and data collection from 19 telehealth centers; preparatory (2023-2024), for refinement and pilot testing of the model; and validation (2025), to assess the model's applicability. The project contributes to the evaluation of public policies, aligning with the Digital Health Strategy 2020-2028 and supporting the continuous improvement of the telehealth scenario in Brazil.

KEYWORDS: Telemedicine; Digital health; Evaluation studies; Benchmarking; Health policy.

RESUMO

A pandemia de COVID-19 acelerou a expansão dos serviços de telessaúde, incluindo atividades de saúde digital e e-saúde, como as teleconsultas. Em 2024 foi lançado no Brasil o Programa SUS Digital, que visa garantir a integração eficaz e a evolução desses serviços para o Sistema Único de Saúde (SUS). O programa não se limita à adoção de tecnologia, sendo a maturidade dos serviços de saúde um fator crítico para sua implementação. Este estudo apresenta resultados do projeto "Ampliação e Padronização dos Núcleos de Telessaúde" conduzido pelo DESD/SEIDIGI/Ministério da Saúde, Rede Nacional de Ensino e Pesquisa e pesquisadores da Fiocruz e UNIFESP. O foco está no diagnóstico dos serviços dos núcleos de telessaúde, na avaliação da sua maturidade e na proposição do Modelo de Maturidade de Serviços de Telessaúde (TMSMM.br) adaptado ao contexto brasileiro. O projeto foi estruturado em três fases: diagnóstica (2021-2022), envolvendo revisão de literatura e coleta de dados em 19 núcleos de telessaúde; preparatória (2023-2024), para refinamento e teste piloto do modelo; e validação (2025), para avaliar a aplicabilidade do modelo. O projeto contribui para a avaliação de políticas públicas, alinhando-se à Estratégia de Saúde Digital 2020-2028 e apoiando a melhoria contínua do cenário da telessaúde no Brasil.

DESCRITORES: Telemedicina; Saúde digital; Estudos de avaliação; Benchmarking; Política de saúde.

RESUMEN

La pandemia de COVID-19 aceleró la expansión de los servicios de telesalud, incluidas actividades de salud digital y e-salud. En 2024, se lanzó en Brasil el Programa SUS Digital, cuyo objetivo es garantizar la integración efectiva y la evolución de estos servicios dentro del Sistema Único de Salud (SUS). Este estudio presenta los resultados del proyecto "Ampliación y Estandarización de los Núcleos de Telesalud", llevado a cabo por DESD/SEIDIGI/Ministerio de Salud, Red Nacional de Educación e Investigación, y investigadores de Fiocruz y UNIFESP. El enfoque está en el diagnóstico de los servicios de los núcleos de telesalud, la evaluación de su madurez y la propuesta del Modelo de Madurez de Servicios de Telesalud (TMSMM.br) adaptado al contexto brasileño. El proyecto se estructuró en tres fases: diagnóstica (2021-2022), que incluyó una revisión de literatura y recolección de datos en 19 núcleos de telesalud; preparatoria (2023-2024), para refinamiento y prueba piloto del modelo; y validación (2025), para evaluar la aplicabilidad del modelo. El proyecto contribuye a la evaluación de políticas públicas, alineándose con la Estrategia de Salud Digital 2020-2028 y apoyando la mejora continua del panorama de la telesalud en Brasil.

DESCRIPTORS: Telemedicina; Salud digital; Estudios de evaluación; Benchmarking; Política sanitaria.

1 INTRODUCTION

The COVID-19 pandemic⁽¹⁾ enabled the expansion of telehealth services with the inclusion of activities from the digital health ecosystem⁽²⁾ and e-health⁽³⁾, such as teleconsultations. Therefore, there was a need for regulations and structuring of digital systems to offer these new modalities.

The continuity of efforts to effectively offer telehealth services underwent significant progress in 2024 with the launch of the SUS Digital Program⁽⁴⁾, established by the Ministry of Health. The SUS Digital Program is not simply about acquiring and using technology, which does not, in itself, guarantee the effectiveness of its benefits. Technology must be embedded in a process that enables the effective and progressive use of resources, which can be determined by analyzing the maturity of the telehealth services offered. More digitally mature healthcare facilities are expected to improve the experience for patients and healthcare professionals, in addition to being able to offer better continuity and transition of care for individuals⁽³⁾. Within the context of the Unified Health System (SUS), digital maturity is a critical factor for the implementation of the SUS Digital Program, being one of the objectives stated in the ordinance that established the program⁽⁴⁾.

This article aims to present the results of the project "Expansion and Standardization of Telehealth Centers"⁽⁵⁾, conducted by the Department of Digital Health and Innovation (DESD), Secretariat of Information and Digital Health (SEIDIGI), Ministry of Health (MS), in partnership with the National Education and Research Network (RNP) and researchers from Oswaldo Cruz Foundation (Fiocruz) and Federal University of São Paulo (UNIFESP). The results presented here address aspects of a diagnostic analysis of the telehealth centers participating in the study, aiming to identify and assess the status of their telehealth services and estimate their maturity stages. This study also proposes a telehealth service maturity model (TMSMM.br) adapted to the Brazilian context. This project contributes to the evaluation of public policies aligned with the SUS Digital Program and the actions of the Digital Health Strategy 2020-2028⁽⁶⁾ within the scope of instrument II. Digital Health Monitoring and Evaluation (M&E) Plan.

2 THEORETICAL FRAMEWORK

In a maturity model, work processes can be structured based on stages of evolution, being clearly defined, managed, and controlled over time. Maturity models use the concept of maturity stage, which refers to the measure of effectiveness or capability in any specific activity or process, described in terms of characterizing the total performance or maximum capacity of that process. The maturity stage relates to the organizational capability obtained from the transformation and evolution of one or more process domains within a given organization⁽⁷⁾.

Studies⁽⁸⁾ have been conducted to develop or adapt maturity models for telehealth service units (TSU). Specifically in Brazil, there is interest in the implementation and development of the so-called telehealth centers. Formed by higher education institutions or health system management bodies, the telehealth center represents a technical-scientific core that was originally part of the federal Telehealth Brazil Network (TBN) (Telessaúde Brasil Redes – TBR) program⁽⁹⁾ with the objective of offering teleconsultations, teliagnostics, formative second opinions, and other services, and supporting the qualification, expansion, and strengthening of the SUS.

Four types of models that identify maturity stages applicable to UST can be listed, according to their structure and form of development: models that present statements and results associated with Likert-type scales, such as the e-health Readiness Assessment Model⁽¹⁰⁾; models that establish guidelines based on longitudinal studies, such as the Seven Core Principles of Telemedicine⁽¹¹⁾ and on knowledge acquired about telemedicine service innovation processes⁽¹²⁾; models structured in a life cycle, which includes the KDS Assessment⁽¹³⁾; and the fourth type encompasses three-dimensional assessment models, an example of which is the Comprehensive Telemedicine Assessment Model⁽¹⁴⁾. Most of them use multiple theories, and their validation methods are based on the evaluation of experts in the field. There is an overlap in themes between the top-down and experience-based maturity models, the most popular being: technologies used; change and behavior management; organizational learning; economics, finance, and costs; policy, governance and legislation⁽⁸⁾.

3 METHODOLOGY

This is a study with triangulation of methods not yet completed and has been carried out since 2020. The project is being conducted in three phases, containing seven evolutionary stages, which resulted in the diagnostic evaluation of telehealth centers⁽¹⁵⁾ and in a maturity model of telehealth services for the Brazilian context (TMSMM.br)⁽¹⁶⁾, as shown below. It has the approval from CEP/ENSP, opinion 7,368,101, registered in the Brazil Platform CAAE 85698625.9.000.5240.

3.1 Diagnostic phase (2021-2022)

a) Literature review: A scoping review⁽¹⁷⁾ was carried out focusing on 35 base documents (16) (ordinances, standards, federal regulations etc.), enabling the creation of a table of 857 quality aspects for telehealth services⁽¹⁶⁾, grouped into 141 categories separated into 12 themes and 35 topics (Table 1).

Table 1 – List of 12 themes with 35 topics adopted in the maturity model⁽¹⁶⁾.

| Theme | Topics |
|------------------------------------|---|
| T1a. configuration | [T1a.1] organizational chart and career [T1a.2] catalog of services provided by the center [T1a.3] regulation and referrals [T1a.4] adherence to the National Health Plan and SUS care lines |
| T1b. Infrastructure and technology | [T1b.1] physical structure [T1b.2] telehealth platform [T1b.3] electronic record systems [T1b.4] technological storage structure [T1b.5] technical support |
| T1c. protection and security | [T1c.1] patient/user consent [T1c.2] electronic security |
| T2a. acceptability and suitability | [T2a.1] staff/user engagement [T2a.2] regulatory compliance |

| | |
|--|---|
| T2b. financial and budgetary management | [T2b.1] financial plan with host institution [T2b.2] direct core costs [T2b.3] economic result |
| T2c. Ethical and legal aspects | [T2c.1] individual security and data protection |
| T3a. Core Human Resources | [T3a.1] core team composition [T3a.2] core team training [T3a.3] core team qualification |
| T3b. User training | [T3b.1] continuing education of users [T3b.2] training of requesting professionals |
| T4a. Processes and activities | [T4a.1] clinical flowchart and protocols [T4a.2] informed consent [T4a.3] failures and incidents |
| T4b. monitoring and evaluation | [T4b.1] activity monitoring strategies [T4b.2] production assessment by categories [T4b.3] satisfaction survey [T4b.4] identification of difficulties and barriers |
| T5a. Citizenship and sustainable development | [T5a.1] citizenship [T5a.2] sustainability [T5a.3] sources of financing |
| T5b. network, innovation and research | [T5b.1] education and research [T5b.2] participation in RNDS/ESD [T5b.3] health surveillance |

Source: (Pisa et al, 2023)

b) Analysis and synthesis: Quantitative and qualitative analyses were conducted on aspects related to service evaluation, resulting in a list of 110 aspects directly related to the study context. A data collection instrument was developed with 19 participating telehealth centers, designated by the Ministry of Health. A diagnostic assessment was prepared based on the analysis of the results of a survey, which included interviews with the center coordinators, technical-scientific meetings among project specialists, and a presentation to Ministry of Health managers.

c) Proposal of a maturity model: A model named TMSMM.br⁽¹⁶⁾ was developed with a focus on telehealth services, adapted to the settings of the centers and with the objective of supporting a monitoring and evaluation (M&E) process. The following steps were carried out: selection of the base maturity model for this proposal based on the context of the telehealth centers indicated for the study; study and translation of the base model, identifying its structure, method, and components; using iterative and incremental development, the component elements of the base model were adapted to the context of the services offered by the telehealth centers; incremental internal evaluation and validation stages were conducted by the researchers. The Telemedicine Service Maturity Model⁽¹⁸⁾ was adopted as the base model, which was inspired by the Capability model. Maturity Model (CMM) presents a conceptual framework that aids in measuring and

improving telemedicine services. This model was chosen for its relevance to the scope of telehealth centers, representing a specific model in telehealth that combines a robust conceptual framework with a matrix representation that facilitates the identification of different scenarios and applications in the field.

3.2 Preparatory phase (2023-2024)

d) Model Application Workshop: A working meeting was held at the Ministry of Health to disseminate the development and application stages of the proposed maturity model and conduct a simulation of the proposed TMSMM.br model. Simulated responses from the evaluation of four telehealth centers were collected, and suggestions and criticisms were recorded for use in the model review.

e) Validation planning: Working meetings were held to plan the validation stages of the proposed TMSMM.br model and to develop an excellence program focused on telehealth centers.

3.3 Validation phase (2025)

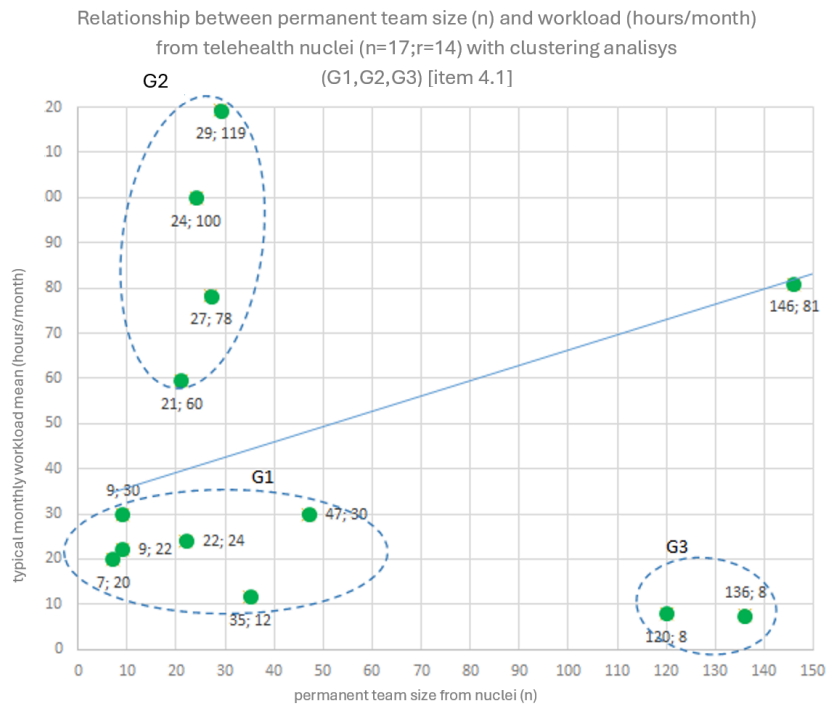
f) Validation of the TMSMM.br model: Model review activities were planned, as well as experimental in-person applications initially in 4 telehealth centers with the aim of obtaining a local assessment of its concreteness within telehealth services, and a consensus conference with an expanded group of telehealth center coordinators for discussion and final validation of the model.

g) Proposal for a program of excellence: A proposal for a program of excellence will be presented, based on the TMSMM.br model, focusing on telehealth centers. A guide will be developed to support the management of existing centers and the implementation of new ones, and training activities will be conducted for the Ministry of Health team responsible for this area.

4 DISCUSSION AND ANALYSIS OF RESULTS

As a result of phase 1, we highlight the structure of the 12 themes with 35 topics (Table 1), resulting from the scoping review and the comprehensive compilation of quality aspects associated with the services offered by the centers. Analyses⁽¹⁵⁾ of different aspects related to the structure of the themes and topics were conducted, enabling an initial identification of the maturity level of the study centers. These analyses include, among others: services provided by the centers segmented by type; regulatory and referral services provided; the status of the organizational chart and professional career; topics of the 2016-2019 National Health Plan covered by the services provided; diagnostic assessment of the centers' maturity; aspects of the financial plan implemented by the center's host institution; distribution of the centers' direct costs; aspects of monitoring and evaluation using indicators of the centers' financial situation; aspects of the centers' use of protocols and clinical guidelines; procedures for obtaining patient consent for the services provided; procedures for managing failures and incidents performed by the centers; number of professionals by profile on the center's team; relationship between team size and workload (Figure 1).

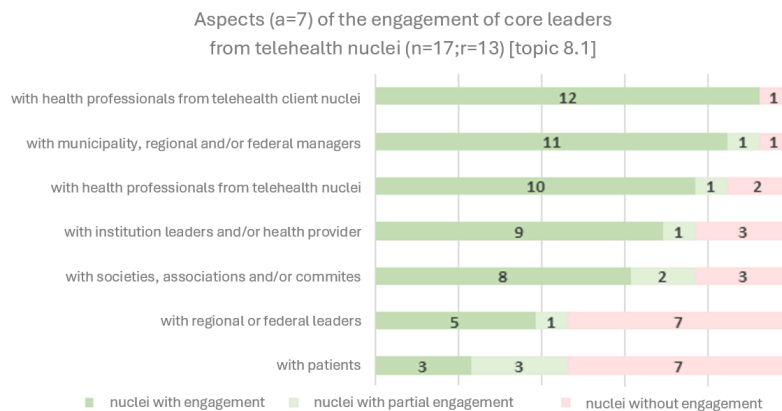
Figure 1 – Relationship between team size and workload [topic 4.1].



Source: research data (2024).

Aspects of team training and the training of requesting professionals; characteristics of the physical structure, platforms and systems used; aspects of technical support; aspects of the engagement of the core leaders (Figure 2).

Figure 2 – Aspects of the engagement of core leaders.

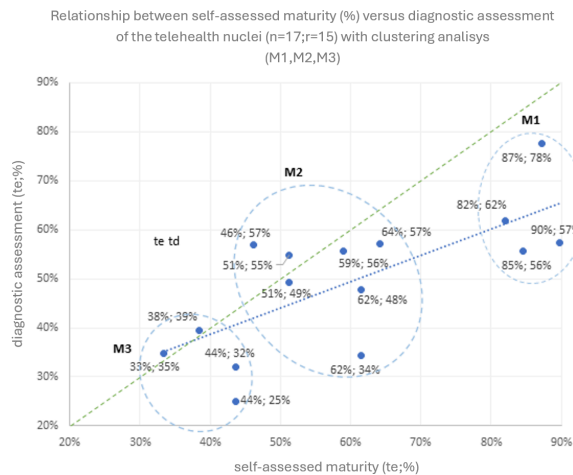


Source: research data (2024).

Furthermore, the following were addressed: coverage of monitoring types by service; categorizations in accounting for the center's activities; aspects of the satisfaction survey conducted by the center; and the use of patient consent forms. Also analyzed were: guarantees from the host institution of data services for the centers' services; ethical and legal aspects of the information systems used in the centers; aspects of

education and research activities in the centers; the centers' activities within the National Health Data Network (RNDS); sustainability; funding sources; the status of diversity in the centers; and a diagnostic assessment of maturity across the different axes of the model (Figure 3).

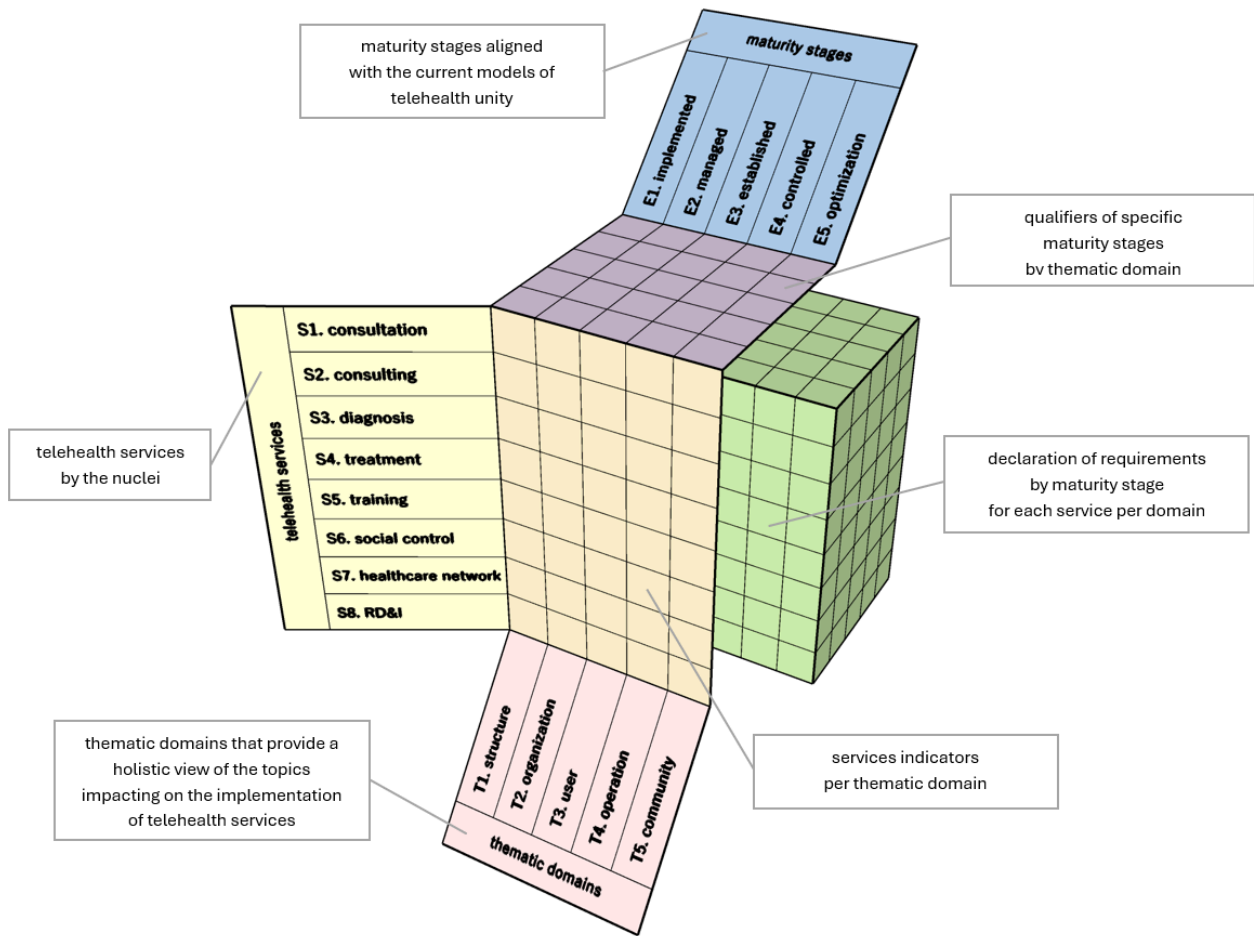
Figure 3 – Relationship between self-assessed maturity versus diagnostic assessment of the nuclei.



Source: research data (2024).

Regarding the proposed TMSMM.br model, its technical base⁽¹⁶⁾ was composed of 21 documents used to obtain the framework of quality aspects related to telehealth activities and services, including the 2030 Agenda for Sustainable Development, the Brazilian Digital Health Index (BDHI), standard 13131:2021(E) – Health informatics – Telehealth Services – Quality planning guidelines and the ordinances and technical notes of the Ministry of Health. Its conceptual model consists of the definition of three structuring dimensions: dimension T of thematic domains (red), dimension S of telehealth services (yellow), and dimension E of maturity stages (blue). The model then presents an indicative chart of telehealth services by thematic domain (orange) and the qualifiers of specific maturity stages by thematic domain (purple). Finally, the model itself can be represented by a polyhedron, resulting from the intersection of the three dimensions mentioned, which contains the declaration of requirements by maturity stage (green) for each service per domain. The polyhedron of the TMSMM.br model visually represents its structural components and indicates a logical order for reading the model, as stated below (Figure 4).

Figure 4 – Visual representation of the TMSMM.br model.



Source: research data (2025).

In numerical terms, the model presents four categories of telehealth services, eight service modalities containing a list of 60 services, five thematic domains that consider 12 themes and 35 topics related to the core organization, six process attributes with 41 described outcomes, 40 blocks of indicators (documents, roles, processes etc.) containing 340 indicators, 200 maturity qualifiers, and six maturity stages containing 200 requirements. Finally, the model, in 'questionnaire' format, presents 144 main questions and 280 secondary questions.

In the diagnostic evaluation⁽¹⁵⁾, the following were also identified: 18 difficulties and barriers that impact the provision and management of telehealth services; comparison between the self-assessment by the telehealth center coordination and the diagnostic assessment conducted by the researchers; estimate of the number of establishments and municipalities served by the telehealth centers per federative unit; and an approximate measure of the coefficient of co-services between the centers studied.

Given Brazil's vast territory, the telehealth centers contracted by the Ministry of Health play an important role in the public health system, providing telehealth services to 3,662 municipalities across all regions, representing 60.36% of the totality of 5,568 municipalities. Analyzing the telehealth activities carried out in

the daily operations of these centers in various regions of the country, the results present a scenario with distinct characteristics and particularities, contributing to a global vision and potentially consolidating the expansion and greater scope of telehealth activities nationwide. Therefore, the development of maturity stages tied to the service context of the centers can provide a baseline for the qualification and improvement of the health information systems in which the telehealth centers are inserted. The situational diagnosis of the centers' maturity levels can ultimately form well-defined, robust, and rigorous technical-scientific methods for monitoring and evaluating telehealth activities in the country.

It is worth noting that the definition of maturity level adopted during the diagnostic assessment conducted with the telehealth centers, one of the stages of developing the TMSMM.br, considers it as a composition of competence, capacity and/or level of sophistication, representing in the context of the telehealth centers an estimate of quality, completeness of services and process capability. On the other hand, a maturity model⁽¹⁸⁾ provides a characterization of an organization's current state through maturity stages and enables continuous improvement by identifying best practices in an evolutionary process. Assessing maturity level does not necessarily mean that a maturity model has been defined. Therefore, the proposition⁽¹⁶⁾ of TMSMM.br presents itself as a natural consequence of the assessment conducted with telehealth centers.

5 FINAL CONSIDERATIONS

The proposed TMSMM.br model represents a theoretical framework that enables telehealth centers, or similar organizations offering public or private telehealth services, to identify and compare essential characteristics and their maturity stages with other centers, from the perspective of the federal contracting framework implemented by DESD/SEIDIGI/MS. Based on relevant models available in the international literature, federal standards, and Brazilian and foreign tools addressing maturity assessment in the telehealth and digital health field, TMSMM.br provides a standardized set of requirements organized into the thematic domains of structure, organization, user, operation, and community for consultation, consulting, diagnosis, treatment and referral, training and qualification, social control and communication, healthcare network, and research, development, and innovation (RD&I). Its implementation requires the formation of a specialized team available to conduct the assessment sub-processes and their recommended activities and tasks.

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