

Implementation process for the unified electronic medical record (UEMR) in Bogotá



Acknowledgments: The IDB team would like to thank all those who participated in interviews and provided key information for this document.

Author: Debora Margarita Pérez Serna.

Technical edition: Luis Tejerina and Fernando Portilla.

Research Assistant: Sergio Lancheros.

Design: www.souvenirme.com

Copyright © 2023 Inter-American Development Bank (IDB). This work is licensed under a Creative Commons CC BY 3.0 IGO (<https://creativecommons.org/licenses/by/3.0/igo/legalcode>). The terms and conditions indicated in the URL link must be complied with and the respective acknowledgment must be granted to the IDB.

Subject to section 8 of the above license, any mediation relating to disputes arising under this license shall be conducted in accordance with the WIPO Mediation Rules. Any dispute relating to the use of IDB works that cannot be settled amicably shall be submitted to arbitration in accordance with the rules of the United Nations Commission on International Trade Law (UNCITRAL). The use of the IDB name for any purpose other than the respective acknowledgment and the use of the IDB logo are not authorized by this license and require an additional license agreement.

Note that the URL link includes terms and conditions that are an integral part of this license.

The opinions expressed in this publication are solely those of the authors and do not necessarily reflect the views of the IDB, its Board of Executive Directors or the countries it represents.



Implementation process for the unified electronic medical record (UEMR) in Bogotá



◇

CONTENTS

..... ◇

EXECUTIVE SUMMARY	6
1. INTRODUCTION	9
1.1. Background on the health sector in Bogotá.....	10
1.2. Identification of UEMR needs	12
2. STAGES OF THE PROJECT.....	14
2.1. Stage 0: vision and readiness.....	15
2.2. Stage 1: integration and operation	16
2.3. Stage 2: consolidation	17
2.4. Stage 3: maintenance and projection.....	18
3. PROJECTION OF NATIONAL INTEROPERABILITY.....	21
4. TECHNICAL DESCRIPTION OF THE BOGOTÁ DIGITAL HEALTH PLATFORM.....	23
4.1. Interoperability standards.....	25
4.2. Unified electronic medical record documents	26
4.3. Conceptual model of the Bogotá Digital Health platform	27
4.4. Architectural features.....	29
4.5. Interaction of the components of the Bogotá Digital Health platform	30
4.6. Change management	34
5. ACHIEVEMENTS AND SUCCESSES OF THE UNIFIED ELECTRONIC MEDICAL RECORD (UEMR)	37
6. CHALLENGES AND LESSONS LEARNED	40
BIBLIOGRAPHY	44

ABBREVIATIONS & ACRONYMS

ADRES	Social Security Health Resource Manager
CRES	Health Regulatory Commission
DANE	National Department of Statistics of Colombia
E.S.E	Social State Companies
EPS (Health Promoting Organizations)	In charge of the registration of affiliates to the social security system in Colombia. They are also in charge of the collection of contributions and their basic function is to organize and guarantee the provision of the mandatory health plan.
FFDS	Financial Fund Health District
IPS (Health Care Provider)	Entities, associations and/or persons, whether public, private or with mixed economy, that are authorized to partially and/or totally provide the procedures required to comply with the Mandatory Health Plan (Spanish acronym: POS); either in the contributory or subsidized regime. This group includes hospitals, clinics and other health centers.
MinTIC	Ministry of Information and Communication Technologies of Colombia
MSPS	Ministry of Health and Social Protection of Colombia
PBS	Health Benefits Plan
POS	Mandatory Health Plan
SDS	District Secretariat of Health
UEMR	Unified Electronic Medical Record
UPC	Capitation Payment Unit



EXECUTIVE SUMMARY

Interoperability is one of the guiding principles of digital transformation and has already shown results, in terms of greater equity and accessibility, by allowing healthcare providers, even those who cater for the most vulnerable people, to have access to medical records. Along these lines, the city of Bogotá has undertaken a process to create a unified electronic medical record system since 2016. Indeed, the process allows for the interoperability of the information systems of the city's integrated public health services network and has become the roadmap for future national interoperability. This document describes the development of this experience, highlighting achievements, successes, challenges and lessons that can be used for the implementation of other experiences in the region.

The process began by identifying why UEMR was needed, which was basically to reduce the fragmentation and dispersion of information in the different institutions of the system. This entailed considerable paperwork for citizens and undermined the continuity of care, decreasing the quality of service, and creating delays and cost overruns. Along these lines, an interoperability platform was designed that would be scalable between different levels of healthcare and between different service providers, with the intention that in the future it could be integrated with all healthcare operators nationwide, with semantic and syntactic standards for medical records, and that would comply with security and personal data protection criteria. Indeed, the project and the dialogue between the local and national governments led to Act 2015 of 2020, which extends the guidelines of the interoperable electronic medical record to the entire country based on the inputs from the Bogotá case.

The project was made up of four stages (vision and readiness, integration and operation, consolidation, maintenance and projection) through which the different stakeholders of the city's integrated health network, led by the District Health Secretariat, and with the participation of the developer Indra, collaborated together, which resulted in three central modules (medical records,

scheduling and medical prescriptions) for the approximately 1,300,000 people covered by the city's public health service.

Central to its success was the ongoing dialogue among the various stakeholders, facilitated by a monitoring structure with three operation management committees at different levels (network committee, steering committee and monitoring committee). After a staggered process of bringing the information systems of the city's four subregions into operation on the interoperability platform, the platform was launched on August 9, 2019.

Technically, the platform enables the processing and operational and semantic exchange of clinical, care and administrative information securely, reliably and in real time from the three aforementioned modules through two main technological components (OneSite and the ESB MIRTH CONNECT Enterprise Service Bus). OneSite consolidates, standardizes and guarantees the consistency of health information available to citizens, healthcare professionals, drug operators and EPS Capital Salud. And the Enterprise Service Bus enables interoperability between the information systems of the different stakeholders through the administration of channels for message management by means of filtering, transformation and routing techniques based on defined rules. The platform was structured based on the HL7 international standard, version 2, for the delivery of medical prescription and scheduling messaging, the CDA version for the reception or delivery of medical record messaging and the FHIR version for the conversion of the data arriving in the CDA version in order to view them in the Health Data viewer. In short, all the information gathered by the healthcare professional using the platform is done in nominal terms and is sent coded under the ICD 10 standard.

The platform includes the three transactional modules; a master patient index (MPI) through which a unique identification of the patient is created, also called ID; a document registration system and a document repository; and management

modules (auditing, reports and ontology catalogs). The main features desired for the architecture were: interoperability, scalability, security, confidentiality, integrity, availability, auditing, high availability and fault tolerance.

By transforming processes, environments and routines, digital transformation produces resistance and inflexibility. To reduce them, the project included three change management processes (awareness, communication and knowledge transfer) with healthcare professionals, technical staff, the drug operator, patients, and help desks at various levels for different types of users. Along these lines, it was a good choice to integrate the *call center* to facilitate the use of the platform for users with limited internet access or low digital literacy.

Bogotá has been a pioneer in medical record interoperability. As of March 2023, the Bogotá Digital Health platform has reached a progress of 89% in the reciprocal exchange of information, with a stated goal of 95% by the end of 2023. It is expected that these changes will be effective in optimizing and improving comprehensive health care in the city, because they have facilitated learning and confidence among different users who employ technology to access services; and because they have made it possible to move towards a preventive model that facilitates the closing of gaps in access to the health system.

In order to make this possible, the commitment of different administrations stands out for their support and continuity to the initiative: **the comprehensive and long-term vision of one administration was supported by the next, with the commitment to build on what was built.**

It was also important that the project made rapid progress in its initial stage of coordination and interaction between the information systems of the sub-networks and the interoperability platform, which provided legitimacy and credibility. **The project featured a specialized team and the commitment of management and officials at all levels.** In addition, the city has an extensive technological and connectivity infrastructure and installed capacity and financial resources.

Regulations also contributed to the development of the project and its national extension: UEMR Resolution 866 was a significant contribution to the 2015 national law enacted in 2021.

One of the success factors is that the process was very rigorous in terms of data management, privacy and information security, which helps to earn legitimacy with stakeholders in the environment. Also the choice of HL7 FHIR as the mechanism for interoperability between changing CDA documents, which provides versatility for the use of apps.

One of the great challenges has been change management; there was a lack of knowledge of digital transformation issues and international standards. More specifically, doctors' lacked computer literacy and engineers lacked medical terminology, and there was resistance from different stakeholders. One lesson learned has been that change management is a fundamental exercise that must be continuous. Looking forward, it will be essential to consolidate political will, long-term goals and projects to ensure the continuity of the initiative.

Another major challenge ahead is the Internet access and digital literacy gap, which especially impacts those most vulnerable. (And a lesson in this regard is that this can be addressed by enabling the use of the *call center* as an alternative mechanism).

As a lesson learned, it was essential to have prior standardization of common data, an aspect that requires dialogue and agreements between institutions. Looking ahead, the challenge is to improve data quality and advance in the definition of indicators that will allow us to take advantage of *big data* and data analytics to improve preventive capacity.



INTERVIEWED FOR THE CASE STUDY

Name	Role
Alejandro Gómez López	Secretary of Health of Bogotá 2020-2023
Luis Gonzalo Morales Sánchez	Secretary of Health of Bogotá 2016-2019
Felipe Guzmán Ramírez	District ICT High Councilor
Juan Carlos Parada Gallardo	Legal Advisor to the Office of the High Counselor of the District ICT Office
UEMR Technical Team, District Health Secretariat- SDS	
Aicardo De Jesús Oliveros	Expert Consultant for Medical Record Data Interoperability with the District Health Secretariat and the Ministry of Health and Social Projection
Rosemberg Álvarez Díaz	UEMR Team Management and Coordination Leader
Juan Gabriel Rubio Ocampo	UEMR Technical Team Leader
Jorge Eduardo Sandoval Plazas	Head of ICT Office Centro Oriente E.S.E. Integrated Health Services Subnetwork
Miguel Mojica Mugno	Head, ICT Information Systems Office Sur Occidente E.S.E. Integrated service subnetwork
Leopoldo Berrío	Internist and internal medicine specialist Centro Oriente E.S.E Integrated Health Services Subnetwork
Jhon Freddy Quintero	Engineer, Centro Oriente E.S.E Integrated Health Services Subnetwork
Lucas López	Operations Manager Indra Colombia
Jeanet Cortés	Advisor. Digital Government Directorate. Ministry of Information and Communication Technologies
Arleth Patricia Saurith Contreras	ICT Director, Health Secretariat in the framework of the UEMR project in Bogotá 2017-2018
Fernando Portilla	Specialist consultant in interoperability standards for Digital Health transformation projects. Consultant for the Social Protection in Health Division of the Inter-American Development Bank. UEMR project advisor at the design stage
Luis Antonio Morales Muñoz	Director of the Master's Program in Biomedical Informatics at Universidad El Bosque and Advisor of the clinical component of the UEMR project in Bogotá. Consultant for the Social Protection in Health Division of the Inter-American Development Bank
Constanza Engativá	Head, IT and Communication Office, Ministry of Health and Social Protection (2022)
Sandra Gallegos	Advisor to the IT and Communication Office, Ministry of Health and Social Protection
Luz Jenny González	Advisor to the IT and Communication Office, Ministry of Health and Social Protection





1. INTRODUCTION



1. INTRODUCTION

» **Interoperability is one of the guiding principles of digital transformation established by the Pan American Health Organization (PAHO) and endorsed in 2021 by 49 countries and territories in the region.**

Its benefits are well explained in the IDB publication “The Great Opportunity of Digital Health”¹ and demonstrated by the improvements in the quality and efficiency of healthcare in the countries where it has been implemented.

Bogotá’s Interoperable Electronic Medical Record (also called unified electronic medical record or UEMR) is an outstanding case of interoperability in Latin America and the Caribbean; its advances in management and coordination allow for the interoperability of the information systems of the city’s integrated public health services network. This document describes the development of this experience, highlighting achievements, successes, challenges and lessons that can be used for the implementation of other experiences in the region.

1.1. Background on the health sector in Bogotá

The country spends about 7% of its GDP on health. 85% of total public spending on health is allocated to insurance, and only 3.9% of spending is allocated to public health programs, significantly lower than the average for OECD countries (13%). Out-of-pocket spending, at around 16%, is lower than the average for Latin American and Caribbean countries (34%) and the OECD (21%), which is evidence of robust financial protection for beneficiaries.

Bogotá is the most populous city in Colombia and the fifth most populous in the region. It is the capital district of Colombia and has administrative and investment autonomy and significant resources of its own. The population is almost 8 million² residents in the urban core, with an additional 3 million people in the metropolitan area, for a total of about 11 million residents who depend on the city’s services.

The unified electronic medical record (UEMR) has emerged through the Bogotá Digital Health platform, a flagship project that integrates simultaneously and in real time the clinical information of patients in the integrated public health services network. About one million people are affiliated with the Public Health Promoting Entity called Capital Salud³ and about 300,000 people are affiliated with other health entities that provide services in the city. This represents about 12% of the population of Bogotá with a unified electronic medical record.

Capital Salud is one of the 30 Health Promotion Entities (Spanish acronym EPS) that are part of the Colombian General Social Security Health System

¹ Available at: <https://publications.iadb.org/es/la-gran-oportunidad-de-la-salud-digital-en-america-latina-y-el-caribe>.

² The figure of SaluData, Demographics and Health in 2022 was 7,901,653 inhabitants. Retrieved from: <https://saludata.saludcapital.gov.co/osb/datos-de-salud/demografia-y-salud/>.

³ The average number of members of EPS Capital Salud is 962,048 people according to the SaluData platform, Oferta de Servicios de Salud, Afiliación según régimen de aseguramiento SGSSS in Bogotá, D.C. 2022 Retrieved from: <https://saludata.saludcapital.gov.co/osb/datos-de-salud/demografia-y-salud/>.



(Spanish acronym SGSSS). The EPS are coordinating and managing entities that collect healthcare resources, both public and private. They distribute them among the Healthcare Service Provider Institutions (IPS), such as hospitals, health centers, diagnostic centers, laboratories and specialized care; and guarantee access to medical appointments, dispensing of medication and other health services.

Since 1991, Colombia has implemented a public health system based on insurance. In 1993, Act 100⁴ established mandatory affiliation, which initially led to guaranteed access to health services for all citizens⁵. In this system, insurance is managed by the EPSs on the basis of two systems, the subsidized (SR) and the contributory (CR), which together achieve coverage of 98.6% of the population⁶, with a higher concentration in the SR (50%, compared to 44% in the CR⁷).

The system is funded both with contributions from employees and employers, with additional resources from the national budget, and has a smaller private component, which depends on the financial capability of the sectors that wish to access private insurance. All Colombians must have a Health Benefits Plan (PBS), and their affiliation depends on the system to which they belong according to their financial capability and their employment status. In the CR, membership depends essentially on the contributions of the members; it includes salaried workers, public servants, pensioners and retirees, and independent workers with the financial capability and income equal to or greater than one minimum wage. In the SR we find people in vulnerable conditions who do not have the financial capability and whose contributions to the system are subsidized with the contributions of people belonging to the contributory system, and with additional resources from the state.

The Health Benefits Plan (PBS) of each Colombian is managed by the EPS in exchange for a premium called Unidad de Pago por Capitación (UPC). The UPC is adjusted annually for variables such as age, sex and geographic location. The Administradora de Recursos de la Seguridad Social en Salud (ADRES), under the Ministry of Health and Social Protection, is the entity that manages the common fund of resources, transferring the value of the UPC to the EPS to cover the health services and technologies of the affiliates. This has resulted in nearly universal coverage. In fact, EPS are explicitly prohibited from rejecting or denying users who wish to enroll, preventing adverse selection⁸.

The uniqueness of Capital Salud is that, in addition to being an EPS, it is a public entity of mixed economy, 90% of whose financing depends on Bogotá's revenues, so it is attached to the city's public sector. Its main purpose is to guarantee coverage of health risks and services for members of the subsidized regime who mainly use the integrated public health services network in Bogotá⁹. The registration of members and collection of contributions are the responsibility of Capital Salud as EPS, which, as such, organizes and guarantees the provision of the PBS¹⁰ and has the responsibility of contracting the public or private IPSs that provide health services to its affiliates.

In general terms, the health sector in Bogotá is headed by the District Health Secretariat. Attached to the Secretariat are the District Health Financing Fund (FFDS¹¹), the EPS Capital Salud and the four integrated health services subnetworks constituted as social enterprises of the state (Subred Integrada de Servicios de Salud Sur E.S.E, Subred Integrada de Servicios de Salud Sur Occidente E.S.E, Subred Integrada de Servicios de Salud Norte E.S.E and Subred Integrada de Servicios de Salud Centro Oriente E.S.E), and also the medical appointment *call center* and the

⁴ <https://www.funcionpublica.gov.co/eva/gestornormativo/norma.php?i=5248>

⁵ <https://www.constitucioncolombia.com/titulo-2/capitulo-2/articulo-49>

⁶ <https://www.adres.gov.co/eps/procesos/bdua>

⁷ Figures for 2023: 1.4% of the population not affiliated to SGSSS and 4.3% affiliated to exceptional regimes.

⁸ Op. cit.

⁹ Council of Bogotá D.C., Agreement 357 of 2009 "Whereby the establishment of a health promotion entity in the Capital District is authorized and other provisions are enacted". Retrieved from: <https://www.alcaldiabogota.gov.co/sisjur/normas/Norma1.jsp?i=34384&dt=S>.

¹⁰ All Colombians must participate in the essential health service through their mandatory insurance and the guarantee of a Health Benefits Plan (PBS), formerly called the Mandatory Health Plan (Plan Obligatorio de Salud). In: Ramiro Guerrero, Ana Isabel Gallego, Víctor Becerril and Johanna Vásquez, "Sistema de Salud de Colombia". Salud Pública de México magazine, vol. 53, supplement 2 of 2011, pp. 146-148.

¹¹ The District Health Financial Fund's main and specific objective is to collect, administer, and allocate all resources intended to fund the public health service in the Capital District.

drug operators, centralized medical appointment scheduling and management of medical prescriptions and devices¹². The four subnetworks were created in 2016¹³ to facilitate user access and reduce paperwork by grouping together the 22 public hospitals and 128 public health service units in the city both in terms of administration and territory.

1.2. Identification of UEMR needs

The UEMR was an attempt to respond to Bogotá's health information management needs, and started from a situation in which each of the hospitals and service units operated in isolation and with different patient data: "Users had to move from one entity to another, clinical information did not reach healthcare professionals in a timely manner, and physicians had to start the care process from scratch by asking for their patients' basic clinical data. The dispersion and fragmentation of information in the institutions providing health services meant that citizens had to go through countless procedures to move from one entity to another, which especially affected continuity of care. This situation generated delays in the procedures, lack of quality in the health service and cost overruns in the care processes"¹⁵.

The fragmentation of health information in the institutions that provide health services had a significant impact on the continuity, quality and costs of patient care processes. The need was thus identified to improve technological innovation processes in order to guarantee comprehensive health care for the population¹⁶.

The city administration focused on three points: updating technological infrastructure; consolidating the information systems of the integrated public health services network through its four subnetworks; and guaranteeing the security and privacy of information within the framework of the interoperability of the city's public system. Moreover, the government of Bogotá anchored the investment with the city's strategic indicators so that it would have continuity in the plans of subsequent administrations.

FIGURE 1:
Integrated health services network



Source: District Health Secretariat and Capital Salud¹⁴.

Although the public service scope in Bogotá extends to an average of **one million low-income people** belonging to the subsidized regime through the EPS Capital Salud, the rest of the city's inhabitants are affiliated with other EPSs with national coverage that also serve users of the contributory and subsidized regime; of these, some 300,000 people affiliated with other healthcare promoting entities are also integrated into Bogotá's unified electronic medical record platform.

¹² SaluData, A click away, medical records in the public healthcare system of Bogotá. 2019 Retrieved from: <https://saludata.saludcapital.gov.co/osb/datos-de-salud/demografia-y-salud/>.

¹³ Council of Bogotá D.C., Agreement 641 of 2016 "Whereby the healthcare sector of Bogotá, Capital District, is reorganized, and Agreement 257 of 2006 is modified and other provisions are issued". Retrieved from: http://www.saludcapital.gov.co/Documents/Acuerdo_641_de_20166.pdf.

¹⁴ Health District Secretariat, "All you need to know about the Reorganization of the Health Sector in Bogotá". Capital Salud. Retrieved from: <http://www.saludcapital.gov.co/Paginas2/reorganizaciondelsectoresaluddebogota.aspx>.

¹⁵ Office of the Mayor of Bogotá D.C., Description of the Necessity, in Previous Studies Selection Process SDS-CON-064 V1 "Information and communications Technologies in Health." District Bank of Programs and Projects of the District Health Secretariat.

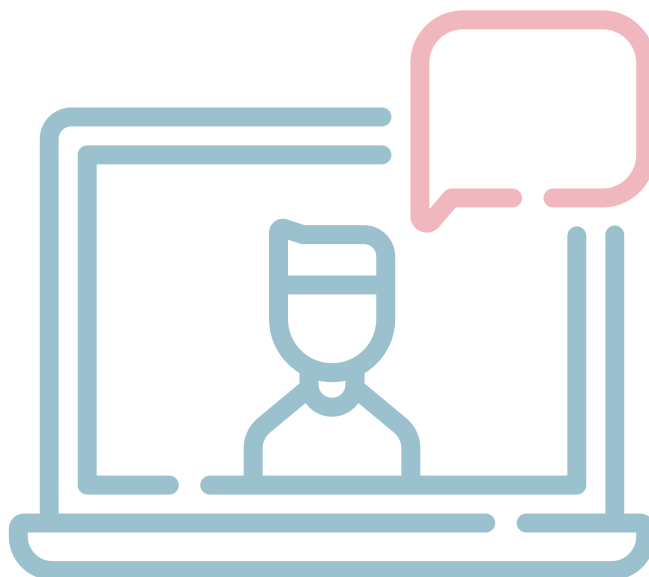
¹⁶ Ibid.

The UEMR was handled through the District Health Secretariat. The aim was to improve the accessibility and timeliness of health services, reduce the costs of non-attendance processes, generate public confidence in the institutions and connect all the points of care of the integrated public health services network. The means for this would be the unification and interoperability of patients' clinical information in order to facilitate nearby access to a health center and prevent patients from having to travel "with their medical records under their arm" for each procedure"¹⁷.

The integration of medication management and medical prescriptions within the interoperability solution was envisaged to prevent patients from having to travel early in the morning and experience long waiting times both at the EPS Capital Salud offices to request a medical appointment and at the dispensing centers to access their medications. It was also planned to have an interoperability platform that would be "horizontally and vertically scalable, both in terms of infrastructure and software"¹⁸, and that could in the near future be coordinated with all healthcare operators at the district and national levels. Furthermore, the interoperability of the platform should be based on the use of semantic and syntactic standards in healthcare for medical records, as well as security and protection of personal data.

» **The interoperability goals were set along the following lines:**

- 1. Unified electronic medical record (UEMR);**
- 2. appointment scheduling; and**
- 3. resources and medical prescription management.**



¹⁷ UEMR technical team interview, February 9, 2022.

¹⁸ Interview Arleth Patricia Saurith Contreras, March 24, 2022.





2.

STAGES OF THE PROJECT



2. STAGES OF THE PROJECT

2.1. Stage 0: vision and readiness

In Stage 0, actions were carried out consequent to the enactment of agreement 641 of 2016, which established the organization and sectoral integration in health in Bogotá¹⁹. This coordination involved the creation of four subnetworks and actions such as the adaptation of the infrastructure for the entire public healthcare system, the consolidation of the hospital information systems for patients (clinical and care) and the administrative and financial information of the entities so that it could be shared within each subnetwork and interoperate with the information systems of the other subnetworks²⁰. For this process, medical records and administrative information software was contracted in each of the subnetworks. Contracts were also made for infrastructure and equipment to connect the points to the node of the hospitals and care centers of each subnetwork.

As state-owned social enterprises, the subnetworks have administrative autonomy to contract technology services and have relationships with suppliers. Therefore, the Secretariat of Health limited itself to issuing guidelines and criteria on the technical requirements to be met by the systems.

The Economic, Social, Environmental and Public Works Development Plan for Bogotá D.C. 2016-2020 “Bogotá Mejor Para Todos” (Better Bogotá for All), adopted through Agreement 645 of 2016²¹,

allocated public resources for the implementation of the UEMR through the project “Plataforma Única Bogotá Salud Digital” (Single Platform for Digital Health). This project is part of the strategic program “Modernization of Physical and Technological Health Infrastructure” of the “Equal Quality of Life” pillar. The project set the goal that by 2020, the district public healthcare system under the District Health Secretariat would achieve 100% interoperability in medical records and appointments, advancing the unification of administrative, technical, and financial information of the public healthcare system. This aims to facilitate citizens’ access to healthcare services through the use of information and communication technologies²².

For the implementation of the UEMR, investment project 7522 “INFORMATION AND COMMUNICATIONS TECHNOLOGIES IN HEALTH”, whose central objective was: “To implement the technological innovation strategy to contribute to the healthcare sector with planning, operation, monitoring, and assessment of the health model for informed decision-making. To achieve this: achieve 100% interoperability in medical records and appointments by 2020 across the information systems of the entire Integrated Public Healthcare Services Network of Bogotá, developing interoperability services among all information systems within the network; and implement the production deployment of unified electronic medical records, appointment scheduling, and management of medical prescription resources”²³.

¹⁹ Agreement 641 of 2016 organized the healthcare sector of Bogotá, Capital District, establishing its mission: to formulate, adopt, direct, plan, coordinate, execute, and evaluate policies aimed at improving the health situation of the population of the Capital District through actions in public health, provision of healthcare services, and management of the General System of Social Security in Health. It also integrated the health sector into affiliated entities: Fondo Financiero Distrital de Salud, the state social enterprises of the four integrated subnetworks (North, South-West, South, Center-East) and related entities; Sociedad de Economía Mixta Capital Salud EPS - SAS; mixed non-profit entities (Entidad Asesora de Gestión Administrativa y Técnica, Instituto Distrital de Ciencia Biotecnología e Innovación en Salud); and agencies (Consejo Territorial de Seguridad Social en Salud and Comité Directivo de la Red).

²⁰ Interview with Luis Gonzalo Morales, Bogotá Secretary of Health 2016-2020. Interview conducted on April 11, 2022.

²¹ Council of Bogotá D.C., Agreement 645 of 2016 “Whereby the Economic, Social, Environmental and Public Works Development Plan for Bogotá D.C. is adopted”. 2016-2020 “Bogotá Mejor Para Todos” (Better Bogotá for All), adopted Retrieved from https://www.ipes.gov.co/images/informes/normatividad/2018/ACUERDO_645_DE_2016.pdf.

²² Office of the Mayor of Bogotá D.C., “Plan Distrital de Desarrollo 2016-2020 “Bogotá Mejor para Todos””. Bogotá Office of the Mayor of Bogotá, Volume I 2016 Retrieved from: <https://shorturl.at/coqt5>.

²³ Office of the Mayor of Bogotá D.C., (Investment Project 7522 “Information and Communication Technologies in Health”) District Bank of Programs and Projects of the District Health Secretariat.

2.2. Stage 1: integration and operation

Between 2017 and 2019, the design of the architecture, specification of standards and implementation of an interoperable solution was carried out through public bidding process No. FFDS-LP-002-2017²⁴. The result was the award of the contract to the Spanish firm Indra²⁵ through two main technological components: MyMed Health Data²⁶, now called OneSite; and the ESB MIRTH CONNECT Enterprise Service Bus. The result was the creation of the Bogotá Digital Health technological platform, which allows for the “operational and semantic processing and exchange of clinical, healthcare and administrative information in real time from the Unified Electronic Medical Record (UEMR), the centralized scheduling of appointments and the management of the medical prescriptions”.

The District Health Secretariat defined that the process should include “stages of analysis and design, parameterization, implementation, functional testing, pre-production, production, and stabilization.” It also required perpetual licensing in the name of the District Health Secretariat and support for a minimum of one year, as well as the transfer of rights for the source code of custom developments generated during the contract execution²⁷. The platform was contracted “in perpetuity and for unlimited users” with a technological infrastructure for an average of one million unique users, i.e., the number of members of the EPS Capital Salud that would enter the interoperability platform. Although the initial scope was primarily aimed at Capital Salud affiliates, the implementation of a platform was projected to have

the capability to link other stakeholders within the healthcare ecosystem of Bogotá in the medium term. (i.e., to other EPSs and entities that provide coverage in health services to the total population of the city and that provide services for both the subsidized and contributory regime)²⁸.

As part of this implementation process, dialogue was established with various stakeholders in the integrated public healthcare services network, leading to agreements on workflows specifically related to health promotion and maintenance pathways. Similarly, the exercise of defining the information to be shared through modeling of relevant minimum content for the medical record began. Agreements were established on standards based on Clinical Document Architecture (CDA)²⁹, specifying which data would be shared and how the information exchange model would operate.

Conversations were generated at various levels of operation involving the project’s general management under the District Health Secretariat (SDS), with the participation of a representative from Indra acting as project manager. The IT directors of the subnetworks and technical experts from the various entities also participated. Operation management committees were created at different strategic and operational levels.

» **Network Committee.** Consisting of the Secretary of Health, leader of the District Health Secretariat (SDS). All the subnetwork managers and the directors of the information technology (IT) area of each integrated subnetwork participated in this committee. At this stage of implementation, it met once a month, or by milestones for final validations of stage changes or strategic approvals.

²⁴ Contract No. 0045-2018, page 9 entered into on April 9, 2018, commencing on May 16, 2018 and ending on June 21, 2019.

²⁵ The copyright of the MyMed technological solution, today called OneSite, belongs to Indra.

²⁶ In Bogotá, a comparative analysis of experiences was conducted, positively evaluating the experience of Spain’s National Health System’s digital medical record system and other technological solutions developed there for the healthcare sector, including the experience of the provider Indra. In Spain, Indra has a broad portfolio of services in telemedicine, digital imaging, electronic prescriptions and electronic medical records. Success stories from Australia, the United Kingdom, Canada, Switzerland, Dubai, South Korea, the United States, France, Austria and Estonia, as well as from Latin American countries such as Chile, Uruguay and Argentina, were also analyzed. The case of Chile was carefully examined because it has a model that aligns, in some aspects, with Colombia’s. (Interviews with Arleth Saurith and the UEMR Team).

²⁷ Office of the Mayor of Bogotá D.C., “Preliminary Studies for Selection Processes, Code.. 6.

²⁸ UEMR technical team interview, February 9, 2022.

²⁹ Electronic clinical documents contain complete information and definitions that may include text, images, sounds and other multimedia content.

- » **Steering Committee.** Made up of the IT managers of the subnetworks and the SDS, the project overseer and the supplier Indra. Technical decisions were made and topics were defined to be taken to the network committee.
- » **Monitoring committee.** In charge of the weekly follow-up of all commitments and the schedule. Some of the members were the SDS's IT director the supervision and controller of the contract and the technical team.

This monitoring structure “facilitated the real success of the project because all possible stakeholders were there, and under the leadership of the District Secretary of Health, many guidelines were issued that led to the success of the project”³⁰. Additionally, working sessions were held to socialize the Bogotá Digital Health platform with the teams from the subnetworks so that everyone understood the operation and the integration plan with each subnetwork’s software: “Dinámica Gerencial Hospitalaria”, which operates in the South, South-West and Center-East subnetworks; and “*Servinte Clinical Suite*”, which operates in the North subnetwork

During this period, a phased process was carried out to operationalize the information systems of the four subnetworks into the interoperability platform based on the levels of technological maturity and integration of hospital information systems. The launch took place on August 9, 2019, with the electronic medical record, medical appointment scheduling and medical prescription management components in the North and Center-East subnetworks; subsequently, the South and South-West subnetworks were linked.

2.3. Stage 2: consolidation

In 2020, a new administration took office in Bogotá and adopted the Economic, Social, Environmental and Public Works Development Plan for the Capital District 2020-2024 “**A NEW SOCIAL AND ENVIRONMENTAL CONTRACT FOR THE BOGOTÁ OF THE 21ST CENTURY**”³¹. The new plan sought to comply with the 2015 law, also of 2020, which extends the interoperable electronic medical record guidelines to the entire country³², building from the experience generated by the UEMR of Bogotá.

Act 2015 paves the way for the development of technological mechanisms that enhance the timeliness and access to healthcare services, and requires the adoption of regulations on digital security and the handling of personal data in Colombia. This law is regulated by Resolution 866 of June 2021³³, which defines the set of clinical data elements and relevant documents for the interoperability of medical records in the country. According to this regulation, EPSs and IPSs, both public and private, will have to initiate plans and processes for the exchange of relevant clinical data in accordance with the advances and guidelines of the Ministry of Health and Social Protection.

In order to comply with the 2015 law and continue with the consolidation of Bogotá’s UEMR, in June 2020 the ICT project 7785 was drafted, called “**IMPLEMENTATION OF THE BUSINESS ARCHITECTURE AND RECIPROCAL EXCHANGE OF INFORMATION IN BOGOTÁ**”. The project introduces new platform maintenance and upgrade goals such as: “to achieve 95% reciprocal exchange of information on (administrative-care) processes in the medical records of the four health services subnetworks and 50% reciprocal exchange of information”³⁴ of

³⁰ Interview Arleth Patricia Saurith Contreras, March 24, 2022.

³¹ Agreement 761 of 2020 adopts the Economic, Social, Environmental, and Public Works Development Plan of the Capital District 2020-2024, ‘A New Social and Environmental Contract for 21st Century Bogotá’.

³² Congress of the Republic of Colombia, Law 2015 of January 31, 2020, “Whereby the Interoperable Electronic Medical Record is created and other provisions are enacted”. Retrieved from: <https://dapre.presidencia.gov.co/normativa/normativa/LEY%202015%20DEL%2031%20DE%20ENERO%20DE%202020.pdf>.

³³ Resolution 866 of June 25, 2021 “Whereby the set of clinical data elements relevant to interoperability of medical records in the country is regulated and other provisions are enacted”. Ministry of Health and Social Protection.

³⁴ Reciprocal exchange refers to achieving that 95% of the clinical documents defined for the unified electronic medical record of Bogotá are inter-operating in the four subnetworks.

(administrative-care) processes in the private IPSs that account for 80% of the supply of highly complex health services included in the health benefits plan, interoperate with the UEMR”³⁵.

A new contracting process was carried out by the Ministry of Health to guarantee the “Administration, management, configuration, control, follow-up and monitoring of the Bogotá Digital Health - BSD interoperability technology platform through the application of processes of the Information Technology Infrastructure Library (ITIL v3.), renewal of the support and guarantee of the licenses and/or subscriptions of the ESB MIRTH CONNECT and ONESAIT HEALTHCARE DATA technology components, formerly MyMed (Application and Database). Renewal and support of licenses carried out with Indra Colombia. (Taking into account that this firm is the only one authorized to provide services with ONESAIT HEALTHCARE DATA formerly MyMed, and other technological components with the Bogotá Digital Health interoperability platform- BSD)”³⁶.

2021 also saw the start of the integration of the interoperability technological platform of the Bogotá Digital Health district with the electronic medical records of the EPSs and private IPSs prioritized in the pilot stage, taking into account that they account for 80% of the health services in the city. This process involved the measurement of progress in the Electronic Medical Record of these entities, considering factors such as information systems, databases, information management, integrations, use and ownership, infrastructure, updating and support. For this stage of the project, the goal was established to achieve a minimum of 50% reciprocal exchange of clinical information in the platform with the prioritized entities. Progress in this stage included measurements of the technological maturity of the prioritized entities, networking, working groups and agreements of intent³⁷.

2.4. Stage 3: maintenance and projection

This stage began in 2022 with the follow-up and monitoring of the Bogotá Digital Health technological interoperability platform, carried out by the Secretariat of Health through the Corporate Undersecretariat of the District Secretariat of Health and the ICT Directorate under it.

Bogotá’s SDS continues with the pre-production and readiness for integration and interoperability with the Bogotá Digital Health platform of 7 IPS and 2 private EPS³⁸. Technical and functional support actions were developed for the work teams of the IPS and private EPSs prioritized within the framework of the integration of the Institutional Hospital Information System of each IPS with the interoperability technological platform of Bogotá Digital Health. Integration is gradual and an assessment of progress is envisaged. The SDS plans to consolidate a change management process with the prioritized private entities. Further progress will depend on the functional regulations to be determined by the Colombian Ministry of Health and Social Protection.

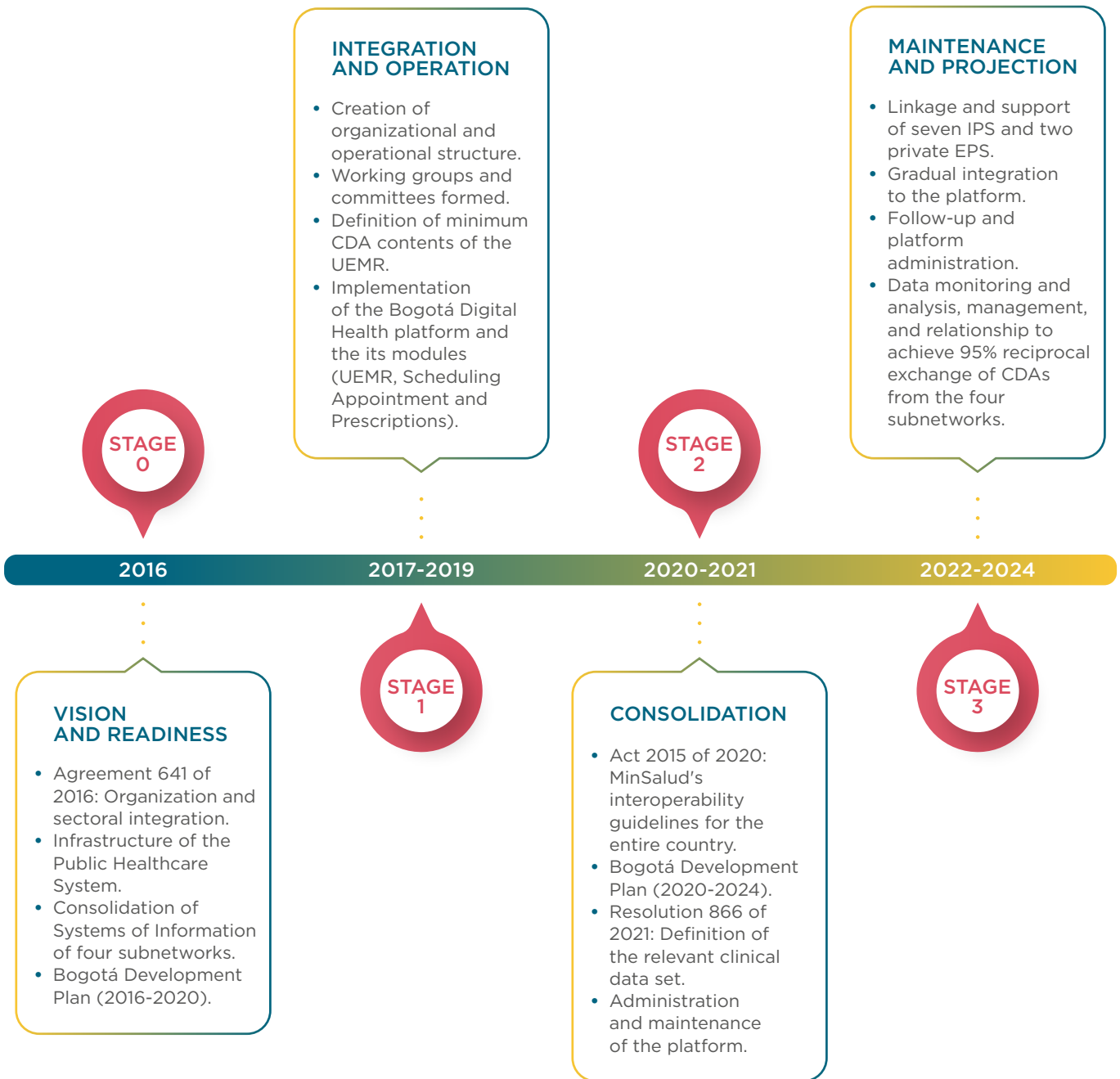
³⁵ Technical Annex Secretariat of Health. 2020.

³⁶ The supply of commercial licenses with the right of use in perpetuity was contracted with the manufacturers of the technological components ONESAIT HEALTHCARE DATA before MyMed, MYSQL, ESB MIRTH CONNECT, Suite ELK (Elastic), RedHAT and Jboss. Technical Annex Secretariat of Health. 2020.

³⁷ Information provided by the UEMR Team of the District Health Secretariat.

³⁸ Seven private IPS that are hospitals (Clínica de la Mujer, Hospital Universitario San Ignacio, Instituto Roosevelt, Hospital Universitario Mederi, Fundación Cardio Infantil, Fundación Santafe, Profamilia) and two private EPS (Sanitas and Compensar) have been linked to the Bogotá interoperability platform.

FIGURE 2:
Timeline



Coordination and current follow-up

Coordination and follow-up are the responsibility of the technical coordinating team made up of three engineers who are part of the Corporate Undersecretariat of the District Health Secretariat. This team leads the coordination of the platform with various areas within the Secretariat, with the Office of the Mayor of Bogotá, with the information systems management of the subnetworks and with the maintenance and operation of the platform and the monitoring of the operation of the infrastructure.

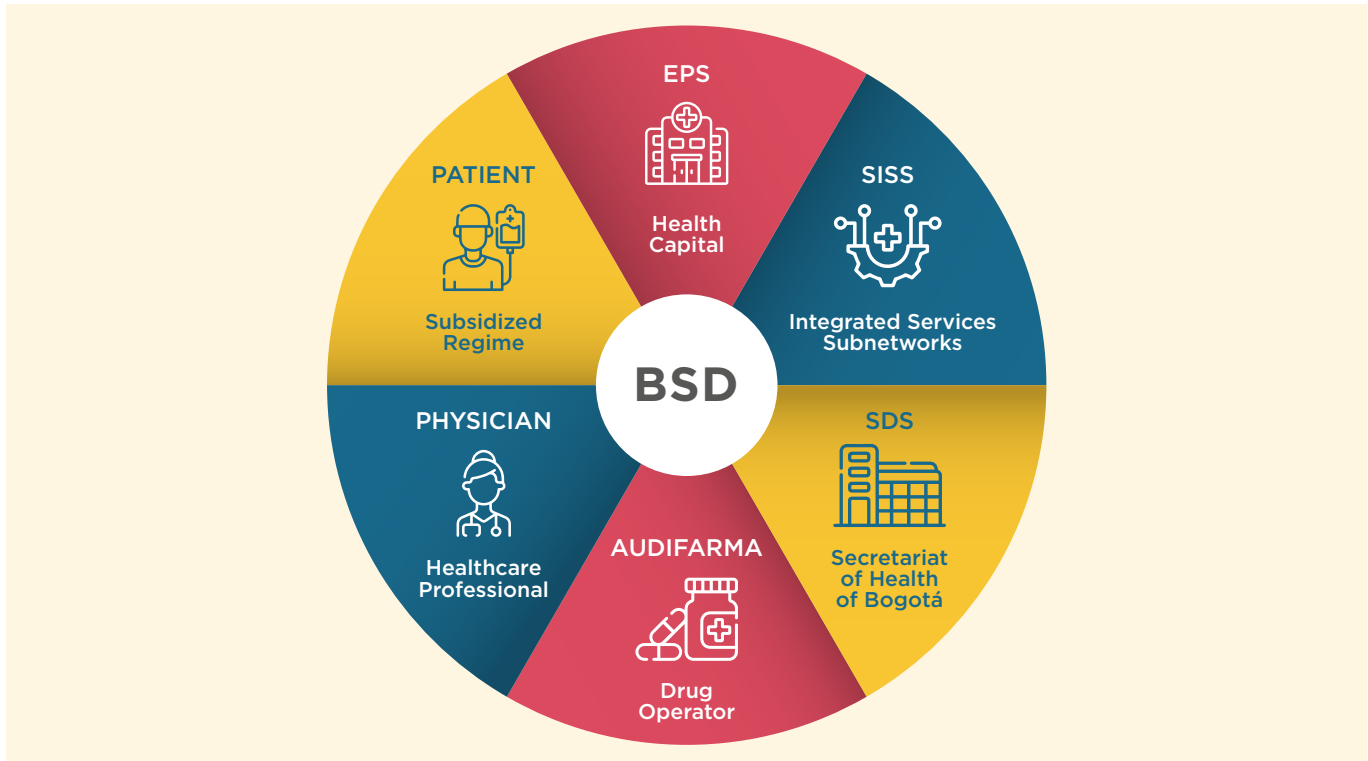
An infrastructure area provides network and infrastructure support through a service desk. Additionally, there is an application area (the entire platform is an application) and the *front-end* layer towards patients was developed within the District Health Secretariat (and not Indra). There are

working groups for each sub-topic (financial, operational, functional) for specific issues as needed, and strategic issues are taken to the management level of the District Health Secretariat. A risk management meeting is held every 15 days, although times may vary depending on the critical path of the project. This meeting is essential because it is part of the follow-up and failures prevention.

Regarding to the relationship with the subnetworks, each one has its own operational teams that connect to the platform to provide the end-stage services to patients, and a technological team is in charge of ensuring the platform's functionality.

» They are all stakeholders in the platform.

FIGURE 3:
Stakeholders of the Bogotá Digital Health platform



Source: Executive Presentation UEMR Team District Health Secretariat 2022.



3.

PROJECTION OF NATIONAL INTEROPERABILITY



3. PROJECTION OF NATIONAL INTEROPERABILITY

As mentioned, the Ministry of Health and Social Protection collected the inputs from Bogotá to draft Law 2015 of 2020 and Resolution 866 of 2021. The Ministry of Health and Social Protection issues guidelines for the fulfillment of interoperability processes for medical records within local health departments. Interoperability standards involving other public management issues are defined by the Ministry of Information and Communication Technologies (MinTIC).

The Bogotá District Health Secretariat and the National Ministry of Health and Social Protection engage in ongoing discussions to align the technical criteria for the use of the Bogotá Salud Digital platform, in anticipation of the Ministry's definition of a national interoperability solution. In this regard, in July 2022 a first test and *connectathon*

exercise was carried out with the participation of five territorial entities. Its participants were Bogotá and the departments of Cundinamarca, Antioquia, Santander and Valle del Cauca. Sixty-four public and private IPSs participated in the pilot exercise to exchange electronic medical records and measure technological and integration gaps in about 20 clinical information systems. About 500 digital care records were exchanged and the aim was to check the conditions of the healthcare delivery networks that participated in the exercise for the exchange of clinical information³⁹. The *connectathon* was attended by the Pan American Health Organization, the Inter-American Development Bank, the World Bank and members of the Latin American and Caribbean Digital Health Network (Spanish acronym: RACSEL).



³⁹ At: <https://www.minsalud.gov.co/Paginas/Minsalud-lidero-la-primera-Conectaton-para-historias-clinicas-interoperables.aspx>.



4.

TECHNICAL DESCRIPTION OF THE BOGOTÁ DIGITAL HEALTH PLATFORM



4. TECHNICAL DESCRIPTION OF THE BOGOTÁ DIGITAL HEALTH PLATFORM

The Bogotá Digital Health technological platform enables the processing and operational and semantic exchange of clinical, healthcare and administrative information in a secure, reliable and real-time manner for the unified electronic medical record (UEMR), centralized appointment scheduling and medical prescription management modules through two main technological components: OneSite (formerly MyMed) and the ESB Enterprise Service Bus MIRTH CONNECT⁴⁰.

Through OneSite (formerly MyMed), the administration and integration of all the components that make up the platform are managed by consolidating, standardizing, and ensuring the persistence of health information available to citizens, healthcare professionals, medication operators, and EPS Capital Salud. The ESB MIRTH CONNECT Enterprise Service Bus enables interoperability between the hospital information systems (HIS) of the subnetworks, the information system of the EPS Capital Salud and the information system of the drug operator through the administration of channels for the management of messages by means of filtering, transformation and routing techniques based on the rules defined for the three modules⁴¹: “That Bus receives all the information coming from the subnetworks, transforms it, and shares it with other subnetworks, or with the medication operators, or with EPS Capital Salud; in other words, with whoever needs it or with the internally developed application that presents the interface to the patient”⁴².

The architecture of the technological solution generates interoperability through the Business Service Bus (BSE) that integrates the information systems of the stakeholders that make up the district’s integrated health services network: the four subnetworks, the EPS Capital Salud authorization system and the Audifarma drug management system (drug operator).

The Bus is robust and scalable to allow for future interoperability between the Capital District’s health sector information systems and the national information systems. The Bus “supports the consumption and publication of services of the other systems regardless of the entity that develops them or whether they are in production”⁴³. It allows interoperability through the exchange format and the HL7 language, which has a compendium of all standardized data that can be interoperated in health at any point in the process⁴⁴.

Each operator maintains their own information system, and once an event is generated (such as a medical prescription or the opening of an appointment schedule), it is transmitted to the Bogotá Salud Digital platform. This is done using standardized catalogs defined for interoperability through the platform, which complies with international standards.

⁴⁰ Technical Annex Secretariat of Health. 2020.

⁴¹ Technical Annex Secretariat of Health. 2020.

⁴² UEMR technical team interview, February 9, 2022.

⁴³ Indra, “Solution architecture for the implementation of UEMR, centralized appointment scheduling and medical prescription management for the District Health Secretariat of Bogotá D.C.”. Reference: FFDS-LP-002-2017. SMS/2018, p. 8.

⁴⁴ The Enterprise Service Bus manages information exchanged by the MyMED ecosystem among its integrated subsystems and integrates the layers of querying/receiving of electronic medical documents, as well as the transformation between HL7 protocols (if required) and the insertion of these in the XSD.b repository. UEMR document - Solution Architecture_ v1.4.docx, p. 33. Indra, 2018.



4.1. Interoperability standards

The Bogotá Health digital platform was structured based on the HL7 international standard⁴⁵

version 2, for the delivery of medical prescription and scheduling messaging, the CDA version for the reception or delivery of medical record messaging and the FHIR version⁴⁶ for the conversion of the data arriving in the CDA version⁴⁷ in order to view them in the Health Data viewer⁴⁸. To summarize, the information migrates to the centralized servers of the subnetwork and from there goes to the Bogotá Digital Health platform in the required formats.

The UEMR has a Master Patient Index (MPI), an XDS document registry system, a repository of

XDS.b electronic clinical documents and a Viewer⁴⁹. These elements are based on the international healthcare interoperability standards HL7 v2, CDA r2 and the IHE integration profiles⁵⁰ XDS.b⁵¹ and ATNA⁵².

The subnetworks have their own hospital information system (HIS), and to interact with the platform they use the catalogs defined for interoperability, which each sub-network had to transform or adapt according to the standards defined by the sub-network itself⁵³.

Table 1 summarizes the interoperability standards (messaging and documents) supported by the Bogotá Digital Health platform architecture.

TABLE 1:
Interoperability standards (1 of 2)⁵⁴

Standard	Type	Application
HL7 V2.x	Messaging	Messaging, scheduling, medical prescription
HL7 V3/ CDA/CCD/C-CDA	Messaging	CDA and IHE XDS profile
HL7 FHIR(JSON)	Messaging	Use of protocols through RESTful service api (oriented to exchanges over the Internet) and representation of objects and documents using JSON
ebXML	Messaging	XDS.b transactions
SOAP / REST	Messaging	Platform exchange services
MTOM	Messaging	Services for sending documents through the platform

⁴⁵ HL7 is the set of standards that facilitate the electronic exchange of clinical information for electronic health information exchange. It is responsible for some of the most widely used communications protocols in healthcare today.

⁴⁶ FHIR is the latest standard developed and promoted by the international organization HL7.

⁴⁷ CDA intermediate version: variations on how to arrange clinical or medical data. These are variations on how to gather and dispose of clinical data information.

⁴⁸ Interview with the UEMR technical team, February 9, 2022.

⁴⁹ Office of the Mayor of Bogotá D.C., "Preliminary Studies for Selection Processes, Code SDS-CON-064 V.1. Integrated Documentary Control Management System". District Health Secretariat - District Financial Fund, Annex 3. Specifications and Technical Conditions. A comprehensive solution for the implementation of the Unified Electronic Medical Record (UEMR), centralized appointment scheduling and medical prescription management. 2017.

⁵⁰ IHE Integrated Health Enterprise is an organization that defines profiles to solve different IT problems in the health sector.

⁵¹ XDS.b is a repository of electronic clinical documents.

⁵² ATNA(*audit trail and node authentication*) can be translated into Spanish as seguimiento de auditoría y autenticación de nodos.

⁵³ UEMR technical team interview, February 9, 2022.

⁵⁴ Technical Annex Secretariat of Health. 2020.

TABLE 1:
Interoperability standards (2 of 2)

Standard	Type	Application
HL7 CDA r2	Documents	Clinical documents
XML	Documents	Used for extended process information
HL7 FHIR	Documents	FHIR resources consumed by RESTful services APIs

4.2. Unified electronic medical record documents

For the exchange of clinical information with the HIS, 7 ADCs⁵⁵ were defined, adopting the HL7 standard at level 3 and/or FHIR (Fast Healthcare Interoperability Resources) using APIs⁵⁶ of RESTful services⁵⁷:

1. CDA Epicrisis Emergencies;
2. CDA Epicrisis Hospitalization;
3. CDA Epicrisis Outpatient Consultation;
4. CDA Dentistry;
5. CDA Laboratory;
6. CDA Maternal Perinatal History;
7. CDA Images.

All the information gathered by the healthcare professional using the platform is done in nominal terms. For interoperability to be viable, any diagnosis (e.g., of arterial hypertension) must be sent coded under a nationally or internationally viable standard. In this case, the diagnosis is made under the ICD 10 standard⁵⁸.

Unified electronic medical record (UEMR) documents

CDA Epicrisis Emergencies

CDA Epicrisis Hospitalization

CDA Outpatient Consultation

CDA Dentistry

CDA Laboratory

CDA Maternal Perinatal History

CDA Images

The solution was structured on the basis of a set of minimum conditions or criteria for each of the main patient care issues on the administrative side and, in particular, on the care side and in all the support functionalities for the four subnetworks.

⁵⁵ District Health Secretariat - District Financial Fund, op. cit., p. 7.

⁵⁶ API(application programming interface) is a set of functions provided to be used by other systems and/or software components.

⁵⁷ Transfer of representational status.

⁵⁸ The International Statistical Classification of Diseases and Related Health Problems determines the classification and coding of diseases and a wide variety of signs, symptoms, social circumstances and external causes of disease. Published by the World Health Organization (WHO), the most recent edition is the tenth edition, ICD-10.



4.3. Conceptual model of the Bogotá Digital Health platform

Figure 4 shows that the information migrates to the platform through the Enterprise Service Bus with the defined interoperability standards (HL7 standard) and that there are several modules to manage the information. The transactional modules (medical records, appointment scheduling, and medical prescriptions) are used by different users (patients, healthcare professionals, administration) and the way in which the information is presented is very similar for the physician and for the patient.

The appointment scheduling and medical prescription modules interoperate with the hospital information systems of the integrated health services subnetworks, with the information systems of EPS Capital Salud and with the information systems of the drug operators.

The medical record module has a master patient index (MPI), through which a unique patient identification, or ID, is created regardless of which

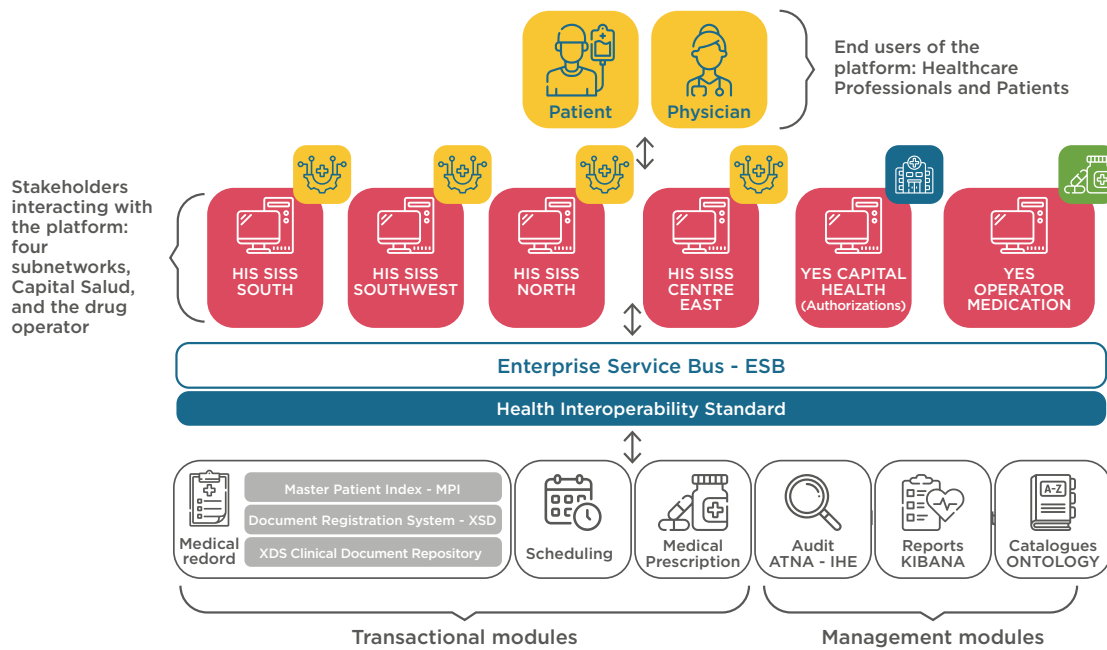
system the patient's information comes from; a document registration system and a document repository, where those clinical documents received in the CDA version are stored in the platform.

The platform management modules are auditing, reporting (which runs under KIBANA) and ontology catalogs, which allow the management of the defined common interchange language. This module contains all the catalogs used by the platform, i.e. the semantic standard.

The master patient index facilitates the creation of a unique patient identification, taking into account that during the course of a patient's life, he/she may have different forms of identification (certificate of live birth, identification card, identity card or official identification document for adults). To avoid confusion in medical records, the computer systems at the network level have a form of patient identification or master patient index that uniquely identifies that individual.

The platform creates a unique ID that identifies you for all transactions with all information systems; when you enter the basic minimum data agreed upon for interoperability the system identifies that it is the same patient regardless of where he/she

FIGURE 4:
Conceptual model of the Bogotá Digital Health platform



Source: Secretariat of Health of Bogotá, 2022⁵⁹.

⁵⁹ Bogotá District Secretariat of Health., Bogotá Digital Health Presentation. 2022.

has been treated, thus building the medical record and ensuring that patients are not being duplicated. As a single user and through an ID all patient information is collected. For example, a patient is seen in a subnetwork for emergencies; data such as name and cell number are collected and the ID is created. Later, when the same patient goes for an emergency check-up at a care center in another subnetwork, all the information such as date of birth, telephone number, cell phone number, etc., can be collected.

When the information is entered, the platform matches the data and identifies its history and associates it with the ID number with which it was created.

Patient data are mandatory and must include information such as the patient's first name and first surname, sex, date of birth, type of document and document number. If any of these do not match, the system displays it. Other information such as nationality, language and country of birth or contact details are not mandatory and may or may not come from the information system.

FIGURE 5:
Patient Master Index User Display Screen

The screenshot displays the MyMED MPI interface for a patient named BLANCA EVELIA GARCIA RANGEL. The user is identified as Juan Gabriel Rubio Ocampo. The patient's profile includes the following information:

- Personal Data:** HN ID, 69 Años, Cédula de Ciudadanía, and a checkbox for 'Paciente importado'. Status: Inactivo (No), Confidencial (No). Last updated: 20/11/2019 16:11.
- Nombre:** Fields for Primer Nombre (BLANCA), Segundo Nombre, Primer Apellido (GARCIA), and Segundo Apellido.
- Datos Generales:**
 - Sexo: Mujer
 - Estado civil: Seleccione uno
 - Nacionalidad: Seleccione
 - Idioma: Seleccione
 - Discapacidad:
- Nacimiento:**
 - Fecha de nacimiento: 07/09/1953
 - Pais de nacimiento: Seleccione uno
- Identificación:**
 - Tutor:
 - Tipo de documento: Cédula de Ciudadanía
 - Número de documento: [Redacted]
- Contacto:**
 - Teléfono: [Redacted]
 - Email: [Redacted]
 - Uso de contacto: [Redacted]
 - Datos de contacto: [Redacted]

Navigation icons on the left include 'Datos personales', 'Direcciones', 'Histórico', and 'Cerrar Guardar'.

Note: The image indicates how an administrator designated to use the platform, who may be a healthcare system professional, can view the master patient index (MPI) on the MyMED platform. The unique registration ID is visible, along with essential data and any additional information that can be supplemented. The platform automatically integrates all of these.

4.4. Architectural features

The integrated technology solution was structured to enable a high-volume transactional environment aimed at providing a scalable operational environment continuously available in a heterogeneous environment. It is a centralized architecture in which the information produced in the system of each subnetwork or IPS is stored in each system and then the summary is sent in CDA format to the central database managed by the Secretariat of Health. There are a number of architectural requirements (non-functional requirements) or quality attributes⁶⁰.

↳ **INTEROPERABILITY:** the system is developed using a service-oriented approach that allows encapsulating functionalities as reusable as possible, contributing to the standardization of integration; thereby avoiding building specific functionalities to interact with other internal or external information systems.

↳ **SCALABILITY:** this requirement means that the integrated technology solution allows all system components to scale both vertically and horizontally to support current and future needs.

↳ **SECURITY:** the application offers a role-based security mechanism that authenticates the user at login and at service consumption using programmatic security under security standards. For each of these roles a series of permissions are defined that will be reflected as accesses to certain components of the application. This information is encrypted and all transactional processes on the platform incorporate a dynamic JWT *token*.

↳ **CONFIDENTIALITY:** ensures that only authorized personnel can access the information stored in the solution and must maintain access hierarchies that restrict the use of information based on groups, users and profiles.

↳ **INTEGRITY:** ensures that the transferred and stored information cannot be modified without the necessary permissions.

↳ **AVAILABILITY:** the solution guarantees protection against denial of service attacks or any attack that prevents access to the services offered by the solution.

↳ **AUDIT:** audit log for all operations defined by the ATNA profile.

↳ **HIGH AVAILABILITY:** operates in a high-availability environment that ensures business continuity. High availability is defined as the capacity to recover from a problem efficiently and effectively, affecting the service as little as possible.

↳ **FAULT TOLERANCE:** refers to how the synchronization and recovery of information will be guaranteed in the event of loss of connection between OneSite and the information systems of the integrated network of health services and drug operators. In addition, the solution has a monitoring and notification system that allows for the control of the response times of the transactions between the information systems to be interoperated according to the defined solution model.

⁶⁰ Indra, op. cit., p. 9.

4.5. Interaction of the components of the Bogotá Digital Health platform

The process of using the platform begins with scheduling; the patient requests a medical appointment from the Capital Salud EPS, then goes to the medical record and the medical prescription. When scheduling medical appointments, the patient interacts with the interoperability platform through the computer in the scheduling module.

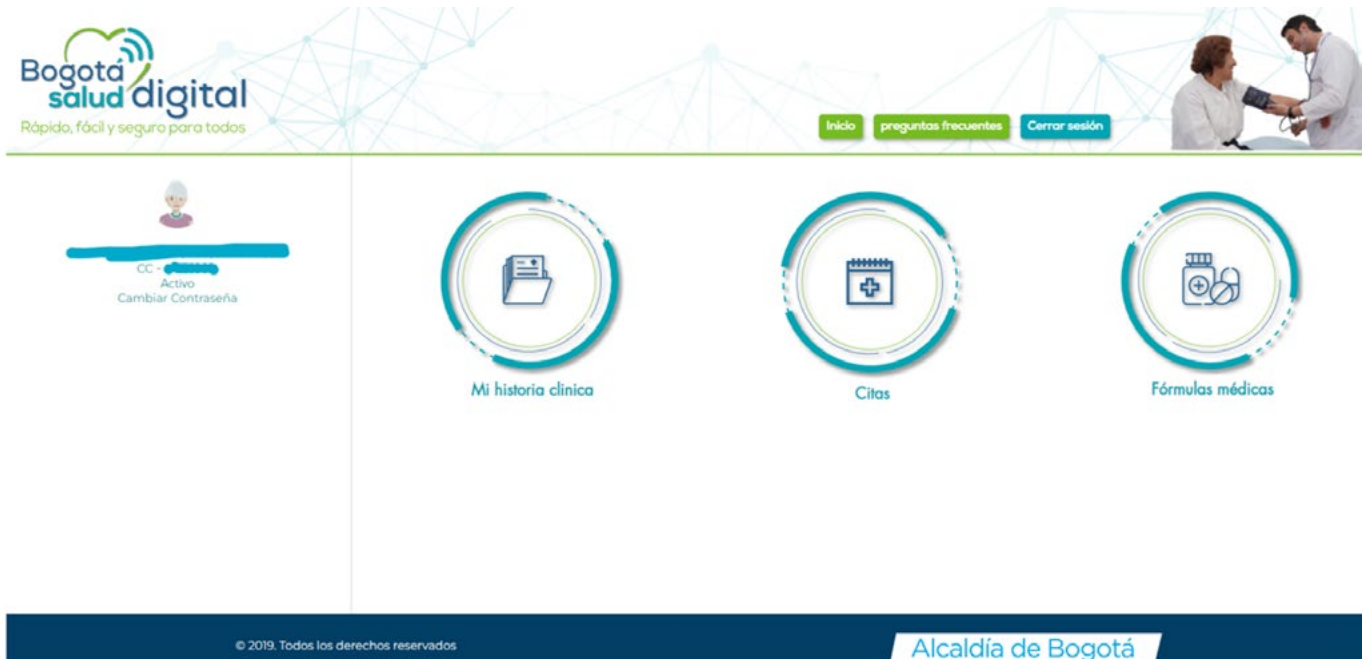
The platform queries the Capital Salud information system and the hospital information system of the subnetwork or all subnetworks, identifying availability and physicians in that specialty. When authorization from Capital Salud as an EPS is required, it is sent through the platform, received again, the information is downloaded and it informs the scheduling system to reserve the slot,

and notifies Capital Salud to authorize it if necessary. This is the case for every patient who requests an appointment⁶¹.

When the patient affiliated with Capital Salud has the assigned appointment, the physician is informed that they are blocked for this appointment. This interaction between physician and patient generates the medical record in the information system of each subnetwork. The medical record is no longer limited to one hospital or health center; with only the identification number, each professional who wishes to access patient information can access the information available from the 22 hospitals in the public healthcare system or other care centers at all levels where there are histories and records.

The electronic medical records of the prioritized IPS and EPS are consulted by the physicians of these entities but not by citizens..

FIGURE 6:
Generating an online appointment in the system (1 of 2)



⁶¹ UEMR technical team interview, February 9, 2022.

FIGURE 6:
Generating an online appointment in the system (2 of 2)

The screenshot shows the 'Agendar cita' (Schedule appointment) page in the Bogotá Salud Digital system. The user is identified as 'Mujer, 68 años'. A progress bar at the top indicates three steps: 1. Buscar (Search), 2. Seleccionar hora (Select time), and 3. Confirmar (Confirm). The '1. Buscar' step is active, showing a search form with the following fields:

- Asegurador:** CAPITAL SALUD (selected), Particular
- Subred:** Subred Sur E.S.E. (selected)
- Centro:** Seleccione una opción...
- Servicio:** Seleccione una opción...
- Prestación:** Seleccione una opción...
- Agenda:** Seleccione una opción...
- Profesional:** Seleccione una opción...
- Fecha de la cita:** 15/03/2022
- Hora inicial:** hh:mm
- Paciente priorizado:** Seleccione una opción...

There is a checkbox for 'Buscar también en días posteriores' (checked) and a 'Buscar cupo' button at the bottom.

© 2019. Todos los derechos reservados. Alcaldía de Bogotá

The screenshot shows the 'Consultar citas' (View appointments) page. It displays the user's profile and a list of appointments:

PRÓXIMAS CITAS PROGRAMADAS

- Ma, 22 Mar 2022 16:15:** ECOGRAFIA DE OTROS SITIOS TORACICOS. Subred Sur E.S.E. - USS Meissen - ECOGRAFIA GENERAL 15 MIN. LUIS [redacted] - ECOGRAFIA GENERAL 15 MIN. Programada.

HISTÓRICO DE CITAS

Search criteria: Escribe 3 caracteres para buscar, Fecha o periodo, Buscar.

15 de 60 resultados

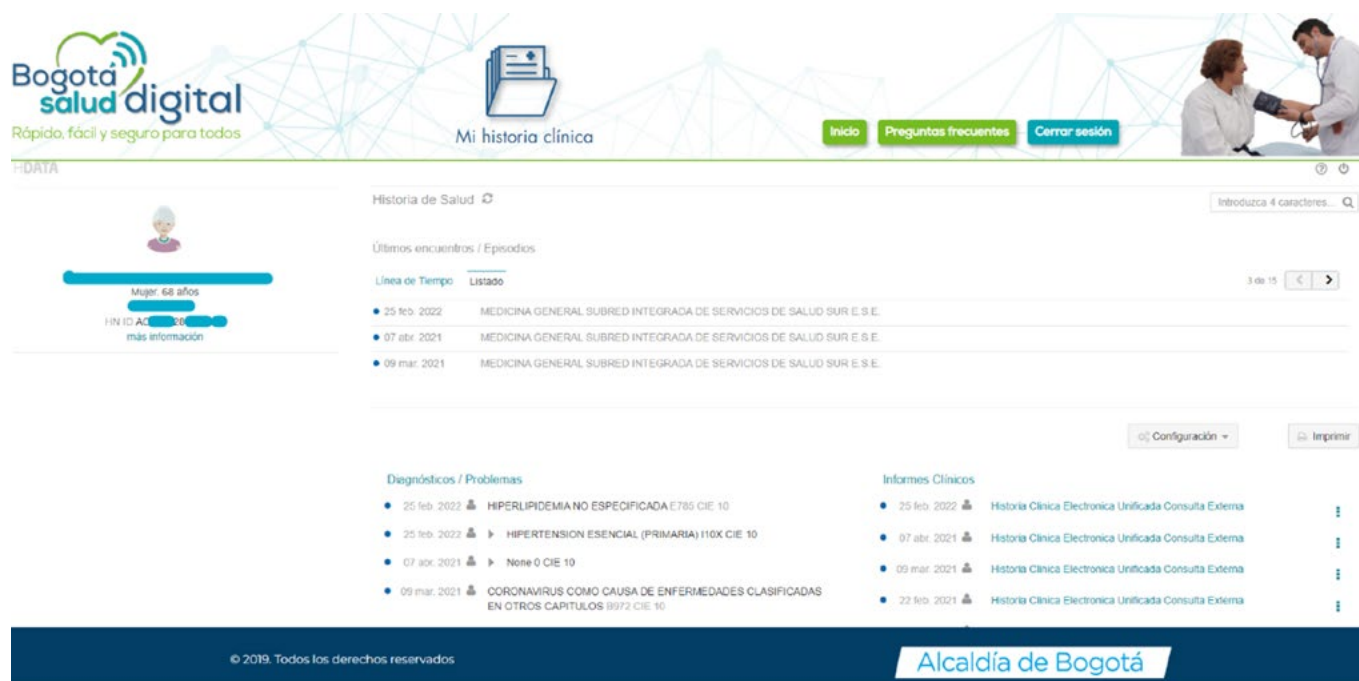
- Vi, 25 Feb 2022 14:20:** CONSULTA DE PRIMERA VEZ POR MEDICINA GENERAL. Subred Sur E.S.E. - USS Candelaria I - CONSULTA MEDICINA GENERAL PRESENCIAL 20. GLORIA [redacted] - CONSULTA MEDICINA GENERAL PRESENCIA... Realizada.
- Ma, 22 Feb 2022 13:20:** CONSULTA DE PRIMERA VEZ POR ESPECIALISTA EN GASTROENTEROLOGIA. Subred Sur E.S.E. - USS Tunal - CONSULTA DE GASTROENTEROLOGIA. LEONEL [redacted] - CONSULTA DE GASTROENTEROLOGIA. Realizada.

© 2019. Todos los derechos reservados. Alcaldía de Bogotá

This is because the integration of EPS and private IPS has been a gradual process, and a resident who is not necessarily affiliated to Capital Salud can access the services of the public health network in Bogotá, such as hospitals and care centers, or an affiliate of Capital Salud can be treated in a private IPS. In this way, physicians can provide continuity of care to their patients beyond the EPS to which they belong.

authorized, again via a message, the prescription travels through the point of interoperability towards Audifarma, the drug dispenser. The medical prescription is received and the medication is delivered. There is an SMS and e-mail messaging process that notifies the user or patient how the process is progressing and at which physical location they can go to receive their medication. It also informs if the medical prescription has been

FIGURE 7:
Image of the personal medical record in the platform



Example of process flow of prescription, authorization and dispensing of medicines

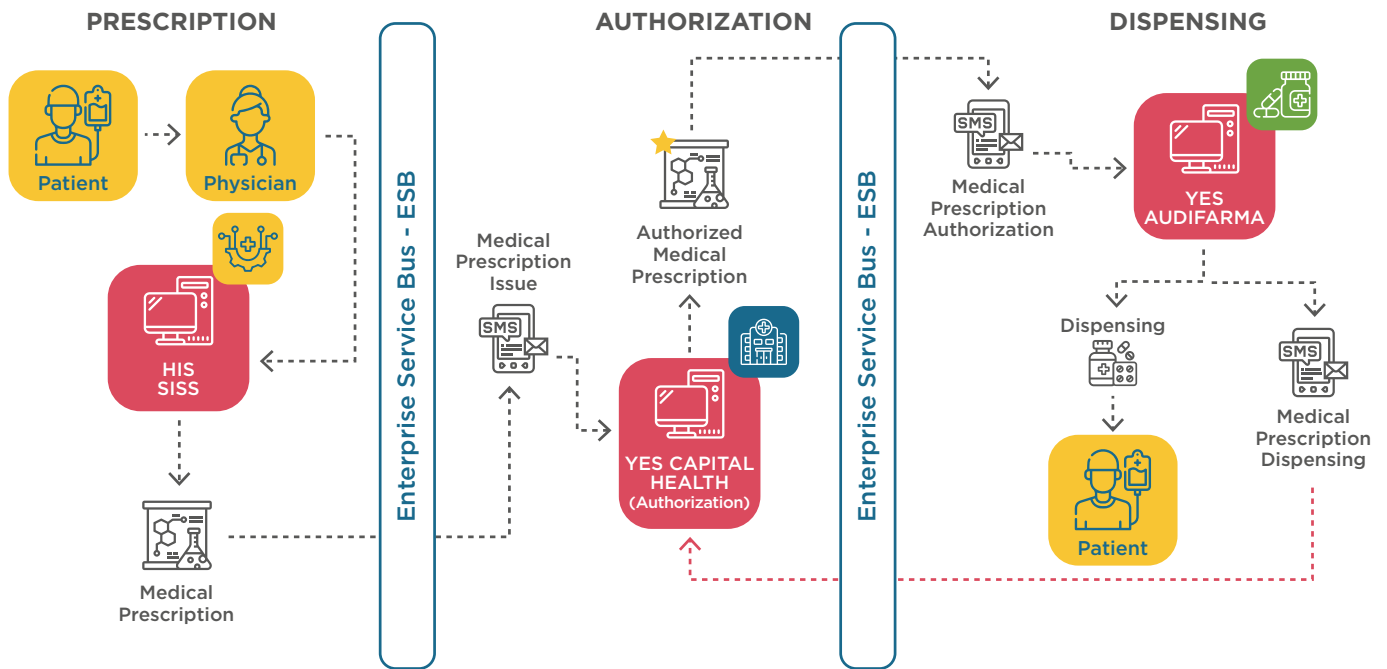
The physician generates a medical prescription through their subnetwork's medical record information system. The prescription is sent to the Enterprise Service Bus through the HL7 version 2 messaging standard and arrives at the Capital Salud EPS information system. The system verifies whether or not the drugs require authorization, and the subnetwork is notified whether or not it is authorized. If the medical prescription has been

authorized or if there are any difficulties. No information is exchanged in pdf or flat files, but rather the prescription is decoded and the platform adapts the information for patient visualization in an HL7 v2 message.

Regarding the dispensing of medication, the information system of the EPS Capital Salud goes to a *back office* that is in charge of analyzing the formulation and authorizing it, which is notified to the patient. All this information goes back to the platform to notify the subnetwork of the authorization and dispensing of the drug⁶².

⁶² <https://ciudadanobogotadigital.saludcapital.gov.co/login>. Access link that is hosted on the website of the District Health Secretariat.

FIGURE 8:
Example of medical prescription process flow



Source: Executive Presentation UEMR Team, District Health Secretariat, 2022.

FIGURE 9:
Medical prescription module screen

The screenshot shows the Medical Prescription module interface. On the left, there is a patient profile card for a 68-year-old woman. The main area displays the following information:

- Fórmulas Médicas:** A link to view the list of medical formulas.
- Detalle de fórmula médica:**
 - Date: 25 feb. 2022 13:49 - Entrega en la subred adscrita
 - Diagnosis: HIPERTENSION ESENCIAL (PRIMARIA)
 - Subsidio: AC1574284291937
 - Profesional: 51897826
 - Centro: U.D.S Candalaria I
 - Entidad: Capital Salud
- Prescripciones:**
 - AMLODIPINO 5 mg TABLETA**

Ids	Cantidad	Posología	Via administración	Indicaciones	CUM
1	90.0	5.0 mg / 1 Días / 90.0 Días	Oral	1 EN LA NOCHE X 3 MESES	55895
 - ACETAMINOFEN 500 MG TABLETA**

Ids	Cantidad	Posología	Via administración	Indicaciones	CUM
1	90.0	500.0 mg / 8 Horas / 90.0 Días	Oral	1 AL DIA SEGUN DOLOR	10935303

Note: this screenshot shows the display of the Medical Prescription module in the Bogotá Digital Health platform. The patient's diagnosis is shown as a check prior to the authorization of the drug. It also indicates the subnetwork in which the patient was treated.

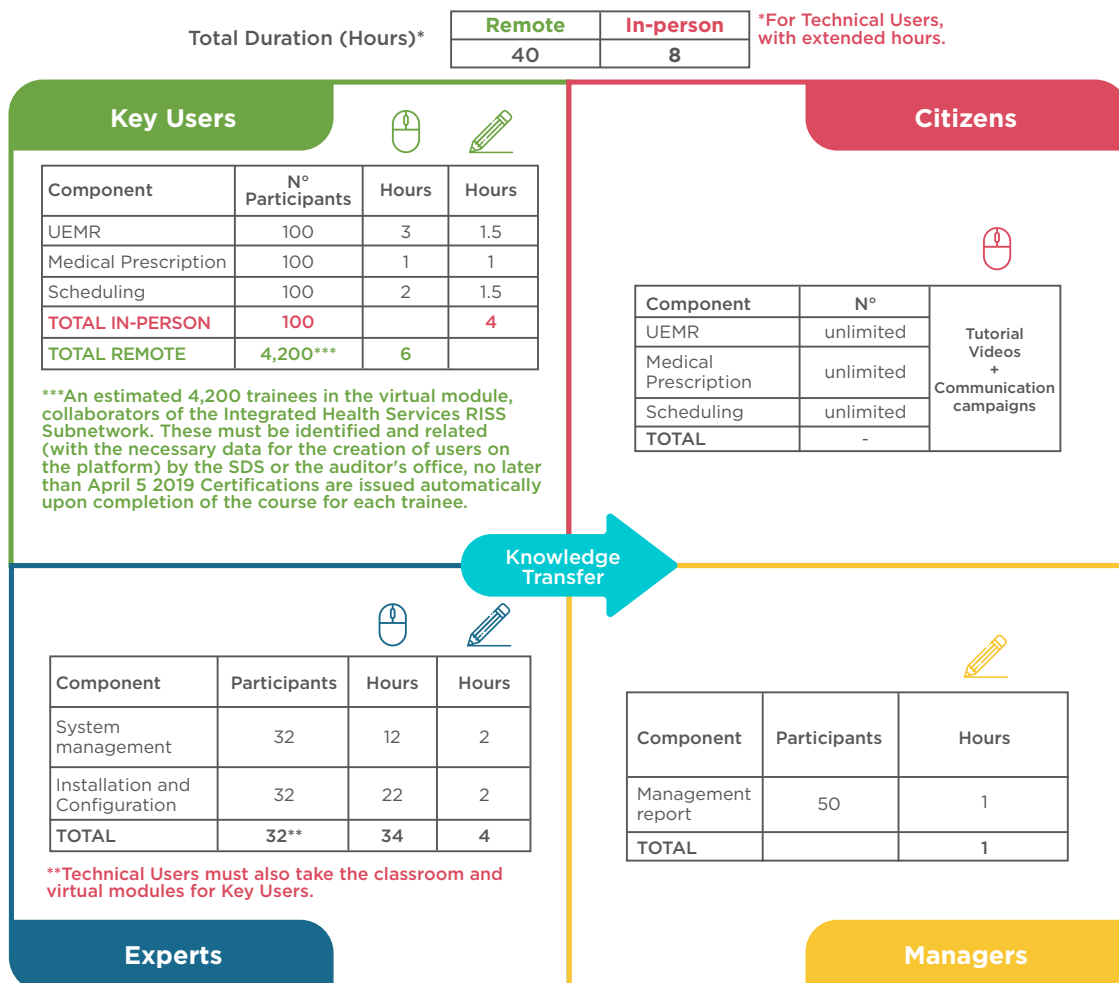
4.6. Change management⁶³

Digital transformation brings about resistance and inflexibility due to its ability to transform processes, environments and routines. For the adoption of the Bogotá Digital Health platform, three change management processes were developed together with healthcare professionals, authorized technical personnel, the drug operator and patients: **awareness, communication and knowledge transfer**. This strategy includes the entire integrated health network and responds to each of the stages of the project and the needs of technical,

functional, analytical and usage knowledge for the benefit mainly of the recipients, that is, the citizens of Bogotá.

An awareness campaign was carried out through mass media and events, conveying information about the solution and each of its components. The communication exercise was mainly aimed at doing away with fear of the unknown and barriers in the health ecosystem, and was carried out with the flow of periodic information through institutional channels and others to which users had access, highlighting the correct use of the platform's components and its attributes.

FIGURE 10:
Table of participation in knowledge transfer process training courses



Source: Indra, 2019.

⁶³ Note that the strategy used does not necessarily represent the state of the art in change management issues. For a full discussion of this topic see e.g. "Irresistible: how to manage change in digital health". IDB.

To guarantee usability and operation of the platform, Indra and the project team led by the District Health Secretariat have developed a **knowledge transfer strategy** to encourage user participation and kindle a spirit of commitment and ownership of this digital tool, so that change is embraced by conviction and not by opposition.

The main source of knowledge transfer was the direct training of all those involved in the management of the platform. On the one hand, workshops and on-site training were held with certification of the knowledge acquired and skills demonstrated by each of the user profiles with job functions at different levels. Secondly, remote courses were held to facilitate user interaction with the platform components through a self-learning process specially designed by the supplier to promote the proper use of the tool.

The trained participants fit into four profiles. First, key users, including service providers with an auditing function in the three modules, and collaborators with knowledge, skill and a preference for understanding the system. Second, technical leaders of Health Secretariat, of each of the subnetworks and of Capital Salud and system administrators in the duplicate and catalog management processes. Third, the strategic managers or the selected leadership team of the Ministry of Health and the project in general. Fourth, the citizens or beneficiaries of the system.

The training process was designed by Indra to apply to the entire network, which was to be responsible for enabling the support infrastructure for knowledge transfer. More specifically, it had to commit to the selection of the target group to be trained, the socialization of the normative framework, the guarantee of the required logistics and the necessary elements for the fulfillment of the remote training. Initially, 32 people with a technical profile (20 from the subnetworks, 6 from the Health Secretariat and 6 from Capital Salud) and 100 healthcare professionals (80 from the subnetworks and 20 from Capital Salud) were expected to participate.

Initially, the technical teams validated the designs and then training sessions were held with healthcare professionals; some of them were held during patient care so as not to interfere with their schedules. **Given the high turnover, remote courses for self-learning knowledge management should be a tool for permanent use.**

It was a good choice to integrate the *call center* through the Capital Salud EPS to facilitate the use of the platform for users with limited internet access or low digital literacy. In these cases, the patient calls on his phone and the *call center* operators enter the patient's ID number into the platform and manage the scheduling of medical appointments. This strategy contributed especially to the use of the platform for scheduling appointments.

Also considered as a change management component was the integration of first-level help desks to train users such as *call center* agents or healthcare professionals; and second-level desks to solve technical problems in the platform. This support service has made it possible to promote learning to more levels of the organizational structure and for those who use the platform to advise other levels of users.

As part of the reflections of the technical team of the District Health Secretariat and the Indra team, it was highlighted how important it is to generate cross-sectional processes for digital transformation adoption that involve the training of different professionals, and not only those of the healthcare sector, in aspects such as data analytics. Likewise, it is essential to involve healthcare professionals from the outset in the design of the technological solution and the development of data exchange standards to ensure that its operation is viable.

» **Change management strategies must continue; it is essential to foster the adoption of the use of the platform on a permanent basis among professionals and users of health services, as well as to provide care and technical continuity.**

FIGURE 11:
Example of content in the knowledge transfer strategy

GESTIÓN DEL CAMBIO

CONTENIDO ESPECÍFICO
TRANSFERENCIA DE CONOCIMIENTO – MODO PRESENCIAL



Certificación en el componente – Historia Clínica Electrónica Unificada.

1,5 horas de duración

1. Ingreso al sistema.
2. Búsqueda y listas de pacientes.
3. Visor de CDA.
 - a. Filtros que aparecen en la ventana: Tipo de informe, especialidad y fecha (calendario que permite indicar una fecha de inicio y una fecha de fin de modo que el filtro es de un rango de fechas).
 - b. Mostrar más filtros: Línea asistencial, centro, servicio y formato.
 - c. Presentación de la lista de informes.
 - d. Selección de uno de los informes y despliegue de las acciones permitidas (Ver informe).
 - e. Presentación del informe (Pegar/despegar, Mostrar todo, Contenido).
 - f. Opciones de visualización del informe.
4. Visor de Historia Clínica.
 - a. Presentación en la línea del tiempo de los últimos episodios y navegación por ella a través de la barra horizontal.
 - b. En la línea de tiempo, se muestran las 10 últimas atenciones del paciente. En base a la relación de tiempo entre cada atención, se calcula la escala de la línea de tiempo.
 - c. Los encuentros se presentan con distintos colores según el tipo:
 - i. Atención primaria: Verde
 - ii. Atención especializada: Cian
 - iii. Urgencias: Rojo
 - iv. Hospitalización: Violeta

GESTIÓN DEL CAMBIO

CONTENIDO ESPECÍFICO
TRANSFERENCIA DE CONOCIMIENTO – MODO PRESENCIAL



Certificación en el componente – Historia Clínica Electrónica Unificada.

1,5 horas de duración

- ① Si no tiene fecha de fin, solo se pinta la de inicio. Si existen las dos fechas, se muestra como una barra.
 - ② Si no tiene fecha de fin, solo se pinta la de inicio. Si existen las dos fechas, se muestra como una barra.
- d. Presentación de la lista de episodios. Selección de uno de ellos y presentación de la información recogida en el sistema del mismo.
 - e. Búsqueda de elementos en la historia por el criterio deseado: Introducción de al menos 4 caracteres y tras la confirmación, presentación de los elementos de la Historia que contiene lo que se registró en el campo de búsqueda.
 - f. Opciones de Configuración generales (Editar cuadrícula para cambiar la disposición y Añadir datos para activar o no la presentación de los distintos tipos de datos existentes).
 - g. Opciones de las cuadrículas: Configuración de filtros y actualizar filtros.
 - h. Opciones de los informes de la lista de informes: Ver informe.

GESTIÓN DEL CAMBIO

CONTENIDO ESPECÍFICO
TRANSFERENCIA DE CONOCIMIENTO – MODO PRESENCIAL



Certificación en el componente – Fórmula Médica .

1 hora de duración

1. Proceso general de interoperabilidad en fórmula médica.
2. Revisión general del visor de fórmula médica.

Source: Indra, 2019.





5.

ACHIEVEMENTS AND SUCCESSES OF THE UNIFIED ELECTRONIC MEDICAL RECORD (UEMR)



5. ACHIEVEMENTS AND SUCCESSES OF THE UNIFIED ELECTRONIC MEDICAL RECORD (UEMR)

» **The creation of the UEMR in Bogotá has contributed to foster process integration among various institutions to optimize and improve comprehensive health care in the city.**

It has promoted learning and confidence of the different users employing technology to access services. It is a strategy that has enabled moving toward a preventive model that facilitates the closing of gaps in access to the health system. It is still too early to have solid evidence about the impact of UEMR but some production and perception figures offer a positive view of this experience.

For the Secretariat of Health of Bogotá, the UEMR Bogotá Digital Health platform fulfills the objectives of consolidating, standardizing and guaranteeing the continuity of health information available to the actors of the public health services network. The SDS deems that continuity of care has been provided to patients through secure access to electronic medical records by health care institutions, and that workflows, security and accuracy of the data used in the coordination of care have been improved. The SDS team believes that Bogotá has been a pioneer in medical record interoperability and is the first Latin American experience in networking, because it was not just a matter of setting up an institutional medical record but of integrating the medical record into a territorial health services network.

The people interviewed for this study agree in highlighting the importance of management commitment on the part of the different administrations, which have supported and given continuity to the initiative⁶⁴. In its inception and implementation stage, the project had a comprehensive and long-term vision that was later supported by the next administration. The project made rapid progress in its initial stage of coordinating the information systems of the subnetworks to the interoperability platform, which gave it legitimacy and credibility⁶⁵. And there was a commitment to build on what has been built, moving forward with the vision of continuing to integrate interoperability services into the platform and to have a wide range of information that will enable data analysis:

“We have already received a robust solution with a high level of ownership by the sector, and from the goals of the Development Plan it was prioritized to complete the implementation in the entire public healthcare system, and an additional challenge, which I think is the biggest, is how to link the private network as part of this same exercise of medical record interoperability and around the entire digital health solution of the Secretariat, which it has led with its subnetworks. A patient receiving care in the South Subnetwork and the next day consults again in the North Subnetwork: the entire medical record can be consulted from the other network”⁶⁶.

It should also be noted that, during its structuring, the UEMR had a specialized team and the commitment not only of the management but also of the staff at all levels.

⁶⁴ Bogotá Administrations 2016-2020 and 2020-2024: “Plan de Desarrollo Económico, Social, Ambiental y de Obras Públicas para Bogotá D.C.” (Economic, Social, Environmental and Public Works Development Plan for Bogotá D.C.). 2016 - 2020 “Bogotá Mejor Para Todos” and “Plan de Desarrollo Económico, Social, Ambiental y de Obras Públicas del Distrito Capital 2020-2024 “Un Nuevo Contrato Social Y Ambiental Para La Bogotá Del Siglo XXI””.

⁶⁵ Interview with Luis Gonzalo Morales, Secretary of Health between 2016 and 2020.

⁶⁶ Interview with Alejandro Gómez, Secretary of Health of Bogotá 2020-2024.

The District Health Secretariat (SDS) believes it is now capable of using data for decision making because a significant amount of information is coming in. For example, number of users connected and using the platform, number of consultations, appointments and prescribed medications, trend in pathologies or hospitalization decisions, among other blocks of anonymized information. It is projected that in the future this information could be used for data analytics.

According to data from the Secretariat of Health, a total of **6.840.030⁶⁷ clinical documents** have been successfully sent through the interoperability technology platform with the following distribution:

OUTPATIENT CLINIC	4,581,228
LABORATORY	682,769
EMERGENCIES	643,618
DENTISTRY	432,386
HOSPITALIZATION	308,910
MATERNAL-PERINATAL	153,152
IMAGES	37,967

As of March 2023, the Bogotá Digital Health platform has reached a progress of 89% in the reciprocal exchange of information among the three modules⁶⁸ with the four subnetworks. The SDS sets as a goal for 2023 ‘to achieve 95% reciprocal exchange of medical records in the four health-care service subnetworks; that is, to increasingly facilitate progressive assimilation and exchange of clinical documents among all information systems that are part of the integrated healthcare services network’⁶⁹.

The process was very rigorous in terms of data management, privacy and information security, which helps to gain legitimacy with ecosystem stakeholders. In addition to political commitment, the city has ample technological and connectivity infrastructure, as well as installed capacity and financial resources that have enabled it to move forward with the project, working closely with the national government⁷⁰.

Another important achievement has been the choice of HL7 FHIR as the mechanism for interoperability, by exchanging CDA documents generated from the subnetworks. This provides versatility for the use of APIs; REST APIs are becoming increasingly important and FHIR enables their implementation. This probably implies that it is not a pure XDS.b model as originally envisaged, but this is how progress was made⁷¹.

In the unified electronic medical record module, it is highlighted as an achievement that the health-care professionals now have access to information about patients who has been treated in the public healthcare system. With one *click*, you can view the medical record on the public interoperability platform, and you do not have to ask the patient for the printed medical record to provide continuity of care. At the hospital level, managing patient care is facilitated because institutions can access their medical record across different entities, ensuring necessary coordination with each hospitalization.

The appointment scheduling module highlights the fact that **patients can access their appointments quickly without having to endure long lines or waiting periods**, as 40% of the capacity of the appointment capacity can be managed through the platform. In the drug management module, auditing processes are improved and resources are optimized by being able to know which drugs are being prescribed and delivered. In addition, the medical prescription is recorded in the medical record and information is generated so that the patient can obtain their medication at the available point of care, more easily and without having to travel in person to obtain authorizations.

⁶⁷ Information by the Health Secretariat. Figures as of February 28, 2023.

⁶⁸ Refers to the percentage of progress in the exchange and incorporation by the 4 subnetworks of the 7 CDAs of defined clinical documents. For example, progress has yet to be made in the North Subnetwork regarding the incorporation and exchange of imaging CDA documents, and in the Central East Subnetwork of imaging and clinical laboratory CDAs.

⁶⁹ At: <https://bogota.gov.co/agendasTD/proyecto/81>.

⁷⁰ Interview with Felipe Guzmán.

⁷¹ Interview with Fernando Portilla.



6.

CHALLENGES AND LESSONS LEARNED



6. CHALLENGES AND LESSONS LEARNED

↪ CHANGE MANAGEMENT: KNOWLEDGE MANAGEMENT AND TECHNOLOGICAL LITERACY

One of the great challenges has been to bring the city to a process of organizational maturity and competence in its implementation. The project had to face lack of knowledge of human resources on issues such as digital transformation in healthcare, international standards for interoperability in healthcare, IT knowledge of physicians and management of medical concepts by engineers. It was also necessary to overcome the lack of participation of healthcare professionals at an early stage, which resulted in some issues being left out of the defined CDAs. Engineers began to move faster and to assemble fields based on the boxes in the medical records of the physical format records that were filled out on a regular basis. One lesson learned has been that change management is a fundamental exercise that must be continuous⁷².

During implementation, there was resistance to change on the part of healthcare professionals because they felt they would face additional workloads. The lesson learned is that this resistance can be overcome with awareness-raising processes, where the benefits of the tool are shown to optimize time and facilitate access to information for patients. (Likewise, physicians should still have additional time to complete and review the patient's digital medical record, in addition to the time they already have to examine patients and enter new information about patient management).

International standards are yet unknown. In Colombia there is still no functional shape of IHE, the body that manages the interoperability protocols of the different information systems. The semantic standards of HL7 in its different versions and FHIR are not yet fully managed by vendors. It is essential to work with experts in infrastructure and interoperability: in most cases, lack of knowledge generates cost overruns or hinders the flow of processes.

UEMR is still faced with the challenge of achieving greater positioning in order to have the resources to implement permanent strategies of ownership, culture and change management with all stakeholders involved.

↪ ACCESS AND CONNECTIVITY

It is essential for an interoperability project that users have Internet access and literacy on digital platforms in order to be able to self-manage the use of the platform. Internet access for the majority of the population is a weakness for Bogotá's public administration that goes beyond the healthcare sector.

Approximately 40% of the Colombian population still does not have a fixed Internet connection⁷³ especially in rural areas. Even though Bogotá reports Internet access for 81% of the population, according to figures from the National Department of Statistics⁷⁴, the gap still exists, especially among the most vulnerable population. The city's poverty figures show strong economic and social vulnerability⁷⁵; the users of the EPS Salud Capital subsidized

⁷² Interview with Miguel Mojica.

⁷³ Interview with Sandra Urrutia, Minister of Information Technologies and Communications of Colombia; available at: <https://elpais.com/america-colombia/2023-03-11/sandra-urrutia-ministra-tic-la-brecha-de-conectividad-en-colombia-is-very-deep-40-of-the-population-does-not-have-access-to-internet.html>.

⁷⁴ At: <https://www.infobae.com/america/colombia/2023/01/02/asi-esta-el-panorama-en-colombia-frente-a-la-llegada-de-internet-5g/>.

⁷⁵ DANE, Press Release, Monetary Poverty year 2020. Bogotá, 2021. Retrieved from: https://www.dane.gov.co/files/investigaciones/condiciones_vida/pobreza/2020/Comunicado-pobreza-monetaria_2020.pdf.

regime, especially, are part of the most vulnerable and marginalized socioeconomic sectors. Most of these populations do not have digital tools to access online services, many are not digital natives and have low digital literacy. Most UEMR patients and users prefer to use the *call center* for their appointments either because of limited digital literacy, lack of internet access or fear of jeopardizing their privacy. For all of the above, it is essential to continue implementing strategies to harness the benefits of the platform, as well as improving connectivity and access to the Internet, especially among the most vulnerable sectors in Bogotá and throughout the country.

POLITICAL WILL, GOVERNANCE AND SUSTAINABILITY

The interoperability project has high operating costs and requires resources for technological updating and physical capacities for the provision of services due to the large amount of information that is exchanged. Having updated infrastructure and technically trained work teams is a permanent challenge. It is therefore essential to have the political will of public administrators and to set long-term goals and projects, taking into account the time required for public contracting processes, which tend to be lengthy and involve risks.

The Bogotá UEMR platform has coverage, support and maintenance until the current development plan is finalized. It is very important for successive local and national administrations to understand the importance of providing continuity⁷⁶. Governance must continue with long-term goals, accountability, resources and co-funding alliances with the private sector.

The regulations may need to be updated, especially for the operational process and aspects related to data processing and digital security. Regulations have been important. In fact, as mentioned above, with the issuance of resolution 866⁷⁷, UEMR was a significant contribution to the implementation of the roadmap established in 2021 by the Ministry of Health.

DATA ANALYSIS AND INFORMATION MODELING

It is recognized as a lesson learned the importance of having prior standardization of common data. To achieve this, agreements must be established between the institutions so that stakeholders work under the same technical guidelines regarding data, technology and the standards to be implemented. The SDS faces the challenge of generating strategies to improve data quality⁷⁸ of the electronic medical records submitted by the entities. It is necessary to continue updating the dictionaries of terms, standards, models, the development of CDAs and all aspects involving the exchange of information, as well as to continue strengthening other processes such as drug formulation and dispensing.

Similarly, **it is essential to make progress in defining indicators** that enable leveraging big data and data analytics to transition towards a preventive healthcare model. This model aims to shorten patient care processes, enable more timely monitoring, and contribute to decision-making for formulating policies aimed at ensuring a more comprehensive and efficient healthcare service.

⁷⁶ Interview with Alejandro Gómez.

⁷⁷ Resolution 866 of 2021 establishes the set of clinical data elements relevant to the interoperability of the medical record that allows health service providers (whether public, private or mixed) and other natural or legal persons related to healthcare to share clinical data to provide continuity in the health care of individuals, facilitate, expedite and support the guarantee of access and the exercise of the fundamental right to health and information, respecting habeas data and the confidentiality of the medical record.

⁷⁸ The concept of data quality refers to an information system that ensures the accuracy, completeness, integrity, currency, coherence, relevance, accessibility, and reliability of data. Data quality is necessary to achieve a high level of processing and analysis for effective decision making at the stakeholder level. See: <https://www.minsalud.gov.co/ihc/Documentos-shared/ABC-IHC.pdf>.

INTEGRATION OF NEW STAKEHOLDERS

In the short term, the SDS plans to achieve the goal of having 55% of the private EPSs in Bogotá interoperating with the Bogotá Digital Health platform to cover all the city's inhabitants. To achieve this, agreements and commitments will continue to be generated to facilitate the progressive entry of all healthcare entities into the platform.





BIBLIOGRAPHY

Office of the Mayor of Bogotá 2016 “Draft Development Plan Bogotá 2016-2020”. Retrieved from: http://www.sdp.gov.co/sites/default/files/20160429_proyecto_pdd.pdf.

Inter-American Development Bank. 2021 “Implementation of an Electronic Medical Record System in the State of Bahia. Partial Results”. Retrieved from: <https://publications.iadb.org/es/implementacion-de-un-sistema-de-historia-clinica-electronica-en-el-estado-de-bahia-resultados>.

Inter-American Development Bank. 2022 “Implementation of the National Electronic Medical Record of Uruguay”. Retrieved from: <https://publications.iadb.org/publications/spanish/document/Implementacion-de-la-Historia-Clinica-Electronica-Nacional-de-Uruguay.pdf>.

Bogotá Council. 2006 “Agreement 257 of 2006. Whereby basic rules are issued on the structure, organization and operation of the agencies and entities of Bogotá, Capital District, and other provisions are issued”. Retrieved from: <https://www.participacionbogota.gov.co/sites/default/files/2018-03/Acuerdo-257-de-2006.pdf>.

Bogotá Council. 2014 “Agreement 576 of 2014. Whereby the electronic medical record system is implemented in the capital district”. Retrieved from: <https://www.alcaldiabogota.gov.co/sisjur/normas/Normal.jsp?i=60456>.

Bogotá Council. 2016 “Agreement 641 of 2016. Whereby the reorganization of the health sector of Bogotá, Capital District is carried out, Agreement 257 of 2006 is amended and other provisions are issued”. Retrieved from: http://www.saludcapital.gov.co/Documents/Acuerdo_641_de_20166.pdf.

Bogotá Council. 2016 “Agreement 645 of 2016. Whereby the economic, social, environmental and public works development plan for Bogotá, D. C., 2016 - 2020 “BOGOTÁ BETTER FOR ALL” is enacted”. Retrieved from: <https://www.alcaldiabogota.gov.co/sisjur/normas/Normal.jsp?i=66271&dt=S>.

Congress of Colombia. 2020 “Act 2015 of 2020. Whereby the Electronic Medical Record is created and other provisions are issued”. Retrieved from: <https://dapre.presidencia.gov.co/normativa/normativa/LEY%202015%20DEL%2031%20DE%20ENERO%20DE%202020.pdf>.

Indra. 2018 “Solution architecture for the implementation of UEMR, centralized appointment scheduling and medical prescription management for the District Health Secretariat of Bogotá D.C.”.

Minsalud. 2019 “ABECÉ. Interoperability of Medical Records Data in Colombia”. Retrieved from: <https://www.minsalud.gov.co/ihc/Documentos%20compartidos/ABC-IHC.pdf>.

Ministry of Health and Social Protection. 2021 “Resolution No. 866 of 2021. “Whereby the set of relevant clinical data elements for the interoperability of medical records in the country is regulated, and other provisions are enacted.” Retrieved from: https://www.minsalud.gov.co/Normatividad_Nuevo/Resoluci%C3%B3n%20No.%20866%20de%202021.pdf.

Ministry of Information and Communication Technologies. 2020 “Resolution No. 924 of 2020. Whereby the personal data processing policy of the Ministry/Unique Fund for Information Technology and Communications is updated and Resolution 2007 of 2018 is repealed”. Retrieved from: https://normograma.mintic.gov.co/mintic/docs/resolucion_mintic_0924_2020.htm.

District Secretariat of Health. 2017 “A comprehensive solution for the implementation of the Unified Electronic Medical Record (UEMR), centralized appointment scheduling and medical prescription management. Annex 3. Specifications and Technical Conditions”.

District Secretariat of Health. 2018 “Preliminary Studies for the Selection Process (SDS-CON-064 V.1)”.

District Secretariat of Health. 2019 “Investment Project 7522 for Information and Communication Technology in Health” Retrieved from: http://www.saludcapital.gov.co/DPYS/Seguimiento%20Proyectos%202013/Proyectos_Inversion_2020/Bogota_Mejor_Para_Todos/Ficha_EBI_7522.pdf.

District Secretariat of Health. 2020 “Preliminary Studies for the Selection Process (Maintain the interoperability, administration, management, configuration, control, tracking, monitoring and integration of the parameterization components of the Unified Electronic Medical Record (UEMR), Appointment Scheduling and Medical Prescriptions through the MyMed component and the other components of the Bogotá Digital Health - BSD platform, using the processes of the Information Technology Infrastructure Library (ITIL v3.), and provide the renewal of support) and maintenance of the licenses supporting the Bogotá Digital Health - BSD platform”.

Superintendence of Industry and Commerce. (n.d.). “Personal data protection in cloud computing services. (cloud computing)”. Retrieved from: https://www.sic.gov.co/sites/default/files/files/Nuestra_Entidad/Publicaciones/Cartilla_Proteccion_datos.pdf.



