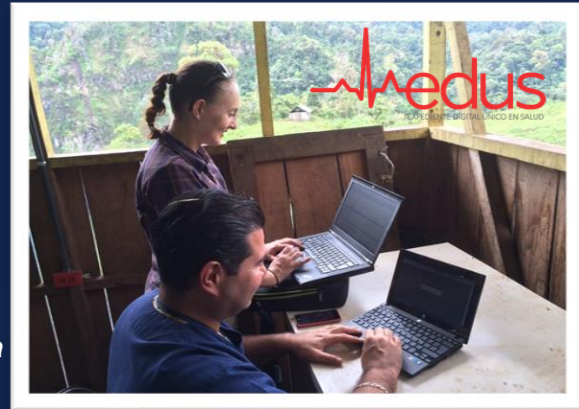


Health, Nutrition and Population Global Practice

Expansion of the Coverage of the Single Digital Health Record (EDUS) in the PHC system in Costa Rica

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KEY MESSAGES:

- Costa Rica has one of the most comprehensive electronic health records in Latin America, becoming a cornerstone and innovator in guaranteeing the right to universal health coverage and improving the quality, effectiveness and efficiency of health services.
- Only three years after the start of the Program for Results, the Single Digital Health Record has been installed at all levels of care, covering even remote areas of the country without electricity or Internet connectivity.
- Strong political and institutional commitment, the proper execution of a solid strategic plan focused on the user and local needs, were some of the facilitators of the project's success.
- Challenges faced included resistance to change, implementation lag, and some connectivity and information systems failures.
- Digital innovation will define future plans by integrating predictive medicine and assisted intelligence with the use of data from the record for the improvement of services and people's health.

Introduction

Electronic health records are user-centered records of health services that provide immediate and secure information in digital format on each user's own health data.(1) It is an essential tool of health information and communication technologies (ICT), with the greatest potential to guarantee and catalyze the right and universal health coverage, by improving the quality and efficiency of health services. In Costa Rica, the Single Digital Health Record (EDUS) was promoted with the objectives of strengthening the guarantee of the right to life and health, advancing towards universality in access to quality medical services, the opportunity to have a digital health record, reducing equity gaps, and promoting the interoperability of information within the system.(2)

In just 15 years, the Costa Rican Social Security Fund (CCSS, for its name in Spanish, Caja Costarricense de Seguro Social) has managed to implement one of the most widely distributed and comprehensive electronic health records in Latin America. (3) Its distribution covers the entire CCSS system, from community care to the third level of care. It includes, of course, the medical and clinical history of users, but it also contains vital information for improving people's health, such as social determinants.

The expansion of EDUS, specifically at the first level of care, was driven through the Program for Results (PforR), a World Bank financial instrument that incentivizes the achievement of strategic program objectives and goals, in which governments seek to improve the use of general public expenditures or improve their performance using their own processes and institutions. In Costa Rica, this

program ran from 2016-2023 for the Strengthening of Universal Health Insurance. Its initial objectives included modernizing and strengthening the primary health care network, improving the quality of services, increasing population coverage, and making the network more capable of prevention, early diagnosis, and control of diseases relevant to the local, national, and regional epidemiological profile. In addition, the objective was also to improve the institutional and financial efficiency of the CCSS.(4)

The EDUS has become a vital tool for the provision of health services and the clinical and administrative management of the CCSS.(5) Its reach has been so extensive that the digital medical record incorporates 99% of total health services care and its mobile application version, available to patients, has more than 5.6 million downloads, being the most downloaded application in the "Health and Wellness" category in the country. (6) In 2019, EDUS was awarded by the United Nations (UN) with the *United Nations Public Service Award*, recognizing the CCSS for its ability to digitally transform itself and better manage health.(7)

The success of this project was possible thanks to the adequate use of several facilitators that allowed its proper development, but at the same time, of a great effort to overcome the barriers and challenges encountered along the way in a project that achieved a total paradigm shift in its execution. This knowledge report, part of a broader series of knowledge reports developed by the World Bank, seeks to describe the main reasons for success, the challenges and the main lessons learned during the EDUS implementation initiative, with the objective of providing a roadmap for other countries interested in implementing similar programs.

Background

Costa Rica has a long history of early adoption of ICT solutions to improve health services. (8, 9) But it was not until 2008 that, based on these previous experiences, the first isolated developments of EDUS began.(8) Subsequently, in 2013, the implementation of a digital health record became a matter of national interest when "Law 9162" was published, establishing the bases and financial and strategic guidelines to develop and implement the EDUS nationwide and at all levels of care in a maximum time frame of five years. To comply with this, the Board of Directors established this mandate as

an institutional priority and created an Executive Unit for the implementation, direction and administration of the project.(8) This allowed for the continuity of EDUS implementation at the first level of care and that in 2015 implementation began at the second and third levels of care.

The EDUS system

EDUS was conceived as more than an electronic record, it is a "repository of patient data in digital format, which is securely stored and exchanged and can be accessed by multiple authorized users."(2) This comprehensive system integrates clinical (e.g., information derived from consultations and hospitalizations), social (e.g., demographic and economic data of families) and administrative (e.g., containing appointments for medical consultations) information and supports the delivery of health services with the inclusion of care support services such as radiology, pathology, laboratory and pharmacy. It also has a component with information on community care and the social determinants of each Costa Rican family (e.g., characteristics, location and basic services of housing). This social information collected by the EDUS is transferred to the National Information System and Single Registry of Beneficiaries of the State, giving them about 80% of the total information they store.(10) Also, it not only stores, but also allows the management of medical agendas and appointments for consultations or support services. In addition, it brings patients closer by offering them web and telephone appointment requests at "905-MiSalud", and electronic access to their personal records through the cell phone application, which provides the essentials for the individual to become empowered and take an active role in their health status.(8)

EDUS planning and expansion

Strategic planning

The implementation strategy was defined in stages, taking into account the complexity of the structure of the levels of care, the willingness of local users, and the infrastructure and resources available in the health areas.(8) Likewise, we started with the centers and areas where there was greater interest, resources and infrastructure for implementation. By showing how some areas already had this technology, the demand for implementation in the less interested centers and areas

was encouraged. It began with the first level of care with the Basic Health Teams (EBAIS) and continued with the second and third level hospitals, completing the implementation of the three levels only three years after the beginning of the PforR.

Being an ICT required technological equipment such as computers and tablets, as well as the necessary infrastructure to provide electricity and internet. These inputs were negotiated with the local directors and were provided with the budget designated to the EDUS implementation initiative. As for *software*, the CCSS made the decision to develop its own computer system so that the EDUS would be aligned with local needs.(10)

Implementation

Implementation at the institutional level was carried out once the clinical component had been approved. Regional directors were in charge of implementation, and those responsible for implementation in the Executing Unit made periodic visits to the centers where the EDUS was being implemented. These visits allowed for on-site monitoring to learn about the needs and problems on the front line, as well as for adaptation to the local context of each center.(11) For example, in indigenous communities, training was provided by local personnel who were familiar with the needs of their population.

EVIDENCE OF INTERVENTION SUCCESS

At the beginning of the Program by Results, in 2016, EDUS coverage at the first level of care was at 50%, and with the momentum of the program it was possible to install a functional EDUS in 90.1% of health areas, including the most remote areas or vulnerable populations such as indigenous communities or low socioeconomic level.(11) In addition, following this support from the World Bank, functional coverage was achieved in the 29 hospitals of the CCSS, complying with the timeframe stipulated by Law 9162.(12)

EDUS is a recognized brand in the country, generating an increasing satisfaction among its users. Health care providers recognize the digital health record as an indispensable tool in their activities, adding value to their patient care and as a method to generate more homogenized, simple and agile processes that improve the management and quality of health care services.(10, 13) Thanks to EDUS, more than 90% of patients reported that their care was better or the same when using the computer, and the majority said that they considered

their data to be more secure in digital format than in physical format.(13)

FACILITATORS

Many elements coexisted that were catalysts for the successful implementation of the EDUS.

Political and institutional will with a legal framework:

This project was declared of national interest and an institutional priority for the CCSS. Therefore, it received the full support and accompaniment of the Board of Directors of the CCSS and the executive presidency of the institution. At the same time, there was a solid legal framework that included Law 9162, Regulation 8954 on EDUS, Law 8968 on personal data protection, and the publication of decrees by the CCSS Board of Directors. All this worked as an important catalyst to achieve implementation before the compliance deadline written in the law.

User-centered design: From the beginning of the conceptualization of the EDUS, it was clear that value had to be offered to the end user, patients and providers interacting with the platform, which is why the EDUS *software* was designed from scratch. (10) The added value for patients was generated by facilitating their interaction with the health system through telephone and *web* appointments, and the mobile application with access to their clinical and pharmacotherapeutic information. For health service providers, the added value was through access to updated information for decision making.

Strategy and implementation adapted to local needs:

The Executing Unit and senior executives of the CCSS monitored and accompanied the process, but implementation was decentralized to the health areas through the regional directors and with the support and formation of Change Management Networks. This decentralization allowed for adequate communication in the field to adapt actions to local needs.

Change Management Component: The system's officers and users recognize the change management component as fundamental in overcoming implementation challenges. The change management methodology included components of leadership, training, communication and sustainability of the project over time. These elements are not only transcendental for its implementation, but also for the evolution of the EDUS

project with the integration of new adaptations and additions that are generated to the system. Its operation was established through the detection of leaders in the local communities where the EDUS would be implemented. These leaders served as change managers, who, in turn, formed Change Management Networks in each of the regional divisions until they covered the entire national territory.(10, 14)



Figure 1. CCSS personnel in training. Credits: CCSS, 2022. (6)

Training: Training was provided to change managers and CCSS staff. A very successful component was peer-to-peer training, whereby users in the same role or profession trained their counterparts in other health areas. This made communication and learning easier and less resistant, as there was an equal balance of power among the professionals themselves.

Intersectoral collaborations beyond the CCSS: An important part in the development of the EDUS was the collaboration with other agents and institutions outside the CCSS, for a proper diversification of activities. Among them were the College of Physicians, which implemented ethics courses on EDUS implementation, the Costa Rican Electricity Institute (ICE) to provide electrical and fiber optic infrastructure in places without access, as well as the Ministry of Science and Technology (MICIT) through the provision of 4,000 tablets and other academic institutions, trade groups, and private and governmental institutions.(10, 15)

Financing: The EDUS project had solid financial backing designated exclusively for its development and implementation. From 2013 to 2017 the total investment made for the EDUS exceeded 11.4 billion colones (approximately 19.7 million USD).(8)

Being a PforR objective: The expansion of EDUS at the first level of care was one of the indicators promoted through the PforR, by common agreement between the CCSS and the World Bank. This ensured that the actions

established were effective in achieving the projected goals.

CHALLENGES ENCOUNTERED AND SOLUTIONS APPLIED

The transformation generated barriers and challenges during implementation. In most cases there was adequate execution of strategies to mitigate these development challenges.

Infrastructure: Infrastructure was one of the biggest challenges for the expansion of the EDUS in the primary health care areas. The two major challenges were the lack of access to internet and electricity. In 2012, only 28% of EBAlSs had internet. (8) The solution to this was to visit each center to identify needs and design specific plans for each case. This was done with the support of a multidisciplinary team of CCSS engineers, health personnel, and ICE staff. Once these designs were approved, ICE was in charge of implementation. These actions even allowed the reduction of the digital divide in the country.

Resistance to change: The transformation process generated resistance among health service providers and health guilds due to fear of change in the way of working, ignorance of the use of technological equipment, or negative attitudes to the transformation process.(16) To deal with this, the team of change managers worked with these resistant users to show them the benefits of EDUS and introduced them to training programs.(14) At the same time, to mitigate resistance from the unions, strategic alliances were made with the unions (nurses, physicians, microbiologists, etc.), which generated optimal communication between both parties to represent all interests. Another strategy that helped to reduce resistance was to generate changes in the provision of health services (for example, by temporarily reducing the number of consultations regularly offered during the working day) to promote and facilitate familiarization with the EDUS.

Standardization of clinical information: When choosing to create its own *software* system, one of the biggest challenges was to standardize the clinical information to be included in the system, especially at the third level of care where complexity is greater. For example, one challenge was deciding which clinical recommendation guideline to use for the classification of medical emergencies, as hospitals were using different guidelines. This challenge of standardization of clinical

information still prevails, but the progress that has been made has been achieved through communication and work with the technical and clinical teams at the central level to include evidence from internationally recognized clinical guidelines.

Región	Área de Salud	EBAIS con SIEB	Total EBAIS Conformados	%	EBAIS Pendientes
Central Sur	Castrojo	21	21	100%	0
Huastla Atlántica	Lamián	20	20	100%	0
Huastla Atlántica	Cariari	18	18	100%	0
Central Norte	Alajuela Oeste	17	17	100%	0
Huastla Atlántica	Oajuelas	17	17	100%	0
Central Norte	Alajuela Norte	16	16	100%	0
Central Sur	Alajuela	16	16	100%	0
Central Norte	Heredia - Villa	14	14	100%	0
Central Norte	Puerto Viejo-Santiago	6	9	67%	3
Huastla Norte	Los Chiles	4	6	67%	2
Central Norte	Alajuela Sur	9	14	64%	5
Chorotega	Nandayaro	3	5	60%	2
Huastla Norte	Pital	3	5	60%	2
Central Norte	Hojas Blancas - Río Frío	4	7	57%	3
Central Norte	Dulce-Amoros	5	9	56%	4
Central Norte	Grecia	7	13	54%	6
Central Norte	San Isidro	2	4	50%	2
Huastla Norte	Guatuzo	2	4	50%	2
Pacífico Central	Orotina-San Mateo	3	7	43%	4
Chorotega	Uruca	4	12	33%	8
Central Norte	San Ramón	4	19	21%	15
Chorotega	Tilarín	1	6	17%	5
Central Sur	Coronado	1	16	6%	15

Figure 2. EDUS coverage list by health areas. Credits: CCSS, 2022. (6)

Implementation lag: Not all facilities progressed at the same pace of expansion. There were some health areas that lagged behind in implementation for various reasons. To accelerate this process, the Executing Unit identified and accompanied these lagging areas. In addition, healthy competition was promoted through the publication of a list of EDUS coverage in the different health areas. The directors of each area could compare themselves with other areas and know where they stood against their peers.(10, 14) Although the COVID-19 pandemic, because it occurred after EDUS implementation, did not have a major impact on EDUS, it did promote the implementation of the electronic passbook, with COVID-19 vaccination, through the EDUS mobile app.

Information security aspects: Despite internal security barriers, EDUS suffered a cyber-attack in May 2022, leaving the system dysfunctional for more than two months. This generated a paralysis in the activities of the CCSS, leading them to return to paper files for a few months. Fortunately, the disconnection protected the EDUS data and information. In response, the Security Department, within the Directorate of Information Technology and Communications, implemented the protocols established for these events, such as the application of antivirus and server cleaning. Subsequently, the medical management required a security certification of the equipment in each health facility.

System failures and slowness: In an interim check conducted in 2018, about 30% of EBAIS officials reported

unstable internet connections and almost 70% mentioned having a system failure in the last 6 months.(8) Likewise, other evaluations reported that the system sustained connection problems and slow operation.(11) The main solution to this was to monitor and control the service managed by the Directorate of Information Technology and Communications. At the same time, an "EDUS disconnected" program was also implemented, which allowed computers that interrupted their Internet connection to temporarily save their information, so that when they were reconnected they could update their information in the system.(8)

Equity and access: Previously, there were rural and remote regions without access to internet or electricity. The EDUS implementation team worked closely with the change management networks in these disadvantaged health areas and generated collaborations with ICE to make the necessary infrastructure adaptations for the EDUS. These included the installation of satellite antennas, electrical cabling, and even solar panels. On the other hand, through the networks of change managers in the EBAIS, it was possible to provide training adapted to the language of the indigenous communities, for access and proper use of the EDUS.(10)

THE ROAD AHEAD AND THE GAPS TO BE CLOSED

The EDUS is in the process of being certified by the Electronic Medical Record Adoption Model (EMRAM) of the *Healthcare Information and Management Systems Society (HIMSS)*, which facilitates the adoption of the digital environment in hospitals until they achieve the complete elimination of paper.(10, 14)

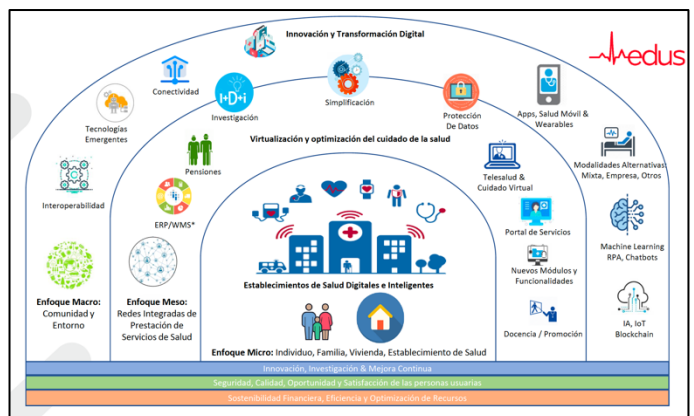


Figure 3. Diagram of the future evolution of the EDUS. Credits: CCSS, 2022. (6)

On the other hand, the objective of implementing and making the EDUS functional at the three levels of care has been achieved, but there is still a need to develop activities that allow it to be "intelligent" in addition to being digital. In the 2018 mid-term evaluations, it was noted that there was still no consensus on the impact of EDUS on improving the quality of health services. To this end, the Institution's strategic portfolio includes the Strategic Program for Digital and Intelligent Health Facilities (PESDI, for its name in Spanish), a series of projects to generate innovation in healthcare facilities, improving the quality and efficiency of services, using the data produced by EDUS.(17) Also, the Directorate of Innovation and Digital Health is being integrated, which will be in charge of the development of digital innovation to advance analytical and predictive medicine, the use of the genome, telemedicine, and machine learning. One of

the first projects to be implemented is data science and data mining for Diabetes Mellitus type 2. (18) The goal of these projects is to provide predictive models based on the data contained in the EDUS. With these models, health professionals could know the risk of their patients developing diabetes mellitus, and thus, propose proactive actions to prevent the disease.(19)

The EDUS system was successfully implemented in each of the CCSS health centers, from the EBAIS to the most specialized hospitals. The lessons learned from this successful program can be found in Box 1. The great ability of the CCSS to adapt to a major change in service delivery through the implementation of EDUS can serve as a reference for other countries that would like to implement, or are in the process of implementing, a similar project.

Box 1. Lessons learned

- Generate interest in decision-makers, preferably with a solid legal framework to back it up.
- Develop a strategic plan at the national or institutional level and gradually implement it based on the local perspective to adapt it to the diversity of all regions of the country.
- Include programs and training focused on change management to reduce resistance.
- Promoting healthy competition catalyzes implementation to cover the last mile.
- The integration of key stakeholders in the process and the generation of alliances with other sectors is fundamental for success.
- The process and expected results should be evaluated with a view to further improvement.

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For more information on the topic, visit: www.worldbank.org/health.

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References

1. (WHO) WHO. Third Global Survey on e-health. Indicator Metadata Registry List - Country has national Electronic Health Record (EHR) 2015 [Available from: <https://www.who.int/data/gho/indicator-metadata-registry/imr-details/4791>].
 2. Single Digital Health Record Act 9162, 9162 (2018).
 3. Robles Cordero É. Challenges and proposals for the National Health System. Academia de Centroamérica; 2022. p. 88.
 4. The World Bank. Program Appraisal Document for a Strengthening Universal Health Insurance in Costa Rica. Program-for-Results. 2016.
 5. Regulation of the single digital health record. Sect. 4 (2018).
 6. Costa Rican Social Security Fund. PowerPoint Presentation: Challenges of EDUS in the Evolution of the Health System in Costa Rica - 13 Lessons Learned from the Implementation of the Single Digital Health Record. 2022.
 7. Presidency of the Republic of Costa Rica. UNITED NATIONS AWARDED THE CCSS DIGITAL EXPEDIENT 2019 [Available from: <https://www.presidencia.go.cr/comunicados/2019/05/naciones-unidas-premio-al-expediente-digital-de-la-ccss/>].
 8. University of Costa Rica. Information and Knowledge Society Program. Hacia la Sociedad de la Información y el Conocimiento en Costa Rica: Informe 2018/.
- Information and Knowledge Society Program, University of Costa Rica. San José, Costa Rica: University of Costa Rica; 2018. p. 458.
9. Cabello Cano S. El Expediente Digital Único en Salud de la Caja Costarricense de Seguridad Social: Inter-American Conference on Social Security; 2019. Available from: <https://ciss-bienestar.org/2022/03/29/el-expediente-digital-unico-en-salud-de-la-caja-costarricense-de-seguridad-social/>.
 10. Arce MR, Zamora Moreira JM. Interview of the CCSS/BM Outcomes Program. In: Rosado Valenzuela AL, editor. January 2023.
 11. Camacho Jiménez K. Final Verification Report - Indicator linked to disbursement #5/ Milestone 1: Expansion of coverage of the Single Digital Health Record to 60% Pan American Health Organization; 2018. p. 56.
 12. (CCSS) CCdSS. Institutional Report 2018. 2019.
 13. Cooperativa Autogestionaria de Servicios de Profesionales Multidisciplinarios SULÁ BATSÚ R.L. Informe Final de Evaluación Expediente Digital Único en Salud (EDUS) San José, Costa Rica 2018. p. 254.
 14. Barrantes G. Interview with the CCSS/BM Outcomes Program. In: Rosado Valenzuela AL, editor. January 2023.
 15. Costa Rican Social Security Fund (CCSS). Memoria Institucional 2018. 2019.
 16. Arias Duran L. CHANGE MANAGEMENT AND COMMUNICATION IN E-HEALTH PROJECTS: PEOPLE FIRST 2019. Available from: <https://recainsa.org/gestion-del-cambio-y-comunicacion-en-proyectos-de-e-health-primero-las-personas/>.
 17. Rodríguez Arce M. THE DIGITAL HOSPITAL: THE LEADING POINT FOR THE TRANSFORMATION OF HEALTH SERVICES 2022. Available from: <https://recainsa.org/el-hospital-digital-la-punta-de-lanza-para-la-transformacion-de-los-servicios-de-salud/>.
 18. Costa Rican Social Security Fund. Memoria Institucional 2021. 2022.
 19. Zamora Moreira JM. Exploitation of Health Data with Data Mining 2020. Available from: <https://recainsa.org/explotacion-de-datos-en-salud-con-mineria-de-datos/>.

