



# Interoperability

Eight Guiding Principles for the Digital Transformation of the Health Sector  
Digital transformation toolbox

Policy Overview

**PAHO**



Pan American  
Health  
Organization



World Health  
Organization  
Regional Office for the Americas

## **ORGANIZATION, COORDINATION, AND DEVELOPMENT**

Department of Evidence and Intelligence for Health Action (EIH) of the Pan American Health Organization (PAHO) in collaboration with the Center for Implementation and Innovation in Health Policy (CIIPS), part of the Institute for Clinical and Health Effectiveness (IECS), a PAHO collaborating center.

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# Abstract

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**Interoperability** is one of the eight guiding principles for the digital transformation of the health sector promoted by the Pan American Health Organization (PAHO). This policy document provides key concepts, recommended lines of action and monitoring indicators, with the objective of advancing interoperability.

According to its PAHO definition, this principle is intended to implement interoperable, open, and sustainable digital health and information systems:

Information systems for health—timely and open access to properly disaggregated data, integration of national and local systems, digital health and information and communication technologies (ICTs)—facilitate effective identification, notification and analysis of cases and contacts, early search and detection of cases and the definition and monitoring of the population at risk, in a safe, interoperable and as personalized as possible way (1, 2, 3).

Over the past decade, ICTs have contributed tools that enable health data to be recorded at or near the sites where care is provided, offering the potential to improve access, quality, safety, equity, and optimization in resource management throughout the health system.

The pandemic caused by the coronavirus disease (COVID-19) has exposed and accelerated new challenges and vulnerabilities; sharing data effectively is becoming a priority to get the most out of information management in individual and collective health.

Interoperability enables different applications to access, exchange, integrate, and use data in a collaborative and coordinated manner through common interfaces and standards, inside or outside the same institutional, regional, national, and even transnational scope, to provide fast and seamless portability of information and optimize health outcomes (4, 5).

To achieve this, it is essential for governments to intervene by creating digital agendas that can generate a consensus on the strategy for building and scaling up health information systems, to facilitate establishing communication bridges across organizational, regional, and national borders.

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**Keywords:** *interoperability in health, health informatics, public health, data governance.*

# Introduction

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This policy brief presents key concepts, recommended lines of action, and monitoring indicators to advance interoperability, one of the eight guiding principles for the digital transformation of the health sector promoted by the Pan American Health Organization (PAHO).

According to the PAHO definition, this principle aims to implement interoperable, open, sustainable information and digital health systems, providing “timely and open access to properly disaggregated data, integration of national and local systems, digital health and information and communication technologies (ICTs) facilitate effective identification, notification and analysis of cases and contacts, early search and detection of cases and the definition and monitoring of the population at risk, in a safe, interoperable and as personalized as possible way” (1, 2, 3).

The digital transformation has reached the health field. In the past decade, ICTs have contributed tools that enable health data to be recorded at or near the site of care provision, offering the potential to improve access, quality, safety, equity, and optimization in resource management throughout the health system.

However, the health sector has multiple stakeholders, with different data recording strategies, which can cause the fragmentation and segmentation of information into isolated silos, without the possibility of effective exchange (6, 7).

The coronavirus disease (COVID-19) pandemic has exposed and accelerated new challenges and vulnerabilities that decision makers have to address to achieve adequate continuity of care and effective reporting, monitoring, search, and early detection of health events in the population. Therefore, effective data sharing is beginning to be prioritized, to get the most out of information management (8, 9).

Interoperability enables different applications to access, exchange, integrate, and use data in a collaborative and coordinated manner through common interfaces and standards, inside or outside the same institutional, regional, national, and even transnational scope, to provide fast and fluid portability of information and optimize health outcomes (10, 11).

# Current status and identification of gaps

Many Latin American governments have developed initiatives that support digital agendas, national plans, or public policies where the strategic guidelines of a national agenda are openly expressed and interoperability is promoted; however, digital health is still a young field, and it is necessary to publicize the benefits that ICTs can bring in the accessibility and management of health information. The constant turnover in public management and the lack of long-term public policies that transcend a term of government can disrupt strategies.

Interoperability has an important policy component, involving such dimensions as **economic sustainability** and the legal and regulatory framework, which, if not addressed in conjunction with other areas of government, can hold back progress on this agenda. Another obstacle can be the lack of incentives in strategic planning regarding the issue, usually a problem for both the public and private sectors. Moreover, not all governments have adapted their legal frameworks to the complexity of digital health; some of the issues that must be put on the legislative agenda include the following: cloud servers hosted in different countries, retention or destruction of digital data, exchange of information between jurisdictions or countries, secondary uses of information, and protection of personal and collective data.

When addressing the **infrastructure** dimension, governments have to face the arduous and complex task of knowing more about the situation of the Region to obtain a good analysis of the state of play. Without a robust diagnosis, the implementation agenda can run into delays owing to lack of access to the Internet, electricity, or the equipment necessary for loading primary data. Tenders involving public-

private partnerships, which are the vast majority, tend to be long and complex.

Access to ICT **education and training** is a challenge for every country in the Region. It is crucial to work towards inclusive digital health, as stated in another of the PAHO guiding principles. Decision makers and the general public must be made aware of the benefits and good practices that interoperability can generate in health. These strategies are often characterized by a lack of specialized human capital, with the added difficulty of retaining talent in the public sector when these professionals would be better paid in the private sector.

A noteworthy development is the rising number of institutional networks to support **digital capacity-building for sustainable development**. It is necessary to promote awareness and understanding of the subject, and to promote synergies and disseminate best practices.

There are still many professional associations of health workers and scientists that have yet to join the effort to advance digital health, so encouraging the creation of networks from all subsectors is crucial.

When it comes to **data governance**, many healthcare organizations struggle to generate data that provides actionable insights. It is important to establish frameworks that can prioritize investments, set policies, protect data and the stock of information, and determine responsibilities and processes for managing data and information. Sometimes, interoperability can be perceived as an enemy of **confidentiality**, which is

why there such a high level of resistance to developing interoperable systems.

Therefore, it is necessary to raise awareness about the positive aspects of data security, which are associated with the availability and integrity of information that leads to better user data and, consequently, more efficient, effective, accessible, and equitable health systems. Equally important is to address organizations' fears about data sharing, clarifying that it is a matter of people's health information and not about the institutions' internal or business processes.

Finally, although the use of **standards** that enable interoperability is increasingly widespread in the Region of the Americas, there must also be laws and regulations that promote their use, with incentives, facilitators, and institutions able to ensure good practices. Likewise, education and training should be encouraged, based on successful experiences, supported by open data protocols and models. Many health facilities currently handle large volumes of unstructured data and computerized medical history applications from different brands or companies that, without protocols, further fragment their information.

# Lines of action

PAHO proposes interoperability as one of the eight guiding principles for the digital transformation of the health sector (1), with the following lines of action:

- Create national plans and public policies that include the following four dimensions:
  - management and governance of information systems
  - data management and information technologies
  - information and knowledge management and innovation
  - integration and digital convergence (meaning the possibility of accessing the same content from different devices)
- Ensure the implementation of data systems and digital health strategies under a governance that guarantees the convergence of investments and action, as well as the interconnection and interoperability of databases and applications, to facilitate access to reliable data and knowledge at the right time, in the right place, and in the right format
- Consolidate an infrastructure for the exchange of open data and critical information, focused on ethical and cybersecurity criteria in information flows
- Adopt a digital literacy program based on the needs identified and addressing the different contexts, with a view to reducing inequities
- Provide the necessary conditions and support to strengthen existing initiatives and forge a multi-stakeholder network that promotes comprehensive and inclusive approaches to digital capacity-building for sustainable development
- Define the governance schemes of the data generated by the interoperability of health systems to encourage the secondary use of data, generating data for tactical and operational decision-making

- Define secure mechanisms that enable the exchange of clinical documentation (syntactic interoperability) using existing standards

Considering these lines of action and the recommendations provided by the experts consulted, the following actions are proposed for advancing implementation of the roadmap for the digital transformation of the health sector in the Region of the Americas, with emphasis on the principle of interoperability. However, taking into account the heterogeneity of the countries of the Region, they must be adapted to the reality of each country, its degree of maturity, and the resources available.

## 1. CREATE NATIONAL PLANS AND PUBLIC POLICIES THAT INCORPORATE THE DIMENSIONS OF MANAGEMENT AND GOVERNANCE OF INFORMATION SYSTEMS, DATA MANAGEMENT AND INFORMATION TECHNOLOGIES, INFORMATION AND KNOWLEDGE MANAGEMENT AND INNOVATION, AND INTEGRATION AND DIGITAL CONVERGENCE (MEANING THE ABILITY TO ACCESS THE SAME CONTENT FROM DIFFERENT DEVICES)

- Create an entity that can steer a digital health agenda at the national level, promoting governance and sufficient leadership to shepherd a long-term project; many countries have already created a national coordination area that could guide and direct this change, such as the National Directorate of Information Systems in Argentina, the National Center on Health Information Systems (CENS) in Chile, and Salud.uy in Uruguay



- Form work teams at each level of government to guide local, regional, and national strategies for the development of an online architecture similar to those at the national or federal levels in order to obtain the appropriate interoperability for the proposed roadmap; the lead teams should be interdisciplinary and work with flexible methodologies based on successful experiences
- Establish a digital agenda to develop the digital transformation, which includes syntactic, semantic, and organizational interoperability as priority principles

### 2. ENSURE THE IMPLEMENTATION OF DATA SYSTEMS AND DIGITAL HEALTH STRATEGIES UNDER A GOVERNANCE THAT GUARANTEES THE CONVERGENCE OF INVESTMENTS AND ACTION, AS WELL AS THE INTERCONNECTION AND INTEROPERABILITY OF DATABASES AND APPLICATIONS, TO FACILITATE ACCESS TO RELIABLE DATA AND KNOWLEDGE AT THE RIGHT TIME, IN THE RIGHT PLACE, AND IN THE RIGHT FORMAT

- Politically align the strategy in conjunction with the national health budget to have adequate financing to accompany the digital agenda process, considering this strategy a long-term national policy that transcends political changes in government.
- Prioritize national investment in digital health in the areas of primary health care

### 3. CONSOLIDATE AN INFRASTRUCTURE FOR THE EXCHANGE OF OPEN DATA AND CRITICAL INFORMATION, FOCUSED ON ETHICAL AND CYBERSECURITY CRITERIA IN INFORMATION FLOWS

- Comprehensively evaluate the current situation of such elements as infrastructure, equipment, connectivity, and the predominant computer solutions to promote a strategy of value enhancement, according to the dynamism and scalability that ICTs require
- Formulate open data policies, laws, and ethical standards in accordance with current regulations, featuring security standards that support the exchange infrastructure

- Promote data security that leads to the protection of the individual, promoting a balance between confidentiality, integrity, and data availability

### 4. ADOPT A DIGITAL LITERACY PROGRAM BASED ON THE NEEDS IDENTIFIED AND ADDRESSING DIFFERENT CONTEXTS, WITH A VIEW TO REDUCING INEQUITIES

- Consider the training of human capital in the subject as a key element, to provide sustainability to the initiative, following the example of countries that hold free regular meetings, open to the public and private sectors, to provide information and generate networks of stakeholders interested in the subject, as is the case of the “Standards Mornings” of the National Digital Health Network of the Ministry of Health of Argentina
- Encourage the creation of interdisciplinary teams that are constantly updated regarding good practices and standards, relying on cost-effective strategies
- Support these efforts with training in standards, preparation of maturity assessment guides, and creation of economic incentives for implementing interoperable systems, and enable institutions to evaluate, measure, and accredit their interoperability, and to learn about and properly manage the change that digital health involves. An example of an assessment guide can be the PAHO Health Information System Maturity Model (IS4H-MM). This guide provides the knowledge needed to plan the way forward with plans and roadmaps for information systems (12, 13)
- Promote digital literacy for the entire population, so that they can understand the importance of empowering themselves with their information and make use of the advantages of ICT and be aware of its risks

### 5. PROVIDE THE NECESSARY CONDITIONS AND SUPPORT TO STRENGTHEN EXISTING INITIATIVES AND FORGE A MULTI-STAKEHOLDER NETWORK THAT PROMOTES COMPREHENSIVE AND INCLUSIVE APPROACHES TO DIGITAL CAPACITY-BUILDING FOR SUSTAINABLE DEVELOPMENT

- Consider communication with private subsectors, and the collaboration of scientific associations and professional associations, taking into account that health information transcends sectors, enabling early adopters to leverage and promote digital initiatives
- Connect and build partnerships or networks that accelerate the advancement of digital health and innovation, where knowledge is shared by growing awareness and understanding of ICT in health, and promote synergies, as well as disseminating best practices
- Share knowledge and free developments to make services available to stakeholders without acquisition or development capacity
- Create certifying bodies that validate the norms, standards, safety, and quality of the systems to be implemented in the health area, enabling them to support updated and scalable system architectures; for example, in Chile, CENS is developing tools for quality assessment of software systems in telemedicine

### 6. DEFINE THE GOVERNANCE SCHEMES OF THE DATA GENERATED BY THE INTEROPERABILITY OF HEALTH SYSTEMS TO ENCOURAGE THE SECONDARY USE OF DATA, GENERATING DATA FOR TACTICAL AND OPERATIONAL DECISION-MAKING

- Functions of data governance should include defining accountability, prioritizing investment requirements, setting policies, implementing processes, setting standards, controlling risk, and monitoring data-related performance throughout the data life cycle
- Empower patients and users, giving them tools for deciding how their data is used, respecting their rights and wishes, and keeping that data secure and protected. One of the most advanced countries in this regard is Australia, with the My Health Record program: this system makes it possible to control one's own health information securely, in one place, at the national level (14)

- Generate data exchange agreements based on a legal framework that supports each section of the plan, considering ethical and regulatory issues and the incentives and obligations of each sector adopting the plan
- Establish regulations and legal agreements that specify the scope of information to be shared within secure environments having different levels of access to health data
- Formulate policies on data and databases used for decision-making at the managerial or public health levels, which enable their secondary use to generate scientific knowledge or for services assessment
- Establish formal, documented procedures to ensure data quality

### 7. DEFINE SECURE MECHANISMS THAT ENABLE THE EXCHANGE OF CLINICAL DOCUMENTATION (SYNTACTIC INTEROPERABILITY) USING EXISTING STANDARDS

- Reach agreements on the concept of interoperability, this being both a technical and political issue; indeed, many institutions currently have the technical, semantic, and syntactic possibility of exchanging patient information, but the political will to do this is still lacking. Therefore, it is advisable to hold national participatory meetings promoting consensus, opinion sharing, and openness to the community of professionals in the field
- Select and encourage the use of standards, both syntactic and semantic, incentivizing the use of open solutions
- Provide tools or services that facilitate implementation and use, such as application programming interfaces (APIs) or coding or terminology services

# Monitoring indicators

With the objective of advancing interoperability throughout the health sector in the countries of the Region, the following indicators are proposed. It is important to clarify that these are general recommendations; this is not an exhaustive list, but each country or region can incorporate other indicators, and define the level of disaggregation necessary and the frequency of measurement (15, 16, 17, 18, 19).

## CROSS-CUTTING INDICATORS TO ALL EIGHT GUIDING PRINCIPLES FOR DIGITAL TRANSFORMATION IN HEALTH

- National digital health strategy established through a regulatory framework
- Governmental organization structure for leading the digital transformation strategy in health
- Budget for a digital agenda that includes human resources and the necessary technology

## SPECIFIC INTEROPERABILITY INDICATORS

### National plans and public policies

- National strategic plan, harmonized and integrated among multisectoral stakeholders

### Investment or action

- Budget for a digital agenda including the human resources, processes, legal-ethical framework, know-how, and technology necessary for its effective functioning
- Proportion of the digital health budget allocated to the areas of primary health care

## Infrastructure

- Interoperability practices linking health platforms
- Integrated national repositories of data from different sources

## Training

- Interdisciplinary teams trained in good practices and standards, and which receive periodic refresher training
- Use of maturity assessment guides that enable evaluation, measurement, and accreditation
- Number of learning and exchange spaces involving interoperability standards
- Number of learning spaces for flexible methodologies and change management
- Number of public awareness campaigns on the importance of health literacy

## Networks and sustainable development

- Percentage of jurisdictions with regulations regarding individuals' rights to the security, privacy, and confidentiality of their health data
- Percentage of providers of systems or services in the field of health that guarantee compliance with regulations

### Data governance

- Periodic meetings of a community of practice led by ministries of health, where knowledge is shared, increasing awareness and understanding of ICTs in the area of health, and promoting synergies and disseminating best practices, including free developments to make services available to stakeholders lacking acquisition or development capacity.
- A certifying body that validates the regulations, standards, safety, and quality of the systems to be implemented in the health area.

### Standards

- A functioning data governance committee that has at least the following duties: defining accountability, prioritizing investment requirements, establishing policies, implementing processes, developing standards, conducting risk control, and monitoring performance related to data throughout its life cycle

- Regulations and legal agreements that specify the scope of information to be shared within secure environments having different levels of access to health data
- Tools and regulatory frameworks to promote patients' autonomy in the use of their own health information
- Number of data exchange agreements based on a legal framework and according to a plan, considering ethical and regulatory aspects, and the incentives and obligations of each sector
- Policies on data and databases used for decision-making at the managerial or public health levels, which enable their secondary use to generate scientific knowledge or for services assessment
- Existence and implementation of a manual of procedures for continuous improvement and monitoring of data quality

# General recommendations

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A digital health agenda must incorporate the interoperability dimension as one of its strategic pillars, promoting transparency, accessibility, scalability, privacy, security, and confidentiality throughout the information cycle, thus achieving continuity of care for citizens.

Interoperability is needed at different levels and sectors in the health area to ensure high-quality, comparable data.

Governments must lead long-term strategies that support and accompany the decision to create interoperable

systems; computerization in health is advancing and, without a strategic framework to guide them, these systems will continue to fragment data.

To address these issues, it is recommended that governments work on national plans and public policies; promote investment; evaluate and strengthen secure infrastructures; foster training and ongoing education, networking, and sustainable development; further data governance policies and standards; and formalize agreements and recommendations regarding standards.

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