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Primary Healthcare Information System in Albania: Ensuring System's Interoperability

Erion Dasho[1*], Arunakiry Natarajan[1], Loreta Kuneshka[2]

[1] Managenment4health, Frankfurt, Germany
[2] Department of Public Health, Faculty of Medicine, University of Medicine, Tirana, Albania

Abstract

Digital health infrastructure has been identified as an instrument for improving healthcare delivery and quality, public health, research and health-related activities in both low- and high-income countries. A key issue of IT systems in health is their interoperability, allowing information exchange between them, thus ensuring the appropriate and timely use of the collected information. In Albania, despite the formidable progress towards digitalization of the health system and primary health care, there is no information on the interoperability of such systems. This short review aimed to highlight the prerequisites for ensuring the interoperability of IT systems, as a critical element for its success. On the basic level, provider-to-patient and provider-to-payer interoperability must be ensured. While moving towards an interoperable environment in healthcare, there are four levels (layers) of interoperability that must be considered: foundational, structural, semantical and organizational. At each level various requirements have to be met. Equally important are the standards of interoperability (unique identifier, vocabulary and terminologies, content, transport, privacy and security). To ensure the interoperability of IT systems in health in Albania one option could be the implementation of an open-source platform that supports interoperability, the most widely used being OpenHIM (open Health Information Mediator) from the OpenHIE (Open Health Information

Address for correspondence: Erion Dasho*, Hebelstrasse 11, 60318, Frankfurt, Germany. E-mail: erion.dasho@m4health.pro

Exchange) project. An overview of subsystems and modules for an electronic medical records (EMR) system for primary health care in Albania has been provided, arguing the associated benefits as well as organizational, physician-related and technical factors that have to be considered in the process.

Keywords: Albania, e-health, digital health, information technology, interoperability, primary health care.

INTRODUCTION

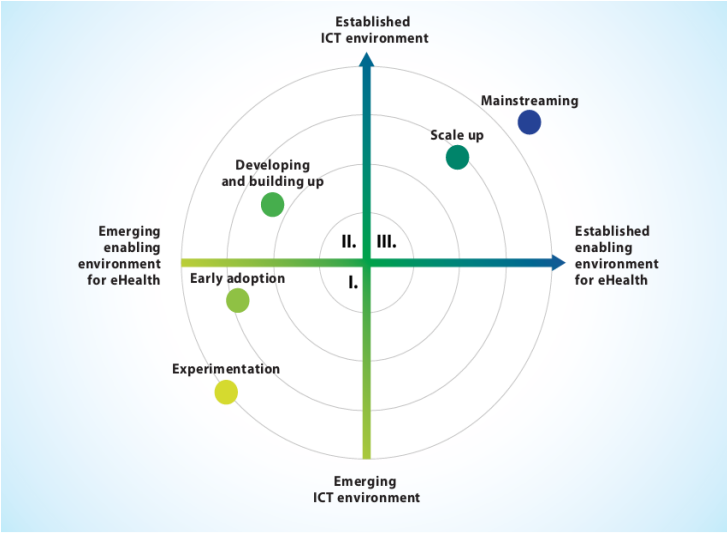
In 2005, the World Health Organization (WHO) through their World Health Assembly (WHA) resolution reaffirmed the "potential impact that advances in information and communication technologies could have on health-care delivery, public health, research and health-related activities for the benefit of both low- and high-income countries" (1). By mean of the same WHA resolution, WHO urged the member countries to elaborate long-term strategic and implementation plans, improve digital health infrastructure, build collaboration with private sector players, establish national centers of excellence, rely on multisector collaboration, and implement information systems to support various aspects of healthcare.

In 2012, WHO collaborated with the International Telecommunication Union (ITU) to develop the "National eHealth strategy toolkit", a practical guide that will lead the countries into developing their national strategies and implementation plans for eHealth development (2).

By 2015, the United Nations (UN) in their 2030 Agenda Sustainable Development Goals reaffirmed that "the spread of information and communications technology and global interconnectedness has great potential to accelerate human progress, to bridge the digital divide and to develop knowledge societies, as does scientific and technological innovation across areas as diverse as medicine and energy" (3).

Information technology adoption: Benefits and barriers

According to WHO/ITU (2) eHealth adoption is associated with many benefits, including improved access to services, efficiencies in health service delivery, improved quality and safety of healthcare, and empowered patients/individuals. Additional benefits include improved operations



Based on two parameters: the enabling environment for eHealth and overall ICT environment in the country, the WHO/ITU identify three eHealth maturity phases:

- Experimentation and early adoption: where both these parameters are in an early stage
- Developing and building up: where the ICT environment growth precedes the eHealth enabling environment
- Scale up and mainstreaming: in which the eHealth enabling environment "catches up" and matures to support the development of ICT.

Figure 1. Figure 1. National Context for eHealth development (source: WHO/ITU)

planning and management, improved monitoring and reporting and support for innovation and growth. The following table provides examples for each of the benefits associated with eHealth.

Table 1. Examples of eHealth benefits (source: WHO/ITU)

Nr	Benefit area	Examples
1	Access to services	• Ability to deliver basic and enhanced health services to rural and remote communities • Ability for patients to locate health-care providers that offer the services they require • Access to second medical opinion from remote specialists
2	Efficiency gains in health services delivery	• Enhanced health workforce productivity due to greater efficiencies in obtaining patient information, record keeping, administration and referrals • Improved utilization of health workforce through remote health-care delivery models
3	Quality and safety of care	• Increased adherence to best practice by health-care providers; reduced instances of medically avoidable adverse events • Improved ability to monitor compliance to medications and other treatment regimes
4	Health monitoring and reporting	• Improved ability to support surveillance and management of public health interventions • Improved ability to analyze and report on population health outcomes
5	Access to health knowledge and education	• Improved access to health-care provider knowledge sources, including medical literature, education, training and other resources • Improved access to consumer health knowledge sources, including health education and awareness, and prevention information for certain health conditions
6	Operations planning and management	• Improved access to quality data sources to inform health-care service and workforce planning and development
7	Empowering individuals	• Improved participation of individuals in self-monitoring and chronic disease management • Improved access to trusted health knowledge sources
8	Innovation and growth	• Increased standardization of information exchange and communication between different segments, agencies and organizations • Increased opportunity for market innovation through access to eHealth standards

Nevertheless, the materialization of the expected benefits has been slower than anticipated and not all of them have been realized. Christodoulakis and colleagues (4) have identified the following categories of barriers that hinder adoption of information technology in healthcare:

Among the **clinicians' adoption barriers**, they highlight the poor design (clinical vs. non-clinical utilization), the underestimation of the complexity of the processes the information systems have to support, unfriendly interfaces that hinder users' utilization and inability to easily customize the available solutions.

In the category of **infrastructure**, the authors list issues related to information security and privacy, as well as system reliability and availability.

Among the **economic barriers**, they highlight cost of purchase of technology and time required for both the procurement and users' learning curve.

Interoperability in healthcare

Defined as "the ability of two or more systems to exchange health information and use the information once it is received" (5), interoperability in healthcare has received attention since the early phases of health information system development. In 2005, Brailer identified interoperability as a fundamental requirement for the healthcare system to realize the promised benefits (6).

Christodoulakis and colleagues (4), identified the following four benefits from ensuring healthcare interoperability:

- **Effective patient care** mainly through better coordination within and between healthcare organizations.
- **Reduced cost** through elimination of duplications, avoidance of paper-based and manual work, etc.
- **Efficient patient care** through minimization of redundant paperwork, tests, etc.
- Large scale **data-driven clinical research**.

In 2013, The United States Department of Health and Human Services (DHHS) identifies five elements as crucial for the attainment of interoperability in health, namely adoption and optimization, standards, financial and clinical incentives, privacy and security and rules of engagement (5).

More recently, authors have come up with recommended framework that contribute to the attainment of interoperability in healthcare. Examples include Khorrami and colleagues that have proposed a framework for the selection of terminology systems, as a prerequisite for interoperability (7).

Primary healthcare information system in Albania

Primary healthcare Information System in Albania has undergone tremendous and significant progress during the last decade, with the introduction of online-based electronic systems for handling of medical visits, prescriptions, referrals, drugs, etc. *(Compulsory Healthcare Insurance Fund, unpublished data)*.

Despite the good progress, there is no information on the interoperability of the separate systems in place, even though some of these electronic platforms currently interact with the e-Albania platform *(Compulsory Healthcare Insurance Fund, unpublished data)*. In this context, the current study aimed to provide the reader with the general components for ensuring interoperability of primary healthcare information systems.

Stakeholders and interoperability levels

The simplest, yet rather comprehensive, representation of healthcare key actors and relations is the one that identifies the patient, the provider and the payer. Indeed, when we look back at interoperability efforts, they have followed the same paradigm.

Looking retrospectively at interoperability development, the provider-to-provider interoperability has been the basis and is frequently cited as the first step or phase in the development of interoperability in healthcare. Provider-to-patient and provider-to-payer interoperability represent the subsequent phases, as they require a mature provider-to-provider interoperability framework to build up (Figure 2).

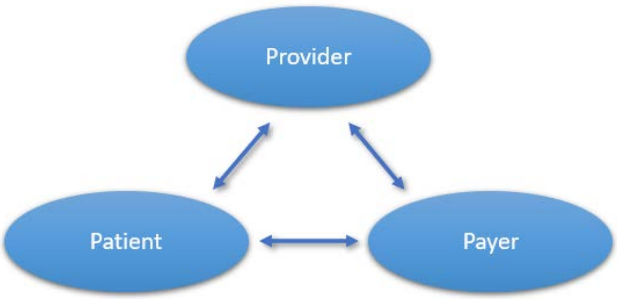


Figure 3. Interrelations between key actors in the healthcare landscape

While moving towards an interoperable environment in healthcare, there are four layers of interoperability that must be considered: foundational, structural, semantical and organizational (Figure 3).

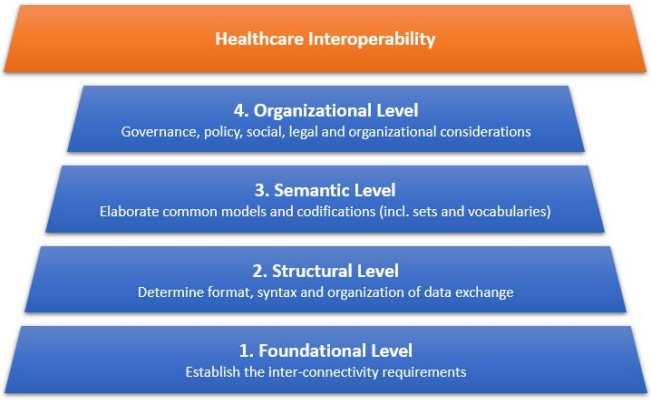


Figure 2. Levels of interoperability

The first step towards interoperability is the documentation of the user-requirements for inter-connectivity, keeping in mind the three main users, namely providers, patients and payers, as well as a fourth important stakeholder that is government and requires data and information for purposes such as public health, monitoring and evaluation, policymaking, etc. From a technical point of view, the documentation includes the requirements for systems and individual applications to securely communicate and receive data from each other.

In the structural level, the attainment of interoperability requires the definition of a standard format of medical information. The scope is to enable the system to automatically detect and interpret predetermined data fields without altering their operational and/or clinical meaning.

At the semantic level, the systems are expected to understand the semantic meaning of clinical concepts such as diagnosis, procedures, lab results, etc. To enable this, the support of coding systems, nomenclatures and terminologies is required.

At the organizational level, the aim is to share and interpret patient data between organizations with different goals, requirements and regulations. Therefore, governance principles, policies, legal and organizational considerations are of paramount importance at the organizational level of interoperability. Upon ensuring organizational interoperability, the data can be shared both within and between organizations.

Interoperability standards

There are different categories of standards in interoperability. The most basic one is **the identifier standard**, which is an important prerequisite not only for interoperability, but for the development of health information systems in general. The three base registers – the citizens' (patients') register, the health facilities' register and the health providers' register – represent the starting point where each of the entities is assigned a unique identifier and a predefined list of other variables. Ability to create, maintain and update identifiers is well documented in the identifier standards according to the FAIR principle (find, access, interoperate, reuse).

The next group of standards are the ones related to **vocabulary and terminologies** that need to be aligned before building up the subsequent interoperability layers. The purpose of vocabularies and terminologies is to represent healthcare concepts in a uniform manner.

The three groups of rather more technical standards are the ones dealing respectively with the content of the messages, transport and security. The **content standards** define the structure and organization of the messages and/or

Table 2. Examples of healthcare interoperability standards

Nr	Standard categories	Examples
1	Identifier standard	• Citizens' (patients') Register • Healthcare Facilities' Register • Health Providers' Register
2	Vocabularies and Terminologies	• International Classification of Diseases Version 11 (ICD-11) • SNOMED Clinical Terms (SNOMED CT) • Current Procedural Terminology (CPT®) • Logical Observation Identifiers Names and Codes (LOINC)
3	Content and Transport	• Health Care Interoperability Resources (FHIR® a.k.a. HL7® FHIR®) • Digital Imaging and Communications in Medicine (DICOM) • Integrating the Healthcare Enterprise (IHE)

the content of the document to be exchanged. The **transport standards** define the formats of data, messages and documents that are exchanged between the computer systems.

Lastly, **the privacy and security standards** aim to protect the rights of individuals and healthcare institutions over the data that is being exchanged, as well as the confidentiality, integrity and availability of the health information.

Interoperability scenario for primary healthcare in Albania

If fragmented and non-interoperable, the components of a healthcare system, including providers of primary and secondary healthcare services, hospitals, ancillary health systems (imaging, laboratory and pharmacy), public health systems, etc. operate in silos and are unable to exchange information. The desired state and end goal is for all this system to become interoperable in a patient centric approach that also accounts the various stages in an individual lifecycle (birth and infancy, childhood, adulthood and elderly) [Figure 4].

One approach is the implementation of an open-source platform that supports interoperability, the most widely used being OpenHIM (open Health Information Mediator) from the OpenHIE (Open Health Information Exchange) project. OpenHIM supports interoperability through providing a central point where information exchange is managed. The Interoperability Layer (IL) that is created receives transactions from the various fragmented health information systems and enables the interaction between them (Figure 5).

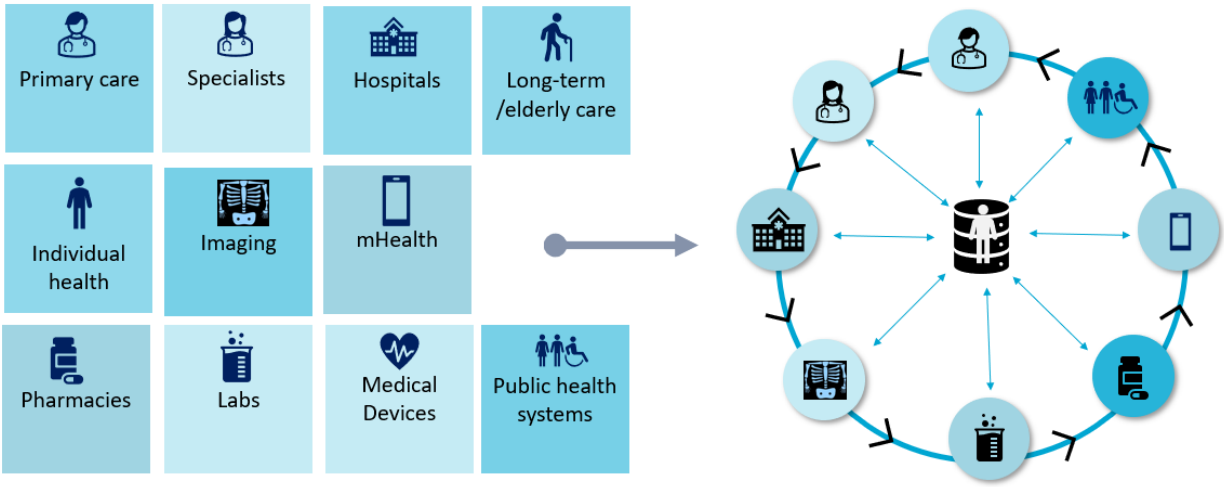


Figure 4. Transition from a fragmented towards an interoperable healthcare system

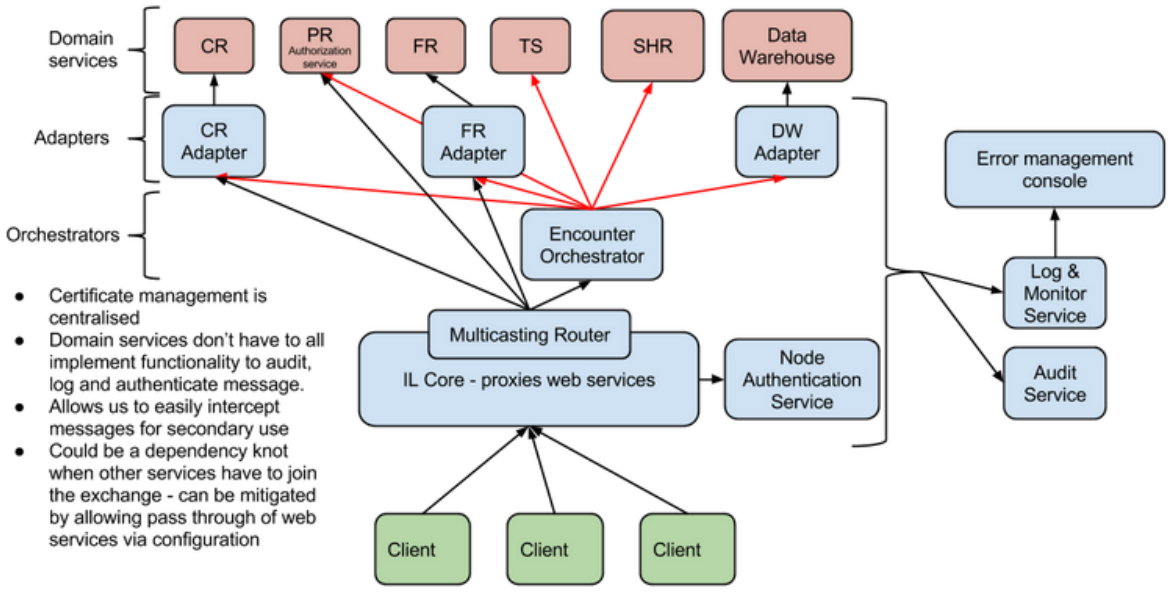


Figure 5. Interoperability Layer (IL) architecture of OpenHIM (source: www.openhim.org)

DISCUSSION

As Yadav and colleagues pointed out (8), the registry is "an organized system or database that collects, stores, uniformed data or information about an entity like a patient/person, facility, etc. and is kept updated at all times to act as a Single Source of Truth for the entity in question". It not only identifies the entity, but also proves its existence in the ecosystem in question.

Baskaya and colleagues (9) provide the example of embedded registries in a District Health Information System (DHIS2), consisting of the Facilities' Register (represented by DHIS2 Organization Unit), the Patients' Register (represented by DHIS2 Tracked Entity Instance) and Providers' Register (represented by the DHIS2 User).

The Albanian Healthcare System (including the Primary Healthcare System) utilizes the Citizens' Register maintained by the General Directorate of Civil Registry (General Directory of Civil Registry) under the authority of the Ministry of Internal Affairs (Ministry of Internal Affairs).

It is less clear whether the Register of Healthcare Facilities and the Register of Healthcare Providers are established or maintained and these two represents the next step towards the completion of the first step towards interoperability (the identifier standard).

The next step should be the identification and implementation of an Electronic Medical Record for Primary Health Care consisting of the following modules:

Table 3. Overview of subsystems and modules for a EMR for PHC in Albania

Nr	Subsystem	Modules
1	Patient Administration System	• Patient registration • Appointment management • Billing • Referral • Reporting
2	Clinical Information System	**Required:** • Physician's notes • Nurse's notes • Clinical templates • Order Entry (including e-Prescription) • Reporting **Desired:** • Guidelines/Protocols • Decision Support Systems (e.g., drug interactions) • Clinical Pathways • Digital Dictation
3	Ancillary Information Systems	• Laboratory Information System • Pharmacy Information System • Radiology Information System • Picture Archiving and Communications System (PACS)

Baskaya and colleagues (9) also focus on the role of the HL7® FHIR® standard in ensuring Export and Import functions through Application Programming Interfaces (APIs). They identify internal APIs that are native to DHIS2 and external FHIR-based APIs that need to be developed through following the FHIR standard. In the case of an EMR for PHC in Albania, the internal (native) APIs could be the ones "embedded" in the to-be Electronic Medical Record (for example: APIs that connect the eventual Referral Module of the to-be EMR with the existing e-Referral System of the country.

The positive effects and outcome of integration and interoperability have been extensively demonstrated. Nakayama and colleagues (10) demonstrated that through enabling information exchanges between PHC doctors and specialists, the outcome of low-to-moderate risk patients was improved, particularly in the rural areas. According to the findings of this study, both all-cause mortality and cumulative serious adverse

event incidence were improved significantly.

Other authors have explored the enabling factors for promoting interoperability and Health Information Exchange (HIE). Guerrazzi and Feldman (11) explored the role of organizational factors such as trust, power, organizational culture, and leadership. They found and recommend that policymakers should take into account differences between diverse hospital settings when adopting policies regarding technological innovations, including healthcare interoperability.

Heath and Potter focused on physicians' leadership when implementing health information exchange (12). They identified four important themes that can assist in bridging the gap and creating collaboration in an HIE, namely trust among physicians, promote involvement and buy-in, infuse value proposition and competition.

CONCLUSIONS

Achieving interoperability within the numerous Primary Healthcare Information Systems and between PHC and the other components of the healthcare systems is associated with numerous benefits. Important organizational, physician-related and technical factors have to be considered in the process.

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Conflict of Interest Statement: The authors declare that they have no conflict of interest.

REFERENCES

1. World Health Organization, "World Health Assembly Resolution: eHealth, WHA58.28", 25.05.2005.

2. World Health Organization, International Telecommunication Union, "National eHealth Strategy Toolkit", 2012.

3. United Nations "Transforming our world: the 2030 Agenda for Sustainable Development", 25.09.2015.

4. Christodoulakis C., Asgarian A., and Easterbrook S., "Barriers to Adoption of Information Technology in Healthcare." In Proceedings of ACM CASCON conference, Markham, Canada, November 2017.

5. Department of Health and Human Services, "The Path to Interoperability", September 2013.

6. Brailer D., "Interoperability: the key to the future health care system", Health Aff (Millwood). 2005 Jan-Jun; Suppl Web Exclusives: W5-19-W5-21.

7. Khorrami F, Ahmadi M, Karami NA, et al. "A framework for selection of health terminology systems: A prerequisite for interoperability of health information systems", Informatics in Medicine Unlocked, Volume 31, 2022, 100949.

8. Yadav P, Bhardwaj K, Kumbhat A, et al., "National Health Facility Registry, Version 1.0",

D Access Digital Health, 05.05,2020 (Last accessed on 13 December 2022 on: https://www.slideshare.net/ACCESSHealthDigital/health-facility-registry)

9. Baskaya M, Yuksel M, Banu G, et al., "mHealth4Afrika - Implementing HL7 FHIR Based Interoperability", MEDINFO 2019: Health and Wellbeing e-Networks for All, 2019.

10. Nakayama M, Inoue R, Miyata S, Shimizu H, "Health Information Exchange between Specialists and General Practitioners Benefits Rural Patients", Appl Clin Inform. 2021 May;12(3):564-572.

11. Guerrazzi C, Feldman S, "Health information exchange: What matters at the organizational level?", J Biomed Inform. 2020 Feb;102:103375.

12. Heath M, Porter T, "Physician leadership and health information exchange: literature review", BMJ Health Care Inform. 2019 Aug;26(1):e100080.