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Armenian eHealth Strategy and Action Plan for 2021-2023

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GLOSSARY

- electronic health information system (ARMED) - ARMED is an electronic health information system used by the health care facilities of Armenia. The system collects data on outpatient and hospital cases and serves as a reporting tool for reimbursement of services provided within the publicly funded Basic Benefits Package. The system also has other functions.
- electronic medical records - Electronic medical records (EMRs) are a digital version of the paper charts in clinician offices, clinics, and hospitals. EMRs contain notes and information collected by and for the clinicians in the office, clinic, or hospital and are mostly used by providers for diagnosis and treatments (see HealthIT.gov).
- interoperability - The ability of different information systems and software applications to communicate, exchange data, and use the information that has been exchanged. Interoperability means the ability of health information systems to work together within and across organizational boundaries to advance the effective delivery of health care for individuals and communities
- Health Level Seven International (HL7) - A not-for-profit, The American National Standards Institute (ANSI)-accredited standards developing organization dedicated to providing a comprehensive framework and related standards for the exchange, integration, sharing, and retrieval of electronic health information that supports clinical practice and the management, delivery, and evaluation of health services (HL7.org)
- National eHealth Services - National eHealth Services is the collection of integrated electronic health and medical information systems and databases collecting and processing health data that operate at the national level.
- health data dictionaries - Health data dictionaries are the approved lists of uniform definitions relating to the full range of health services and a range of population health parameters. Used for the standardization and unification of collected data.

ABBREVIATIONS

BBP	-	Basic Benefits Package
COVID-19	-	coronavirus disease
DICOM	-	Digital Imaging and Communications in Medicine
EHIS	-	electronic health information system
EHIU	-	eHealth Implementation Unit
EKENG	-	e-Governance Infrastructure Implementation Agency
GIP	-	e-Governance integration platform
HDD	-	health data dictionary
HIAC	-	Health Information and Analytical Center
HIS	-	health information system
HL7	-	Health Level Seven International
ICD	-	International Classification of Diseases
ICT	-	information and communications technology
LLC	-	Limited Liability Company
LOINC	-	Logical Observation Identifiers Names and Codes
MOH	-	Ministry of Health
NEO	-	National eHealth Operator
NGO	-	nongovernment organization
NIH	-	National Institute of Health
PHC	-	primary health care
SHA	-	State Health Agency

A. Introduction

1. The Government of Armenia program 2019-2023 was approved by the Decree No. 650 on the 16th of May 2019. Development of the eHealth vision and strategy is part of this program, which identifies the directions and required tasks for the implementation of effective eHealth services for the country.

2. Digitalization of health care in Armenia is considered a priority task among other health care reforms focusing on the rationalization of the health information system infrastructure, accessibility of health services, medical education, and patient satisfaction.

3. In the last decade, Armenia has advanced in the digitalization of health care data and the implementation of a nationwide and comprehensive electronic health information system (EHIS). In 2017 the country implemented EHIS called ARMED.¹ Currently, ARMED operates in around 500 health care institutions in the country, in six insurance companies, and in the State Health Agency (SHA)—the agency responsible for the reimbursement of state-funded health care services of health care organizations. It is mainly used for reporting and reimbursement of publicly funded services covered under the BBP.

4. In the meantime, after about three years of implementation, the EHIS is still not implemented on its full scale. Further development of the system is required to establish open and secure eHealth services and advance the level of digitalization in health care. It will allow the delivery of high quality, integrated, and accessible patient-centered health care services, a high level of transparency in sharing patients' medical and health records, safeguarding the protection of privacy and data security, ensuring the accuracy of data to improve the provision of health care services, including health promotion, disease prevention, health-related statistics, and research and development activities. Transparency, data integrity, accuracy will make the provision of high-quality health care services, evaluation, supervision, financing, and evidence-based policy and planning possible.

5. The government defines two core regulatory documents for the further development of the eHealth sector of the country: (i) the government decree on the vision and roadmap for eHealth development, which was drafted and submitted to the Government, and (ii) Health Ministry's order on the eHealth strategy and action plan, which was approved by the MOH Order on February 16, 2021.

6. The current document ²describes the eHealth strategy and action plan of Armenia for the period of 2021-2023 and is based on the government decree on the vision and roadmap for eHealth development. It defines the strategic goals, desired outcomes, main principles, key development area, and concrete actions required for the successful implementation of effective health information infrastructure for the country.

B. eHealth Vision

7. The draft government decree on the vision and roadmap for eHealth development defines the eHealth vision as follows:

¹ ARMED and electronic health information system (EHIS) are used interchangeably in this document.

² The strategy was developed by the Task Force operating with the Ministry of Health of the Republic of Armenia in 2019 - 2020. The strategy is based on the assessment of the existing health information systems and digital health initiatives in Armenia and applies the World Health Organization-International Telecommunication Union (WHO-ITU) toolkit and structure, the Asian Development Bank (ADB)- Asia eHealth Information Network (AeHIN) Health Information Governance and Architecture Framework, and the ADB Investing in Digital Health Guidance Note and Impact Model.

By 2023, Armenia will have modern, comprehensive, and effective national eHealth services, operating in all health care service providers of the country, supporting the reliable collection and effective use of the health data for planning, management, delivery, and monitoring of health services, which result in high-quality health care services and a more equitable health system for all the people of the country.

8. The above-mentioned eHealth vision is in line with the draft Health Care System Development Strategy 2020-2025, which contains the following paragraph on the strategic goal of the eHealth system:

One of the main goals of the 2020-2025 health care system development is the design and complete investment of a modern and effective electronic health information system. The availability of the electronic system will enable effective management of the beneficiaries and the provision of the information required for decision-making. Thus, it will provide high quality and effective health care services delivered to the population, as well as transparency of the health care system performance and a high level of public satisfaction.

1. Strategic goals of eHealth development

9. Below are the strategic goals for the development of national eHealth services:

- (i) **The core of national electronic health services is the electronic health information system (EHIS).** EHIS provides the essential eHealth services to its consumers, allowing them to collect, store, process, exchange, and use health data nationwide.
- (ii) **EHIS is equally available for all the health care providers and other interested stakeholders across the country.** Health care providers, pharmacies, laboratories, Ministry of Health (MOH), National Institute of Health (NIH), and other consumers shall become the subscribers of EHIS and have access to eHealth services regardless of the location and their abilities to use information and communications technologies (ICT).
- (iii) **National eHealth services collect and use health data according to the national regulation and legal requirements and follow the internationally recognized digital health data standards.** The collection, storage, access, and processing of personal health data shall be transparent, standardized, strictly controlled, and audited. All health care providers, regardless of their legal status, size, or method of financing, must share certain patient care data as defined by legal regulations. Non-personal information shall be available for a broader range of eHealth data consumers, including health workers, health care service providers, and health decision-makers for reporting, decision making, and analytical purposes.
- (iv) **Health data collected and processed by the national eHealth services are unique, reliable, and of high quality.** Health data for the single episode of disease is collected only once and available for use over a defined period of time and sharable between the EHIS and other systems in accordance with relevant regulations.
- (v) **Data collected by the national eHealth services represent meaningful information for health policy development and are useful for evidence-based decisions.** Health sector decision-makers are able to make better-grounded and quicker decisions regarding the optimum use of resources at all levels, including health care providers, regional health and social sector departments and national level stakeholders. Health care providers and health workers are enabled to develop effective health care plans, provide more effective and precise treatment, and to prevent the diseases.

- (vi) **The EHIS as a central component of national eHealth services is interconnected with other health and non-health information systems and services to be identified and able to exchange data based on established national and international standards³.** Data exchange between the systems occurs electronically (web services), ensuring a reliable and secure data exchange and based on the established national and international standards.
- (vii) **The patient has full access to his/her personal health history and has the necessary tools and interfaces to manage and use this data.** The population shall be able to access its health data through the patient portal of the EHIS. The patients shall be able to consent to the use of personal data by consumers. The patients shall be able to get the medical documents in electronic format without visiting the health care provider's office through the web portal.
- (viii) **The governance structure and responsibilities of National eHealth services (i.e., EHIS) are clearly defined and executing institutions appointed.** The roles and responsibilities for the implementation of the eHealth strategy are clearly defined, and effective communication between the MOH, National eHealth Operator (NEO), and other institutions is established.

2. Principles of development of eHealth services

10. To achieve the strategic goals of eHealth development, the below data acquisition and e-services development principles are of conceptual importance. These principles are followed consistently in all the focus areas and development activities in this strategy.

- (i) **eHealth services are of high quality.** eHealth services should be patient-centric, health data for patients should be valid and represent a meaning full information for analysis and decision making.
- (ii) **Implement open data principles.** The use of the patient's personal data should be regulated by the existing legal framework and its use restricted. Non-personal data, however, that are legally not restricted and represent valuable information for analysis, research and public usage must be available for the public use with minimal restrictions.
- (iii) **Ensure the data privacy and security.** eHealth services should be designed in the way to ensure the privacy and security of the personal data. Patient shall be able to audit the use of their data and be able to limit the usage within the a legal context. Necessary measures should be considered to ensure key aspects of information security—integrity, privacy and availability.
- (iv) **Ensure the single entry and reuse of data.** Data are entered into the eHealth systems once and should be available for use by other health systems if needed. Double registration of the same data shall be avoided.
- (v) **Data follows the national and international standards.** The health data collected by eHealth services should be in line international data standards and health data dictionaries developed in the context of national data standardization.
- (vi) **Continuous learning, training, and education.** To ensure the sustainability of all the eHealth initiatives, the necessary eHealth training and continuous education component (increasing the capacity of the human resources) must be implemented. Continuous learning shall include basic computer literacy for the medical staff as an essential requirement of undergraduate study and also the mandatory specialized eHealth related courses for the postgraduate students as part of their specialization curriculum. These trainings will need to be adaptive, and revisited and updated regularly to reflect the development and adoption of new technologies.

³ Data sharing/exchange needs to be guided by a concrete purpose and patient privacy protected.

- (vii) **Innovation.** The development of eHealth services should always follow the current information technology (IT) trends and best practices. eHealth systems are frequently subject to innovation and change—therefore, they need to allow for continuous learning and adaptability while demonstrating a clear benefit to health systems, health services, and/or health indicators.

3. Key focus areas of eHealth development

- 11. The development of the eHealth services should be focused on the following areas:
 - (i) **Development and implementation of the legal framework for eHealth services.** The activities in this area are necessary for the operation of the electronic health care system and the maintenance of health care databases.
 - (ii) **Development of standards and implementation of interoperability between systems.** The activities in this area are in line with international standards and with the digitalization standards applicable in the Republic of Armenia and developed by the Ministry of High Technology Industry of the Republic of Armenia.
 - (iii) **Leveraging health data analytics.** The activities in this area include improving and enhancing data entry, reporting, and analysis capabilities of the system.
 - (iv) **Development and implementation of new eHealth services.** The activities in this area include the development and introduction of disease registries, subsystems for electronic prescriptions, electronic referrals, and electronic disability sheets.
 - (v) **Empowerment of health care service providers for the effective use of eHealth services.** The activities in this area aim to strengthen the electronic health system, technical capacities of medical organizations, and delivery of continuous training of users of the system.
 - (vi) **Empowering the population with access, handling, and use of eHealth services.** The activities in this area aim to expand the opportunities for the population to use the electronic health care system.

C. Background and Status of eHealth in Armenia

12. Implementation of eHealth and health information systems in Armenia has undergone several stages. The State Health Agency (SHA), established in 1999, had a considerable impact on this process. From the beginning of 2000, health care providers gradually built the capacity to report their performance to SHA on state budget financing. Starting in 2010, the digitalization of the health care sector has been a high priority task for the Government of Armenia.

13. To support the comprehensive approach of the sector development in 2009-2010, the government developed the concept of the implementation of the integrated electronic information system in the health sector (No. 50 protocol session decree, 23 December 2010) with the primary purpose for the design and development of an electronic health information system for all health care providers, designed to support not only the financing functions but also to feed data for clinical performance analyses, more comprehensive quality control and care coordination functions.

14. In 2012-2013, the government approved the program and the timeline of activities required for the implementation: (i) Republic of Armenia Government Session: Annex 1 to the protocol Decree No. 43, 25 October 2012, Program of the implementation of integrated electronic health information system in the health sector and (ii) Prime Minister of the Republic of Armenia decision No. 159-A, 27 February 2013, on approval of the list of measures for the elaboration of legal acts necessary for the introduction and implementation of the unified electronic information system in the sphere of health care of the Republic of Armenia. It

initialized a review of the legal acts needed for the development, adoption, and implementation of the nationwide electronic health care system. The government assigned the implementation of the program to the e-Governance Infrastructure Implementation Agency (EKENG), which is the national coordinator of e-government projects in Armenia.

15. In 2014, EKENG developed a term of reference for the system and announced a tender for the design and development of a system through a loan provided by the World Bank Public Sector Development Program. A consortium of international and local companies (Ericsson Nikola Tesla d.d. Limited Liability Company [LLC] - Croatia and local Masis Apahov LLC) won the tender, and in 2015-2016 managed the development and adoption of the electronic health care system called ARMED. In 2017, the government announced another bid following the Decree No. 95-N “On approving the procedure for transferring the electronic health care system through a concession agreement, setting up a tender committee, and approving the timeline for the implementation of the system among the licensed entities that provide medical care and services and are engaged in pharmaceutical activities.” A joint venture of two companies, namely Sylex SARL LLC (Switzerland) and Masis Apahov LLC (Armenia), won the tender and formed the NEO Closed Joint Stock Company.

1. Laws and regulatory documents

16. The regulatory framework related to Armenia eHealth initiatives is represented by several sector-specific and general laws, government decrees, and ministerial orders. Table 1 provides a list and description of documents that are related to the regulatory aspects of the eHealth activities.

Table 1: Regulatory Documents Related to Health Information and eHealth

No.	Issuing Body	Legislation # and Date	Title of the Legal Act
1	Laws		
1.1	Republic of Armenia National Assembly	4 March 1996	The Law on Medical Care and Service to the Population
1.2	Republic of Armenia National Assembly	18 May 2015	On Personal Data Protection
2	Other regulatory documents (decrees, orders, etc.)		
2.1	Republic of Armenia Government Session: Excerpt from the protocol	No 18 03 May 2001	On the Concept of the Development of the Industry of Information Technology (IT) in the Republic of Armenia
2.2	Government of the Republic of Armenia Decree	No 695-A 21 June 2007	On the Government Program of the Republic of Armenia
2.3	Government of the Republic of Armenia Decree	No. 293-N 13 March 2008	On Approval of the 2018 IT Services Promotion Service and Schedule of Implementation of the Program Implementation Plans
2.4	Republic of Armenia Government Session: Excerpt from the protocol	No. 35 28 August 2008	On Approval of the IT Industry Development Concept
2.5	Government of the Republic of Armenia Decree	No. 1207-N 30 October 2008	On Approval of the Sustainable Development Program

2.6	Government of the Republic of Armenia Decree	No. 666-N 20 May 2010	Annex N 1 on Services to Promote the IT Sector
2.7	Government of the Republic of Armenia Decree Government of the Republic of Armenia Protocol Decree	No. 50 protocol session decree December 23, 2010	On Approving the Concept of the Implementation of the Integrated Electronic Information System in the Health Sector of the Republic of Armenia
2.8	Republic of Armenia Government Session: Annex 1 to the protocol Decree	No. 43 October 25, 2012	Program of the Implementation of Integrated Electronic Health Information System in the Health Sector
2.9	Prime Minister of the Republic of Armenia decision	No. 159-A February 27, 2013	On Approval of the List of Measures for the Elaboration of Legal Acts Necessary for the Introduction and Implementation of the Unified Electronic Information System in the Sphere of Health Care of the Republic of Armenia
2.10	Prime Minister of the Republic of Armenia Decision	No. 573-A 3 July 2015	On Approving the List of Measures Enforcing the Law of the Republic of Armenia on "Protection of Personal Information"
2.11	Government of the Republic of Armenia Decree	No. 1093-N August 31 2015	On the Establishment of General Security, Interoperability, and Technical Requirements for Electronic Systems Used by the State and Local Self-governing Bodies for Electronic Services or Operations
2.12	Government of the Republic of Armenia Decree	No. 29-N 20 January 2016	On Approval of the Schedule for Implementation of Measures to Assure the Information Technology Promotion Services 2016 Program
2.13	Government of the Republic of Armenia Decree	No. 95-N of January 26 2017	Approval of the Procedure for Transferring the Electronic Health Care System to the Concession Contract, Establishing a Tender Commission, and Approving the Schedule for Introducing the Mentioned System in Medical Care and Service and Licensed Entities Implementing Pharmacy Activities
2.14	Government of the Republic of Armenia Decree	No. 192-N 16 February 2017	On Approving the Procedure for Electronic Transfer of Personal Data being Processed in Databases of State and Local Self-government Bodies
2.15	RA Minister of Transport, Communication and Information Technologies decree	No. 1242-A November 11, 2017	Approval of the 2018 IT Services Promotion Service and Schedule of Implementation of the Program Implementation Plans

2.16	Decree of the Prime Minister of the Republic of Armenia	No. 1556-A 29 December 2017	On Approving the Roadmap for Implementation of Unified Electronic Information System in the Health Care Sector of Armenia
2.17	Order of the Minister of Health of the Republic of Armenia	No. 1664-A 29 June 2018	On Approving the Procedure for entering, suspending and creating waiting lists of treatment cases in electronic health system
2.18	Government of the Republic of Armenia Decree (point 241)	No. 1030-L of 6 September 2018	On approving the Action Plan of the Government of the Republic of Armenia for 2018-2022
2.19	Order of the Minister of Transport, Communication and Information Technologies of the Republic of Armenia	No. 162-A 6 March 2019	On Approval of the Schedule for Implementation of Information Technology Promotion Services for 2019

17. The legal aspects of eHealth are provisioned through the Law on Medical Care and Service to the population. Initially passed in 1996, this was the first legal document stating the main definitions, the scope of services, the functions, rights, and responsibilities in the health care sector. In the first version, it provides the legislative reference on health information describing the medical certificate as a recording or a reporting paper or electronic document. In the late 1990s and 2000s, parallel to the health reforms, the law underwent several amendments. However, there was little attention to legal aspects of health information systems until 2018, when the MOH started the cardinal revision of the law, which included specific chapters on eHealth and telemedicine. In particular, the new amendment of the Law contains:

- (i) Definition of eHealth systems and services;
- (ii) Definition of and description of telemedicine, health care databases and purposes of their maintenance, electronic health care system; and
- (iii) Principles and non-alignment with the electronic health care system.

18. The National Assembly passed this amendment in mid-2020, which makes the law the principal regulatory document for eHealth and telemedicine.

19. The law on Personal Data Protection regulates the procedure and conditions for processing personal data, exercising state control over them by state administration or local self-government bodies, state or community institutions or organizations, legal or natural persons. It defines the main terms such as personal data, processing of personal data, transfer of personal data to third parties, use of personal data, the processor of personal data, the data subject, database, information system, and others. The law defines that personal data is being processed for legitimate and specified purposes and may not be used for other purposes without the data subject's consent. It also follows the concept of minimum data use when the processor of personal data is obliged to process the minimum volume of personal data that is necessary for achieving legitimate purposes.

20. Despite the presence of the above-mentioned laws and regulatory documents, there are still gaps in the regulatory framework for this sector, including the lack of standards, vision, and strategy for the future development of eHealth in the country. Following the adoption of the law, it is necessary to develop and apply by-laws and regulations that will serve as a basis for carrying out the functions of this field following the requirements of the law.

2. National eHealth Operator and ARMED system

21. National eHealth Operator (NEO), on a concession basis, manages and operates the ARMED system. NEO began its operations in 2017. The government signed a concession agreement for 15 years. The main functions of NEO include:

- (i) Technical management and improvement of the ARMED system;
- (ii) ARMED software maintenance;
- (iii) ARMED subscribers and user services;
- (iv) ARMED user training; and
- (v) Further development of the ARMED system based on roadmap agreed with the government.

22. The nationwide implementation of the system was carried out by the Decree No. 1556-A of 29 December 2017 of the Armenia Prime Minister "On the roadmap for the introduction of a unified electronic information system in the health sector of the Republic of Armenia." This roadmap included 11 activities that were carried out and completed at the end of 2018. The activities carried out in the 2017-2018 timeframe included the essential capabilities of the system such as the case registration, health dictionary management, reimbursement of state order, etc., but missed other important components required to fulfill all the needs of the health sector. One of the main limitations was the incomplete legal framework.

23. Currently, the system has different functional sections that can be conditionally divided into two main functional groups: (i) obligatory for the use by the health care facilities that are state-funded and (ii) additional, which are optional, and health care facilities have a right to use them or not.

24. The core functions of the system include the recording and accounting of state order cases of diseases. These functions enable entering data on hospitalization, primary health care, dental and outpatient pregnancy control services as well as entry of data on state-funded services provided to beneficiaries of the social package that is used by the SHA to make financial reimbursements based on the performance reports of medical facilities within the scope of state-funded medical care and services. Data collection and processing is regulated by Order N 1664-A of 29 June 2018 of the Minister of Health of the Republic of Armenia "On approving the procedure for entering, suspending and recording cases in the electronic health care system."

25. The system also has an obligatory function for registering with a physician and managing the population. It enables the people to exercise the process of freely choosing a primary health care (PHC) provider, regulated by the Decree No. 420-N of 30 March 2006 "On approving the procedure for choosing primary medical care providing physician and registering for the service." In the first half of 2019, the subsystem of electronic registration to visit primary health care doctors was implemented, which enables the population to register for a visit to primary health care facilities via the ARMED patient portal. The implementation of the subsystem is still in progress and is only available for the primary health care facilities in Yerevan.

26. Starting from October 2019, a subsystem of electronic referrals was developed and started experimentally within ARMED and it is obligatory for state-funded facilities. It enables digitizing the process of referring the patients from PHC facilities to hospitals. In the first trimester of 2020, this subsystem was made available to all medical facilities of the primary health care sector.

27. Due to the coronavirus disease (COVID-19) pandemic, in mid-2020, new functional capabilities were developed and implemented that allow collecting and registering the results of COVID-19 testing and make that information available to the primary health care doctors. The system also allows the patients to report their symptoms themselves via the system, even

though this capability has not been used yet. There are also several reports and brief information about the current state of transmission and dynamics of COVID-19. The positive test results of the population are reflected on the map of the country.

28. The system also implements some experimental non-obligatory functions, including the system of automation of clinical guides, data portal of clinical trials, the subsystem of saving and analyzing pictures, the subsystems of automatic diagnosis, telemedicine, and management of vaccine storage.

29. The ARMED system is available to the population through the patient portal. After registering in the system, patients can see the information about their visits to primary health care facilities or hospitals.

30. NEO deploys and operates the system data center server hardware at one of the largest national network providers (VivaCell-MTS's) service centers. According to the concession agreement, the hardware equipment of the system belongs to the Government of Armenia and is provided to the NEO on a free-of-charge basis.

31. The ARMED system is connected to the EKENG electronic signature system and the electronic system of the Armenia Police's register of the population.

32. System maintenance costs are borne out of system subscription fees. Subscribers of the system are health organizations (medical centers, polyclinics, hospitals, outpatient clinics, dental clinics, etc.), the SHA, and private insurance companies. To access the system, the subscribers sign a contract with the NEO, the provisions of which are governed by a concession agreement between the government and the NEO. In 2017-2018 the subscription fees of the system were significantly higher than the mean market price of other similar IT services in the Republic of Armenia, which caused discontent among medical facilities in 2017. To this end, the MOH started to provide full or partial subsidies for the ARMED system subscription payments in 2017 and onwards. In parallel, based on the agreement reached between the MOH and the NEO, the principles of subscription payments were revised because of which the system service fees were reduced by approximately 50% since 2020, and the state subsidy for the system was eliminated entirely. Subscription fees vary based on the type of health care facilities (medical center, hospital, primary health care). This model of subscription does not require additional fees for sub-systems available in ARMED (for example, eReferrals, etc.).

33. In 2019, an assessment and analysis of the ARMED system were performed by the MOH with assistance from the Asian Development Bank to evaluate the existing features of the system and reveal the opportunities for the development of eHealth strategy for the 2021-2023 period.

34. Earlier, with the support of the United States Agency for International Development, another study of the system was carried out by non-governmental organizations Asparez Journalists Club and Transparency International Anti-Corruption Centre. This study focused on the legal aspects of the system operation, patient data privacy issues, as well as the practical matters identified by the system users.

35. The main findings of these assessments are as follows:

- (i) The primary consumers of the system are the health care facilities providing state-funded services. Meanwhile, most health care facilities are not using ARMED to collect data on privately paid services and cases;
- (ii) The reporting functions of the ARMED system primarily serve the purpose of managing state-funded services. Analytical and on-demand reporting tools and forecasting capacity of the system is lacking or have no practical application.

- (iii) The MOH, NIH, and regional health and social security departments make little or no use of the ARMED system;
- (iv) The system does not yet implement the disease registers' functions, health statistics, and disability datasheets. Electronic referrals and electronic prescription functionalities have begun to be used by the health sector recently. Still, there is a need for a systematic approach and a robust legal basis for implementing these services;
- (v) There are various functional modules available in the ARMED system but not used by the health care facilities. Meanwhile, applying these functions to the country's health care system's current requirements still needs to be assessed and implemented;
- (vi) The system is primarily serving to fit the reporting needs of the state budget financing for SHA. The ARMED system lacks supporting health care professionals with clinical work, collection, and reporting of yearly statistical information, quality of care indicators;
- (vii) Users sometimes report various technical problems, including slow system performance, data loss, and inaccuracies during the data entry process, unnecessary input fields, frequent system changes that are not reflected in user training videos on time;
- (viii) Currently, there is no clear understanding of how the governance of the ARMED system is achieved. By the concession agreement, the parties of the contract are the government, MOH, EKENG, and NEO. However, there is no precise distribution of roles and responsibilities mentioned;
- (ix) The system is not yet interoperable with other governmental information systems such as the State Revenue Committee, Ministry of Labour and Social Affairs, Ministry of Justice, and the Armenia Police;
- (x) Currently, ARMED unilaterally collects the data from some of its subscribers (Arabkir Medical Center, Vardanants Medical Center, emergency cases management system, etc.) by using the Health Level Seven International (HL7) health data exchange specification. However, the assessment of the current situation revealed some issues related to data exchange between the ARMED and health facilities, and this is an important aspect to consider during the implementation of ePrescription services because many pharmacies will request to connect their internal management systems with ARMED through data exchange interfaces; and
- (xi) Although the ARMED system implements a patient portal, in its current state, the portal capacities are limited and require further enhancements. The system is missing functions to access and download medical documents (epicrisis, copy of the prescription, and so on) and receive counseling in cases of various clinical conditions and diseases.

3. Other information systems and services

36. Besides ARMED, there are other information systems currently operating in the health sector which collect and report health, health-related, or health management data.

a. Emergency cases management system

37. In 2013-2014, the MOH implemented an ambulance served case management system in the Yerevan Emergency Service unit and other ambulance/emergency service providers in the country. The system underwent a significant upgrade in 2016 and currently operates from 210 endpoints nationwide. The system allows tracking ambulance cases integrated with automatic call recording devices of emergency units, as well as implementing geographical features like tracking locations of ambulance vehicles and the status of emergency visits. The

system is maintained by the private organization, and the MOH announces open tender each year for the provision of maintenance services of the system.

b. Birth and death certificates registration services

38. In Armenia, registration of birth and deaths is performed by the Civil Status Acts Registration office. The office uses a special online software application for such records. In 2016-2017 the software underwent some changes allowing the medical staff to access the system and directly register the event (births and deaths) in the system instead of using the old method of issuing the special paper forms. Currently, the system is not interconnected to the ARMED system.

c. Electronic registry of health care providers

39. Previously, the Licensing Agency of MOH had used special software for collecting, storing, and reporting the information about the licensing of the medical organizations. The first version of the software was developed in early 2007, which allowed the creation of an electronic registry of the medical organizations based on the paper archive. In 2011-2012 the software application was updated, which included more functions with a focus on medical personnel. However, the software was limited in use. In 2014-2015, as a part of common approach to unify the licensing processes of various sectors, the government introduced an electronic registry of licensed health providers. The latest version of the registry is currently operating in the department but still have limited usability. Currently, the registry is not integrated with ARMED or any other information system.

d. The database of registered drugs

40. Founded in 1992, the Scientific Centre of Drug and Medical Technology Expertise has a broad range of functions, which also includes the registration of the drugs allowed for use in the country. The center implements the database of registered drugs. This system is a part of the internal management information system of the center. The list of the drugs stored in the database is essential information for other systems in terms of using the unified dictionaries for data exchange and reporting. Currently, with the funding from United States Agency for International Development, the center plans to upgrade its system and work on the development of the user and technical requirements of the system. The current database has no connections with other systems, including ARMED.

e. Health workforce information system

41. Currently, official statistics about medical personnel in the country are collected by the Health Information Analysis Center (HIAC) at the NIH. HIAC collects data through the annual reporting forms from medical service providers, which then summarizes and publishes data in the NIH yearly statistical report. The information collected by HIAC does not contain personal information about the doctors and nurses. It contains only summary information about the total number of doctors and nurses per facility broken down by regions, specialties, and sex, and whether they work full-time or part-time, which are meant for higher-level reporting purposes.

42. In the structure of the ARMED system, there are basic functions for registering information on health workers. However, ARMED is not set up to include comprehensive functions of a health workforce information system.

43. Neither of the two mentioned mechanisms can be considered as appropriate for meeting the MOH requirements due to significant limitations. These limitations include the missing analytical and regular reporting functions, mechanisms to update data in a timely manner, the limited possibility for ownership by MOH to follow-up the data collection and

updating process, and limited functions such as planning, management, and tracking qualification of medical personnel. They cannot exchange data with each other, and therefore have little value for everyday use by MOH.

f. Hospital information systems

44. Currently, in Armenia, there are few large private health facilities that implement their own internal data management systems. The Arabkir, Vardanants, and Erebuni medical centers are the ones that use their own systems, which were developed and implemented before the ARMED implementation. Since 2017, these organizations have worked closely with the NEO to integrate their systems with ARMED. As per available information, Arabkir Medical Center could implement some level of interoperability while Erebuni Medical Center left the idea and stopped the integration in 2019, referring to the issues raised during the implementation stage.

g. mHealth solutions

45. In Armenia, mobile applications for health services are in their initial stage of development. During March-August 2020, and related to the COVID-19 pandemic, the Government of Armenia used mobile solutions for tracking COVID-19 patients and isolating contingent during the state of emergency. However, using the tracking features of mobile devices had a negative response from the population, and it has been decided that data collected through these devices shall be destroyed after lifting the state of emergency.

46. One of the biggest telecom providers of Armenia—UCom Closed Joint Stock Company introduced a mobile application called UDoctor, which provides paid services for booking with physicians such as (i) registration for consultation with duty physician 24/7 in case of urgent issues, (ii) book consultation with one of the narrow specialists patient's desired time, (iii) talk with a doctor with video, audio or chat, (iii) learn about doctors professional experience and other users feedback that consulted with, (iv) get a detailed written conclusion and advises from a doctor after the consultation and (v) upload and save medical documents to one's own account for ease of use. The tool has not much usage yet and based on the public data, after a year of implementation, there are only 10,000 downloads of the application.

D. Focus Area 1: Development and Implementation of the Legal Framework for eHealth Services

47. The legal framework is an essential component of the national eHealth system. Currently, the eHealth area regulatory documents include the Law on Medical Assistance and Service to the Population and the Law on Personal Data Protection.

48. The Law on Medical Assistance and Service to the Population includes the terms and definitions for the eHealth in the scope of the last amendments, which were approved by the National Assembly in 2020. These terms include the definition of databases in the health area and the key concepts related to the use of the unified electronic health system. However, the terms in the Law reflect only the key concepts, and there is a need for the further development and adoption of the policies and other regulatory documents, as well as for adapting other sector-related legal acts to the recent legislative changes.

49. The development and adoption of policies shall be the primary responsibility of the MOH. In the meantime, it will be important to consult with various stakeholders, including NEO, as they currently operate the core of the country's electronic health information system. Moreover, the involvement of specialists from other agencies and institutions is important to ensure that the policy documents are in line with the national standards toward the processing of electronic systems and the use of data.

50. The documents which are still needed for regulating the eHealth sector are identified as follows:

- (i) Minister's order "On approving the training requirements and procedures for the users of electronic health information system";
- (ii) Minister's order "On defining the minimum technical requirements and specifications for connecting (to become a subscriber of) to electronic health information system";
- (iii) Minister's order "On defining the procedures for defining, managing and maintaining the disease registers, and those who responsible for maintaining the disease registers";
- (iv) Minister's order "On defining the rules for viewing health data by patient through the patient portal, the scope of the patient's access to the information with the consent of the patient (or his / her legal representative), the rules for accessing the patient's electronic health information and consent form for entering the patient portal";
- (v) Minister's order "On defining the rules and requirements for implementing the telemedicine"; and
- (vi) Minister's order "On defining and approval of the procedure for entering personal, including special category and medical data, by health licensees in the electronic health information system".

E. Focus Area 2: Development of Standards and Implementation of Interoperability Between Systems

51. The current National eHealth Services (eHealth ecosystem) of Armenia mostly has a monolithic structure with ARMED at its core. Besides the ARMED, there are few other information systems that collect and process health-related data. Some of these systems are interconnected with ARMED, while others have no such interfaces. In addition, the country's e-Government infrastructure includes several state information systems, which are important for the eHealth ecosystem and require interoperability. Currently, only a few of these systems and services exchange data with ARMED. The aim of improvement of interoperability between systems is to create common health data space for the individual person. The health data space will be achieved by standardized information exchange between ARMED, electronic medical records of health care providers, and other health-related databases and services.

52. Pursuing the principle of a single source of data, effective data exchange practices shall be implemented. Moreover, the implementation of new eHealth services requires well-designed and effective solutions to fulfill the necessary level of data interoperability with other systems.

53. Conditionally, data exchange could be divided into two categories—personal data exchange⁴ and non-personal data exchange. It is important to highlight that exchange of medical data, which in the majority of cases contains personal data, should be strictly regulated. Medical information and health care data shall be shared upon the request and permission of the person's consent. Integrated Health Care Enterprise Basic Patient Privacy Consents are recommended to provide a mechanism to record the patient privacy consent(s) and a method for Content Consumers to use for enforcing the privacy consent appropriate to the use. Effective data exchange requires the use of standards.

1. National and international standards

54. Development of standards shall follow two main directions.

⁴ The legal foundation for the personal data exchange between the institutions is the Government Decree No. 1849, which is issued on 19 December 2019 and replaces the previous decree regulation of the data exchange area.

- (i) Standards for the (a) definition of health data dictionaries [terminologies, classifiers, other taxonomies for eHealth] and (b) data exchange between health-centric information systems and services; and
- (ii) Standards for exchange of the data with non-health systems and services.

55. The development of an updated interoperable digital health infrastructure shall support the exchange of health data with other private and public health care providers nationally and across borders and enables continuity of care. Also, updated digital health infrastructure is suitable for the building of knowledge databases by interacting with other state databases and registries to enable the potential use of artificial intelligence.

56. To ensure a seamless exchange of medical and health data between different health-centric information systems and services, MOH shall lead the development and publication of a health data dictionary (HDD) building on and updating existing lists that will include catalogs of eHealth standards, services, and taxonomies.

57. A technical working group coordinating the development of the HDD shall be established, which shall include not only health sector representatives but also specialists from other agencies. For the support, MOH can also rely on the main institutes of digitalization as defined in the digitalization strategy of the Republic of Armenia.⁵

58. Health data dictionaries shall be based on international standards and taxonomies as much as possible. However, the implementation and use of international standards should not be a default choice, and the selection of standards shall be based on the following principles:

- (i) **The practicality of use of the standard.** The use of a standard shall serve a purpose. If the standard defines a process or system which is not used by existing solutions, then there is no need to implement the standard at this stage.
- (ii) **The level of preparedness of the health care providers and electronic medical records developers to use and enforce the standard.** The implementation of any standard shall be done gradually. If the sector is not ready, there is a need to start with preparatory work and capacity development prior to the implementation of a standard.

59. The mandatory fields for using international data exchange standards shall be the data exchange outside the ARMED system. For this purpose, the HL7 standard, a widely used eHealth standard for data exchange, is the selection of choice. The standard was implemented in the ARMED system from the beginning, and any other system processing health data, which requires data exchange with ARMED shall implement the HL7 and relevant modifications. The unified terminologies and classifiers should be used in a coordinated manner across the health care stakeholders, and also within ARMED.

60. The MOH is responsible for the implementation of medical and health data standardization, including medical terminologies, classifiers (e.g., International Classification of Diseases [ICD-10]), lists of provided medical and health care services in Armenia. HIAC at NIH is responsible for the adoption and implementation of health data exchange standards (e.g., HL7, Logical Observation Identifiers Names and Codes [LOINC], Digital Imaging and Communications in Medicine [DICOM], etc.), localization, development, and maintenance. Except for the ICD-10, other standards are not fully implemented yet, and HIAC mentions the need for further efforts to adopt and use these standards. All standards and interoperability frameworks documentation shall be versioned, published, and publicly available on the HIAC website.

⁵ Currently the digitalization strategy is in the development and discussion stage, thus there is no official document yet to refer to.

61. Currently, the classifiers and lists of medical and other health care services needed for reimbursement are developed, maintained, and published by SHA. While the expertise for such classifiers shall continue to be the part of this agency, however, these classifiers and lists shall become an integral part of the HDD and maintained according to the principles described above in this section.

62. eHealth and other health-related information systems shall be interoperable with other state information systems for specific purposes that need to be further defined. These systems include the systems and services operating at State Revenue Service, Ministry of Labor and Social Security, Civil Registry Agency, Police, etc. To support the data exchange with these agencies and institutions, MOH shall follow national eGovernment standards. At the policy level, MOH shall follow the recommendations and requirements of a responsible agency, the Ministry of High-Tech Industry (MOHTI). In the draft strategy, MOHTI defines the following standards: (i) functional standards, (ii) internal and external data circulation security standards and (iii) technical standards.

63. At the infrastructure level, health systems and services shall be compatible and interoperable with the e-Governance integration platform (GIP). Any exchange which requires interaction with other governmental institutions outside the health sector should be planned and designed for working through the GIP.

2. Interoperable eHealth infrastructure

64. The ARMED system does not function as an isolated IT system. For the provision of necessary services, it interacts with other information systems to get the required information (personal data of patients, electronic signatures, etc.). The growing demand for new eHealth services reveals the need for broader interoperability with other current and future information systems and services. The objective is to build a comprehensive eHealth infrastructure that will enable a health information exchange between different health information systems. The implementation shall support the expansion of interoperability (i) between health-focused systems and services, and (ii) between health and non-health systems and services.

3. Expanding interoperability with health-focused systems and services

65. Health-focused systems and services fall into two different categories (i) internal management information systems of ARMED subscribers (health providers, insurance companies, pharmacies, etc.), and (ii) health sector information systems and databases operating at the national level (drug registry, electronic registry of licensed health providers, health workforce information system).

66. For the implementation of the principle of single data entry and multiple use, the electronic health information system (EHIS) shall implement interoperability with other information systems operating at the national level. These systems shall serve as the primary data sources for the ARMED system regarding the data catalogs such as the registered drugs of the country, licensed health care providers, and of course, the health care personnel.

67. Given the interoperability challenges outlined in the background section, the strategy for the organization of effective data exchange will require guidance and leadership by MOH and additional efforts from the NEO to identify the needs for the future interoperable environment. The actions shall include:

- (i) The NEO shall develop and share all the necessary documentation based on integration interfaces of the ARMED system through the available means, including the ARMED web site. The third-party development and IT firms working in the development of information systems for health care facilities

shall create necessary interfaces with minimal involvement of ARMED specialists;

- (ii) Data exchange interfaces shall be available not only for hospital and ambulatory cases but also for all or at least for most of the data collection interfaces, including medical staff registrations, registries of the medical consumables and devices, etc.; and
- (iii) Provision of the security information for connecting with the ARMED system (application ID, security key) via web services shall be generated automatically after signing the contracts and receiving access to the account. Subscribers of such services shall be able to regenerate IDs and security information online according to the best practices for such an operation.

c. Establishing interoperability with non-health systems and services

68. The plans to implement additional eHealth services such as the electronic disability sheets, ePrescription, disease registry requires the ability of ARMED to exchange data with non-health information systems. It includes the systems operating in the Ministry of Labor and Social Security, State Revenue Committee, the electronic systems of the Ministry of Justice (Civil Status Acts Registration Agency), and Police of the Republic of Armenia. Having interoperability with these systems is important to ensure that ARMED interacts with the primary information sources.

69. Besides consuming the data from other systems, the electronic health information system shall be capable to provide certain data to other systems. In the meantime, preparation of various data exchange interfaces will require investing time and resource. Currently, the government, with the direct involvement of EKENG, is working on the implementation of a unified data exchange (GIP) system allowing to interconnect all information systems on a nation-wide scale. The project is in the final development stage. Thus, it is essential to evaluate the readiness of this system and work closely with EKENG to make the electronic health information system capable to connect to a GIP platform. This will also solve the consumption of data from the systems that is already connected to the GIP platform.

F. Focus Area 3: Leveraging Health Data Analytics and Reporting

70. Implementation of a national health information system is only the first step toward building a productive eHealth ecosystem. Currently, ARMED provides full data entry and reporting interfaces for the collection and reporting of information necessary for the MOH to plan and manage state-funded health services. However, the assessment of the overall utilization of the system by the end-users (health service providers, MOH, and the relevant agencies) reveals the need for improving the quality of data entry and enhancing reporting and introducing an analytical capability of the system. To achieve this goal, MOH shall consider the following objectives:

1. High-quality data collection and effective data processing

71. For effective data acquisition and reliable data processing, the electronic health information system shall meet the following requirements:

- (i) **Patient-focused.** The system should be designed in a way that it allows creation of a complete health profile of the patient based on the data collected during the health case registration;
- (ii) **Targeted.** Data collection should be targeted—that data collection shall not be generic for all users of the system and shall be adopted for each group of the users collecting the data;
- (iii) **Validated.** The system should implement data validation during data entry. The free text entry fields shall be minimized. Any information subject to

- categorization shall be standardized. The system should also implement data validation during the data processing (revealing double registrations, etc.);
- (iv) **Standardized.** Data collected in the system should follow national and international standardization requirements;
 - (v) **Customizable.** The system shall be designed in a way that it allows customization of the datasets in case of need without major program changes; and
 - (vi) **Legally approved.** Any information collected by the system shall follow the legal regulations. In case the system collects unusable or is not approved by the legislation, the data set shall be eliminated from the data acquisition process.

2. Improved data analysis and reporting capabilities of the MOH to effectively use data for decision-making

72. There is much potential to leverage data collection and storage for analysis and reporting. The assessment of the current capabilities of the end-users of the system (MOH, NIH, health care providers, physicians, etc.) indicates a low profile in using the data for the decision-making process. To improve the analytical and reporting capabilities of end-users, the MOH and the NEO shall implement four main tasks:

- (i) Empower the standard reporting capabilities of the existing system;
- (ii) Build an advanced analytical module and introduce new functions across the existing system and databases (ad-hoc reporting, data warehouse, etc.);
- (iii) Train the end-users of the system to utilize and visualize the existing data from the system effectively; and
- (iv) Implement geo-enabled health data analytics.

73. **Empower the standard reporting capabilities of the existing system.** Currently more than 20 statistical reports are prepared by HIAC. However, HIAC does not use the data from electronic health information system to produce these reports. Only after making the EHIS available for all health providers, the collection and compilation of yearly statistical information based on data from this system will become realistic. Thus, this shall be the target indicator for the NEO to empower the system capabilities supporting the statistical reports.

74. Standard reporting is the shortest way for users to get information from the system (standard reports are the pre-defined summary or detailed reporting forms). The NEO shall continuously improve these interfaces based on feedback from the users. Overall, any standard reporting forms shall have flexible filtering, grouping, and aggregation features to generate the same report for various perspectives (the same report shall be available to get for the health care provider, regional level or national level).

75. **Build an advanced analytical module and introduce new functions over the existing system and databases.** The national health information system shall support the ad hoc querying as well as advanced analytic features. Currently, only the NEO has access to advanced analytics. However, the NEO shall develop features in the system, allowing the users of the system (MOH, NIH, health care providers, etc.) to perform advanced analysis and ad hoc reporting outside of NEO's premises. In most cases, advanced analytics does not require the personified information of the patients. Thus, the NEO shall establish a depersonalized data warehouse solution to achieve the goal. Online analytical processing models (OLAP) of data storage shall be considered.

76. Moreover, the business intelligence frameworks shall be applied as well. The NEO shall provide access to the data warehouse whether through raw access or through predefined data analysis and reporting tools. In case the MOH prefers to use its analysis tools over the data warehouse, raw access to depersonalized data shall be considered. Such an approach

provides better flexibility to MOH and NEO in terms of using the data for the analysis. In case MOH does not have preferences in using specialized solutions for the data analysis, the NEO shall propose the relevant one, designed across the data warehouse.

77. **Train the end-users of the system to utilize the existing data from the system effectively.** Training is an integral part of achieving the effective use of health data for advanced analytics and data-driven decision-making process. MOH and the NEO shall plan targeted training courses for the various groups of users, engaging them in the data analysis and reporting processes.

78. **Implement geo-enabled health data analytics.** A geo-enabled health information system (HIS) is a system that fully benefits from the power of geography, geospatial data, and technologies through the proper integration of geography and time across its business processes. During the COVID-19 pandemic, the NEO implemented the mapping of the infected people over the map of the country. However, this feature of the system showed only the location of COVID-19 cases, while geo-enabled services include many more functions that are important to be considered and implemented. Geo-enabled health system implementation shall follow the principles of the HIS geo-enabling framework (Annex 1), as stated in the HIS Geo-Enabling Toolkit⁶.

79. The HIS geo-enabling framework should include nine elements that need to be in place for a HIS to be considered as geo-enabled. These nine elements are described in Annex 3. It is not obligatory that a geo-enabled system technically is part of the existing ARMED system. The geo-enabled system could be a separate system that interacts with the ARMED system in terms of gathering the necessary information for building the required maps and geo-enabled features. The geo-enabled system shall closely integrate or be a tool for the HIAC, as a primary beneficiary of the system, which prepares and distributes health system performance and statistical information.

G. Focus Area 4: Development and Implementation of New eHealth Services

80. The country's eHealth ecosystem is not static and will evolve in a continuous manner. This will require continuous learning, monitoring of the system, evaluation against user needs, adaptability, and modularity of the system. Currently, the ARMED system supports the following eHealth services:

- (i) Registration of patient visits and services (medical records);
- (ii) Population enrollment services (physician choice);
- (iii) eReferrals (except the referrals to laboratories) ;
- (iv) eBooking (partially);
- (v) Telemedicine consultations by PCPs (piloting);
- (vi) Vaccination inventory management;

81. The eHealth vision prioritizes the following eHealth services to be implemented by 2023;

- (vii) ePrescription;
- (viii) eReferrals;
- (ix) Electronic disability sheets;
- (x) Disease registries;
- (xi) Electronic registration books of health care providers;
- (xii) Telemedicine;
- (xiii) Health workforce information system; and
- (xiv) Geo-enabled health data services

⁶ Health GeoLab Collaborative. 2018. *HIS Geo-Enabling Toolkit Version 1*. https://www.healthgeolab.net/DOCUMENTS/HIS_geo-enabling_toolkit.pdf

1. Implementing ePrescription services

82. Electronic prescription (ePrescription) is described as a computer-based electronic generation, transmission, and filling of medical prescriptions. The goal of ePrescriptions is to make it more convenient for patients to obtain prescription medicines, improve drug prescription accuracy, increase patient safety, and reduce costs, as well as enable secure, real-time, bi-directional, electronic connectivity between clinicians and pharmacies. Implementation of ePrescription electronic services was under the MoH vision since launching the ARMED system and is considered an important part of the national eHealth ecosystem. The services are not functioning yet. ePrescription services shall address the tasks as described below:

- (i) **Promote and increase patient safety.** The services shall be designed and implemented in a way to ensure the prescriptions without errors;
- (ii) **Support instant clinical alerts.** The services shall support clinical alert mechanisms allowing physicians to prevent adverse drug events caused by allergies, interactions with other drugs or treatments, and other factors—like high dosages and chronic use of specific medications;
- (iii) **Tracking prescription fulfillment.** ePrescription services shall help doctors track if patients have picked up the next refill or not. In this way, these systems can let clinicians know which people are staying on top of their medication and which may have stopped following prescribed treatment;
- (iv) **Increase prescription efficiency.** ePrescription interfaces shall be designed and implemented in a way allowing clinicians to fill in the necessary fields of prescription automatically;
- (v) **Reduce readmission cases.** ePrescription services shall reduce errors, and this shall be available for the decision-makers to measure and monitor the rate of readmission over time; and
- (vi) **Cost savings.** Overall, all these advantages also shall result in cost savings for practices that adopt ePrescription services.

83. From a technical standpoint, there are two approaches to the implementation of ePrescription services (integrated and standalone services). For Armenia, the integrated approach is the recommended model due to several factors. The country has an ARMED accessible for most of the health care providers. According to the information from the NEO, the ePrescription functionality has already been developed in this system but has not yet been rolled out. This can allow the ARMED system to manage the data in a centralized manner and link the prescription information with the patient data. Physicians do not need to use different interfaces to access patient information and prescribe medications. It is also important that ePrescription services are interoperable with the national drug registry, as described in the previous section.

84. The implementation shall be a gradual process. In the first stage, ePrescription shall be implemented in Yerevan. The pilot stage shall last at least 4-6 months, allowing to reveal the issues regarding the implementation stage. This stage can also be divided into the partial and full coverage of all health service care providers and pharmacy network.

85. Prior to the implementation stage, training for the health care service providers and pharmacy personnel shall be organized. MOH shall ensure that pharmacies joining the network have the necessary technical and human resource capacity to utilize the ePrescription services at the required level. It should be also noted that there is a legal issue related to subscribing to ARMED system by pharmacies. Pharmacy networks subscribing to ARMED as single legal entity are able to access the system online from different locations, but they are nevertheless required to sign separate contracts and pay additional subscription fees for each pharmacy included in their network (i.e. for each location), otherwise they may face suspension of license. Therefore, the required regulatory framework (government decree,

minister order, etc.) shall be developed and adopted and already be in place before starting the implementation process.

2. eReferral system

86. The eReferral system was launched in early 2020. It allows referrals from PHC specialists, and this service is online for all health care providers. In October 2020, NEO included some laboratories in the system interacting electronically with the health care facilities. These efforts shall be continuous, and the access to the ARMED system shall expand to all laboratory service providers. This will allow the full automation of not only the referrals but also the collection and processing of the results of lab examinations. The implementation of the necessary components of eReferral system shall be finalized at the beginning of the year 2021.

3. Electronic disability sheet

87. Digitization of the disability sheets is one of the priority tasks to implement as a part of enhancements of the electronic health information system. To implement this subsystem, there is a need for close cooperation with the Work Information and Analytical Center at the Ministry of Labor and Social Security (MLSA). In 2017, after the implementation of the electronic health information system (EHIS), NEO initiated workgroup meetings and discussions with the MLSA to plan and implement electronic disability sheets. However, there were technical issues revealed during these discussions, which are mainly connected with the structure and functionality of electronic systems at MLSA. These systems were designed and used a decade ago and had incompatibilities in terms of interoperability. In the meantime, MLSA plans to upgrade the existing information systems and to implement a unified social security services management information system. From this perspective, it is essential that MOH, jointly with NEO, initiate the technical level discussions during the design period to ensure the required level of interoperability with the MLSA system.

4. Implementing disease registries

88. The goal of this task is the implementation of special disease registries aimed to enhance the capacity of MOH and health care providers to manage common chronic conditions of the population. The national vision on the development of eHealth for the upcoming years identifies the need for developing and implementing disease registries for cancer, diabetes, coronary heart disease, arterial hypertension, mental diseases, and narcology patients.

89. Disease registries are the special type of patient registry widely used in public health practice for the management of health problems. By definition, the disease registry is an organized system that collects, analyses, and disseminates the data and information on a group of people defined by a particular disease, condition, exposure, or health-related service, and that serves predetermined scientific, clinical, and/or public health (policy) purposes. By tracking patient information, a disease registry helps physicians and other members of the care team to identify and reach out to patients with gaps in care. It also prompts them to ensure that appropriate and timely care is provided during patient visits. The registries shall allow health professionals and decision-makers to:

- (i) Ensure regular follow-up of the target population by the care team;
- (ii) Serve as a data source for the development of evidence-based guidelines into daily clinical practice;
- (iii) Integrate specialist expertise and primary care;
- (iv) Provide timely reminders for providers and patients;
- (v) Identify relevant subpopulations for care;
- (vi) Facilitate individual patient care planning;

- (vii) Share information with patients and providers to coordinate care; and
- (viii) Monitor performance of the practice team and care system.

90. The primary function of a disease registry is to provide multiple views of information about a list of patients for use in three situations⁷:

- (i) **At the point of care**—to provide patient-specific information (e.g., lab results, medication lists) and advice to support decision making (typically a report or display called a visit planner or patient profile and often including specific treatment recommendations);
- (ii) **Between visits**—for use in identifying patients with apparent gaps in care (patient lists, called exception or outreach reports); and
- (iii) **Periodically**—to provide status reports showing aggregate information about the patient population for treatment progress and continually improving care delivery (population reports).

91. Disease registries shall provide three types of outputs:

- (i) **Detailed reports**—printed patient reports at the point of care provide information on specific conditions and prompt provider teams to conduct appropriate assessments, deliver recommended interventions, and capture data to update patient records.
- (ii) **Aggregated reports**—provide information about how well individual care teams and the overall provider organization are doing in delivering recommended care to the patient population.
- (iii) **Notifications**—are registry generated exception reports that identify patients who are overdue for care or are not meeting management goals, and include important patient information such as last visit and test date to develop an appropriate outreach strategy for each patient.

92. Successful implementation of a disease registry requires physicians and medical groups to consider several important issues:

- (i) **Ensure up-to-date, complete, and accurate patient information.** Because of the burden of manual data entry, electronic feeds of data from practice management, laboratory, claims systems, or electronic medical records are highly desirable. Careful attention to the quality of the data is needed, regardless of the source of registry information.
- (ii) **Integrate registry use into the workflow of the clinic or practice.** Using a registry requires care teams to rethink how they prepare for and conduct patient visits, create new processes for following up with patients, and produce and distribute feedback reports.

93. Delivering these functions requires that the registry manage patient information in a centralized database and include an application that can deliver multiple views of that information. Thus, disease registries shall be part of the existing EHIS.

94. Disease registries shall supplement rather than replace individual patient medical records and should support providers in the treatment setting. They help assure that data are complete, readily available, and arranged to make it easier for care teams to deliver the appropriate care and follow-up to each patient. The table in Annex 2 defines the basic and advanced functions of the disease registries.

5. Telemedicine

⁷ J. Metzger. 2004. *Using Computerized Registries in Chronic Disease Care*. California Healthcare Foundation. https://www.chcf.org/wp-content/uploads/2017/12/PDF_ComputerizedRegistriesInChronicDisease.pdf

95. The telemedicine allows distant video or audio meetings to be conducted between a patient and their healthcare professional as an effective tool for remote consulting. In some cases, doctors may use telemedicine to prevent the spread of COVID-19, flu and other infectious diseases. It also reduces the need for sick people to visit medical facilities. This is especially true for pregnant women, elderly, or patients with chronic or immune deficiencies. The tool can also be used instead of scheduled patient visits to the primary care physician for medication referrals.

96. The implementation of nationwide telemedicine services is closely connected with the status of ICT infrastructure of the country. Telemedicine services are not included in the Law on Medical Assistance and Service to the population as a component of EHIS. In 2020 NEO implemented a pilot on telemedicine. However, there are also other plans to implement telemedicine services in various particular areas. The Global Fund and the Asian Development Bank are supporting the Extension for Community Healthcare Outcomes (ECHO) project, which aims to implement telemedicine services for the management of tuberculosis patients. Thus, the telemedicine services shall be considered both as a part of the EHIS and as standalone solutions for solving the specific health issues.

6. Health workforce information system

97. The importance of the need for a comprehensive, flexible, and effective human resources for health information system was highlighted once again during the COVID-19 pandemic. For emergency planning and appropriate distribution of medical personnel during the pandemic, MOH was continuously requesting the relevant information directly from the health care providers, as neither the existing statistical information from HIAC or the data available from ARMED were able to meet their requirements.

98. In a national context, an electronic health workforce registry should be considered the single authoritative source of health workforce information that can provide an accurate count of all health care personnel that either has worked or are currently working at the national level. The main core functions of the system are the registration of the workforce information, support for the continuous education and qualifications of physicians, and the reporting and analytical capabilities of the system.

99. The functions of such a system are the following:

- (i) Build a complete electronic database of medical personnel;
- (ii) Properly maintain, update, and keep up to date the medical workforce information system;
- (iii) Support the continuous professional training and development system requirements;
- (iv) Provide the necessary information for supporting the annual statistical reporting and emergency planning;
- (v) Provide the reporting and analytical tools for the management as well as planning and forecasting the medical workforce needs; and
- (vi) Provide necessary information about the medical personnel to other information systems through interoperability.

100. The business intelligence and analytical tools of this system can benefit from applying artificial intelligence (AI). By using these innovative approaches, MOH can forecast and plan the needs of medical personnel for upcoming years and during emergency situations. Information sharing with other information systems will require ensuring the interoperability of the system. AI and interoperability would lend the system innovative features.

H. Focus Area 5: Empowerment of Health Care Service Providers for the Effective Use of eHealth Services

101. Health care providers are the key consumers of the ARMED system and other health information systems. The effective uptake and use of the system by health care service providers is essential in terms of data collection, verification, and reporting and to ensure the sustainability of eHealth development. To achieve the goal, it is essential to effectively engage with end-users, assess their needs, and build their capacity.

1. Enhancing the IT capacity of the medical personnel and administrators

102. The analysis of the digital skills of health care professionals and administrators reveals a considerable gap between the needed skills for fluent use of ICT and the current situation. This applies both for primary and secondary use of data. Most of the digital data that is sent to ARMED by health care institutions are entered manually by data entry operators from paper forms previously filled by the nurses and physicians. To avoid wasting human resources and potential mistakes, the data should be entered in the place where it is generated, either by physicians or by nurses, if the latter provides health care services independently. Thus, there is a need to design and implement a training program for physicians and nurses. This would allow medical personnel to perform the data entry effectively and integrate data collection as part of the clinical workflow. At the same time, multiple data entry forms should be avoided to not burden health care workers. Besides, the health care professionals shall undergo training on basic aspects of cybersecurity to avoid phishing emails and other security risks. Current positions of data entry operators must be used more for data analytics and data quality control instead of mechanical data entering.

103. It is also important to engage universities to implement courses on eHealth. Currently, NEO works with Russian-Armenian (Slavonic) University to implement the postgraduate courses on eHealth. Such platforms shall be considered also in future as potential sources for better preparation of eHealth specialists.

2. Enhancing the technical capacities for more effective use of the eHealth services

104. In the last decade, health care service providers advanced in the use of computers and different software packages during the everyday work process, including for collecting and processing health data and preparing reports. Results of the joint assessment carried out in 2019 by MOH and ADB demonstrate, that data entry personnel at health facility level is able to properly implement data entry and reporting requirements when using ARMED and other electronic health systems. However, such capacities were developed mainly by administrative staff who deal with ARMED, while most of the health workers still lack similar skills. Most of the health organizations are able to procure and maintain the necessary equipment for the medical personnel. However, there is a further need across health system for the support to keep sufficient computer equipment for accessing the eHealth services, as well as to provide continued technical maintenance and upgrading of existing equipment. Another important factor is the access to the eHealth services through the high speed wired internet, which allows the consumers of the system to work effectively while uploading and downloading medical files such as scanned documents, radiology images (x-ray, etc.) and use the telemedicine services. Thus, there is a need for closer cooperation with ICT sector representatives to reveal the existing gaps and to find better approaches for the development of proper ICT infrastructure.

I. Focus Area 6: Empowering the Population with Access, Handling, and Use of eHealth Services

105. Supporting patients to become active in managing their health care and wellbeing underpins the shift from reactive to preventative health care. Empowered people are enabled to make the right health care related decisions and have access to better value care. To achieve the goal, the features of the patient portal of the ARMED system shall be enhanced. Parallel, with the technical enhancements the MOH shall work to raise public awareness of the population for the broader use of electronic health services. Updating the electronic health information system, including new functions for the patients will encourage access to information and targeted prevention among the population.

106. The individual person/patient interacts with the system through the patient portal. Currently, the patient portal provides access to various features, including creating and managing appointments, limited view functions to medical history and cases, which are mainly available for the publicly-funded BBP cases. However, the patient portal shall be enhanced and shall include other features as described below:

- (i) Patient shall be able to register and manage appointments;
- (ii) Patient has access to a complete history of the cases registered in the system;
- (iii) Patient has access to the prescribed medication lists, labs, and test results;
- (iv) Patient shall be able to register and initiate a telemedicine session through the patient portal;
- (v) Patient portal shall provide self-examination service;
- (vi) Patient portal shall allow the patient to export and print any medical documentation related to the cases of the patient;
- (vii) Patient portals have general purpose and patient centric educational materials; and
- (viii) Patient portals implement updatable health-related news, with a focus on the patient specifics.

107. Below are actions to enhance the patient portal functionalities and to increase the access of the portal for the population.

- (i) **Technical enhancement of the system to provide more features for the patients to interact with the health information system.** The NEO shall add missing functions to the patient portal as a part of the system's continuous development plan. The requirements shall be discussed with the MOH according to the contract and relevant organizations based on the regular assessment and monitoring activities.
- (ii) **Public awareness campaign to enhance the awareness of the population using electronic health services.** The public awareness campaign shall run continuously, encouraging the selected population to broader use of the available eHealth services through the patient portal. For this activity, NGOs and other resources shall be involved.
- (iii) **Monitoring and analysis of the use of the patient portal by the population.** MOH shall monitor the processes of technical enhancement and public awareness campaigns. The surveys and assessments shall be organized to evaluate the effectiveness, user-friendliness, and patient-centeredness of the portal and based on the result of the evaluation, the necessary corrections to be made in the overall process. The NEO shall also be involved in surveys and assessments implemented by the MOH.

108. It is also important to consider the security aspects related to the use of personal information. Legal acts and regulations related to accessing the patient portal in the EHIS shall include an agreement about access rights to data, rules for accessing the EHIS data and processing of personal health data. The person-centered approach of an EHIS intends to allow and prohibit access to a person's health-related data upon the decision of the person. This decision shall be related to health care professionals, a body conducting an investigation, researchers, and policymakers, except in the situation where the access to personal health

data of the person is required to protect the vital interests of the data subject or of another natural person where the data subject is physically or legally incapable of giving consent. Below are the principles on which the management of personal data shall be organized when the patient is involved in the process of consent.

- (i) Personal health data fields in the electronic health information system are defined by law;
- (ii) Patient interacts with the health information system through the patient portal—the integrated module of the ARMED system;
- (iii) Patient must register in the system through the tools officially approved by the MOH and according to the national requirements;
- (iv) Patient and his or her legal representative have access to his or her data in the health information system;
- (v) Patient has the right to prohibit the access of a health care provider and a health care specialist to the personal data in the health information system;
- (vi) Health care provider shall, on a wish expressed by a patient, prohibit immediately access to the personal data of a patient in the nationwide electronic health information system;
- (vii) Patient has the right to close and reopen his/ her personal medical data in the nationwide electronic health information system;
- (viii) Officials of the State Health Agency (SHA) have access to personal data in the health information system for the financing of provided quality health care services;
- (ix) For national statistics, criminal and judicial proceedings, registration of common diseases of animals and people, as well as in emergency situations for organizing and implementing preventive measures, including medical care and service, the personal data shall be issued and may be exchanged from the nationwide electronic health information system without the consent of the data subject in line with the legal requirements set by the law;
- (x) Officials of the Healthcare and Labor Inspectorate of the Republic of Armenia have the right to access personal data in the health information system for the supervision of health care professionals and health care specialists; and
- (xi) Personal data shall be issued from the health information system only with the signed consent of the data subject and/ or based on provided legal ground.

1. Leadership and governance

109. International experience shows that large-scale eHealth systems are successfully implemented if the design and implementation are clearly governed with strong leadership. The success of the digitalization of health care data and processes depends on the involvement of all stakeholders in health care. The digitalization should cover the whole process that is re-engineered; otherwise, the result is a duplication of analog and electronic activities, causing frustration of the workforce and increase of expenses. Therefore, the digitalization of health care requires dedicated leadership and the gradual implementation of new e-services according to an agreed implementation plan. Every step of eHealth system design and development must have a process owner, implementation plan, and performance indicators. For the implementation of the strategy efficient governance structure shall be organized with a task to ensure the achievement of all strategic eHealth goals defined in the strategy document.

110. In Armenia, the MOH has taken the leadership of national eHealth services development. The ministry is leading the implementation of the eHealth strategy, ensures consistency of the e-services with the health care policies and the legal aspects of eHealth services, coordinates the work of eHealth strategy implementation between health care stakeholders, and ensures that the achievement of the strategic goals is in line with MOH requirements. This is high-level governance to align the digitalization of health care with other

e-government developments and guarantee the achievement of the goals of the government. MOH coordinates the ARMED system integration with the EKENG electronic signature system—the electronic system of the Armenia Police’s population registry, birth and death certificate registry, and other intersectoral services. The MOH led by the Deputy Minister in charge of eHealth will appoint specific organizations and departments to be responsible for particular processes of health care digitalization. It also establishes committees and boards for coordinated implementation of national eHealth services. One of these committees will be the **eHealth Strategy Implementation Working Group** steered by MOH which will be responsible for coordinating the implementation of strategic goals and monitoring eHealth strategy implementation (Figure 1).

111. To implement the objective of the strategy, MOH shall carefully plan and closely work with the NEO. MOH shall analyze the regular feedback from end-users and develop a plan for improvements with the NEO. Each year, MOH shall perform the assessment of existing functions of the system to collect and retain timely feedback from the users. For this purpose, MOH shall involve independent institutions capable of performing nationwide surveys. MOH shall analyze the result of studies with the NEO to develop a detailed plan of action for improvements. It is of utmost importance to agree and appoint responsible people and organizations of key activities for implementation of national eHealth services.

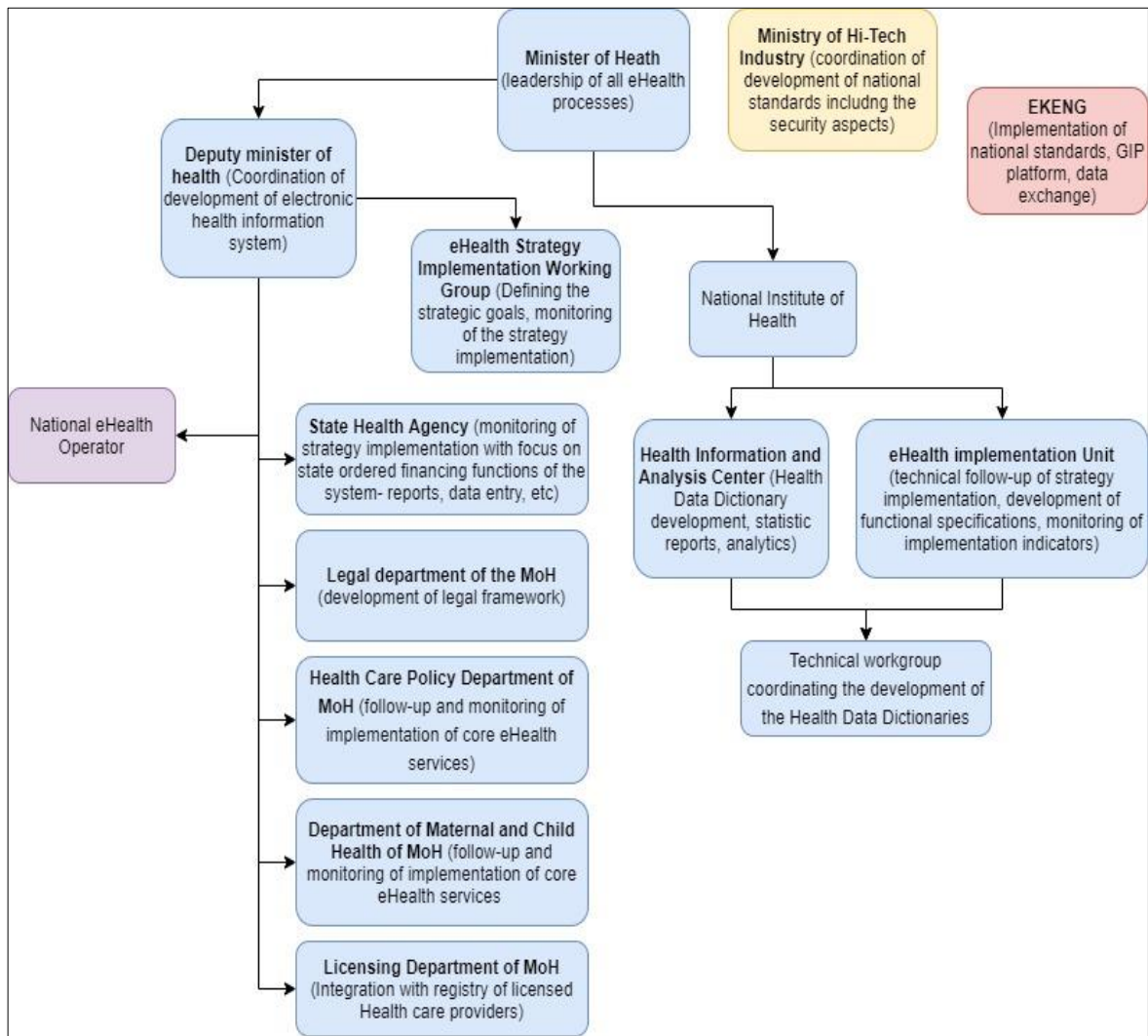
112. Development and maintenance of Electronic Health Information System (EHIS). The technical development and maintenance of EHIS are assigned to the NEO, on a concession basis. NEO provides access to and contracts subscribers of the EHIS.

113. From the government perspective and to ensure the coordinated involvement of other healthcare-related information systems, the eHealth Implementation Unit (EHIU) of NIH will be a responsible partner. EHIU will be responsible for the efficient coordination of the development process of particular e-services and fulfillment of agreed development tasks, i.e., the management of development projects. Also, it controls the realization of the expectations of the MOH (e.g., deadlines, results, budget) and ensures the necessary capacity for implementation and efficient use of the eHealth services (competence and skills of users; service development know-how and methods).

114. NEO will use standards published by EHIU and share all necessary documentation for the integration of interfaces of the ARMED system through the available means, including the ARMED website. The third-party and IT developers working on the development of information systems for health care facilities should be able to create necessary interfaces with minimal involvement of ARMED specialists. Data exchange interfaces will be available not only for hospital and ambulatory cases but also for most of the data collection interfaces, including medical staff registration, registries of the medical consumables and devices, etc.

115. The MOH, supported by the eHealth Strategy Implementation Working Group must ensure that health care providers (public and private, PHC providers and hospitals) will work closely with the NEO to integrate their systems with ARMED. NEO will be responsible for the integration of the Emergency Cases Management System with ARMED in cooperation with MOH.

Figure 1: Leadership and Governance Organogram



116. **Making proposals for new services and tools in EHIS.** Different stakeholders in the health care domain could make proposals for the improvement and development of new services in ARMED. The proposals are evaluated by the eHealth Strategy Implementation Working Group, which prioritizes the tasks and orders technical development from NEO. eHealth Implementation Working Group invites representatives of health care professionals' societies and patient associations for discussions about the status and needed improvements of EHIS services and patient portal.

117. The main task of the eHealth Strategy Implementation Working Group in the coming few years is to ensure that the ARMED system will support health care professionals in clinical work, collection of digital data, reporting of yearly statistical information, and quality of care indicators.

118. **Adjustment of legal acts and regulations for the implementation of national eHealth services.** The legal department of the MOH is responsible for collecting proposals from health care stakeholders for adjustments in current legal regulations and for proposing necessary changes in the legislative documentation to implement national eHealth services. There is a need to define a minimal set of medical data and information that should be

exchanged by health care providers and government authorities through national eHealth services. Also, once the consumers of the EHIS are the health care facilities providing state-funded services and most health care providers are not using ARMED to collect and share data about paid services and cases, there is a need to legally bind health care providers to sign for EHIS use to ensure health care data integrity.

119. Reimbursement of state-funded health care services for health care providers. Currently, one of the main functions of ARMED is to provide the State Health Agency (SHA), which is responsible for the reimbursement of state-funded health care services, with information on medical activities performed by health care organizations. SHA will be responsible for the development of a health care services classifier (list of services and diagnose related groups [DRG]) that would be used for reporting of medical activities through ARMED. The expertise for such classifiers will be part of SHA knowledge. SHA will be a partner for NEO in the development of a reimbursement information system that should be functionally separate from electronic medical records and eHealth services used by medical specialists for diagnosis, treatment, rehabilitation, and long-term care of the patient.

120. Digital data standards, data exchange standards and health data dictionary (HDD). Medical and health data standardization, including medical terminologies, classifiers (e.g., ICD-10), lists of provided medical and health care services in Armenia, is the responsibility of HIAC.

121. The EHIU at NIH is responsible for the adoption and implementation of health data exchange standards (e.g., HL7, LOINC, DICOM, etc.), localization, development, and maintenance. All standards and interoperability frameworks documentation shall be versioned, published, and publicly available on the EHIU website.

122. HIAC shall lead the development and publication of an HDD that includes catalogs of eHealth standards, services, and taxonomies. A technical workgroup coordinating the development of the HDD will be established, which shall include representatives from EHIU, HIAC and also specialists from other agencies including EKENG and Ministry of High-Technology Industry.

123. Registry of licensed health care providers. The Licensing Agency of the Ministry of Health is responsible for collecting, storing, and reporting the information about the licensing of medical organizations.

124. Health workforce information system. There is an urgent need to develop digital registries of health care professionals and organizations. The overall leadership of this process should be under the MOH. The Deputy Minister of Health shall lead the process while the human resource department of MoH jointly with National Center for Certification and Professional Development shall advise and assist in the implementation of the system.

125. Development of digital registry of medicines and medical devices/aids. Scientific Centre of Drug and Medical Technology Expertise is responsible for keeping records and database of medicines. The database will be integrated with other systems, including the ARMED. The centre, with NEO will develop necessary applications to connect with ARMED.

126. Development and maintenance of disease registries. The owner of the registries is the MOH. NEO will be responsible for technical development and maintenance of different disease registries defined by the Health Care Policy Department of MOH. The implementation of disease registries shall be coordinated with HIAC.

127. Health care statistics and public health reporting. The HIAC at the NIH will be responsible for developing an information system for health care statistics and public health

reporting. The main source of data will be ARMED. NIH will be responsible for cleaning and normalizing collected digital data. NEO will be responsible for the improvement of the analytical and reporting capabilities of end-users. NEO, in cooperation with MOH, will empower the standard reporting capabilities of the existing system, build an advanced analytical module, and train the end-users of the system to utilize and visualize the existing data from the system effectively. NEO is responsible for developing EHIS to allow the users of the system (MOH, NIH, health care providers) to perform advanced analysis and ad-hoc reporting outside of NEO's premises.

128. **Data privacy and security.** Data privacy and security are the primary responsibilities of MOH. Multidepartment efforts will be needed with the involvement of the MOH legal department as the primary responsible department to reveal the legal aspects of data privacy and security, with further establishing the legal basis in this area.

J. Funding Options

129. The implementation of the proposed eHealth system requires appropriate funding. Since there are various governmental and non-governmental parties involved in the implementation of the strategy, the sources, and the mechanisms for funding of strategical tasks are different. In general, the funding sources can be grouped into the following categories:

- (i) Ministry of Health (on behalf of the government);
- (ii) Health care providers;
- (iii) Public insurance funds⁸;
- (iv) Private sector investments; and
- (v) Development partners.

130. In the first stage of eHealth implementation (2017-2019), MOH subsidized some of the medical organizations (mainly the publicly owned regional hospitals and PHC providers) for the maintenance services of the eHealth system. In the meantime, according to the vision of the current strategy, MOH has to exclude the future subsidy of the organizations for eHealth service maintenance of the medical service providers. MOH shall consider funding the activities which are used for further development of the system, rather than subsidizing the health care organizations.

131. Health care providers shall continue to pay for the services. This mechanism of the payment will eventually become the core source for funding of the eHealth activities. The service cost shall be calculated and included in the annual budget of the medical organizations. Health care providers shall also invest in their internal management system with close cooperation with local ICT organizations. The model shall comply with the standardization requirements from MOH. Such spending includes but is not limited to the acquisition and administration of hardware and software, and/or to software development. In parallel with the development of public insurance, the above-mentioned mechanisms are subject to change and shall be revised accordingly.

132. International donors are expected to play an important role in the funding of eHealth development and enhancement during 2021-2023. International funding shall be used for the development, integration, and implementation of other health information systems such as the registry of the medical personnel, licensing, drug expertise. International partners are expected to support the activities for the development of the standards, preparation of eHealth specialists, mHealth (mobile Health) specialists. MOH, as a part of international cooperation, shall pay special attention to the necessary directions and actively stimulate entrepreneurship or research and development.

⁸ Social Health Insurance Fund is yet to be established after Armenia adopts the Universal Health Insurance Concept.

133. Mainly, private sector investments shall be concentrated on the development of health care providers' internal management systems, adoption, and integration with the central eHealth services. MOH shall use different cooperation models with the private sector for the quicker spreading of innovation related to e-services in the health care system, as well as for the development of national potential in the areas of health care, informatics, etc. Avoiding vendor lock-in and ensuring the private sector adheres to standards (promoted by MOH) is also important and shall be taken into consideration.

K. eHealth Implementation Roadmap and Action Plan

134. Table 2 describes the key development focus area and the corresponding actions.

Table 2: eHealth Roadmap and Action Plan

No.	Focus area and actions	Timeline											
		2021				2022				2023			
		1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th
		quarter				quarter				quarter			
1	Development and implementation of the legal framework for eHealth services												
1.1	Minister's order "On approving the training requirements and procedures for the users of electronic health information system."												
1.2	Minister's order "On defining the minimum technical requirements and specifications for connecting (to become a subscriber of) to electronic health information system."												
1.3	Minister's order "On defining the procedures for defining, managing and maintaining the disease registers, and those who responsible for maintaining the disease registers."												
1.4	Minister's order "On defining the rules for viewing health data by patient through the patient portal, the scope of the patient's access to the information with the consent of the patient (or his / her legal representative), the rules for accessing the patient's electronic health information and consent form for entering the patient portal."												
1.5	Minister's order "On defining the rules and requirements for implementing the telemedicine."												
1.6	Minister's order "On defining and approval of the procedure for entering personal, including special category and medical data, by health licensees in the electronic health information system."												

	Review of service operating conditions of NEO in line with the requirements and standards of the RA.													
2	Development of standards and implementation of interoperability between systems													
2.1	Adopt the ARMED system to use the translated version of LOINC and SNOMED standards. Review data exchange standards for interoperability and adapt latest data exchange standards.													
2.2	Integration of the electronic health information system with the information system of the State Revenue Committee.													
2.3	Integration of the electronic health care system with the information systems of the Ministry of Justice.													
2.4	Integration of the electronic health care system with the information systems of the Ministry of Labor and Social Affairs.													
2.5	Integration of the electronic health care system with the Police.													
2.6	Integration of the electronic health care system with the document validation platform.													
2.7	Integration of the electronic health care system with the electronic notification platform.													
2.8	Expanding the interoperability with health-focused systems and services.													
3	Leveraging health data analytics and reporting													
3.1	Empower the standard reporting capabilities of the existing system.													
3.2	Build an advanced analytical module and introduce new functions over the existing system and databases.													
3.3	Train end-users of the system to utilize the existing data from the system effectively.													
3.4	Implementation of geo-enabled features of the system.													
4	Development and implementation of new eHealth services													

4.1	Development of electronic referral subsystem and implementation at full scale.	■	■	■										
4.2	Digitalization of disability sheet and introduction of electronic disability sheet subsystem.	■	■	■	■									
4.3	Processing of electronic prescription subsystem and digitalization of prescriptions used by medical facilities.	■	■	■	■									
4.4	Implementation of the disease registry for the diabetes.	■	■	■	■	■	■	■	■	■	■	■	■	
4.5	Implementation of the disease registry for the coronary heart disease.	■	■	■	■	■	■	■	■	■	■	■	■	
4.6	Implementation of the disease registry for the arterial hypertension.	■	■	■	■	■	■	■	■	■	■	■	■	
4.7	Implementation of the disease registry for cancer.	■	■	■	■	■	■	■	■	■	■	■	■	
4.8	Implementation of electronic registration books used by health care providers (drugs, referrals, disability certificates, vaccinations, pregnancy cases and dispensary registrations).	■	■	■	■	■	■	■	■	■	■	■	■	
4.9	Implementation of electronic versions of documents provided to the patient.	■	■	■	■	■	■	■	■	■	■	■	■	
5	Empowerment of health care service providers for the effective use of eHealth services													
5.1	Enhancing the IT knowledge and skills of medical personnel.	■	■	■	■	■	■	■	■	■	■	■	■	■
5.2	Enhancing the technical capacities of health care providers for more effective use of the eHealth services.						■	■	■	■	■	■	■	■
6	Empowering the population with access, handling, and use of eHealth services													
6.1	Improving the patient portal and introducing new functions.			■	■	■	■	■	■					
6.2	Public awareness campaign to enhance the awareness of the population using patient portal of electronic health information system.						■	■	■	■	■			
6.3	Monitoring and analysis of the use of the patient portal by the population.									■	■	■	■	■

L. Monitoring and Evaluation

135. Monitoring and evaluation play an essential role in demonstrating the progress that a country is making towards the development of its national eHealth environment and the results of changes that these efforts are delivering. Establishing a successful national monitoring and evaluation framework requires dedicated resources and effort, often at various levels, to develop, manage, and operate an effective process. The government should consider monitoring and evaluation as part of the planning and costing of their national eHealth programs, thereby ensuring that appropriate resources are dedicated to the work.

136. A monitoring and evaluation framework enables a government to track and assess the results of implementing the eHealth action plan.

- (i) **eHealth outputs**—the deliverables, such as eHealth components, resulting from the activities undertaken (as above);
- (ii) **eHealth outcomes**—the strategic outcomes that eHealth outputs enable or contribute to enabling; and
- (iii) **Impact**—the change that eHealth outcomes create for health and non-health sector stakeholders.

137. A monitoring and evaluation framework assigns accountability (who) and determines the approach (how) and timing (when) for measuring the results. An effective monitoring and evaluation framework is constructed around a set of meaningful indicators, the measurement of which provides insight into the adoption, use, and results that eHealth is delivering.

138. Monitoring the progress of the action plan requires an understanding of where a country is starting from (baseline measures) and what it is expecting to achieve (target measures). National governance provides oversight, coordination, and guidance for monitoring and evaluation efforts and ensures timely intervention when there appears to be a divergence between what is happening and what a country was aiming to achieve through its eHealth program. Table 3 describes the outputs mapped against the strategic goals and the parties responsible for outputs while Table 4 shows the performance indicators and the recommended quantitative values of indicators.

Table 3: Outputs mapped to the strategic goals

No.	Output	Responsible Agency
1.	National eHealth services are equally available for all the eHealth consumers over the country.	
	1.1. All health care providers are subscribers of the electronic health information system (EHIS). 1.2. Medical laboratories are subscribers of the electronic health information system and have access to electronic referrals. 1.3. Pharmacies are subscribers of the electronic health information system and have access to the electronic prescription system	<ul style="list-style-type: none"> • eHealth Implementation Unit • National Health Operator
2.	The core of national eHealth services is the electronic health information system.	
	2.1. EHIS implements electronic medical records, electronic disability sheets, electronic referrals, electronic prescriptions, and telemedicine services. 2.2. EHIS has electronic registries of diseases, including diabetes, coronary heart disease, arterial hypertension, and cancer.	<ul style="list-style-type: none"> • Health Care Policy Department of the Ministry of Health (MOH)

No.	Output	Responsible Agency
	2.3. EHIS implements functions for the maintenance of care providers' registration books and functions for provision of medical documents for patients in electronic format.	<ul style="list-style-type: none"> • Department of Maternal and Child Health of MOH • Health Information and Analysis Center of National Institute of Health (NIH)
3.	<p>National eHealth services collect and use health data in accordance with corresponding legal and regulatory documents.</p> <p>Ministerial orders are developed and adopted, including:</p> <p>3.1. Minister's order "On approving the training requirements and procedures for the users of electronic health information system."</p> <p>3.2. Minister's order "On defining the minimum technical requirements and specifications for connecting (to become a subscriber of) to electronic health information system."</p> <p>3.3. Minister's order "On defining the procedures for defining, managing and maintaining the disease registers, and those who responsible for maintaining the disease registers."</p> <p>3.4. Minister's order "On defining the rules for viewing health data by patient through the patient portal, the scope of the patient's access to the information with the consent of the patient (or his / her legal representative), the rules for accessing the patient's electronic health information and consent form for entering the patient portal."</p> <p>3.5. Minister's order "On defining the rules and requirements for implementing the telemedicine."</p> <p>3.6. Minister's order "On defining and approval of the procedure for entering personal, including special category and medical data, by health licensees in the electronic health information system."</p>	<ul style="list-style-type: none"> • Legal Department of MOH • Health Care Policy Department of MOH • Department of Maternal and Child Health of MOH • NIH
4.	<p>Health data collected and processed in electronic format are unique, reliable, and of high quality.</p> <p>4.1. Medical personnel is trained and capable of using all functions of the EHIS, including the registration of medical records, management of disease registries, electronic referrals, electronic prescriptions, electronic disability sheet, telemedicine services, electronic registration books.</p> <p>4.2. The integration of the EHIS with other health information systems is in place including the emergency case management system, birth and death certificates registration services, electronic registry of health care providers, health workforce information system and hospital information systems.</p>	<ul style="list-style-type: none"> • eHealth Implementation Unit • National Health Operator
5.	<p>Data collected by the national eHealth services represent meaningful information for health policy development and useful in terms of using evidence-based decisions.</p>	

No.	Output	Responsible Agency
	5.1. Standard reporting capabilities of the existing system are enhanced and in place. 5.2. Advanced analytical module and introducing new functions over the existing system and databases are in place. 5.3. End-users of the system, including the MOH, NIH and users from the regional health and social security departments, are trained to utilize the existing data from the system effectively. 5.4. Geo-enabled features of the system are in place.	<ul style="list-style-type: none"> • Health Information and Analytical Unit of NIH • eHealth Implementation Unit
6.	The EHIS is interconnected with other health and non-health information systems and services and able to exchange data based on established national and international standards.	
	6.1. The integration of the electronic health care system with the information system of the State Revenue Committee is in place. 6.2. The integration of the electronic health care system with the information systems of the Ministry of Justice is in place. 6.3. Integration of the electronic health care system with the information systems of the Ministry of Labour and Social Affairs.	<ul style="list-style-type: none"> • National eHealth Operator • eHealth Implementation Unit • EKENG
7.	The patient has full access to his personal health history and has the necessary tools and interfaces to manage and use this data.	
	7.1. Digitization of registers, reporting forms, and documents provided to the population in medical facilities is in place. 7.2. Public awareness campaign to enhance the awareness of the population using electronic health services is conducted. 7.3. Monitoring and analysis of the use of the patient portal by the population are conducted.	<ul style="list-style-type: none"> • Public Relations Department of MoH • EHIU
8	The governance structure and responsibilities of National eHealth services (i.e., EHIS) are clearly defined and executing institutions appointed	
	8.1. Clear governance structure with responsibilities for all the participants is established	<ul style="list-style-type: none"> • Minister of Health • Deputy minister of Health

Table 4: Performance Indicators

No.	Indicator	Baseline	Target	2021				2022				2023			
				1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th
				quarter				quarter				quarter			
1	Number of legal acts relative to eHealth	0	7	3	7	7	7	7	7	7	7	7	7	7	7
2	% of patients with coronary heart disease registered in the system	0%	90%	0%	0%	0%	0%	5%	10%	20%	30%	40%	50%	70%	90%
3	% of patients with arterial hypertension registered in the system	0%	90%	0%	0%	0%	0%	5%	10%	20%	30%	40%	50%	70%	90%
4	% of patients with cancer registered in the system	0%	90%	0%	0%	0%	0%	5%	10%	20%	30%	40%	50%	70%	90%
5	% of patients with diabetes registered in the system	0%	90%	0%	0%	0%	0%	5%	10%	20%	30%	40%	50%	70%	90%
8	% of health care providers available to ePrescription	0%	100%	0%	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
9	% of pharmacies connected to ARMED system	0%	100%	0%	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
10	% of disability sheets filled in electronically by the system	0%	100%	0%	0%	10%	30%	50%	100%	100%	100%	100%	100%	100%	100%
11	The system exchanges data with the State Revenue Committee through the web services	No	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
12	The system exchanges data with the Ministry of Justice through the web services	No	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
13	The system exchanges data with of Ministry of Labor and Social Affairs through the web services	No	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

14	Number of registration books maintained electronically by the system	0	11	0	3	9	11	11	11	11	11	11	11	11	11
15	Number of electronic medical documents for the patients available to get from the system	0	7	0	1	2	3	4	5	7	7	7	7	7	7
16	% of medical personal trained to use the new systems of ARMED	0%	100%	80%	90%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
17	% of the population able to use the system to access and use the medical documents	N/A	2%	0%	0%	0%	0%	1%	1%	2%	2%	3%	3%	4%	5%

The Principles of Health Information System Geo-enabling Framework

Nine elements need to be in place for a health information system to be considered as geo-enabled.

- (i) A clear vision, strategies, and action plan for the management and use of geospatial data and technologies have been defined;
- (ii) A governance structure supporting the vision, strategies, and action plan has been established;
- (iii) Enough technical capacity has been developed;
- (iv) Geospatial data specifications, standards, and protocols have been defined and are being implemented to ensure the availability and quality (completeness, uniqueness, timeliness, validity, accuracy, and consistency) of geographic information across the whole data lifecycle;
- (v) The master lists for the core geographic objects (health facilities, administrative divisions, and villages, and reporting divisions) and their associated geography have been developed, made accessible, and an updating mechanism put in place for each of them using a common geo-registry;
- (vi) The appropriate geospatial technologies have been identified and are being used by good geospatial data management practices;
- (vii) Use cases supporting health programs (communicable diseases surveillance, malaria elimination, health service coverage, disaster management, etc.) towards reaching Sustainable Development Goal 3, are being implemented and documented;
- (viii) Policies supporting and enforcing all the above, as well as geospatial data accessibility, have been released; and
- (ix) The necessary resources to ensure long term sustainability has been identified and secured.

Functional Requirements of Disease Registries⁹

Elements of Chronic Care Management	Basic	Advanced
Ensure regular follow-up by the care team	Track desired intervals for next visit, test, or contact based on care guidelines. <ul style="list-style-type: none"> • Allow clinicians to record patient-specific interval for the next visit or intervention. • Provide patient lists sorted according to overdue status or patient status according to management control. • Provide outreach or exception lists for each physician or care team. 	Provide telephone call lists and/or mailing labels and patient reminder letters for follow-up. <ul style="list-style-type: none"> • Display the next appointment date for patients on outreach or exception lists.
Embed evidence-based guidelines into daily clinical practice	Incorporate information about care management guidelines into reports and displays for care teams.	Include prompts to recommend changes in patient care plans using guideline-based algorithms and patient-specific information.
Integrate specialist expertise and primary care	Incorporate care guidelines for primary care with input from relevant specialists.	Incorporate information about decision criteria for patient referral to a specialist, reports for care teams. <ul style="list-style-type: none"> • Include prompts recommending referrals for specific patients using guideline-based algorithms and patient-specific information.
Provide timely reminders for providers and patients	Track desired intervals for next visit, test, or contact based on care guidelines. <ul style="list-style-type: none"> • Allow clinicians to record patient-specific intervals for the next visit or intervention. • Include information about the due date for visits and other interventions in patient reports and displays. 	Send email notification to physicians or care teams when registry patients are seen in the emergency department.
Identify relevant subpopulations for care	Track information for identified subpopulations of patients with a designated chronic condition. <ul style="list-style-type: none"> • Manage the list of active and engaged patients for each physician and care team. 	Assist with the identification of new patients with a chronic condition by reviewing electronic information in external systems.

⁹ The requirements are adopted from J. Metzger. 2004. *Using Computerized Registries in Chronic Disease Care*. California Healthcare Foundation. <https://www.chcf.org/wp-content/uploads/2017/12/PDF/ComputerizedRegistriesInChronicDisease.pdf>

Elements of Chronic Care Management	Basic	Advanced
		<ul style="list-style-type: none"> • Stratify patients according to the severity of the condition.
Facilitate individual patient care planning	Provide a condition-specific view of current patient status and progress.	Recommend changes in patient care plans using guideline-based algorithms and patient-specific information.
Share information with patients and providers to coordinate care	<p>Patient information is available to all members of the primary care team.</p> <ul style="list-style-type: none"> • Record patient self-management plans for subsequent access by the care team. 	<p>Patient information available to case managers, specialists, and others involved in care.</p> <ul style="list-style-type: none"> • The patient version available from the registry, including information on status, care plan, and self-management plan.
Monitor performance of the practice team and care system	<p>Provide population reports for lists of patients and user-specified conditions of management control or guideline compliance status two.</p> <ul style="list-style-type: none"> • Provide a tabular analysis of trends in any of the above. • Provide population reports for individual physicians and care teams, clinics, and medical groups. • Provide peer comparison reports for individual physicians and care teams and clinics. 	Provide graphic displays of trends in user-specified conditions of management control and guideline compliance in population reports.