Georgian-African Business Association

2015

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Executive Summary

In 2011, the MoLHSA will implement a new and innovative program to interconnect the information needs of the Ministry, insurers, providers and patients. ***Healthy Georgia, Connected to you***, will be a comprehensive Health Management Information System (HMIS) that will draw from lessons learned around the world, and will be built upon existing international standards. In addition, it will also be uniquely designed to meet the current and future requirements of the citizens of Georgia and the country's Healthcare Delivery System.

While providing the leadership role, the MoLHSA will also partner with other governmental agencies and representatives of the private sector to provide a new Governance structure that will be responsible for the HMIS. This new body will define the Georgian Health Management Information System Strategy and it will include the stewardship, strategy, vision and policies necessary for operational success.

Just as an architect uses a blueprint, this vision will provide the framework within which various entities (both private and public) will operate in the future across the health sector. It will identify priorities, highlight major issues, and mandate adoption of standards, to raise the quality and improve the performance of health care delivery in Georgia. This common vision will ensure that all future efforts are directed toward development of health systems that are interoperable and provide an accurate view of the health status of Georgians.

New software products such as an electronic medical record, personal health record and public health surveillance system will be obtained and integrated. Because these systems must be in compliance with the governmental requirements and standards, they will allow a uniform set of core health data elements to be collected throughout the healthcare delivery system. The subsequent availability of accurate clinical information, will not only improve care delivery to individual patients, but will also allow for the aggregation of the population's healthcare information. It is this integration of information that allows the Georgian leadership to obtain true knowledge on the current health status of its citizens. Utilization of this knowledge will empower the patients, the providers and the Government. Patients will have access to their personal health information and will have improved awareness, education and self-management of chronic diseases. No longer will providers only have fragmented pieces of a patient's medical care but instead will have access to a longitudinal view of each patient's medical history. The Government will be able to optimize healthcare delivery by focused interventions in the event of a disease outbreak, by measurement of clinical outcomes by different treatment approaches and by identification of opportunities to improve resource allocation.

For every stakeholder within the healthcare delivery spectrum, the implementation of this vision will result in a ***Healthy Georgia, Connected to you***.

Goals and Objectives

The goal of the Government of Georgia is to create a country wide health care information system that will support the Citizens of Georgia, State of Georgia and the Health care industry. Success in this endeavor will be measured in:

- Increased efficiency
- Increased governmental oversight of state subsidized programs
- Increased transparency of healthcare financing and reduction of fraudulent claims
  - Standardized and Institutionalize business processes and increase service quality
  - Improved quality of healthcare data allowing benchmarking against international statistics
  - Increased access to healthcare and insurance information to patients
  - Creating effective tools for decision and policy making.

The objective of this document is to describe the Georgian Health Information Strategy and provide a framework for action for the development of a Health Management Information System (HMIS). This concept paper will guide the developmental processes resulting in the creation of a country-wide health management system that will serve as the basis for evidence based decision processes. These concepts will help to communicate the Ministry of Health's vision, mission, and long-term strategic goals to the various stakeholders and other interested parties.

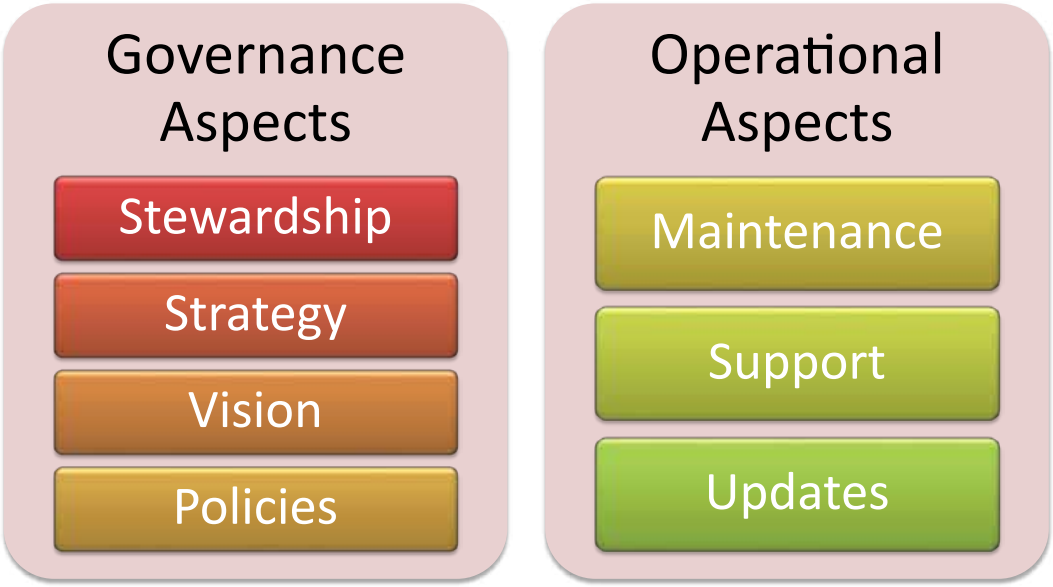
The HMIS Project will be initiated in February 2011 and will define these strategies and identify potential partners that will re-engineer and modernize the current environment to a knowledge managed health system. Information Technology (IT) and Information Management Systems (IMS) have a central role as an enabler in the healthcare business and the ministry recognizes that it requires a sophisticated IT system to measure and improve the quality of care.

Strategic Goals of HMIS Implementation

Health Gain Reduce the burden of disease by addressing the priority health areas through the development of evidence based national protocols and standards for the prevention and treatment of these conditions.	**Primary Care Development** Promote the role of family health care as being at the heart of health service provision in Georgia and to deliver health promotion, preventative, curative, rehabilitation and palliative services.	**Quality, Clinical Excellence and Performance Improvement** Improve quality and responsiveness of services and strengthen the role of the Ministry of Health as regulator in the promotion of clinical excellence and the performance management of service improvements.
Future Investment Develop a structured approach to investment in existing and new services, workforce development, buildings, equipment and drugs to ensure delivery of the Georgian Health Strategy.	**Service Development** Develop an integrated model of health care provision that delivers high quality services as locally as possible.	**Partnership Working** Develop local, regional and international partnership working with providers to achieve service rationalization, optimize scarce resources and skills, and minimize duplication.
Organization and Management Ensure the appropriate organizational structure is in place to implement the Strategic Direction. Strengthen and decentralize responsibility for the management of health services, separating responsibility for policy, strategy and performance management from operational issues.	**Human Resources** Strengthen human resources management, workforce planning and value staff in their provision of health services.	**Community Involvement** Encourage individuals, families and communities to take more responsibility for their own health and to contribute to determining the shape and pattern of delivery of health services in the future.
Financial Management Develop sound financial management skills and systems to support the delivery of the Strategic Direction and optimize the use of resources.	**Education, Research and Development** Develop the role of the health services in education, research and development in partnership with other agencies and focus on health services research.	**Information and Communications Technology (ICT)** Build upon the current strategy for the development of ICT systems, ensuring the implementation of new technology underpins the Strategic Direction and that necessary organizational change accompanies investment in technology.

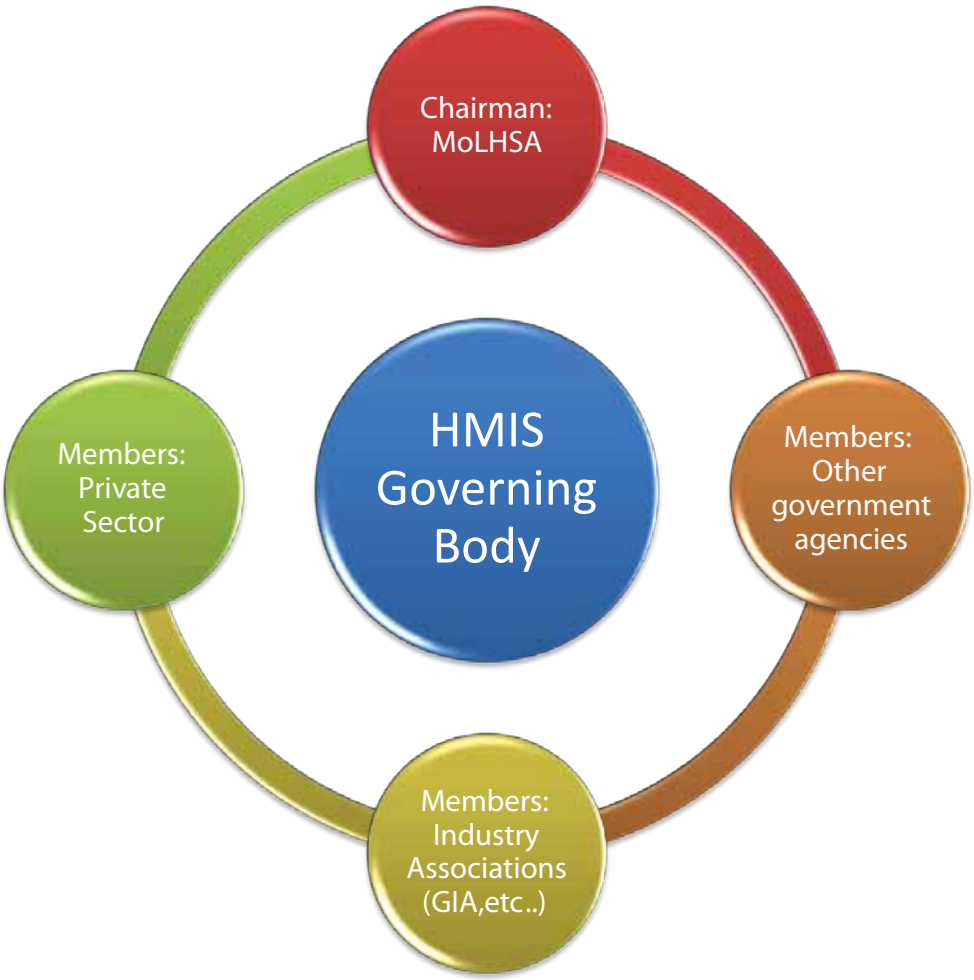
Governance

Technology continues to evolve, and the needs of the country will also continue to evolve. It is important to agree on an entity that will maintain, support and update the system, and the rules for this entity's operation, funding, and decision making process. There are several scenarios for the proper formation and governance of this entity. We need to distinguish at the outset between two important functions: the *operational aspects* that include the maintenance, support and update of the system, and the *governance aspects* that includes who decides the policies for information access, who sets the priorities and the evolution strategy, who has the ultimate stewardship of the system.



The operational aspects are sometimes housed within the ministry of health in the country, but this typically has challenges. Governments are well geared toward establishing policies and representing the best interests of their citizens, but they are not always efficient at running information systems. There is also the risk that several governments around the world are facing which is losing key qualified personnel to a private sector that generally pays more than what governments pay. It is recommended that after an initial period of housing the Georgian HMIS within MoLHSA or other agencies that the operational aspects of HMIS are outsourced to a local company within Georgia that has the capacity to properly execute and deliver on its commitments.

The governance aspects are more important and more strategic than the operational aspects. Governance is what governments do very well, so this is where MoLHSA and other government agencies need to play a key role related to HMIS. There are several models of governance, including ones where the government is the only entity that exercises governance of the HMIS, and one where a joint government / private sector model is developed. Also, there is the question of which government agencies need to play a role in governance and what weight. It is generally the case that ministries of health (or in the case of Georgia, MoLHSA) have the best insight as to the needs of workers in the healthcare domain. MoLHSA because of its proximity to the issues and challenges surrounding healthcare is expected to demonstrate leadership of the governance of HMIS, but this is in collaboration with other government agencies and even private sector and industry associations that are involved. It is envisioned that a governing body will be created which has members from the government and from private sector or associations.



This Government-wide health I.T. governing body will be established and the HMIS included as an official e-Government project. This will be a collaborative effort to set the mission, vision and strategy for the development of the Health Management Information System. The group will be tasked with adopting a portfolio of existing health information interoperability standards (health vocabulary and messaging) for nationwide implementation that will enable all health enterprise stakeholders to communicate. This will be based on common enterprise-wide business and information technology architectures. The governing body will also create policy and legislation surrounding issues directly related to the HMIS deployment. Examples include policies and legislation to:

- Protect the confidential healthcare information of the citizens of Georgia.
- Ensure the completeness and accuracy of information entered into the EMR (this could include mandating provider entry of certain clinical domains such as a problems, allergies and medication list.)

Based upon adopted standards, policies and legislation, the governing body will oversee the development and implementation strategy for a Clinical Data Repository/Health Data Repository (CHDR) that will provide bi-directional exchange of computable health data.

Medical computing of the future will have a significant impact on the practice of medicine and considerable implications for the healthcare service organizations and patients. The future will bring a new healthcare consumer, a new healthcare provider and a new healthcare delivery organization. The governing body will need to develop policies and legislation to keep pace with the changing healthcare environment.

Operational Aspects

The HMIS will require a centralized IT infrastructure of human and hardware/software resources to support it. A centralized approach will increase system integration, reduce IT personnel required for support and allow for redundancy of resources, avoiding a "single point of failure". This support organization will consist of the following areas of expertise:

Security Management – This group will be responsible for creating a security model for all HMIS information systems (this could also be extended to include other GoG information systems) This security model will create a process for requesting and granting system logons, allow access to healthcare data based on end user role and their "need to know" while protecting the confidential healthcare data of the individual patient. This group will need the authority to investigate security and confidentiality breaches.

Support Helpdesk – The HMIS will create the need for a centralized location for end users of all types to call to gain assistance with the use of the information systems in the HMIS. The help desk will require a system to track, triage and route calls. The helpdesk team (or support group) will need to interact with vendors and developers to resolve information system and end user issues.

Training – Training course development and instruction will be a huge component of the HMIS. Classes will range from Basic Computer instruction (i.e. keyboarding, Microsoft basics) to software application training to more complicated subjects such as how to use the Clinical Data Repository and its tools to perform analysis.

Technical Infrastructure **-** As the footprint of the HMIS evolves and is implemented, the MoLHSA IT department will need to expand their current teams supporting the Data Center, Hardware, Network, Servers, Storage/Backups, Operating Systems, Application Delivery and Database Administration to accommodate the increase in end users, information systems and transactions.

Software Application Coordinators **-** Regardless of a buy or build decision on the components of the HMIS, the need for Application Development and Upgrades and daily Operational support including testing of all system changes will increase the need for IT personnel with specialized knowledge and training in clinical, administrative and financial arenas.

HMIS Standards

One of the most challenging issues in healthcare information technology is development or adoption of healthcare data standards. These standards are critical to facilitate not only the interoperability between heterogeneous information systems, but also the aggregation and interpretation of pooled data from multiple sources. Data may come from hospitals, clinics, external devices or elsewhere. To turn this data into information and knowledge requires an information model that utilizes a standardized message structure that is populated with predefined vocabularies.

Most countries, including the US, UK, Australia and Canada struggle with incompatibility of data due to the failure to develop healthcare systems using a logical systems strategy and a controlled approach. The Georgian HMIS development process will avoid the mistakes of others by adopting and implementing a strategy designed by the senior leadership and implemented at each level of healthcare delivery.

Message Standards

A standardized set of message structures, to be known as the Georgian Message Standards (GMS) will be the foundation for the development of an interoperable HMIS. Examples of widely adopted International Standards include Health Level Seven and DICOM.

Health Level Seven International (HL7) is an accepted global message standard and is widely used by healthcare software vendors to send patient, clinical and administrative/financial information between systems and to a centralized clinical data repository.

Digital Imaging and Communications in Medicine (DICOM) is used or will soon be used by virtually every medical profession that utilizes images within the healthcare industry. These include cardiology, dentistry, endoscopy, mammography, ophthalmology, orthopedics, pathology, pediatrics, radiation therapy, radiology, surgery, etc. DICOM is even used in veterinary medical imaging applications. DICOM also addresses the integration of information produced by these various specialty applications in the patient's Electronic Medical Record (EMR). It defines the network and media interchange services allowing storage and access to these DICOM objects for EMR systems.

Utilizing a predefined format and populated with a standard code set, HL7 messages are created and sent by an information system in response to an occurrence of an event such as a patient admission, a pathology result finalized. HL7 standards include predefined formats for fields such as date and time. HL7 also provides vocabulary standards including predefined lists of values for many fields within the message formats such as Marital Status or Gender. The HL7 standards should be the starting point for establishing standard vocabularies for an HMIS and should be incorporated into any web applications developed or software deployed as part of the HMIS.

By using a standardized message structure (and requiring developers and software vendors to adhere to the message standard), data exchange between disparate healthcare systems and data exchange to/from the clinical data repository is streamlined and development time reduced because the integration engine (see Integration Engine section below) only has to be programmed to accept and process one set of message formats from many information systems. Because the message structure and code sets are identical between systems using GMS standards, all of the data is computable and interoperable.

DICOM and other messaging standards work in a similar manner.

Vocabulary Standards for Medical Care

The development or adoption of a standardized message structure, while an important first step, is not sufficient to address all of the needs for robust data integrity and interoperability. The GMS must be complemented by Medical Vocabulary Model (to be known as the Georgian Vocabulary Standards (GVS)) to provide developers and systems with the roadmap to provide interoperable systems.

Under the governance of the governing body, one or more working groups will be tasked with assessing the business and information requirements of the Ministry. This group will utilize a Service Oriented Architecture (SOA) approach and for each requirement, an assessment will determine the appropriate terminology standard to be adopted or developed and will result in the GVS. This will take into account the viewpoint of the enterprise, information, computation, engineering and technology.

Vocabulary standards may be defined as

1. Local (Unique to one facility or one information system)
2. National (Georgian only)
3. International (Globally accepted)

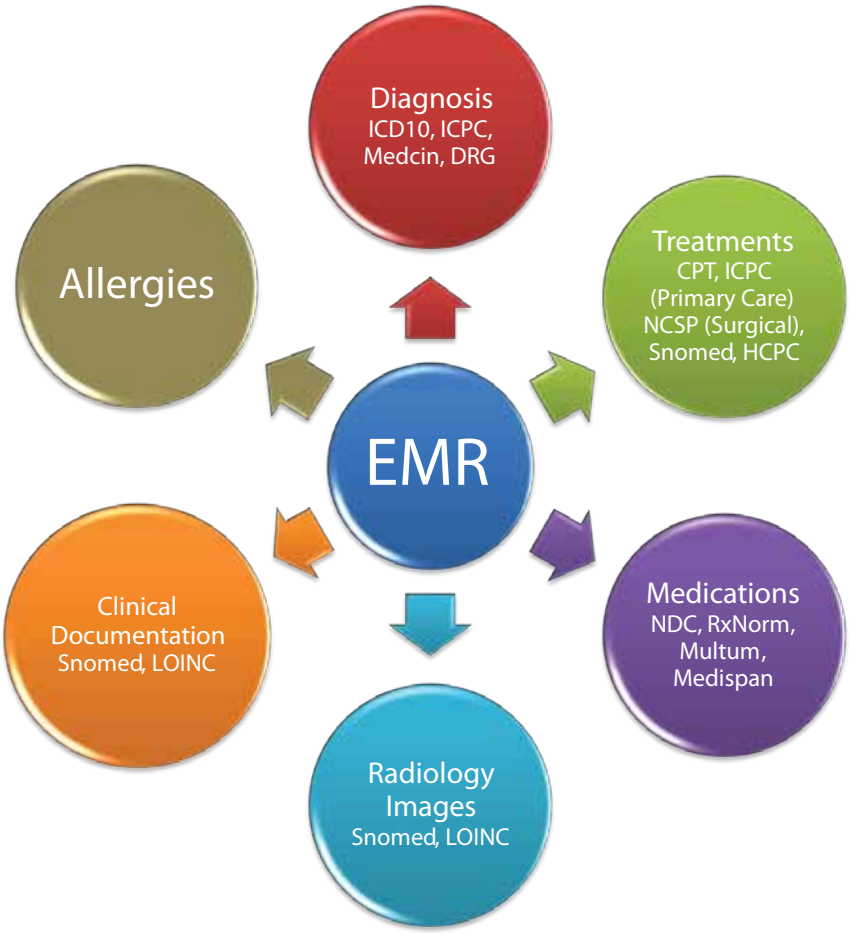
Each of the different components (such as diagnosis) within a message structure or fields on the screen of an information system that sends data to the Clinical Data Repository will require the adoption of a vocabulary standard. For many components, currently existing international standards, such as International Classification of Diseases (ICD-10), Current Procedural Terminology (CPT), or Systematized Nomenclature of Medicine (Snomed) will be utilized

The GVS will be designed to provide high quality, computationally comparable, and re-usable terminology to all of the enterprise stakeholders. The GVS will be integrated into all applications in order to provide comparable and computable data between systems and organizational levels. As with the standard message structure, developers and software vendors for the HMIS must be required to integrate the standard Georgian Medical Vocabularies into their software.

The MoLHSA has begun the process of creating a GVS by mandating the use of the following vocabularies in Georgian Healthcare facilities by the year indicated after each vocabulary:

International Classification of Diseases (ICD-10) – January 2010
International Classification of Health Process in Primary Care (ICPC) - March 2011
NOMESCO Classification of Surgical Procedures – March 2011

There are many different Medical Vocabularies developed by public and private organizations and used for different purposes and by software vendors. The diagram below shows some of the more prevalent vocabularies in use in the Healthcare environment. The paragraphs following describe the most accepted vocabularies for certain domains.



Diagnosis - ICD 10, Medcin

ICD-10 was endorsed by the Forty-third World Health Assembly in May 1990 and came into use in WHO Member States as from 1994. The classification is the latest in a series which has its origins in the 1850s. The first edition, known as the International List of Causes of Death, was adopted by the International Statistical Institute in 1893. WHO took over the responsibility for the ICD at its creation in 1948 when the Sixth Revision, which included causes of morbidity for the first time. The World Health Assembly adopted in 1967 the WHO Nomenclature Regulations that stipulate use of ICD in its most current revision for mortality and morbidity statistics by all Member States.

The ICD is the international standard diagnostic classification for all general epidemiological, many health management purposes and clinical use. These include the analysis of the general health situation of population groups and monitoring of the incidence and prevalence of diseases and other health problems in relation to other variables such as the characteristics and circumstances of the individuals affected, reimbursement, resource allocation, quality and guidelines.

It is used to classify diseases and other health problems recorded on many types of health and vital records including death certificates and health records. In addition to enabling the storage and retrieval of diagnostic information for clinical, epidemiological and quality purposes, these records also provide the basis for the compilation of national mortality and morbidity statistics by WHO Member States.

The International Classification of Primary Care (ICPC), developed by the ICPC Working Party, broke new ground in the world of classification when it was published for the first time in 1987 by WONCA [6], the World Organization of National Colleges, Academies, and Academic Associations of General Practitioners/Family Physicians, now known more briefly as the World Organization of Family Doctors (Wonca). For the first time health care providers could classify, using a single classification, three important elements of the health care encounter: reasons for encounter (RFE), diagnoses or problems, and process of care. Problem orientation of the medical record and linkage of encounters over time enables classification of the episode from the beginning with an RFE to its conclusion with a more defined problem, diagnosis, or disease.

MEDCIN, a system of standardized medical vocabulary, is a proprietary medical vocabulary and was developed by Medicomp Systems, Inc. MEDCIN is a point-of-care vocabulary, intended for use in Electronic Health Record systems. Developed by Medicomp Systems, it includes over 250,000 clinical data elements encompassing symptoms, history, physical examination, tests, diagnoses and therapy. This clinical vocabulary contains over 26 years of research and development as well as the capability to cross map to leading codification systems such as SNOMED, CPT, ICD, DSM, GSM and LOINC. The MEDCIN coding system is touted especially for point-of-care documentation and architecture. Several Electronic Medical Record (EMR) systems embed MEDCIN, which allows them to produce structured and numerically codified patient charts. Such structuring enables the aggregation, analysis, and mining of clinical and practice management data related to a disease, a patient or a population.

Treatments - CPT

Common Procedural Terminology: is a comprehensive system of classification developed and maintained by the American Medical Association; lists descriptive terms and identifies codes for reporting medical procedures and services. It is also referred to as CPT. It provides a standardized language for the accurate description of diagnostic, medical, and surgical services. It is an effective method for promoting dependable communication among healthcare practitioners and third parties across the nation. CPT is the most established form of medical classification that is used to report medical services and procedures under private and public programs of health insurance. It is employed within an administrative management process and includes claims processing and developing standards for review of medical care.

Drugs –RXNorm, Multum, Medispan, First Data Bank

RxNorm provides normalized names for clinical drugs and links its names to many of the drug vocabularies commonly used in pharmacy management and drug interaction software, including those of First Databank, Micromedex, MediSpan, Gold Standard Alchemy, and Multum. By providing links between these vocabularies, RxNorm can mediate messages between systems not using the same software and vocabulary. The other companies named above provide solutions that enable physicians, pharmacists, and nurses to identify potentially harmful drug reactions before prescribing medications. Their drug information also includes valuable information specific to each drug, such as patient education leaflets, side effects, pharmacology and therapeutic categories. These solutions may also provide clinicians with patient specific, expert drug dosing at the point of care. These solutions work by considering clinically relevant factors such as age, height, weight, liver and kidney function.

Lab – **LOINC**, SNOMED

LOINC is one of the standards for use in U.S. Federal Government systems for the electronic exchange of clinical health information. In 1999, it was identified by the HL7 Standards Development Organization as a preferred code set for laboratory test names in transactions between health care facilities, laboratories, laboratory testing devices, and public health authorities.

SNOMED CT (Systematized Nomenclature of Medicine -- Clinical Terms), is a systematically organized computer processable collection of medical vocabulary covering most areas of clinical information such as diseases, findings, procedures, microorganisms, pharmaceuticals etc. It allows a consistent way to index, store, retrieve, and aggregate clinical data across specialties and sites of care. It also helps organizing the content of medical records, reducing the variability in the way data is captured, encoded and used for clinical care of patients and research

Administrative Standards

Despite a GMS and GVS and until they are broadly implemented, large amounts of healthcare data maybe gathered by legacy information systems or systems external to the enterprise. Very little of that data can be shared between systems. Typically little of it is useful in the format it is captured and transmitted. A caregiver can seldom rely on it to justify treatment, and an administrator cannot analyze it for outcomes, costs or decision-making. Most importantly, an enterprise cannot create comprehensive, electronic, longitudinal patient

records until it can accurately aggregate each patient's healthcare data—no matter when or where they were performed. This can only be done with codified data connected to a patient's uniquely identified record. Before computerized healthcare data can be put to work, all of it must be concretely defined and consistently translated into a common, meaningful language.

In addition to adopting existing medical vocabularies, there will be the need to create Georgian or even information system specific vocabularies, master files or reference tables. (A master file is a common reference file used by one or more application systems. For example: A provider master file would list all healthcare providers in Georgia). We will call these Administrative Standards. As the HMIS evolves additional standards will need to be developed. Initial areas where Administrative Standards must be set are:

Citizens/Patients

The Civil Registry Agency will be the master source system or "single source of truth" for patient identification and demographics. Each citizen is assigned a personal id and this will be the unique patient identifier for every information system comprising the HMIS. Each information system will need to validate and pull patient demographic information from the CRA database. This validation process should be standardized across all information systems and may flow through the Data Exchange Agency if appropriate. The high quality of the data and personal identifiers in the CRA database will need to be maintained to ensure the success of the HMIS.

Provider Credentialing, Licensing and Unique Identifiers

Like the patient identifier, a unique identifier will need to be assigned to every Healthcare provider in Georgia. This includes individuals (doctors, nurses, laboratory technicians etc…), clinics and hospitals. A centralized provider master file will need to be maintained by the MoLHSA State Medical Activity Regulation Agency or other appropriate organization including credentialing and licensing information. A working group will need to determine the properties to collect for each medical service provider in order to track credentials, licensing, clinical experience and analyze provider trends. A centralized database would need to be developed or augmented if one exists to store this information. This information would be the master source system or "single source of truth" for all medical service providers and each information system in the HMIS would validate and pull provider information from this database. This database would also be a data source for the CDR and would need to have a high level of quality to ensure that (for example) the Dr. Alexander Beridze who is a surgeon at a polyclinic and also see patients at a hospital in Tbilisi is uniquely identified and information regarding his medical experience is aggregated and reported under one provider name and unique identifier.

National Drug Database

The HMIS will require the creation of a National Drug database (NDD) and corresponding information system listing all drugs approved by the MoLHSA State Medical Activity Regulation Agency. The NDD would register medications that are allowable in the country. The NDD system would allow the MoLHSA to enter the characteristics such as pharmacology and therapeutic categories of all drug items including prosthetics and expensive single use items. The NDD would track information on the importation date, the registration date, available stock of each medication and where the stock is located. Pricing information would be standardized, maintained and accessible by all providers and patients. The NDD would be the master source system or "single source of truth" for all medications and each information system in the HMIS would validate and pull medication information from this database. The NDD would work hand in hand with the EMR clinical medication functionality which would build on the NDD information by providing drug interaction checking, patient education, medication side effects and patient specific dosing recommendations.

Health Data Dictionary

A national Health Data Dictionary (HDD) links disparate vocabularies and master files from multiple information systems to unify information into the electronic patient record and clinical data repository. An example will help clarify. Over a course of time, a patient goes to 3 different labs with 3 different lab information systems (LIS) and has a complete blood count test performed. Suppose each LIS has its own individual master file

for Lab tests and the complete blood count test is called a CBC in one, a Blood count, complete in the second and a complete blood count in the third. A Health data dictionary will map all three to the same identifier and the 3 tests will appear in the EMR and CDR linked and able to be trended as one test name. In addition to performing this cross-mapping functionality, the HDD would store all Georgian national standards.

HMIS Key Indicators and Metrics

Health Indicators are the building blocks for a successful health situation analysis. The availability of information that is based upon valid and reliable data forms the basis for an objective evaluation of the overall health situation. Only from this type of information can the senior leadership make evidence-based decisions that will have a meaningful impact on the health status of the country.

While morbidity and mortality have been historic indicators of health, great value can be added by consideration of other dimensions of a population's health status. Accurate determination of non-biological determinants of health, disability, access and quality of care environmental factors and high-risk behaviors are increasingly necessary to document people's capacity for physical, emotional and social health.

The governing body will deliberate and select Leading Health Indicators on the basis of their ability to motivate action, the availability of quality data to measure progress, and their importance as public health issues.

The Leading Health Indicators might include:

- ☐ Physical Activity
- ☐ Overweight and Obesity
- ☐ Tobacco Use
- ☐ Substance Abuse
- ☐ Responsible Sexual Behavior
- ☐ Mental Health
- ☐ Injury and Violence
- ☐ Environmental Quality
- ☐ Immunization
- ☐ Access to Health Care

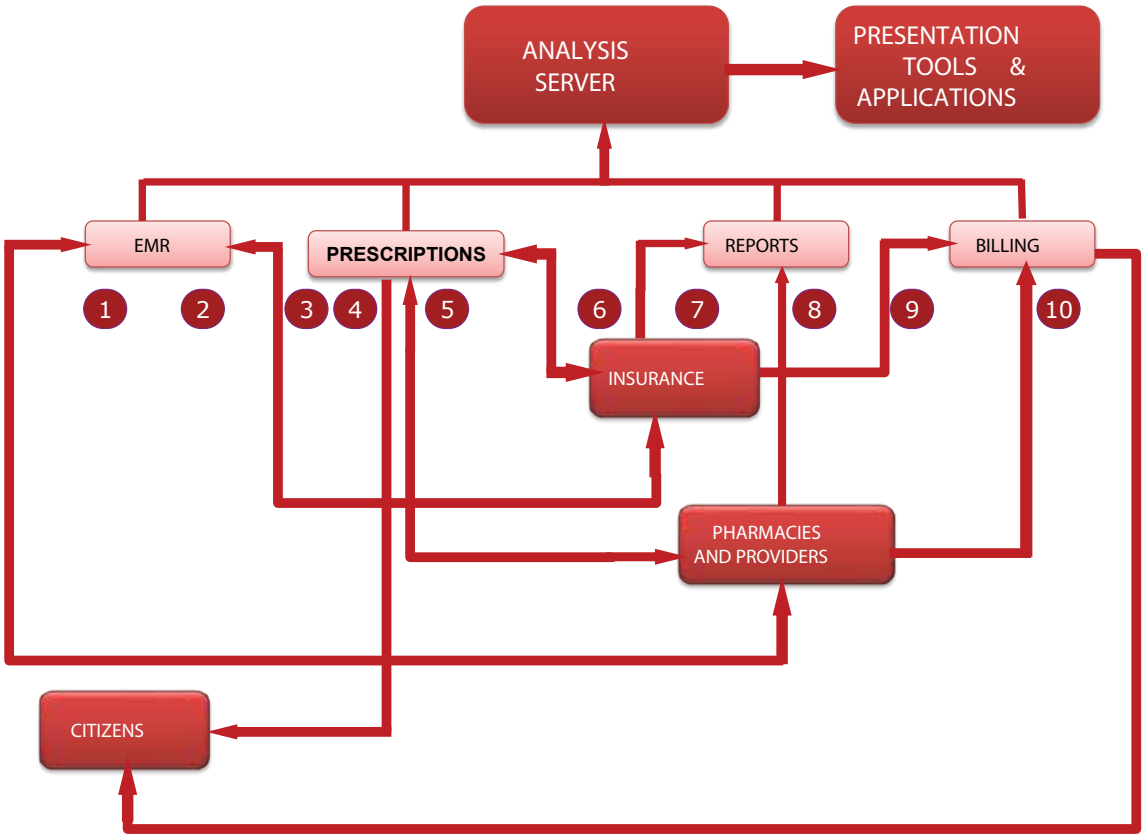
HMIS Core Data Sets

The "Core Data Set" is the shareable electronic data that are relevant for administrative, demographic, and clinical information about a patient's healthcare, covering one or more healthcare encounters. It provides a means for one healthcare practitioner, system, or setting to aggregate all of the pertinent data about a patient and forward it to another practitioner, system, or health data repository. The primary use is to provide a snapshot in time containing the pertinent clinical, demographic, and administrative data for a specific patient. The core data set is the minimum data set necessary to provide basic EMR functionality and should map to the Health Indices the MOLHSA wants to measure. The HL7 Continuity of Care Document should be reviewed as a starting point for the development of the HMIS Core Data Sets. This core data set will be developed as part of the HMIS implementation.

HMIS Functionality

Overview

The components of an HMIS will vary from country to country depending on the priorities and pain points of the citizens, government and institutions (private or public) surrounding healthcare. For reference, Appendix B lists a sampling of HMIS components other countries have identified as prioritized or implemented. To meet the unique needs of the Georgian people, the MoLHSA developed a high level vision of the information flow (or data exchange) for the HMIS:

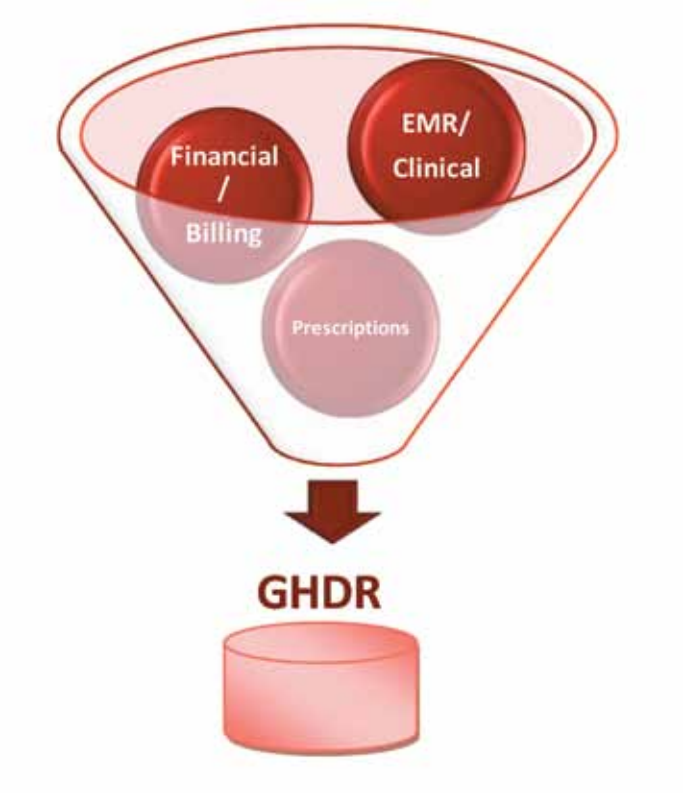


1. Medical Service Providers upload/download Electronic Medical Records.
2. Citizens may have a web access to view their Medical Records.
3. Insurance companies upload/download Electronic Medical Records.
4. Medical Service Providers and Pharmacies upload/download information about prescribed medicines or medical services.
5. Citizens may have a web access to view their prescriptions.
6. Medical Service Providers and Pharmacies upload/download information about prescribed medicines or medical services.
7. Insurance companies submit their periodical report to the State.
8. Medical service providers and Pharmacies submit appropriate reports to the State.
9. Insurance companies submit invoices to the State.
10. Medical service providers and Pharmacies submit invoices to the State.

A preliminary list of HMIS benefits and functionality by stakeholder was also developed:

Providers' module would provide opportunity for:	Establishing an electronic patient record system;
	Automatic data exchange between providers and insurance companies;
	Standardized (national classifications) statistical data exchange between providers, MoLHSA (NCDC) and other national authorities (public register, etc.);
	Quality of services internal and external review;
	Transparency in service provision and financial accountability.
Insurers' module would provide opportunity for:	Automatic data exchange between providers and insurance companies;
	Standardized data exchange between insurance companies, MoLHSA (NCDC, mediator) and National Bank;
	Quality of services internal and external review;
	Transparency in service provision and financial accountability.
Pharmaceuticals' module would provide opportunity for:	Automatic data exchange between pharmaceutical companies and MoLHSA concerning available stock and resources in the country;
	Transparency of drug registration, import and quality.
NCDC would serve as an information hub as country's statistical and epidemiological center.	
Populations' module would provide opportunity for:	Effective and transparent system management;
	M&E of health system and evidence-based decision making;
	Automatic data exchange between the MoLHSA and the rest of the governmental institutions (e-government);
	Transparency and accountability to the public.

To meet these needs, the functional components of the Georgian HMIS will include:



1. A **Nationwide Electronic Medical Record** (EMR) to address the clinical and patient care needs of the population, including their pharmaceutical needs.

2. A **Financial Information System (FIS)** to facilitate the information and financial data exchange between the many entities providing the financing and billing associated with the healthcare services in Georgia. (Providers, Insurance, MoLHSA, MOF)

3. **Georgian Health Data Repository (GHDR)** – The patient clinical and financial/billing information from the EMR, FIS and the Prescriptions modules will flow to a large nationwide database or data warehouse that will allow the MoLHSA and other stakeholders to query the information for decision making, analysis and other purposes. This large database will be called the Georgian Governmental GHDR. This nationwide database will include Data compilation, Reporting and Analysis tools to aid in the decision making and transparency required in the Healthcare environment in Georgia. The GHDR database will consist of both clinical and financial or billing information.

Each of these base components may include Extension modules which will expand on the base functionality. For example, the Electronic Medical Record will include a patient portal which will contain functionality specific to the needs of the patient/citizen. The components of the HMIS are described in detail in their respective sections of this document.

What is not an HMIS component

Just as important as describing what is included in an HMIS, we need to define what is not considered part of the HMIS. Larger organizations will have internal information systems that are proprietary to their organizations which have been either purchased from a software vendor or developed to meet the needs of that organization. These hospital, insurance company and medical facilities **internal operational systems** will likely send information to the HMIS but are not considered a part of the HMIS. Examples of these excluded information systems include but are not limited to:

1. Internal patient or insurance billing systems
2. Insurance claims handling processing systems – these will send information to the FIS/HMIS through the reporting functionality but the internal insurance company system will not be part of the HMIS.
3. Supply chain and inventory tracking systems
4. Hospital Patient Registration and Admission Discharge and Transfer functionality which allows the hospital to enter patient information, place a patient in a hospital bed, indicate which beds are vacated and need to be cleaned by housekeeping and which beds are ready to accept a new patient.
5. PACS Radiology Imaging systems – the provider's internal PACS will send information to the EMR/HMIS but is not considered part of the HMIS
6. Radiology Information Systems (RIS) – the provider's internal RIS will send information to the EMR/HMIS but is not considered part of the HMIS
7. Laboratory (LIS), Blood Bank – the provider's internal LIS will send information to the EMR/HMIS but is not considered part of the HMIS
8. Facility Human Resource and Payroll systems
9. General Ledger,
10. Operating Room scheduling,
11. Anesthesia monitoring
12. ICU monitoring
13. Staff Scheduling systems

Software Acquisition versus Development

The existing processes and systems will be modeled to create a business requirements definition document. Once the functional requirements are developed, a review will be performed of the different electronic solutions. This review will include high level local and international Electronic Medical Record software vetting to determine if existing solutions are applicable to the clinical environment in Georgia. Working closely with MoLHSA, the Governing Body will provide options and follow the steps below within the following 3 categories including high level work effort and budget requirements:

1. Vendor software (Buy)
2. In-house development (Build)
3. Hybrid (Buy-Build and integrate)


Form WG
•HMIS Governing Body forms small working group with Subject Matter Experts from all areas that will be impacted by the system: IT, End Users, MoLHSA, Providers, Insurance Companies, etc...
BR
•Develop Business Requirements (BR) for software
•Develop Standards for Business Requirements
Market
•Assess Industry prebuilt software for products that may meet BR/Standards
BUY/BUILD
•Working Group reports to Governing Body and makes recommendation for BUY versus BUILD decision
•Governing Body makes and documents BUY/BUILD Decision
RFP
•GoG issues a Request for Proposal (RFP) clearly outlining Scope of Work or Software, Business Requirements, Standards to be adhered to and contractual obligations to multiple vendors (either Software vendors or Development partners)
Cost Analysis
•Based on RFP responses, Working Group selects top candidates and performs a detailed cost analysis including License fees, Hardware, 3rd party Software, Implementation, Training and Support Fees to compare top vendors
Demos
•Based on RFP responses and cost analysis, final vendor choices perform a structured demonstration of their products or services. The Working Group should clearly outline specifics on what functionality they want to see in the Demonstrations instead of giving the vendor full control.
Site Visits
•The Working Group should visit client sites with products by the Finalists (Top 2) vendors as well as visit the working offices of the vendor.
Vendor Selection
•Working Group reports to Governing Body and makes recommendation for selecting software vendor or development partner. Working Group may also recommend that Governing Body revisits the BUILD/BUY decision based on additional information gathered.
Contract Negotiations
•Representatives from the Working Group join in the centralized contracting process to negotiate business and legal terms to execute a contract with the selected vendor.

Regardless of a BUILD or BUY decision, Software vendors and Development partners must adhere to all standards established by the MoLHSA in the strictest manner to ensure integration and usefulness of the data from disparate systems. This adherence to standards should be a requirement of any contracts issued for the HMIS. When appropriate, HSSP can provide a separate document outlining other contractual obligations that should be considered.

Many organizations do not follow a centralized formal process for negotiating contracts with software vendors and developers. As clinical information systems are becoming more and more a mission critical component of patient care, this may leave the customer financially vulnerable to healthcare software vendor and developers. A centralized formal software contracting process can protect the MoLHSA from vendors who do not deliver on their sales promises, are not forthright regarding the "hidden" costs of the purchase, sell "vaporware", sunset products… The list goes on.
Vaporware is software not released on the date announced by their developer, or announced months or years before their release. Sunset products are those products for which vendors no longer product support, upgrades, bug fixes or enhancements.

A centralized formal contracting process utilizes resources familiar with software life cycle and implementation projects to work with the legal department and system stakeholders to help the MoLHSA negotiate a software purchase or development contract that is fair, not biased to the vendor and is based on a successful software implementation.

The software contracting process resources will negotiate with the vendor to

- √ Follow the organization's Information Technology (IT) standards
- √ Ensure projects do not stretch the current IT infrastructure to a breaking point
- √ Protect the organization
- √ Follow purchasing and budgeting guidelines
- √ Uncover all costs associated with the purchase
- √ Make certain Payment of Software License, Implementation and other fees are milestone based
- √ Check that System warranties work in the customer's favor, not the vendors
- √ Ensure Support parameters and costs are in line with the industry and the organization is getting the most for their support dollars
- √ Include Request For Proposal (RFP) responses in the contract and tie payments or warranties to the responses. This will guarantee the purchased system is as described in the sales process.
- √ Develop a detailed Statement of Work for the project including FTE requirements, deliverables, integration points, out of scope items and estimated timelines.
- √ Review contracts when projects do not go according to plan and work with the vendor to obtain credits or other concessions as allowed by the contract.

The software vendor or developer contract is the guiding document for the software purchase or development and implementation and the long term relationship forming between the customer and the vendor. As such it requires a dedicated process to formalize its business terms.

Depending on the MoLHSA decision for future direction, Governing Body and project team members will assist with the development of a project charter including a detailed budget and project work plan, address patient confidentiality issues and project risks and perform other tasks including
(By option):

Option	Task
Buy	Create a centralized, transparent and detailed vendor selection process including contract negotiations.
	Provide oversight of the vendor implementation project to ensure the business requirements of the health care delivery system are being realized.
	Provide subject matter experts to design system and perform system build work as required by vendor implementation partner.
	Assistance with project issue resolution
	Recommendations for standards, project direction, workflow changes etc… to insure the success of the vendor implementation
	Oversight and resources to perform system testing process
	Assist in clinic rollout planning including training, end user go live support
Build	Develop use cases, business requirements, scope of project and system design specifications
	Determine technology, resource requirements, project schedule etc…
	Oversight of local information technology firm hired for development include specification and build validation and sign-off
	Establish checkpoints or milestones for technology firm and ensure vendor meets these deadlines
	Assistance with project issue resolution including direction for vendor programming required to resolve issue.
	Establish requirements for standards, project direction, workflow changes etc… to insure the success of the development
	Oversight and resources to perform system testing process
	Assist in clinic rollout planning including training, end user go live support

Selective review of relevant systems that are already available in Georgia

The following information systems have been deployed or are in the process of being developed in Georgia. These systems will need to be analyzed for the best method to include the information they store into the HMIS. The information systems may need to be incorporated into HMIS components as appropriate, rewritten to follow MoLHSA Standards or extended to accomplish the data exchange required by the HMIS.

Hesperus

HeSPA (Health and Social Programs Agency) was a sub agency of the Ministry of Labour, Health and Social Affairs of Georgia, which general goal was to finance the Healthcare and other Social Services in the country; it was done through a series of programs (both Healthcare and social). The main objective of HeSPA was to procure such services, signing of contracts and then monitoring the implementation of service providing process, and finally – paying for provided services. The general business process of HeSPA activity contains 2 layers: Management level and Operational level.

Vaccinations system

Program "Geovac" (Georgia Vaccination) was created within the project "Georgian Health Information System and Epidemic Surveillance Reform". It was developed for facilitating the employees of Georgian regions public health centers, in order to improve large flow of immunization data in a short time period. This program makes it possible to quickly define the immunization coverage-related problems and weaknesses, and distribution of vaccines spending to increase supplies and proper assessment of the main obstacles (contraindications, parents' refusal) determination. "Geovac" allows to immunization managers spent more time on management information system data use and elaborate spread of disease control measures in response. Software "Geovac" was developed based on Ministry of Labour, Health and Social Affairs Public Health Department, Disease Control and Medical Statistics National Center advanced working group and the International Foundation Curatio numerous comments, ideas and proposals.

Electronic registration for births and deaths system

Civil registry of the Ministry of Justice electronically registers information about citizen's birth and death. This system is used by doctors, who by Georgian law have the right to issue birth or death certificate form. From January 1 new law came into effect, which states that doctor should only do birth and death medical record electronically.

TB system, AIDS system,

HIV/AIDS in the conditions of routine epidemic surveillance is detection of cases, reporting and epidemic researching is carried out routinely, determined contingent across the country and on the base of specific facilities.

Goal of HIV/AIDS routine epidemic surveillance is accurate, timely and complete information providing about HIV/AIDS, which will be used for the following purposes:

- Determining of HIV/AIDS persons characteristics and risk factors
- HIV –the newly registered cases, HIV prevalence and disease burden trends monitoring
- Actual and possible stress estimation of health system and determination of health resources needs
- Timely information
    - For the development and implementation of advocacy strategies
    - For the mobilization of resources
    - For programming
    - For monitoring and valuation

HIV/AIDS new cases today appear manly in passive epidemic surveillance conditions. In terms of Passive epidemic surveillance system by the health providers happen that person's evidence, which are addressing to health facilities and taking place that cases reports, which satisfy the HIV/AIDS cases standard definition.

The TB system works by the same method.

Surveillance system (DETRA) – Infectious Disease

"DETRA" is Biological Threat Reduction Program.

Biological Threat Reduction Program software includes:

- Human Surveillance Module
- Veterinary Surveillance Module
- Laboratory Management Module
- Replication and Notification Module
- GIS Module
- Reporting Module
- Analysis, Visualization and Reporting Module (AVR)
- Administrative Support Module

Each site computer works with its site common Database.
Databases of parent and child sites (for example EMS and SS) are synchronized.

EU project for MD's in villages to be equipped with 400 PC's.

This project is on hold at the moment.

SIMS

SIMS (Social Information Management System) is in process of software developing project.

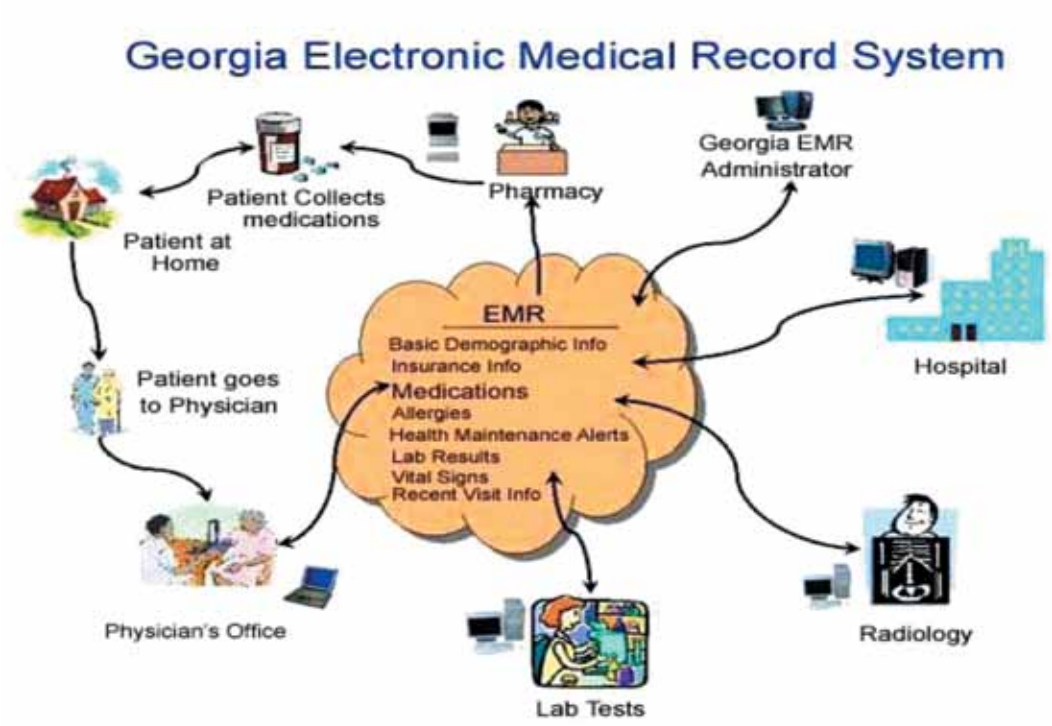
Social Service sphere is an important component of Government. The operational and quality service delivery to vulnerable segments of one hand is to maintain a healthy community and the first precondition and for the other hand provides state funds effective disposal. At present the Social Service Agency has a number of management systems, which do not operate in integrated environments, and serve only a specific direction of management objectives. Social Service Agency serves 2.5 million citizens, which is 60% of the population; monthly 1.6 million citizens receive any benefits. During the month Social agent and social workers are provided 35 thousand home visits – in year more than 400 thousand. Also Social Service Agency serves hundreds of Georgians living abroad to the appointment of retirement.

Electronic Medical Record (EMR)

Electronic medical record systems lie at the center of any HMIS. Without them other modern technologies such as decision support systems, surveillance systems, on-line monitoring for chronic patients, cannot be effectively integrated into routine clinical workflow. Over the past decade, the political impetus for improving the healthcare system in many countries has become stronger and stronger. Incontrovertible evidence has increasingly shown that current systems are not delivering sufficiently safe, high quality, efficient and cost effective healthcare, and that computerization, with the EMR at the center, is effectively the only way forward. As Tony Abott, Australian Minister for Heath and Ageing, said: "Better use of IT is no panacea, but there's scarcely a problem in the health system it can't improve". Governments in Australia, Canada, Denmark, Finland, France, New Zealand, the UK, the USA and other countries have announced - and are implementing - plans to build integrated computer-based national healthcare infrastructures based around the deployment of interoperable electronic medical record systems.

The Electronic Medical Record (EMR) system is a system dedicated to collecting, storing, manipulating, and making available clinical information important to the delivery of patient care. The central focus of such systems is clinical data and not financial or billing information. While some organizations deploy systems limited in their scope to a single area of clinical information (e.g., dedicated to laboratory data), what we mean here is a comprehensive system that covers virtually every facet of clinical information pertinent to patient care. It is a longitudinal electronic record of patient health information generated by one or more encounters in any care delivery setting, or even at the patient's home or work place. Included in this information are patient demographics, progress notes, problems, medications, vital signs, past medical history, immunizations, laboratory data and radiology reports. The EMR automates and streamlines the clinical workflow. The EMR has the ability to generate a complete record of a clinical patient encounter and supports evidence-based decision support, quality management and outcomes reporting.

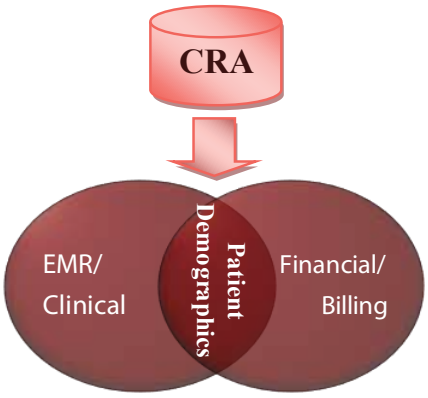
Larger healthcare organizations in Georgia may purchase or develop their own internal Electronic Medical Record. In this case, the organization will be required to meet all GoG standards and send patient clinical information in the GoG approved standardized message format and using the GoG approved data exchange and messaging standards. Other organizations may opt to use the Georgian EMR to directly enter patient information and use the EMR as part of their internal processes to provide patient clinical care. Patients have the right to securely access their medical information as well.



According to the United States Institute of Medicine, there are core capabilities that EMRs should possess. Applying this concept to Georgia, we need the following capabilities:

Personal and Health Information

Having immediate access to key information - such as patients' demographic, as pulled to/from the Civil Registry on a real time basis, would ensure the EMR system has the most up to date information for the patient. This following data, in standardized format should be included in order to improve caregivers' ability to make sound clinical decisions in a timely manner: Primary information (Name, date of birth, sex, identification), Marital status, Contact information for patient and employer, Primary provider, Language and ethnicity, Insurance coverage, diagnoses and problem list, allergies, immunizations, and current medications, vital signs, and structured review of systems.



Results Management

The ability for all providers participating in the care of a patient in multiple settings to quickly access new and past test results including labs and radiology increases patient safety and the effectiveness of care.

Order Management

The ability to enter and store orders for prescriptions, tests, and other services in a computer-based system enhance legibility, reduce duplication, and improve the speed with which orders are executed. Online drug search, prescription tracking, and e-prescriptions allow a provider with the appropriate security profile to create an outpatient prescription and send the prescription electronically to the patient's choice of pharmacy to fill. Thanks to the use of the standardized National Drug Database, order management can also improve the rational use of medications on a national level within Georgia, including the reduction of waste due to medication expiration. Support for Electronic Signature to the extent mandated or recognized by the Georgian government should be clearly incorporated.

Decision Support

Using reminders, prompts, and alerts, computerized decision-support systems help improve compliance with best clinical practices, ensure regular screenings and other preventive practices, identify possible drug interactions and allergies, and facilitate diagnoses and treatments. Structured clinical note templates are important to force providers to complete certain documentation steps in filling out data. Providers would be unable to complete the clinical note unless critical data is filled in.

Reporting

Electronic data storage that employs uniform data standards will enable health care organizations to respond more quickly to reporting requirements, including those that support patient safety and disease surveillance.

Electronic Communication and Connectivity

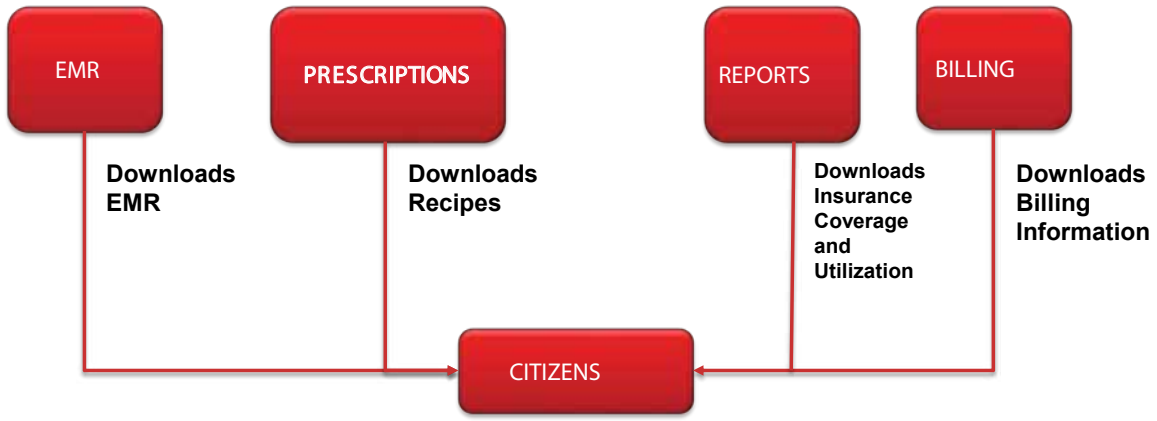
Efficient, secure, and readily accessible communication among providers and patients improve the continuity of care, increase the timeliness of diagnoses, prescriptions, and treatments, and reduce the frequency of adverse events. This also includes the capability to scan documents and upload them to the system for easier commu-

nication. Modern solutions work with biomedical devices to transfer information from the patient's device to the EMR, such as mobile vital signs monitoring, Ear thermometer, handheld digital Blood Pressure monitoring, Glucose monitoring, Smart pump infusion integration, and Secondary alerts. Additional extension modules are available for hospitals internal use to meet operational clinical needs. These would send messages to the EMR but would not be considered part of the Georgian EMR: Medication dispensing cabinets, Smart beds, Patient controlled anesthesia (PCA) pumps, Supply automation & inventory management, Tissue tracking for pathology, Specimen tracking, and Endoscope tracking and use-cycle management.

Patient Support

Tools that give patients access to their health records, provide interactive patient education, and help them carry out home-monitoring and self-testing can improve control of chronic conditions, such as diabetes.

Information Flow for Citizens



SMART Card - Health care organizations worldwide are implementing smart health cards supporting a wide variety of features and applications. Smart health cards can improve the security and privacy of patient information, provide the secure carrier for portable medical records, reduce healthcare fraud, support new processes for portable medical records and provide secure access to emergency medical information.

The patient portal will also leverage the widespread technologies (Web, e-mail, and texting) to develop an integrated approach to reaching large populations of at-risk and chronic disease patients for the purpose of effecting long-term behavior change and healthy lifestyles. Based upon the present of certain triggers (presence of a condition), preventive health information will be pushed to the consumers. While this general concept will apply to, and will ultimately be developed for a broad range of chronic disease conditions, early targets could include a subset of important conditions on which to initially focus, such as Type 2 diabetes, obesity, hypertension, or coronary artery disease.

Health Risk Analysis (HRA): A Web-based application in which consumers enter their pertinent data to assess health risk and educational needs (e.g. pertinent medical information, demographics, anthropometrics, cultural influences, physical limitations, financial status, lifestyle habits,) and answer questions designed to gauge the person's functional health literacy. This information will be computer-analyzed against current evidence-based guidelines and the consumer will receive feedback regarding which aspects of their personal information represent risk factors. In addition to the initial evaluation, this software could facilitate periodic reassessment.

Virtual Goal Adviser (VGA): The consumer will be asked questions to determine their current stage of behavior change based on the Trans-theoretical Model of Change, and then select which of their identified risk factors and self-management behaviors they would like to address. They will be guided to develop individualized SMART (Specific, Measurable, Attainable, Relevant, and Time-bound) health goals for improving chosen aspects of their lifestyle. Alternatively, the consumer may wish to enter goals already defined between themselves and their healthcare provider.

Personal Health Tracker (PHT): The consumer will be provided with tracking tools and encouraged to monitor his/her progress and securely store ongoing personal health information (cholesterol, glucose, weight, blood pressure, etc.) as they progress with their SMART goals. The PHT will also allow the consumer to manage a daily log of diet and physical activity, and a calendar of events (e.g. medication schedule, upcoming appointments, etc.). The information entered into the PHT will also drive automated feedback and reminders from the Virtual Concierge Service (see below). At the consumer's discretion, this serial information could be accessed by his/her healthcare provider(s) and included in a patient registry of self reported health data. The patient registry would provide de-identified, aggregate data to generate report card summaries, for example, that would be of interest to provider groups, payers, and researchers, resulting in an important potential disease management tool.

Virtual Concierge Service (VCS): The VCS is the cornerstone "push technology" component of the program and is the innovation that will drive the success of this approach. While the
HRA and VGA provide the basis for consumers to initiate their self-management programs, and the PHT provides the basis for monitoring progress, the VCS is the component that will keep consumers engaged in their ongoing self-management. It will automate communication with the consumer, utilizing a wide variety of standard and personalized message types delivered via e-mail, SMS, and online message board. Personalized messages will be driven by the consumer's SMART goals and PHT entries, tailored to cultural and age-specific preferences, and designed to (for example):

- Reinforce behavioral goals by giving positive feedback, encouragement, or offering suggestions for improvement (e.g. tips from published successful interventions and behaviors)
- Sustain important self-care behaviors by providing medication and appointment reminders
- Educate by providing practical diet and exercise tips and "Learn more" links to "pull" the consumer towards credible Web-based health information.
- Empower by providing "fresh" information using links to educational activities and health related resources.

Through the VCS, the consumer will be able to appoint coaching "buddies" as support individuals (informal caregivers, family, friends, other patients, etc.) who can also receive communications designed to encourage active participation in the consumer's regimen.

Administrative Processes

Computerized administrative tools, such as scheduling systems, greatly improve hospitals' and clinics' efficiency and provide more timely service to patients. The patient in Georgia should be able to do the following

Pay Bills, Track Account balances – This would link to provider websites so the patient could pay their outstanding healthcare bills with a credit card and review detailed patient bills and account balances.

Request Appointments – This would link to a provider website or email to send an appointment request to a queue maintained by the provider's office staff.

Track Referrals from primary care providers to specialists including inpatient admissions and surgeries.

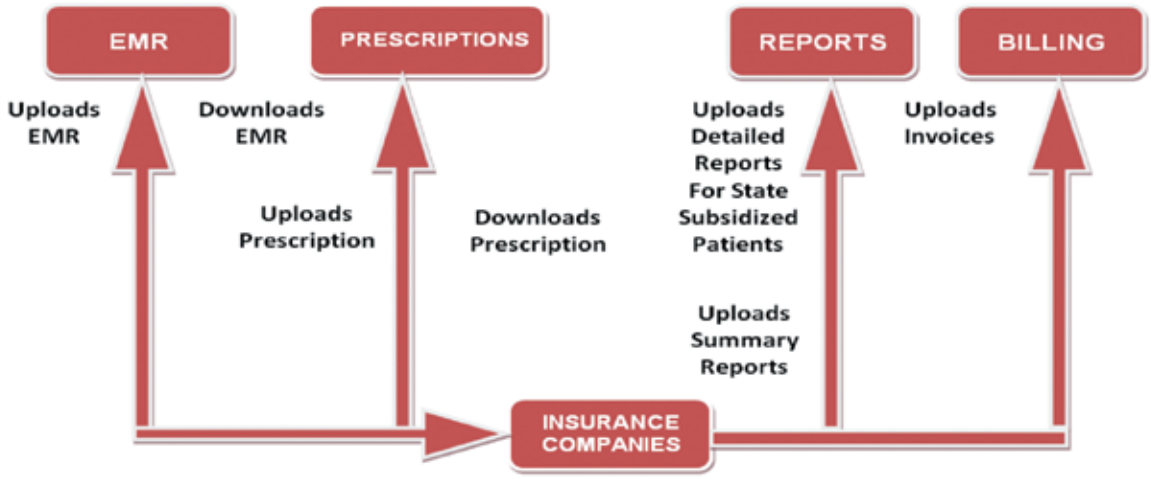
Insurance Coverage and Utilization - Ability to view which insurance company is covering the patient's healthcare services and what are the details of the insurance package. Insurance benefit utilization based on claims filed by insurance company including limits of coverage (for example: 50 GEL limit for outpatient medications)

Financial Information System Functionality

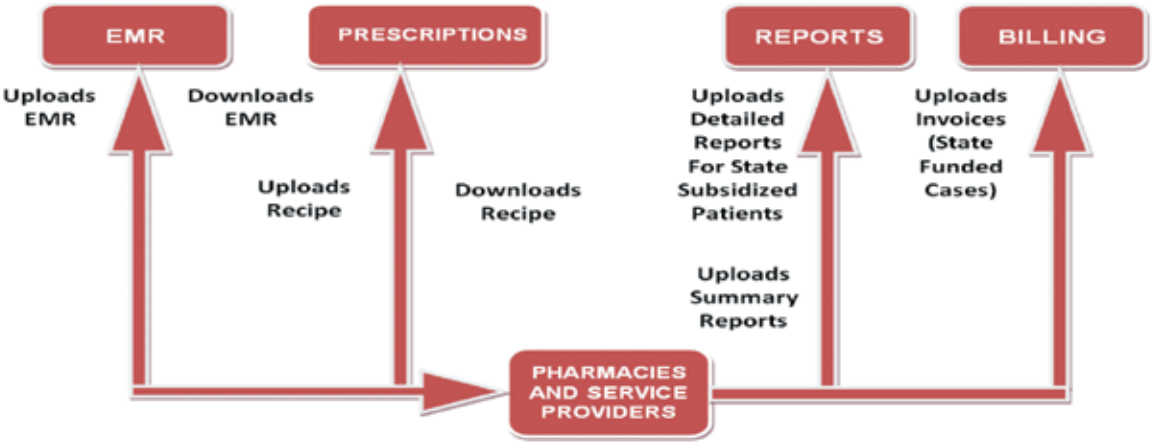
While the Electronic Medical Record collects the clinical information, the Financial Information System(s) (FIS) will collect the financial and billing information needed to provide and distribute GoG funds for state subsidized (including vertical programs) insurance programs. In addition, private and corporate healthcare insurance information will also be collected by the FIS.

All transactions for state subsidized programs will be collected in a detailed format.
Summary information will be provided for all non-state subsidized insurance programs.

Information Flow for Insurance Companies



Information Flow for Pharmacies and Service Providers



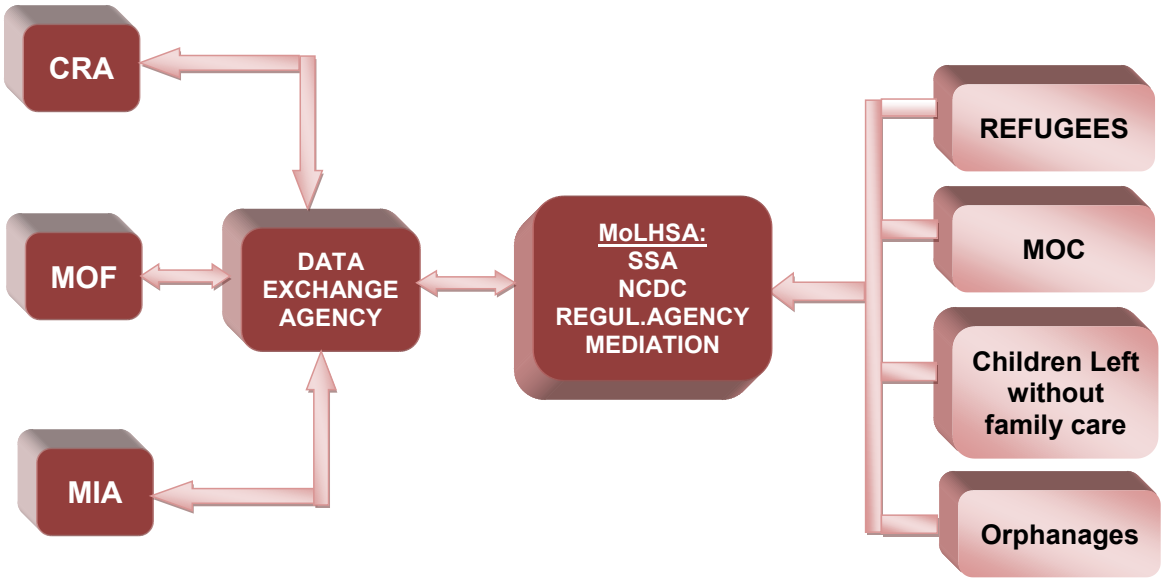
Based on the information flow diagrams above and an understanding of the administrative workflow of the state subsidized insurance programs, below is a recommended list of functional requirements for the HMIS FIS component:

Functional Requirements	Stakeholders				
	SSA	Insurance Companies	Healthcare Providers	Patients	Other Stakeholders (Note 1)
Consolidated list of state insurance program beneficiaries from multiple sources	X				
Logically created master list of beneficiaries by Insurance Company including real time updates for births, deaths and change in poverty status. These updates will be "flagged" to ensure they are done.	X	X			
Monthly insurance premium calculations and payment approval process	X	X			X
Electronic notification to the treasury (Ministry of Finance) for insurance company premium payments in cooperation with MoF IT staff.	X				X
Standardized formats for entry of claims for reporting to SSA including drop down selections to ensure quality of data entry.	X				
Price lists of all services are published openly to allow comparison	X	X	X		
Ability to import information through an upload of EXCEL or other formatted files for claims reporting to SSA. Imports will be required to meet HMIS standards.	X	X			
Insurance benefit utilization based on claims filed by insurance company including limits of coverage (for example: 50 GEL limit for outpatient medications)	X	X	X	X	X
Track patient out of pocket expenses for state subsidized insurance programs				X	X
Ability to identify potential double insurance or fraud insurance cases.	X	X			
Capability to share information regarding insured persons with other insurance companies. For example: This insured person is a candidate for a "black list" due to fraud involving insurance claims.		X			
While the initial intent of the HMIS is to collect information regarding state subsidized insurance programs, the system can be easily adapted for private and corporate insurance as needed.		X			X
Ability to view which insurance company is covering the patient services and what are the details of the insurance package.			X	X	X
Standardized and optimized patient medical history list showing all services and medications provided to patient by providers (based on insurance company claims)		X	X	X	X

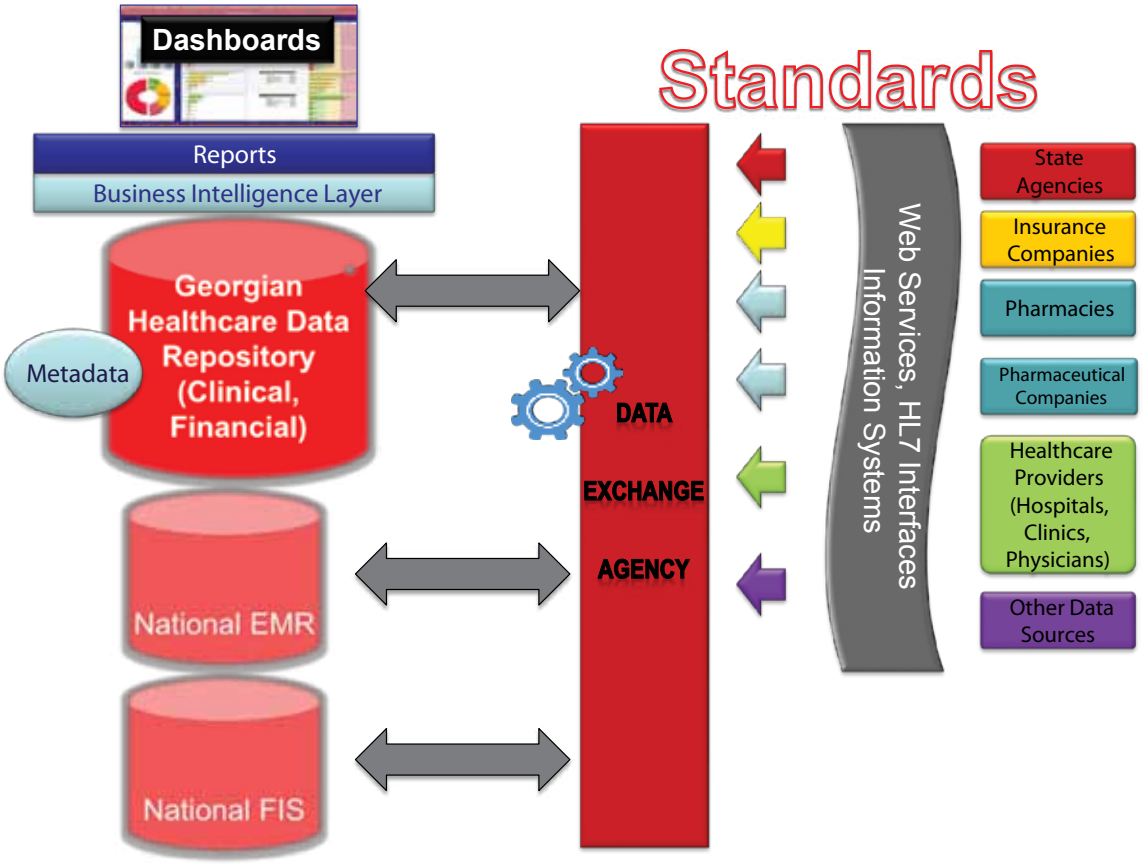
Updating the insurance company (as required by insurance company) with the status of all requested services by patients.			X		
Ability to enter services performed by provider in the EMR and mechanism to send this information to the insurance company. Insurance company would then enter additional information such as payment information.			X		
Referral Management: Ability to view referral information entered by insurance company or provider when the patient is referred to another provider or facility.		X	X		
Ability to enter referral information when referring a patient to another provider. Notification mechanism to referring provider.			X		
Summary and analytical reporting on services provided to beneficiaries	X	X	X		
Ability to provide reports supporting the regulation of administration of health insurance programs. These reports can be produced based on the information entered in the FIS database.					X

Note 1: Other Stakeholders include National Bank of Georgia, Insurance Supervision, MoLHSA, MOF, GIA, HIMS and others

Below is an illustration of a potential information flow for the FIS showing multiple agencies that would provide data on state insurance beneficiaries and utilizing the Data Exchange Agency to exchange information from GoG agencies responsible for citizen identification (CRA), funding of insurance coverage (MoF) and the Ministry of Internal Affairs for final verification of below the poverty level beneficiaries. Process and design specifications will need to be created and approved by stakeholders for all FIS functionality listed above.



Georgian Health Data Repository (GHDR)



The Electronic Medical Record and Financial Information Systems will support the day to day operational functions surrounding the provision of healthcare to the citizens of Georgia. These systems will contain standard operational reports that end users may produce to assist in their daily work load. For example: a patient is traveling out of the country and would like the provider to print a list of their medications for them to carry. Or an insurance company would like to print a work list of error messages and rejected transactions from an upload file. These types of reports would all be produced within the EMR or FIS. The EMR and FIS databases will typically be patient centric.

Best practice dictates a data warehouse be established for use in cross population studies, analyzing data from disparate systems and to support queries looking at a large number of records. EMR and FIS data may be stored redundantly in a data warehouse but a data warehouse database is typically structured to optimize cross-patient queries and is not patient centric. Using a data warehouse for these types of queries will protect the EMR and FIS from performance issues if a query is not written efficiently or if queries are pulling a large amount of data. The Georgian Governmental Healthcare data warehouse will be called the Georgian Health Data Repository (GHDR).

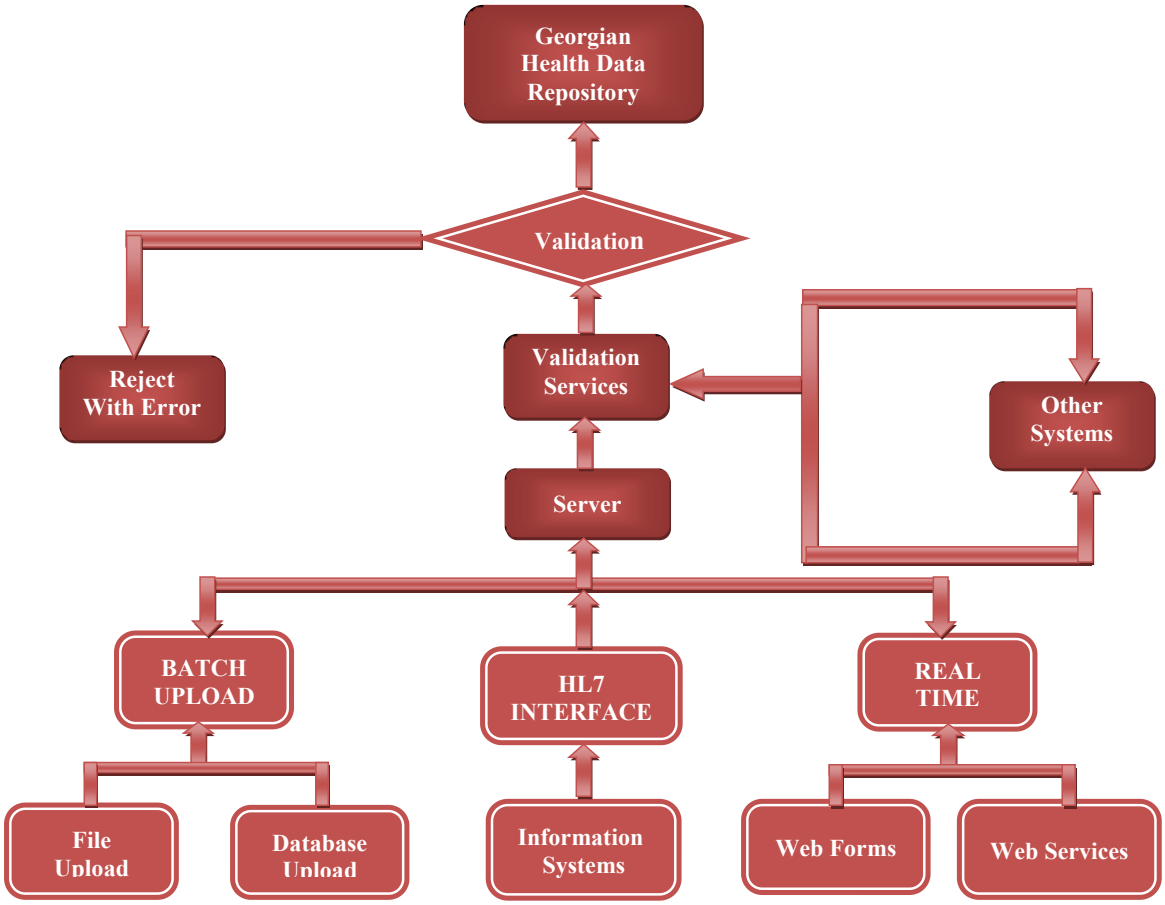
The GHDR will collect data from multiple systems such as the EMR, FIS, Pharmaceutical company internal information systems, SIMS etc… and consists of an ETL tool, a Database, a Reporting tool and possibly a Data Modeling tool. These tools will be described further below.

As part of the HMIS, the MoLHSA will provide a National Health Information Center that will provide real time online analytical decision support tools to assist in the improvement of daily operations and clinical practice, as well as data warehouse decision support tools for analyzing retrospective information that will assist in prospectively planning improvements for the quality of services provided, the effectiveness of the delivery

of services, and the efficient utilization of resources. This National Health Information Center will consist of personnel with expertise in Data Warehousing, Subject Matter experts in the healthcare field and experts in the major HMIS components such as the EMR and FIS, Business Analysts and Government representatives well versed in the business aspects of providing healthcare to the Georgian people. A centralized approach to reporting will ensure that HMIS standards are adhered to and a "single source of truth" is maintained across all organizations. A single source of truth ensures a standard definition for HMIS Key Indicators exists and that all stakeholders agree on the definition and resulting metric.

Populating the Georgian Health Data Repository (GHDR)

So how does data get into the GHDR? As the diagram shows below, data will be exchanged in either real time or batch mode from multiple sources: web applications, the EMR and FIS, HL7 interfaces from vendor systems and batch upload from some systems. All data will run through a validation process which will help to ensure the quality of the data. This validation process will require Information Services (e.g. Web Services) from other agencies such as Civil Registry, Ministry of Finance and Ministry of Internal Affairs to ensure unique identifiers are correct (for example personal id from the Civil Registry) and that data is accurate. These validation checks will be performed prior to any data being loaded into the GHDR. Representatives from the source systems will be designated to fix data errors identified during the validation process.



Extract, Transform Load

ETL is a data warehousing tool which

Extracts data from outside sources.

Transforms the data to fit operational needs. Transforming data involves mapping and converting data from one format to another, modifying the data to meet standards and performing data cleansing or quality improvement functions.

Loads the data into the GHDR.

The functionality available in the Integration Engine (Biztalk) purchased by the Data Exchange Agency should be evaluated to determine if this tool may be utilized as the ETL tool for the GHDR.

Data Domains (Categories)

The MoLHSA will need to employ (contract) personnel with expertise in data modeling. Data modeling is a method used to define and analyze data requirements needed to support the business functions of an enterprise. These data requirements are recorded as a conceptual data model with associated data definitions. Data modeling defines the relationships between data elements and database structures. Data modeling needs to occur at an enterprise level to be successful and IT resources need to work closely with end users and MoLHSA stakeholders familiar with the business processes surrounding the data.

The GHDR database will contain all information regarding the provision of healthcare in Georgia. This information will cover many areas or domains. Queries may be run looking at one domain or across multiple domains. An initial list of domains is below but will evolve as the functionality of the HMIS components is finalized.

EMR Clinical patient data	Public Health Surveillance	Eligibility, Financial Billing and Payments – to insurance companies, by individual patient
Georgian Healthcare Statistics	Insurance Benefits and Utilization	Healthcare Services Pricing including Prosthetics, High Cost single use items (viewable by MDs and patients)
Drug Inventory Tracking	Approved Drugs	Pharmaceutical Logistic Information: importation date, the registration date, the available stock and where

Data Analysis and Presentation

Reporting

Based on the Key Indicators and Metrics the MoLHSA needs for decision making, resources in the National Health Information Center will create standard reports to be determined as part of the implementation of the HMIS. These reports will be used by many stakeholders (MoLHSA, NCDC, Providers, Insurance Companies, Pharmaceutical companies etc…)

These Analytical Reports will form the basis for the Georgian Healthcare Statistics and will need to be maintained and upgraded as additional data sources are added to the GHDR and as the MoLHSA changes the definitions for existing Key Indicators or adopts new Key Indicators. The Reporting tool (typically called a Business Intelligence or BI tool) will need to have

Flexibility and mobility

1. Flexibility to change data structure in future as new source systems are added to the HMIS
2. Flexibility to generate custom tailored reports ("Adhoc" queries)
3. Mobility to access reports from different tools and platforms (e.g. mobile phone, iPads etc…)
4. Ability to allow a data analyst to enter "What If" parameters to perform forecasting and budgeting analysis in the healthcare environment.

Other requirements for the Business Intelligence or Reporting tool include:

Reporting Tool Functionality
Current Level of Integration if any with other HMIS components and Planned Future relationship with HMIS application and vendors
Ability to integrate multiple database sources (i.e. Oracle, DB2, Web services, SQL server)
Easy report creation tool including drop and drag capabilities
Ability to integrate data from the GHDR and non-warehousing systems into one report (for example from a reporting instance of a production database)
Extensive Dashboard capabilities including graphing
Cost of license fees (scalable) and extensive vendor support
Integrated Product Suite - use the same infrastructure and access from the same point - avoid bolt-ons
Mature Report formatting capabilities
Single point of entry to the BI tool (i.e. A web portal) that could integrate other tools
Statistical analytical capabilities
Robust security with patient confidentiality/record access auditing and LDAP authentication
Ability to email reports including dissecting one report and sending portions of the report to different recipients
Unstructured text search
Ability to report on real time data
Ability to enter data values into the BI Tool and use the data entered on reports
Microsoft Office application integration
Open Architecture so support staff can query system tables to monitor report utilization etc...
Metadata tool to store data and standard metric definitions – available to reporting analysts during report creation.

Dashboards

Dashboards are a component of a Reporting or BI tool that gives end-users an "at a glance" solution to often complex and challenging business questions. Most people comprehend and develop more insight when observing the visuals such as pictures, images, graphs, etc that appear on dashboards. End-users can intuitively interact with their data via BI dashboards, drill down into aggregated data or detailed data and can modify their view of the data easily. BI dashboards provide another mechanism for report and information distribution to end-users. Once properly constructed and tested with end-users, BI dashboards are essentially self-service in nature and require minimal IT support. Dashboards will become an important tool for the MoLHSA to keep abreast of healthcare key indicators and track progress and issues with these and other metrics.

Watch Video Demonstration of iDashboards

GHDR Uses

By consolidating all healthcare information in a longitudinal, cross population repository, the information in the GHDR becomes available to a broad audience of end users to perform analysis of the many facets of providing healthcare to Georgian Citizens. A short list of potential uses of the GHDR data includes:

Georgian Healthcare Statistics

The NCDC and MoLHSA will use the GHDR to produce country and global health statistics for publication to the Georgian people, international entities and donor organizations. NCDC will become experts in the reporting and dashboard tools and will utilize the data sent from the EMR and FIS to generate Georgian healthcare statistics in a timelier manner. As data collection needs are identified, additional web applications can be created as part of the HMIS to allow providers, insurance companies and other sources of information to enter any additional information required to generate the healthcare statistics.

Monitoring Healthcare Costs

Public Health Surveillance

This is the ongoing, systematic collection, analysis, and interpretation of data essential to the planning, implementation, and evaluation of public health practice. When integrated with the timely dissemination of these data to those responsible for prevention and control, it allows decision makers and communicable disease monitoring authorities to have real-time access to critical information on the prevalence and incidence of important communicable diseases.

Decision Support: Improving Patient Care

At the clinical level is a system or application that helps health professionals make clinical decisions to enhance patient care by generating case-specific advice. At the Ministry level, knowledge management integrates multiple data sources (clinical, financial) to present decision makers with causative relationships such as clinical outcome measurements by procedures or specific medications. This relationship between clinical outcomes and resource utilization will allow senior management to most effectively allocate capital to maximize the countries health status. For example it will allow the Ministry to choose the most cost-effective medications and benefits packages.

Pharmaceutical Inventory Tracking

Pharmacies and Pharmaceutical companies will send prescription and inventory/manufacturing information to the GHDR. This information can be used for many purposes. Examples include informing patients of

medication recalls in case of harmful side effects, immediate knowledge of specific medication inventory and locations in Georgia in case of a catastrophic event or epidemic.

Research

Overseen or directed by the Ministry the data in the GHDR will offer the opportunity for the leadership to identify new opportunities to improve healthcare. For example it can develop a knowledge-based graphical representation that shows a set of variables and the probabilistic relationships between diseases, treatment and outcomes. Based upon the information through the HMIS, theoretical approaches can be compared to measured outcomes to help drive future resource allocation decisions.

Data Quality

The vision of the MoLHSA and benefits realized by an HMIS become greatly diminished if the underlying data quality is poor. Data Quality issue identification and resolution are an ongoing process that requires attention from the top down. Adoption and adherence to HMIS Standards is a first step to ensuring the quality of the healthcare data. A centralized group such as the National Health Information Center should be charged with monitoring data quality and facilitating the resolution of data quality issues. But this group will not be able to tackle data quality issues alone, they will need involvement from MoLHSA representatives with expertise in a particular business area as well as the people responsible for entering and creating the erroneous data. The governing body will appoint Data Stewards for each data domain. A Data Steward is typically an executive level official who has planning and policy-level responsibilities for access and management of Institutional Data in his or her functional areas. The roles and responsibilities of these Data Stewards and the personnel in their organization would include:

1. Develop/create complete and accurate **Metadata** documentation according to an approved template. All new data being added to the GHDR will be documented prior to addition and availability in a production environment.
2. **Access:** The value of data as a GoG asset is increased through its widespread and appropriate use; its value is diminished through misuse, misinterpretation, or unnecessary restrictions to its access. Data Stewards may approve Data Users who have a reasonable request for access to restricted data.
3. **Integration –** Data Stewards work to resolve discrepancies in how similar data is used, created, updated etc… across the HMIS and GoG databases.
4. **Quality** – Data Stewards have responsibility for data quality and validity including system and process changes required to fix identified defects. Data Stewards will assess current state of the data in their functional area and establish target goals for data quality improvement. Data Stewards will assure data collection is complete, accurate, valid, timely, and that data are maintained as close as is possible to the source or creation point of the data.
5. **Data Definitions and Metrics** – Data Stewards work with technical, business, and application stakeholders to develop a consistent method of defining, collecting, and publishing data and key performance indicators. Data Stewards will understand from start (i.e. Workflow and entry into source system) to end (data availability to Data Users) the business requirements of key business processes and define **Business Rules** for the data in their functional areas and work with key stakeholders to resolve multiple and inconsistent definitions.
6. Data Stewards provide **User Support** to assist Data Users with interpretation and use of HMIS data. Data Stewards are responsible for providing documentation of the information, training and consulting services as needed to ensure Data Users are informed and educated in their area of data so as to provide a consistent, single source of truth across the enterprise.
7. Data Stewards will approve all data and reports in their functional areas **Disclosed** to **Outside Organizations** to ensure they are accurate, correctly represent the activities/financials etc… of GoG.
8. Data Stewards will **allocate resources and funding** towards data quality improvement projects, influence changes to business processes**,** and **restrict access** to applications and data to resolve or suspend behaviors impacting negatively on data quality.

The governing body may also need to develop policy and legislation required to fix data quality issues. An example of this might be a mandate may need to be set forth that all validation errors identified for data uploaded to the GHDR must be resolved and the corrected data resubmitted within 3 days of error identification.

HMIS System Architecture

Considering the objectives of HMIS and its functional requirements, it is important to have an HMIS system architecture that is flexible, scalable, reliable, highly secure, easily accessible, and that seamlessly integrates with any external system. These requirements could be viewed as standard requirements for any nationwide IT solution. However, considering the size of the HMIS project in terms of number of stakeholder systems, number of users, the complexity and agility of business processes, and the project constraints, meeting all of these requirements is a challenging mission.

To overcome the above mentioned challenges, the HMIS architecture should be built using the right system architectural model and applying state of the art design patterns with open and standard technologies that satisfy systems interoperability and support multi data formats and standards.

Architecture Model and Design Patterns

The HMIS system architecture is centered around the following data exchange and system architecture models and design patters:

Architecture Model: 3–Tier with MVC

The 3-Tier system architecture outperforms other architectural models in several ways:

- It uses less resources.
- It is more secure.
- It does not need client deployment, hence providing better, faster, and less cost of deployment and administration.
- It supports load balancing and clustering capabilities.
- It provides better performance scalability; support the increase in traffic and number of users through the use of web technology.

The server architecture follows a layered architecture, Data layer, Service layer, and Presentation layer or what is called Model, View, and Controller (MVC). The MVC architecture allows supporting several views (such as SMS, fax, http, web service, etc) to the same service and has the capability to store data in different storage format such as data base and XML.

Design Patterns: SOA, AOP, IoC

HMIS architecture should apply SOA, AOP, and IoC design patterns which offer the following advantages:

- Make services more durable and better support long-term goals.
- Improve business scalability; manage the increase in number of services and number of stakeholders.
- Improve functional scalability; addition of new services as required.
- Give more flexibility; easy to modify service or service provider thanks to the IoC design pattern.

Exchange Model: Web based Middleware

Web based Middleware supports all characteristics of the required HMIS model such as invocation, routing, mediation, messaging, service orchestration, event processing, security, and management. All of that is achieved through a set of tools and protocols implemented within the core system.

The above mentioned characteristics, however, are not enough to make the HMIS system neither capable of exchanging data between various stakeholders nor integratable with different systems. In order to achieve that, the proposed HMIS should carry out the following two important functions through the adoption of **Stubs** and **Multi-Channel** interface:

- It makes services and functionalities available to all stakeholders using multi channels with the capability of changing any service address/port or adding new ports for the same service dynamically.
- It supports different formats with the capability of adding new formats dynamically.

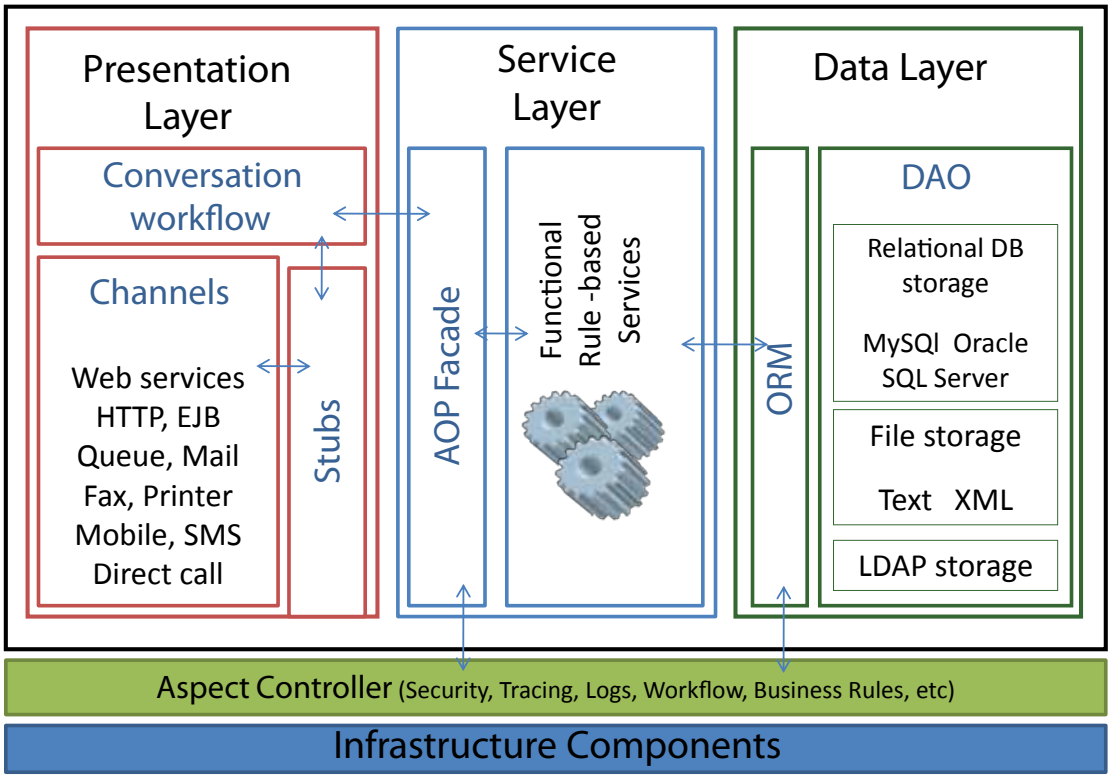
Architecture Components

Each HMIS Subsystem and Module, such as EMR, FIS, and GHDR, is composed of the following architectural components:

- **Integration Bus (IB)**
- **Service Registry**
- **Interface Tools**

The Integration Bus, as its name implies, integrates HMIS, as well as its subsystems and modules with any external system such as the CRA systems to allow them to exchange information securely and seamlessly. The **IB** uses a set of **Interface Tools** to communicate with external entities including systems and users. The **Service Registry** is used to register a set of services and its attributes to dynamically control the service transactions during the run time.

The Figure below shows a layered architectural view of any of the HMIS subsystems . It consists of three layers, presentation layer, service layer, and data layer.



Internal System Architecture of HMIS subsystems

Presentation Layer

The Presentation Layer works as a frontend of the subsystem. It receives incoming messages and sends outgoing messages from/to the external callers whether they are users or systems. It consists of three main components, **Channels, Stubs,** and **Conversation Workflow.**

A message consisting of Service Name, Call Type (synchronous or asynchronous), Transaction, and Parameters, is received by **Channels**. The architecture can support several types of channels including web service, http, mail, SMS, EJB, fax, printer, etc. The message format is then transformed to the internal system format using a suitable **Stub**. Finally, the **Conversation Workflow**, once it constructs the required message, calls the service layer to process the message and execute the associated functions.

Service Layer

The Service Layer processes messages coming across the layer and executes the associated functions as a Service. The service encapsulates functions with many aspects such as security, transaction, tracing, alert, audit, etc. to assure the reliability, security, and traceability of the execution of functions.
The Service Layer is composed of two components, **Façade** and **Functional rule-based service**.

The **Façade** is a frontend for service layer. It receives messages from the presentation layer, aspect controller, data layer, or even from the service layer itself. Its main function is to monitor and route all messages coming across the service layer to its right destination internally or externally.

The **Functional rule-based service** component is the core of the subsystem architecture holding the business logic. The business logic could be functional such as the functions of EMR or FIS, or non-functional such as routing and coordination functions. Business rules are registered separately as aspects in the Service Registry, giving the whole system more flexibility and scalability.

Data Layer

The Data Layer is the backend of the subsystem that interfaces with external data storage systems to perform read/write operations. There are two basic components that build up the Data Layer, **Object Relational Mapping (ORM)** and **Data Access Object (DAO).**

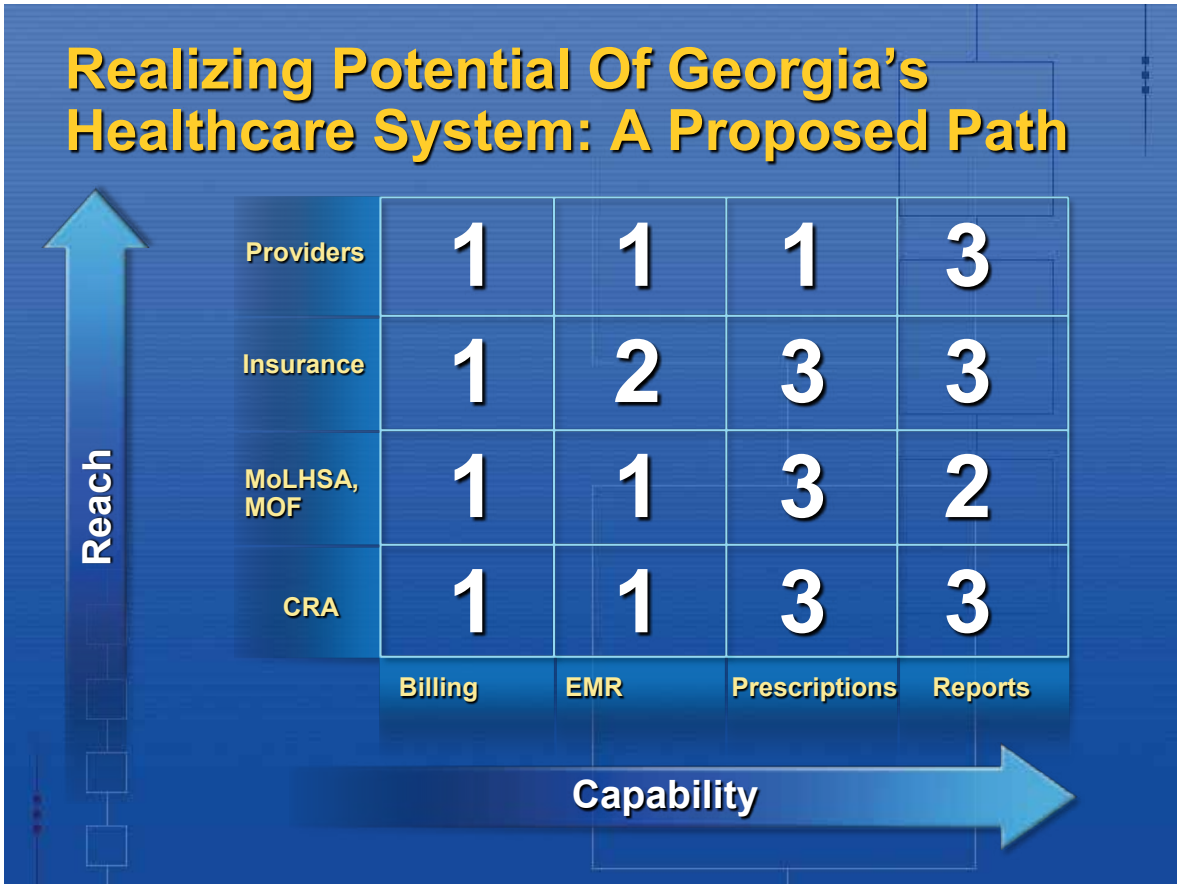
The **ORM** receives, realizes, and transforms requests coming from the Service Layer as Objects into intermediate representation.

The **DAO** transforms the intermediate representation into internal representation of the related data source which is found by interrogating the Service Registry. The DAO may have several implementations according to the number of supported data sources; RD such as Oracle and MySQL, File format such as Text and XML, or LDAP. Additional data sources may be added dynamically.

HMIS Project Phases

Since complete implementation of a HMIS is typically a multi-year project, beneficial to have a methodology for prioritization based on the needs of the country. One approach that is used by organizations or governments of varying sizes is the "reach/functionality prioritization matrix." This matrix lists on one axis the levels of the functionality needed by the organization, and on the other axis the levels of reach (constituencies) within the organization. The cells of the matrix are then filled with numbers to represent the priority of covering that type of functionality for that type of constituency of the organization.

Based on this approach, implementation of the HMIS has been broken into preparation followed by a three phase plan . Interdependencies exist between many of the projects but most of this phasing should not be considered sequential. Projects may be worked on in parallel based on resource and funding availability. However integration and adherence to HMIS standards will be essential to the overall success of the HMIS. Therefore the Governing Body should act as or appoint an Enterprise Architect(s) to analyze the impact of each individual project on the overall HMIS vision. As the HMIS implementation progresses, the phases listed below may changed based on changes in direction, resources, technology advances etc…



Prepare

Preparation Phase

- Form Governing Board
- Identify available Resources and engage Project Management expertise for HMIS
- Establish Process for Centralized Budget, Procurement and Contracting
- Complete HMIS Budget Proposal – Review funding sources for allocation to HMIS components
- Formulate Implementation Roadmap for realization of HMIS vision (Year 1 detail, Year 2 – 3 at a higher level)
- Form Working Groups reporting to the Governing Board
  - Standards
  - Security
  - BUILD/BUY Investigations and Recommendations
  - Identification and Documentation of HMIS Key Indicators
- BUILD/BUY decision for major components
- Vendor Selection process for Development and Acquisition
- Revise HMIS Budget as appropriate

Phase 1

- Revise existing or create new Information Technology Operational Structure to implement and support HMIS
- Integration with Civil Registry Agency for citizen/patient identification
- Identify and Implement HMIS Standards (Messaging, Vocabularies, Administrative)
- Process Standardization (which institution submits which report and how, validation procedures) – implement paper based process as interim solution
- Development of Billing Module and implementation to pilot organizations
- Implement (Develop or acquire) EMR to pilot organizations
- Limited Reporting capabilities
- Implement Patient Portal with limited functionality
- Develop/acquire core data warehouse for GHDR
- Develop Project Charters for each item slated for Phase 2

Phase 2

- Rollout of Billing Module – increase number of institutions
- Rollout of EMR Module (Hospitals, Primary Health Care, GP)
- Increase Reporting capabilities
- Increase Patient Portal functionality
- Increase Data domains available in GHDR
- Develop Project Charters for each item slated for Phase 3

Phase 3

- Collect Pharmaceutical Company manufacturing and inventory information
- Integrate Pharmacies into EMR with e-Prescribing
- Incremental increase in Patient Portal functionality and Implement Personal Identification Cards
- Implement Business Intelligence tools to create reports and dashboards

References and Additional Reading

Messaging Standards

Health Level Seven International (HL7)
http://www.hl7.org

Digital Imaging and Communications in Medicine (DICOM)
http://medical.nema.org/

Medical Vocabularies

Logical Observation Identifiers Names and Codes (LOINC)
http://loinc.org/

Systematized **No**menclature of **Med**icine-**C**linical **T**erms (SnoMed)
http://www.ihtsdo.org/snomed-ct/

Current Procedural Terminology (CPT)
http://www.ama-assn.org/ama/pub/physician-resources/solutions-managing-your-practice/coding-billing-insurance/cpt.shtml

Healthcare Links

Institute of Medicine (IOM)
http://www.iom.edu/

Appendix B:
Other Countries HMIS Functionality

Category	Description	Country
Data capture	Data entry screens designed to resemble the format and look of hard copy forms	Ghana
Data capture	Modules for data collection and recording	Djibouti
Data capture	Allows participation of all providers, including private sector, military, etc	Ghana
Data capture	Incorporates a vital registration system module (to register births and deaths) and exchange info with civil systems	South Africa and others
Data capture	Enables the design of customized medical records interface by users without the need for programming knowledge	Vietnam
Data capture	Use standard vocabularies like ICD, International Classification of Functioning, Health and Disability ICF, International Classification of Health Interventions ICHI	Many
Data capture	Assemble all data entry forms (hard copies) and identify the core ones.	Ghana
Data capture	Build in process for routine verification of data	Senegal
Data capture	Process for migrating historical data with limited historical data gaps	Djibouti
Data capture	Build on standard tools for indicators and data quality (tables of indicators with clear definitions)	Sierra Leone
Data capture	Collected data must be adapted to the reporting requirements for donors and other health programs	ALL
Data capture	Captured data must be at all levels – down to community and village level which is usually not reported in national health systems	Nigeria and others
Data capture	Regular feedback on the quality of data collected from prvinces and district to help better future collection and consolidation	laos
Data capture	Use internationaly accepted standards to gather and analyse data	Armenia
Data capture	Institutionalizing the data quality assessment criteria	Armenia
Data capture	Other data collected: Detailed transportation network, general cartography and geo-referenced census data	Mexico

Data capture	Use of PDAs to record and communicate census results	Bangladesh, Kenya
Data exchange	Decentralized system that can analyze and present data at a regional level, not just at the ministry level.	Djibouti
Data exchange	Allow periodical transfer of data at varying periodicity based on user needs	Ghana
Data exchange	Allows FTP protocol to exchange data files when always-on connectivity is not available	Kenya
Data exchange	Possibility to use a cell-phone based system component to facilitate decentralization of data entry	Rwanda and other
Data exchange	Mobile phone based medical advice transmitted from health centers in rural areas	Bangladesh
Data exchange	Use of biometric smart cards for families (below poverty line) to store family info and read it into the system when family comes to receive treatment	India
Data exchange	Integrated voice response system and SMS system for communicating with communities	Rwanda
Data exchange	Teleconference network between MOH and other districts	Mongolia
Data exchange	Code of conduct for data exchange and sharing	ALL
Data exchange	Use of wide area network and wireless broadband to exchange information with remote healthcare centers	Nigeria
Data exchange	Using of Internet via satellites, to exchange info over web applications	Nigeria
Data exchange	Data is communicated between all levels district, regional and central	Namibia, Nigeria, Senegal
Data exchange	Communication with civil registration system (if available) to share with the health info system in order to revise death info , marriage and divorce, birth info …etc. and cross check with data collected for the health system	South Africa and others
Data exchange	High response data rate when exchange info between different systems	Sudan
Data exchange	Voice and video conferencing with district health managers	Bangladesh
Data exchange	Wi-Fi, GPRS, and Vsat enabled connectivity	Mozambique
Data exchange	Incorporate telemedicine capabilities	Kosovo
Data presentation	Modules for data reporting, aggregating and tallying	ALL

Data presentation	System is flexible and easily adapted to the needs of users especially when it comes to user interface and to reporting	Djibouti
Data presentation	Data to be produced in different format (EXCEL, WORD, PDF, HTML ...etc.)	Senegal
Data presentation	Clear presentation of information in terms of data charts for easy decision making	Senegal and others
Data presentation	Timely delivery of data	Ghana
Data presentation	Adequate feedback to benefit community workers and health care providers in the field	Nigeria
Data presentation	Generation of interactive maps	Tunisia, Bangladesh, Tonga
Data processing	Focus on data analysis and use of data in decision making process	Sudan
Data processing	Incoprporates a robust decentralized statistical system module	Djibouti and others
Data processing	Integrates current standalone vertical systems and programs that collect data using different tools and formats (e.g., for HIV, TB, maternity health, etc)	Sudan
Data processing	Uses district health information system in the establishment of a data warehouse at all levels	Ghana
Data processing	Incorporates a public health emergency process	
Data processing	Standardize the computation of indicators	Ghana
Data processing	Enables data auditing	Kenya
Data processing	Incorporates a GIS database, has a digital health map (carte sanitaire); health info per region in Tunisia, link GIS to hospital info systems in Tonga - use GIS to identify regions and collect data in Bangladesh	Tunisia, Bangladesh, Tonga
Data processing	Has human resource module to record and manage health workers data: recruitment, promotion, leave, transfer, separation, demotion, training, grievance, reporting, vacancy management, distribution …etc.) and performance management and incentives calculation	Ethiopia, Kazakhstan, Swaziland, and other
Data processing	Incorporates performance monitoring module for continuous performance monitoring and improvement	Ethiopia
Data processing	Incorporates iHRIS suite for human resource information system strengthening	iHRIS Qualify implemented in Uganda; iHRIS Manage: in Kenya, Rwanda, Tanzania, Uganda and Botswana ; iHRIS Plan piloted in Namibia

Data processing	A financial module to Monitor health finances and medical expenditure and service quality	Armenia, China, Kazakhstan
Data processing	Help plan for prophylaxis activities	Kazakhstan
Data processing	Automate processing of state and other departmental forms	Kazakhstan
Data processing	Drug management and monitoring system module (quality of drugs, consumption of free drugs, prevention of drug-related disease/death, physical and economic accessibility of drugs)	Kazakhstan
Data processing	Integrated drug testing operations managemnt information system (IDTOMIS)- provides automatic notification on drug test results, drug abuse, drug abuse treatment and rehab, etc	Philippines
Data processing	Integrated financial IS, Laboratory IS, HMIS, Client based data (HER) and logistic MISs - need to design and implement these systems to harmonize HIS nationwide	Ethiopia
Data processing	Supported with a set of referral criteria and referral system	Belize
Data processing	Central health database :: data ware house	Vietnam
Data processing	All harmonized data forms are linked by district and then transferred to the national (HIS) data server.	Kenya
Data processing	Comprehensive data warehouse	Zambia
HR related	A national HIS advisory committee that includes all possible stakeholders to guide the implementation process (Relevant Sectoral Ministries, donors, statistics agency, Telecom agencies, Universities, Regional Health Centers.	ALL
HR related	Health Information Council of Ministers, to draft regulations.	Ethiopia
HR related	National HIS committee	Ethiopia
HR related	Strong leadership within MOH to ensure an enabling environment and availability of infrastructure.	Sri Lanka and others
HR related	Nomination of national technical task force	Sudan
HR related	Motivate the involvement of community groups , health providers, health managers, and health planners. (using effective incentives)	All
HR related	Establish a network of software developers inside and outside the county between ministries of health and universities.	ALL
HR related	Maintain low rate of employees turn over to keep the knowledge and expertise	Namibia

HR related	Volunteers selected from villages for the Community Health Worker program (like Rwanda) in order to bring basic health services to remote people (maternal and child health. volunteers work with a local leader. Team is supervised by social worker from health center. CHWs are trained for the main tasks: - community integrated management of child illness (IMCI) - community-based maternal and new born healthcare (C-MNH) - behavior change communication (BCC) - Service delivery data management : community HMIS	Rwanda
HR related	Involve local leaders and religious leaders and traditional service providers and chiefs when appropriate	Siera Leone
HR related	HIS stakeholders working group	Cambodia, Thailand
HR related	Multi-institutional committee	Uganda
HR related	Frequent training needs analysis , for health workers and non-healthworkers	ALL
HR related	Ensure regular training and supervision for health workers	Djibouti
HR related	Train HIS personnel on data analysis and management	Djibouti
HR related	Diploma for Health Information Technicians (HIT)	Misc
HR related	District health information officers trained	Ghana
HR related	Develop the ability to synthesize, analyze, and dessiminate info to enable propoer day to day managemnt	Armenia
HR related	Technical ICT training for ICT professionals before system deployment	Mozambique
HR related	Long term relationships with all current stakeholders, and expand this relationships as the need for more parties to be involved in the future development of the system	Swaziland and others
HR related	Involve international Donors	ALL
HR related	Involve WHO	ALL
HR related	Involve healthcare providers, and health centers (private and public)	ALL
HR related	Involve universities, schools of medicine and schools of information technology	Namibia & other

HR related	Involve telecom provider in the country	Cook Islands
HR related	Intersectoral collaboration for health data collection	Uganda
HR related	Building up learning capacity at leadership level	ALL
HR related	Get support from local pharmaceutical and drug industry	Syria
HR related	Digital training facility	Kosovo and others
HR related	Insure complete transition from initial project to sustainable nationwide program	ALL
HR related	Incorporate implementation of HIS strengthening activities	Cameroon & others
Other	Supported with procedure manuals and guidelines for information use	ALL
Other	All relevant manuals are customized to the situation of the country	ALL
Other	Government standardized software, hardware, guidelines and all necessary documents	India
Other	Power efficient computing infrastrcuture	Mozambique
Other	Solar power infrastructure	Mozambique
Other	SmartCare Electronic Health Records system: integrates with current paper record systems, uses unique identifiers, has reliable connectivity to clinics, secure, scalable, uses distributed data base; sustainable with good training practices	Zambia, South Africa, Ethiopia
Other	Low maintenance cost. Use of Open Source software decreases licensing costs (i.e.: PHP & My SQL)	EL Salvador
Other	Tele-presence of doctors in community clinics	Bangladesh
Other	Building a medical e-library and physical library	Kosovo
Policies	Leadership, coordination, political commitment and enabling legislation is critical for the success of project	Tanzania, Sri Lanka, Ethiopia, South Africa, and others
Policies	Facilitate the initiation of modification of existing laws and legislation and drafting new laws and legislations and include policy plan and HIS strategic plan document	Namibia

Policies	Advocacy and raising awareness to influence legislations	Uganda
Pre-system	Establish health insurance fund	Estonia
Pre-system	Accurate and complete information and situation analysis is essential prior to starting to set priorities and achieve results	ALL
Pre-system	Define patient data elements, patient flow and indicators early on	ALL
Pre-system	Define and implement new /FAMILY FOLDER/ that captures both health and non-health household data	Ethiopia
Pre-system	Priority setting and planning : this requires developing a plan for strengthening the national health information systems.	Cameroon & others
Pre-system	Plan must be carefully costed to ease budgeting and sourcing of funds.	Cameroon & others
Pre-system	Adequate funding is reserved	Sri Lanka and others

Georgian-African
Business Association

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