Healthcare Information Technology Infrastructures in Turkey

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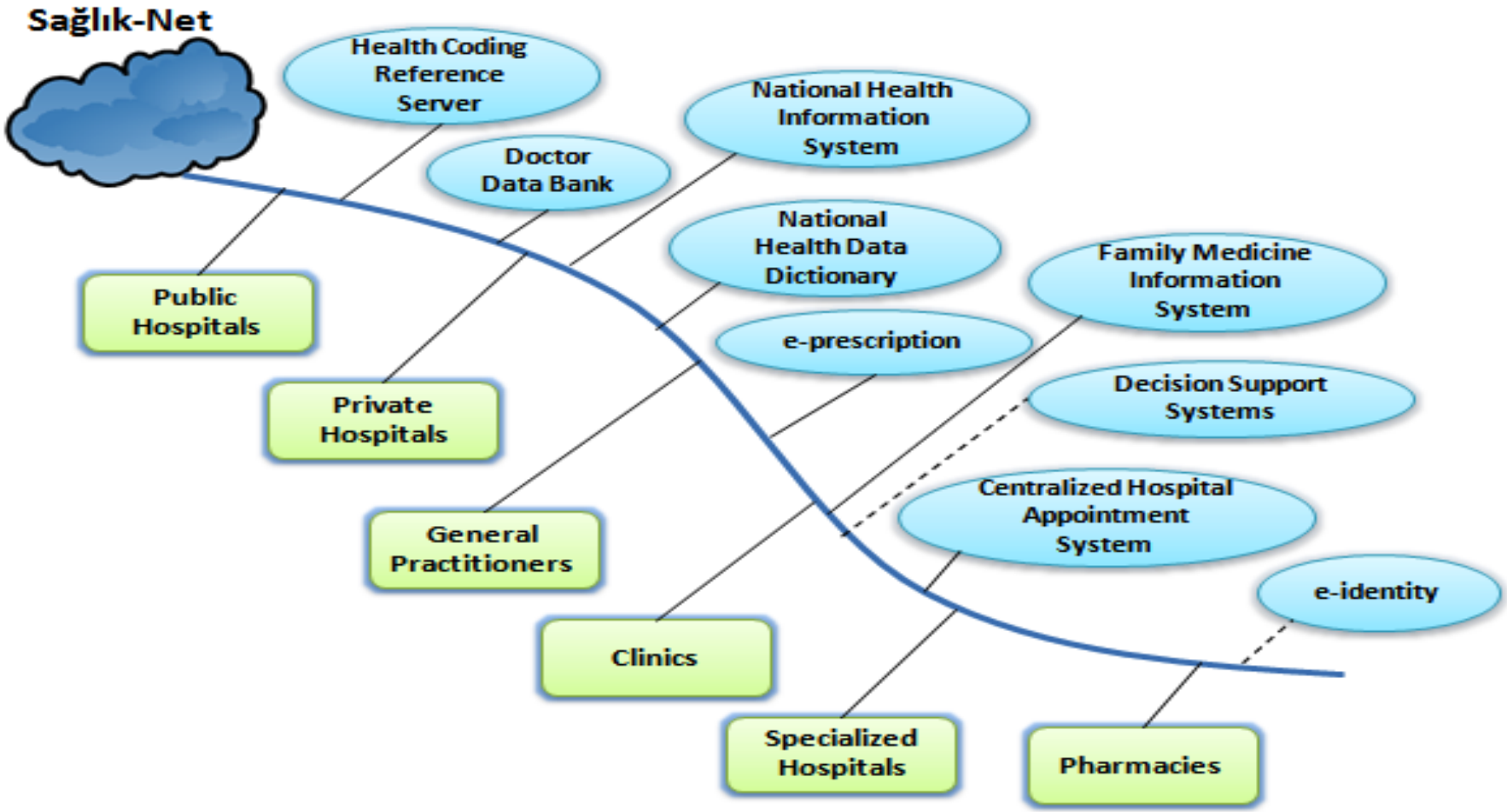
Introduction

- Health Transformation Program of the Ministry of Health, Turkey, was published in 2003.
- One of the main components of this program is achieving e-health, with the following objectives:
  - Ensuring standardization of data used in healthcare
  - Creating the Electronic Health Record for citizens
  - Data analysis support for managers (Decision Support System)
  - Speeding up the flow of information among stakeholders
  - Saving resources and increasing efficiency in the healthcare system.
- Following the Health Transformation Program, several IT systems have been developed
  - National Health Information System (NHIS)
  - Family Medicine Information System (FMIS)
  - Centralized Hospital Appointment System (CHAS)
  - Basic Health Statistics Module (BHSM)
  - Core Resources Management System (CRMS)
  - e-prescription system of the Social Security Institution.

Saglik-NET

Saglik-Net


Sağlık-Net
Health Coding Reference Server
Doctor Data Bank
National Health Information System
National Health Data Dictionary
Family Medicine Information System
e-prescription
Decision Support Systems
Centralized Hospital Appointment System
e-identity
Public Hospitals
Private Hospitals
General Practitioners
Clinics
Specialized Hospitals
Pharmacies

Health Coding Reference Server

- The Health Coding Reference Server encapsulates all the international and national coding systems used in Turkey within a publicly accessible server
  - International code Systems
    - ICD-10
    - Anatomical Therapeutic Chemical Classification System
  - Locally defined for certain sets of information
    - Clinics, Patient Discharge Type, Pregnancy Result, or Baby Monitoring Calendar
  - Currently, there are 329 coding systems maintained in the server

The National Health Data Dictionary

- Contains the commonly used healthcare data elements
  - "Address", "Name", "Main Diagnosis", "Vaccination", and "Treatment Method"
  - The format of these data elements is defined according to the rules and guidelines given in ISO/IEC 11179-4 Standard
  - V1: active from 2008 to mid 2012 had 261 data elements
  - V2: update of the first version based on feedback from the users and decision makers, has 464 data elements
- The "Aggregate Core Components", which are called Minimum Health Data Sets (MHDSs), are formed using these data elements
  - The Minimum Health Data Sets define the data that emerge at the time of presenting a specific healthcare service,
    - infant monitoring data set
    - pregnant monitoring data set
  - There were 46 Minimum Health Data Sets in the first version of the National Health Data Dictionary, and now there are 65 of them.
- The data elements within the Minimum Health Data Sets are mostly coded using coding systems that are available from the Health Coding Reference Server

National Health Information System (NHIS)

- A nation-wide infrastructure for collecting and to some extent sharing patients' Electronic Health Records (EHRs)
- supports the transfer of episodic EHRs from secondary and tertiary healthcare provider information systems to NHIS servers at the Ministry of Health
  - Yet, only the general practitioners (GPs) can access the EHRs of their own patients, through their Family Medicine Information System (FMIS) client applications.

National Health Information System (NHIS)

- Became operational in January 2009
  - NHIS and FMIS were two separate systems with their own databases and Web services
  - problem is solved in August 2012 with the 2.0 release of the NHIS, which is an improved, standards compliant and technically capable redevelopment of the first release
  - WITH NHIS 2.0 all the client side applications of primary, secondary and tertiary care providers interact with the unique national system

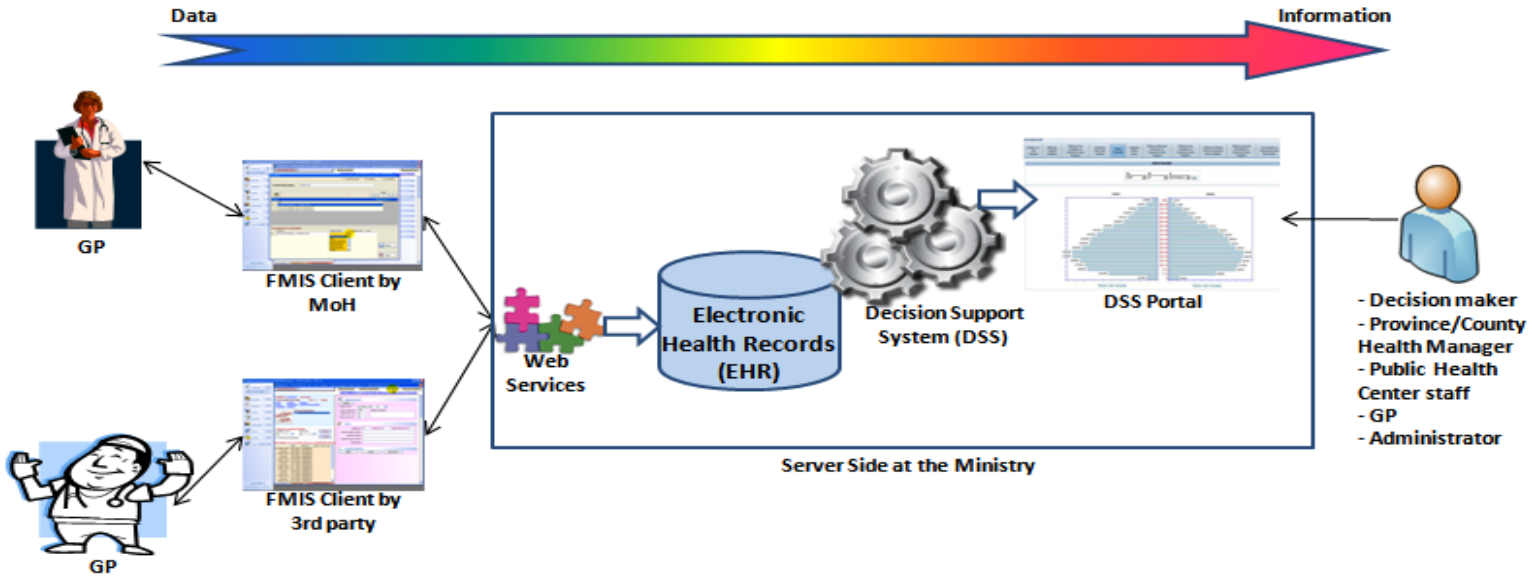
National Health Information System (NHIS)

- The episodic EHRs collected through the NHIS, also called the Transmission Data Sets, are aggregated from the Minimum Health Data Sets
  - Seven Transmission Data Sets, namely “Citizen Registration”, “Examination”, “Patient Demographics”, “Test Results”, “Inpatient”, “HIV” and “Death Notification”
  - capable of collecting all 65 Minimum Health Data Sets in various combinations
- The Transmission Data Sets are mapped to HL7 CDA Release 2 to create the “Transmission Schemas”
  - Minimum Health Data Sets are mapped to CDA sections
  - Data elements of the MHDSs are mapped to CDA entry classes and their attributes
  - A “Transmission Schema” instance constitutes the payload of an NHIS EHR exchange message and HL7 v3 Web Services Profile is used at the transport layer

Family Medicine Information System (FMIS)

- A national system for exchanging primary care records among general practitioners and the Ministry of Health
  - The content of healthcare data under the GPs responsibility is also defined through the Minimum Health Data Sets, which are available in the National Health Data Dictionary
  - The FMIS has a client-server based architecture. The centralized part is hosted by the Ministry of Health in Ankara and the desktop client applications are used by the GPs in their own offices
    - based on HL7 compliant Web Services of the harmonized NHIS 2.0
  - The client applications that are used by the GPs can work both in online and offline modes
    - Rural areas

Family Medicine Information System (FMIS)



- Infant Observation
- Child Observation
- Vaccine Tracking
- 15-49 Age Woman Observation
- Pregnancy Observation
- Puerperal Observation
- Death Notification
- Generic Patient Examination
- Consultation Notification
- Used to evaluate the performances of the GPs
  - Vaccine success rate
  - Infant observation success rate
  - Pregnancy observation success rate
  - Referral rate
  - The number of citizens in need of mobile service

Decision Support System of FMIS

- Provides an overall view of the primary care patient records at various levels, e.g. in the country as a whole, or statistics per province/county or per GP
  - patient records can be grouped according to the topics while displaying statistical data. For example, with a single click, it is possible to list all women who are in the final month of their pregnancy, and then dig into their individual records, find the responsible GP
- Used by
  - The policy makers (i.e. decision makers) including the Minister of Health
  - Administrator
  - Province/County Health Managers
  - Public Health Center staff
  - General Practitioners

Other systems

- **Centralized Hospital Appointment System (CHAS)**
  - enables the citizens to make appointments in any public secondary and tertiary healthcare provider by calling the CHAS Call Center phone number “182” or online through the CHAS Web Portal [12] and mobile applications (Android, iOS, Windows Phone, Blackberry)
  - Operational since 2011
- **Basic Health Statistics Module (BHSM)**
  - collect information about the health status, health risks and indicators across the country to direct the resources and programs of Central and Provincial Directorates of the Ministry of Health
    - work is in progress to improve the FMIS Decision Support System to obtain these reports automatically to replace the manual BHSM reports
- **Core Resources Management System (CRMS)**
  - to monitor the staff, institutions, equipment of the Ministry of Health
- **Human Resources Management System (HRMS)**
- **Investment Tracing System (ITS)**
- **Private Health Organizations Management System (HOMS)**

e-prescription System

- Web-based e-prescription infrastructure as a part of their Medula system, which was originally developed to automate the reimbursement of the medical expenses of the citizens covered by social security
  - became operational in the whole country by July 2012.
- Linked with Sağlık-Net and seamlessly integrated with the healthcare provider information systems through Medula Web Services
  - health professionals continue prescribing medications via their regular interfaces
    - enter medication details together with the ICD-10 codes of patients' diagnoses which are stored in the e-prescription system
    - Each e-prescription is assigned a unique identifier by the e-prescription system
    - The health professionals can also view patients' ongoing medications and the amount not yet consumed
- Patients apply to pharmacies for dispensation with their citizen IDs and unique e-prescription identifiers provided by the health professional
  - Using the Medula Pharmacy Software, the pharmacies are able to query, view and dispense the e-prescriptions
  - Keeps track of all the medications provided to the patient so far, prevents unnecessary dispensation, and offers replacements whenever a specific product is not available
  - Used by the Social Security Institution for the reimbursement of pharmacies

International Collaboration

- **ICT-PSP epSOS: Smart Open Services for European Patients**
  - Turkey provided an open source implementation of the epSOS cross-border interoperability platform. This implementation triggered an open source community with the involvement of a number of epSOS beneficiaries for further development
  - Exposing of the clinical data that are collected in Turkey's National Health Information System to Europe through standards-based epSOS interfaces
- **FP7-ICT EMPOWER: Support of Patient Empowerment by an intelligent self-management pathway for patients**
  - a modular and standards-based Patient Empowerment Framework, which facilitates the self-management of diabetes patients based on Personal Health Records (PHRs) and Self-Management Pathways through context-aware, personalized services
  - One of the two pilots, the other is in Germany
- **ICT-PSP PALANTE: PAtient Leading and mANaging their healThcare through Ehealth**
  - Empower patients to lead and manage their healthcare by informing the patients about their health problems with the help of a Personal Health Record (PHR) system
  - The Turkish pilot focuses on patients suffering from severe arthritis. The Virtual Arthritis Clinic Service of the pilot is a Web based patient-doctor shared arthritis disease management system, which is already integrated with both the National Health Information System and the local hospital information systems of hospitals in two different pilot regions

Lessons Learned

- Transition from SaglikNet1.0 to SaglikNet 2.0
  - Single interface to both NHIs and FMIS data
  - First release of NHIS was that the transmission schemas were HL7 v3 Web Services compliant and reused HL7 CDA R2 schema; however they were not totally CDA compliant due to renaming of attributes
    - was done to facilitate the interpretation of the Web Service schemas by the developers
    - in the long run, it caused maintainability problems for both the Ministry and the vendors
      - Updates to schemas, even the minor ones, were difficult to achieve
  - In the second release of NHIS, with its full compliance to the generic CDA schema
    - it is possible to add new data elements or Minimum Health Data Sets to the existing Web Services with minimum effort

Conclusions

- By November 2013, 98% of the public hospitals and 80% of the private and university hospitals are connected to NHIS sending the EHRs of their patients on a daily basis
- The average number of EHR instances that are sent by the healthcare provider information systems and successfully persisted in the NHIS can reach to 4.6 million a day
- As of November 2013, there are more than 2 billion EHR instances in the NHIS
- The number of connected healthcare providers is 3,573, and this number is still increasing while the remaining healthcare providers are completing their integration to the NHIS
- Since August 2012, all the GPs are also connected to the NHIS; hence the total number of connected nodes is 24,918
- So far, electronic healthcare records of 78.9 million people have been created in the NHIS.

Conclusions

- Currently, only the general practitioners can access the EHRs of their patients
- To make EHRs accessible to the authorized health professionals in the secondary and the tertiary healthcare systems as well as the patients themselves, a legal framework and a proper patient consent mechanism are necessary

Thank you for your attention…