

The Design and Application of an Electronic Health Record System for Digital Health Management

Li Li, Zhao Dongsheng, Meng Haibin, Wang Huishu and Wu Feng

Institute of Health Service and Medical Information, Academy of Military Medical Sciences, Taiping Road, Beijing, China

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Abstract: To detailed elaborate the content and function of the Electrical Health Record system, this paper respectively introduces its data model, function structure, user role, data collection process and deployment model. And the present pilot work of the system is briefly described in 32 units of Guangdong area. The summary in this paper offers a theoretical basis for the further improvement and application of the system, and provides the theoretical basis and practical experience for the exploration of a new mode of digital health management.

1 INTRODUCTION

With the rapid development of economy and the improvement of people's living standard, the implementation of health management (Sheppard et al., 2012) in health promotion, health protection, health and disease prevention as the main content (Sijing et al., 2011), through the establishment of electronic health records of residents throughout the whole life process, has become one of the important contents of national health world. EHR (ISO/TS 18308, 2004; Hoerbst1 et al., 2010) is a dynamic electrical record to gather and store individual health status. Integrated universal administration network platform is individual health centered, and initially provides comprehensive and all-around health management service for guarantee objects (Ball et al., 2006). Making use of this platform is a major method to transit from traditional medical model to digitalized health management model (Oliver, 2004).

This paper introduces data model, function structure, user role, data collection process and deployment model of the electronic health record system. The pilot work of the system is briefly described. The conclusion of the study is to construct a new mode of health management health records based on the theoretical and practical foundation for next step.

2 SYSTEM DESIGN

2.1 Data Model

The system data contains two aspects, one is electronic health record data, one is user data, data dictionary, data security protection, system management specification data, standard data etc.

The electronic health record data is the set of all records of the residents' health service process. It mainly includes 6 parts: basic information, health promotion, disease prevention and control information, the information of medical service information, injury management information and women's health information, a total of 33 types of information (Figure 1). Compared with the national electronic health records (Ministry of health of China P.R, 2009), the electronic health records reduces child module and increases the health promoting module. Occupation disease prevention and supervision, health hazards monitoring information is added to the disease prevention and control module. Pre hospital first aid and nursing information is added to the medical service module. Occupation disease, injury and oral disease management information is added to the injury management module.

2.2 System Function

To satisfy health management and guarantee

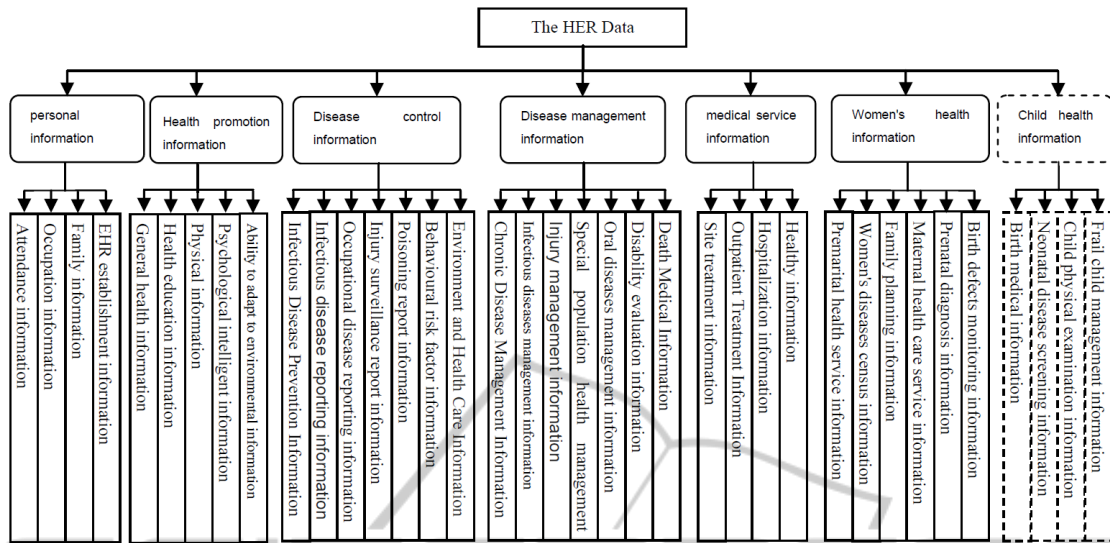


Figure 1: The Electronic Health Record data Structure Diagram.

institutions of all levels, EHR system is divided into health record business, health service business, and system management system, and each one has two categories (Li et al., 2011). Health record related health service activities, including health service and decision support activity come from all business domain. Activities are implemented by different health institutions, and detailed information is recorded as business form. (Table 1).

Table 1: System Business Domain Classification.

| No | Level 1 categories | Level 2 categories | Business identifier |
|----|----------------------------|--------------------------------------|---------------------|
| 1 | Health record business | 001 Health records to establish | BA001 |
| | | 002 Health Librarianship | BA002 |
| 2 | Health services business | 001 medical business | BB001 |
| | | 002 Public health service | BB002 |
| | | 003 Basic medical and health service | BB003 |
| | | 004 Comprehensive health management | BB004 |
| | | 005 self-care | BB005 |
| 3 | System management business | 001 The file data maintenance | BC001 |
| | | 002 Support data maintenance | BC002 |
| | | 003 system management service | BC003 |

EHR has four functional modules: basic business, share statistics, health management and system management. Functions include health record file's establishment and management, data collection and summarizing, information statistics and demonstration, health status monitoring and risk assessment, safeguard measure assessment and promotion, health policy observation, etc. The system gathers information of personal stamina, intelligence and psychology, environment adaption capability, disease, medical treatment, etc, through

data collection plug-in. Information is shared by units of hospitals, sanatorium, CDC, etc by manual input and output, electrical medical record' automatic input in hospital network and business data base capture. Personal ID is used as index. Real-time data from every basic units and medical departments are standardized disposed, encryption transferred, and completely put in storage. User's function demand for authorization, identification, and privacy protection is ensured by digital signature and certificate, identity authentication and timestamp service, identification plug-in (Figure 2).

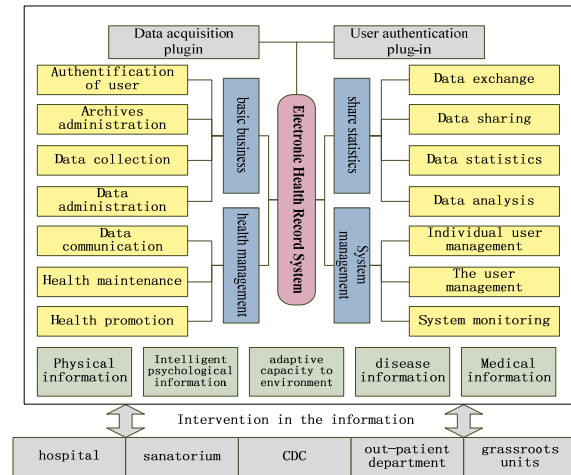


Figure 2: EHR Function Structure.

2.3 User Role

Based on public service and health management, the user role of this electronic health records system is

divided into 5 categories, Including ordinary residents, health management, health responsibility of doctors, medical staff, organization management etc.

Ordinary Residents can refer to all of their own health information from the unified military electronic health record system terminal, to strengthen the self health management, develop self disease prevention measures and improve the self health level. In order to timely, accurate, comprehensive grasp of community residents' health status and health risk factors, health management staff is set. Using electronic health record information, they carry out population health status and health risk factors analysis, population health risk assessment, disease surveillance and public health emergencies early warning, environmental health inspection, health maintenance and disease management supervision. In order to make each resident health attention falls to real point, health responsibility doctor role is set. It is the key position construction, electronic health record and health management information system for the management and use of the process and is responsible for the security range construction of electronic health records and health management. The doctors collect and adjust the basic health information, physical fitness test, environment monitoring and other information. They are responsible for the liability management range residents health consultation, risk assessment, guidance and supervision information supplement, special disease (chronic) information acquisition and management etc..In the process of diagnosis and treatment, the medical staff access to electronic health records of patients and view the information of diagnosis and treatment, to the maximum extent possible to avoid misdiagnosis and missed diagnosis, to choose the best treatment and improve the accuracy of diagnosis. Through regular analysis of data, the results can be used to provide data support for the health assessment and early warning of disease. Through this system, government management can invoke the required statistical information and decision support to help managers more direct, effective, comprehensive, systematic grasp the overall situation. First, they can assess the grass-roots health management performance. Second, they carry out a statistical analysis of the data, from the overall index (such as the incidence rate of hospitalization, outpatient, morbidity, position) to groups of health, to judge the health work attention key. Third, they predict emergencies to improve the timeliness of emergency response.

2.4 Data Collection Process

Application process of EHR system is: collecting personal relevant health data from existing information system and other relevant health service record; then transfer to EHR data center for storage after standardizing and packing data (Feng et al., 2010). Afterwards data extracting is implemented according to relevant principles, and then shaped EHR is used for health information sharing and utilization, medical service collaboration, health operation linkage, health management aid decision making and personal health administration through extracting and utilize data. Every authorized agency and person can have access to health record through the system, which realizes health information sharing and utilization, medical service collaboration, health operation linkage, health management aid decision making and personal health administration. (Figure 3).

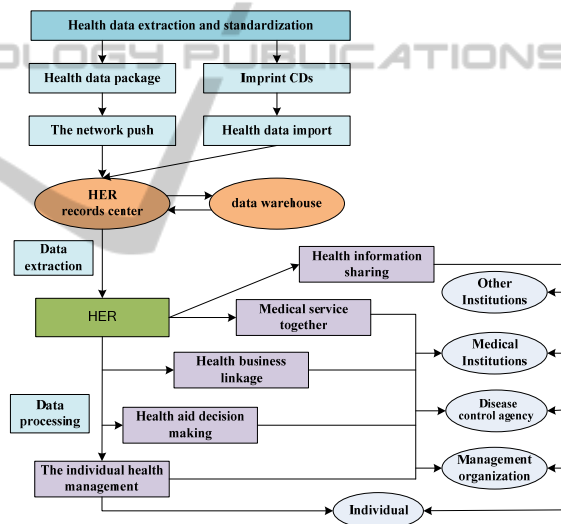


Figure 3: Application Process of EHR System.

3 DEPLOYMENT AND APPLICATION

3.1 System Deployment

EHR supports the architecture model of multistage platform vertical deploy, and realizes three-level platform architecture from headquarters to grassroots unit in the whole country. The 1st and 2nd levels of health record data center are built, and large-scale data base Oracle and document library is deployed. Information is sourcing from business

system data in system hospitals, grassroots units and health administrative authority. Health record abstract and prime index information is stored, and health record data is exchanged and shared. Health managers could make use of the data base to strengthen various data's gathering, collection and analyzing, and support accurate data for decision-making departments to complete health management service system and making health management policy. Individuals could view all of his health information from the data base service website to strengthen personal health care management, and to take self-precautionary measures.

Mix (group and distribution) structure is used in the deployment of the system. Stable exchange and effective connection of users' EHR data is realized among users of hospitals, clinics, CDC, and grassroots units, etc, through various network accesses like satellite communication network, wired and wireless network, etc, to reach the purpose of real-time access and effective utilization for every guaranteed object. (Figure 4)

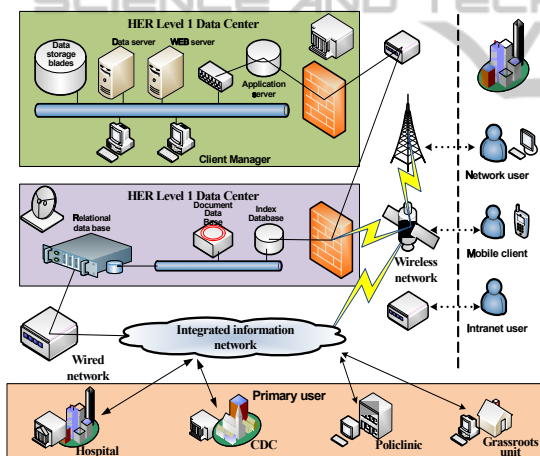


Figure 4: EHR System Deployment Model.

3.2 Application

At present, the pilot work of the system is underway in 32 units of Guangdong area, involving more than 37000 residents. We have been collecting outpatient, hospital, sanatorium, infectious diseases, and medical information more than 250000 data document. The establishment of more than 22000 resident's electronic health records has been completed.

4 CONCLUSIONS

Construction of this system achieves various health data integration, completes health evaluation criterion, enforces standard health management process, and makes full use of information and health resource. But there are many theoretical and practical problems that remain to be researched and solved, such as optimization of system structure, perfection of business function, unity of standard and system, etc.

Next, based on the improvement of electronic health records the basic theory and the platform function, we will improve the health standards, Standardized health management process, create a new model of health management to provide a systematic, individual, real-time health assessment, disease prevention, health services and management for the residents and to better safeguard residents Omni-directional health.

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