
Portable Medical Records Accessibility*

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Abstract

Portable Medical Records Accessibility (PMRA) is an inter-relational data base system providing transport and remote access capabilities of an individual's medical records. The system is designed around a primary inter-relational database which contains the complete data of all individuals subscribing to the PMRA system. Patients' portable medical records are ported into an individual database which is stored on a digital media storage device along with the appropriate access engine. Security is maintained utilizing an encrypted password which can be provided by the patient. In the event that the patient is non-responsive, qualifying medical personnel are granted access, through a release agreement, by contacting the associated hospital. Access to the PMRA records allow efficient and accurate decision capabilities, based on the patient's current medical and health records, to be made by medical personnel in remote and emergency situations.

1. Introduction

In emergency situations, medical professionals are often forced to make quick decisions without the benefit of background information. Portable Medical Records Accessibility (PMRA) will enable physicians and other health care personnel to render immediate and accurate medical treatment. PMRA will allow physicians instantaneous access to a patient's medical records, decreasing

the risk from potential complications such as allergies, drug, or blood interactions.

Generally, patients wear Medic Alert bracelets, which emergency personnel are trained to locate for information regarding immediate treatment. These bracelets, however, only inform medical personnel of a current major medical condition such as diabetes or epilepsy. The PMRA will be capable of holding medical information such as allergies, implanted devices such as pacemakers or AICD (implanted defibrillator), or current or past medications or surgeries. The PMRA will also include important personal and religious treatment preferences such as a DNR (do not resuscitate), preference against receiving blood transfusions, or organ donor status. The PMRA will also contain detailed records such as X-rays, MRIs, lab test results, and critical emergency contact information. PMRA will include all of this information, thereby giving medical professionals a comprehensive history of their patients and assuring swift, accurate treatment in the event of an emergency.

Currently, no such comprehensive wearable health info media device is in use. Hospitals, clinics and doctor's offices use credit-card-like patient identification to speed up the check-in process.¹ These cards contain basic information such as name, address, phone number, and date of last medical treatment. These cards, however, are proprietary per system, i.e., a patient of Hospital X cannot use their card at Hospital Y. PMRA provides a universal method of communication using portable digital storage media commonly available on the market today.

Routine use of the PMRA will have numerous benefits. Switching from paper to electronic files will reflect a profound reduction

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in health care expenditures by decreasing the manpower and current costs necessary for the maintenance, retrieval, copying, and transmission of paper medical records.² By eliminating the middleman involved in information retrieval, the PMRA will provide instant access to patient records thereby increasing the safety and accuracy of health care delivery (see Figure 1). The PMRA will promote increased efficiency in patient care with health information literally at the fingertips of patients and medical personnel. The PMRA will reduce delays in obtaining necessary patient information and thus, expedite treatment and decrease patient frustration by eliminating the need for repetition of his health information. The PMRA device will be readily available to medical personnel as it will be worn in the form of a wrist band, necklace, or key fob.

2. System Organization

A primary database will be compiled through input from hospitals, physicians, pharmacists, insurance companies, and patient surveys. The data will be input digitally and through survey forms. This process, though outside of the scope of the current health care industry was indicated as inevitable and essential in interviews with health care professionals. The primary database may be located at a sponsoring hospital or commercial service provider with essential security levels implemented.

The primary database will be inter-relational in nature and consist of a file of primary patient records containing fields indicating specific patient information and medical data of emergency and historical nature.

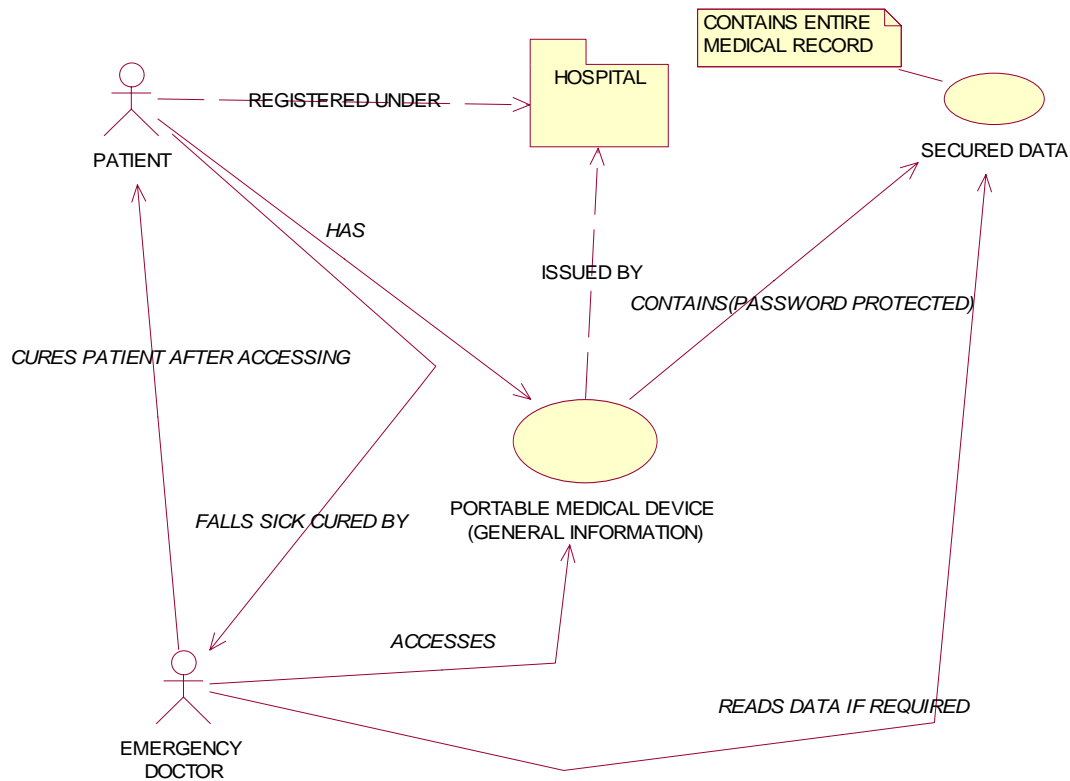


Figure1: Use Case Diagram - Portable Medical Records

This file will be linked to the supporting data files (see Figure 2) utilizing a patient identification number, physician numbers, and treatment numbers.

The first of the supporting files will be a file of physician records containing data to identify primary care physicians, and treating specialists involved with the patient. This data will be of a contact and affiliation nature cataloging physicians on the system. Two keys will link the data in this file to the inter-relational system. The first will be contained in the patient record indicated as the patient's primary physician. The second will be contained in records in a file which will catalog individual instances of treatment for a patient.

This treatment record file will contain information describing discrete instances of treatment and will contain specific information such as the date and a transcription of the treating physician's data. The records in this file will contain several key fields allowing relational links in the inter-relational database.

The first two of these key fields will link the treatment record to the patient record in the patient file and to the treating physician record in the physician file. The third key will be a system generated treatment reference number and will serve to provide a link to a file containing information regarding stored images such as MRI and x-ray results. The final key field in the treatment record will be a link to an ICD-9 Code³ file which is a medical industry standard system of codes relating to descriptions which indicate prognosis and treatment procedures.

The ICD-9 Code file will be integrated into the PMRA inter-relational database as a download from a standards site and be kept up to date as revisions occur. This file allows concise descriptions of prognosis and treatment procedures, which are accepted by the medical and insurance industry, to be displayed. These would supplement the transcript of the physician's report and also allow searching by specific procedure codes.

A second file with records linked to specific records in the treatment file will contain record of images. This file has two portions, a data portion with descriptive information regarding the type, date and description of the image referenced, and a reference to an image stored on the system.

Currently in the development stage is the consideration of a catalog file. This file will contain information regarding prescription medicine and holistic treatment options. Additionally, further files will catalog basic system information such as blood type, health conditions, and allergies. These definition files will ensure data integrity throughout the system providing consistent spelling and informationally correct data sets. These files also allow the single point adjustment of descriptions in a single field, in a single file, in the event of a discovered misspelling of some technical term or phrase, rather than a the requirement of a system wide correction. These definition files also allow system administrative corrections of data controls through expansion or restriction of the data set without any requirement of code alterations or any necessity for re-compilation.

The data system will consist of two entities. The first is the main database, which may be located at a sponsoring hospital or commercial service provider. The second entity will be the individual patient's data stored on a portable media storage device. Once a patient has entered into the program, data will be compiled on the main database through input from hospitals, physicians, pharmacists, insurance companies, and patient surveys. Once the patient's data is compiled, the patient will subscribe to the system using an on-site update or through the use of a non-web-based interface which utilizes the internet infrastructure as a conduit, thus minimizing security risks. Eventually a web based internet update interface may be considered if sufficient security issues are resolved. The patient will log into the system and activate his PMRA device,

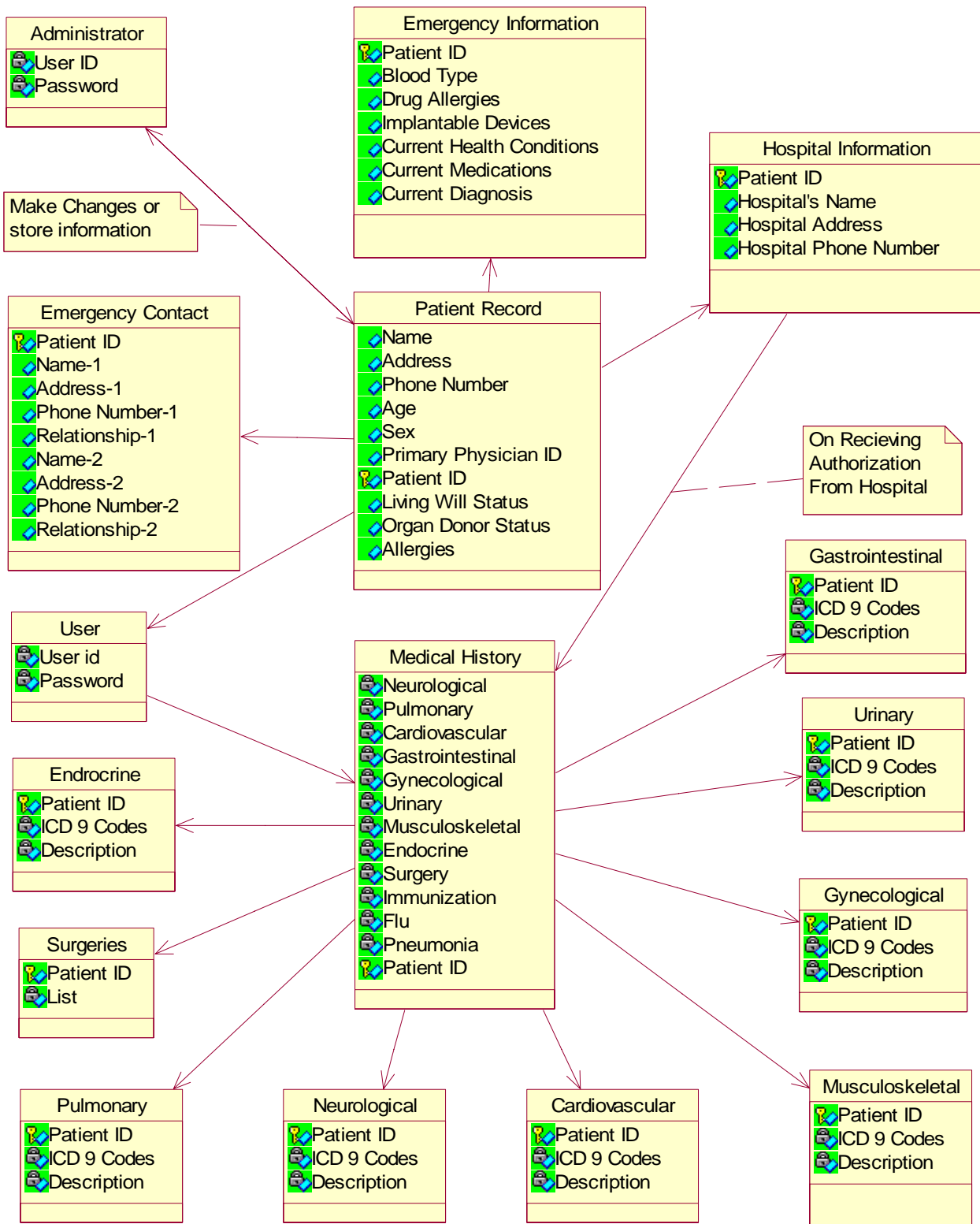


Figure 2: Class Diagram - Portable Medical Records Accessibility

registering and downloading a concise version of the main database which only includes records pertinent to the patient's data. This process will involve a query of all of the system's definition files, downloading only that data being utilized by the patient's data. For example, the physician database may contain hundreds or thousands of physicians while the patient has received treatment from only a few. Only those physicians who have treated the patient will be transferred to the PMRA device data base, thus minimizing the required memory.

Two phases of this process will be available. First, a data set for facilitating emergency treatment only. This will be a small and concise data set which has been developed through interview of numerous medical professionals involved in emergency treatment scenarios. This data will be clearly organized and carefully prioritized for immediate and efficient access. Examples here are solutions to issues that plague emergency personnel in the treatment of non-responsive patients. Immediate knowledge of certain personal requirements of religious nature, though non-medical in a sense, is important to for emergency medical personnel. A consideration for this phase is an on-line interface to the extended data set of the patient through secured access utilizing a non-web-based internet infrastructure access protocol. This phase is designed with the consideration of memory limitations on the PMRA device.

The second phase of data transfer will be an option based on patient preference and selected the PMRA device. This phase will contain an extensive version of the patient's medical history including the emergency information and will be transferred to the PMRA device during the activation phase and during later updates after new treatment instances occur.

Patient data *and* the software to access the data will be included on the PMRA device. Therefore, normal interface software installed on a system that is expected to read the data is not required. The PMRA device will be a stand-

alone system, only requiring access to the CPU of a personal computer, laptop, or PDA. This, in conjunction with readily available USB and SD interface ports will allow inexpensive and common access to the data stored on a commercially available device.

This convenient access necessitates an efficient security system in the event of the PMRA device being lost or stolen. Consideration is being reviewed regarding off-site interface and access in the event of a non-responsive patient, which will allow convenient yet secure options for the patient's data.

3. Development Plan

The development of the PMRA system has required extensive discussion within the development team regarding choices driven by perceived marketability of such a system. For instance, the system would require enough publicity to be within the scope of awareness of medical personnel for these professionals to know to look for such a device on a non-responsive patient. Discussions with specific medical professionals indicated that the patient and the medical and insurance industries have very specific and detailed requirements regarding privacy, accessibility and ownership of the data. Certain disclosure restrictions are outlined in HIPAA (Health Insurance Protection And Accountability issued in the Health Information Privacy Act of 1999⁴) and in guidelines set forth by AHIMA (American Health Information Management Association) which are of an important consideration to the development of the PMRA system.

The final position of the industry is that a patient's medical information is the patient's property and responsibility, however a system must be designed with consistent integrity to provide perceivably valid data to medical personnel to be of any value. For this reason considerations must be made regarding the patient's preferences while taking into account

the requirements of the medical professional administering treatment.

A considerable effort has been invested in conducting interviews with medical and information technology professionals at St. Mary's Hospital in Munster, Indiana, St Catherine's Hospital in East Chicago, Indiana, and the University of Chicago in Chicago, Illinois. The research indicated the monumental task before medical professionals in the treatment of public citizens regarding privacy, security, and religious issues. Further research indicated strict attention to the social and legal issues surrounding the project are as important as the design of the project itself.

In this regard, careful consideration has been given to determine if the concept is reasonable and useful from a practical sense regarding patient and medical personnel utilization. The interviews conducted indicated that ready access to the emergency medical and contact information, and patient treatment preferences would be extremely valuable. Consideration has also been given to the involvement of the patient in the compilation of the data in the sense of impairing validity and hence usefulness to medical personnel.

4. Investment Evaluation

The development of any project of this scope in a commercial environment would obviously involve the cost of extensive man-hours, cost of computer and software access, testing of practical applications, along with considerations of legal liabilities and professional accreditations of sponsoring entities. In the academic environment, many of these costs become obscured by the university structure. The primary investment in the PMRA project is the time of the team members and those professionals who graciously donated their time for the interview process.

Consideration has been given to the cost of the hardware from the sense that the financial burden upon the patient must be minimized for

any interest to be created. Availability of digital media and the assurance the patient would have the device at times when other media would not be carried, for example, while jogging or swimming. The media must, by implication of usefulness-through-availability be quite durable and resistant to environmental distress. Several digital media devices in today's market meet the design team's initial specifications and remain on the list for consideration.

The goal of the project's team is to keep the cost to the patient minimized, approaching nil, while simultaneously preventing the "marketing" of the data to commercial entities to fund the system. Commercial backing of products of this nature inevitably involves access to the data by sponsoring entities, a situation that the team members and the medical industry itself insist cannot occur.

5. Conclusion

The team for this project includes the prerequisite computer and information personnel but also nursing and technical writing associates. The eclectic mixture of the team has not inhibited effective communication in any manner. In fact the input from additional perspectives has been exciting and challenging, providing a true real-world sense to the development efforts.

Considerations have been raised, discussed, and addressed that would never have been evaluated in a computer science-only development team. This process has provided insight to the necessity for accurate communication between the disciplines.

Our primary goal for this project is to provide better assistance to medical personnel in the treatment of patients in emergency and non-emergency situations, with an emphasis on the accessibility to emergency medical personnel, where the team feels would provide the greatest contribution to society.

References (see page 8.7 of 8.7)

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