Development of a Medical Module For Disaster Information Systems

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Abstract. This study aims to improve a medical module which provides a real-time medical information flow about pre-hospital processes that gives health care in disasters; transferring, storing and processing the records that are in electronic media and over internet as a part of disaster information systems. In this study which is handled within the frame of providing information flow among professionals in a disaster case, to supply the coordination of healthcare team and transferring complete information to specified people at real time, Microsoft Access database and SQL query language were used to inform database applications. System was prepared on Microsoft .Net platform using C# language. Disaster information system-medical module was designed to be used in disaster area, field hospital, nearby hospitals, temporary inhabiting areas like tent city, vehicles that are used for dispatch, and providing information flow between medical officials and data centres. For fast recording of the disaster victim data, accessing to database which was used by health care professionals was provided (or granted) among analysing process steps and creating minimal datasets. Database fields were created in the manner of giving opportunity to enter new data and search old data which is recorded before disaster. Web application which provides access such as data entry to the database and searching towards the designed interfaces according to the login credentials access level. In this study, homepage and users' interfaces which were built on database in consequence of system analyses were provided with www.afmedinfo.com web site to the user access. With this study, a recommendation was made about how to use disaster-based information systems in the field of health. Awareness has been developed about the fact that disaster information system should not be perceived only as an early warning system. Contents and the differences of the health care practices of disaster information systems were revealed. A web application was developed supplying a link between the user and the database to make date entry and data query practices by the help of the developed interfaces.

Keywords. Disaster Information System, Health Information System, Disaster, Medical Informatics

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Introduction

Since the existence of the humanity, natural disasters get out as a part of the life from time to time. A large part of the world's population is at risk of natural disasters. Annual reports are prepared at national and international level about the types, effects, results, political and strategic approaches of disasters and disaster preparedness. Annual reports of International Red Cross and Association of Red Crescent Federation can be given as examples. According to the reports, it has been reported that communities are confronted with dramatic results about biological, physical, social, economic and political aspects independently from the type of the disaster and it's also reported that it has negative repercussions on the countries that have contributions on the disposal of the dramatic results [1,2]. 0-72 hours of the disaster is the most important gold time to save lives. Because of this, it's important to attempt in a quickly, coordinated and effective manner in order to save lives. To correspond the medical needs, in the processes as the dispatch of rescue teams, dispatch operations of the victims according to their triage case and recording the dispatch information, generally voice or paper-based registration systems are used. The size of the physical damage in the affected area as a result of a disaster restricts the usage of the communication technologies and so it's prevented to carry out the processes within the framework of time constraint [3]. With the usage of the information technologies in the processes of data entry and data/information flow required to correspond medical needs, coordination of the processes of victims, logistics, personnel etc. and formalization of process steps have been ensured. Whereby it's expected to play an active role in the process planning about the information that can be obtained among post-disaster data and related disaster risk and crisis management issues. As analyzing the studies about this topic in our country, it can be seen that studies are focused on Geographic Information (GIS)-based systems [4,5]. Whatever purpose of scale does the information system have, it should be capable of data collecting, editing, analyzing and also communication and data evaluation capacity. Responsibility area of each unit that will collect and manage the information should be identified [6].With this study, it's aimed to develop a Medical Module for Disaster Information Systems that performs the medical information flow about the pre-hospital processes of conducting medical services during disasters and also ensures processing, storing and transferring of the records in electronic form.

1. Methods

Software development part of this research study was held at the Department of Medical Informatics in Dokuz Eylül University in İzmir. This study is a complementary software application. In this study which is handled within the frame of providing information flow among health care professionals in a disaster, coordination of health care team and transferring complete information to specified people at real time, Microsoft Access as database and SQL as query language were used. It was developed on Microsoft .Net platform using C# language. Incident information system-medical module was designed to be used in disaster area, field hospital, nearby hospitals, temporary inhabiting areas like tent city, vehicles that are used for dispatch, and providing information flow between medical officials and data centers. For fast recording of the disaster victim data, accessing to database which was used by health

care professionals was provided (or granted) among analyzing process steps and creating minimal datasets. Database fields were created in a manner which gives opportunity to enter new data and search old data which is recorded before disaster.

1.1. System Analysis

A system is a combination of the related components that are brought together in order to accomplish an objective, have predetermined restrictions and have input and output parameters. One of the golden key of competitiveness in the globalized world is the speed of accessing to information. In the health care sector, speed and efficiency of access to information is a vital issue. According to the results of system analysis, general process steps of health services in case of disaster are emerged as seen in Figure 1.
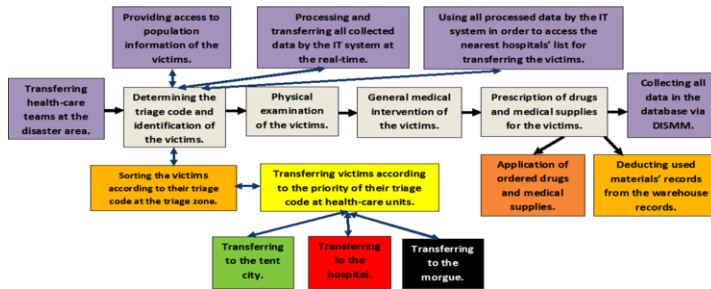

Figure 1. General process steps of health services in case of disaster

1.2. Healthcare Information Flow in case of Disaster

Continuity of information about the victims in case of a disaster must be ensured on the basis of the personal health records' continuity. Continuity of personal health data will be possible when the data produced during execution of health services in the disaster area is correctly directed to where the victim has been transported according to his/her triage case. Data transferred by disaster zone triage teams, field hospital information, ambulances information, tent city information and district hospital information can be collected in disaster data center and also communication of data/information between the units can be provided via internet.

2. Results

Because this study is basically an implementation project, the findings reflect the results of the practice.

2.1. Entity-Relationship Diagram of Disaster Information System-Medical Module (DISMM)

The process beginning at the intervention to the victims by the health personnel until the transportation to the target location was analyzed. Relational database that was modelled as examining the probable entities of this process (victim, health personnel, medical resources, referral vehicles, health institutions, triage code, location

information etc.) was symbolized by entity-relationship diagram. With established relationships between entities, it's guaranteed that data is stored more structured and more efficient.

2.2. Disaster Information System-Medical Module Interface Design

On DISMM's homepage, user must give a valid user name in Latin letters except Turkish characters in order to log in to the system. In password section, numeric and/or character information that is approved by the system administrator including Latin characters except Turkish characters is required from the user. On the left side of the DISMM's homepage, there is the menus' section that is ranked according to user authorization and there is the section including general information and overall queries of the system. In the future in case of an integration with the page of victims' identity information page including credentials and triage code information of victims and central population data supplied by the system of Interior Ministry, General Directorate of Population and Citizenship Affairs, necessary integration field has been created in the database. DISMM's page of health care professionals' credentials is an interface design that allows entering and updating personal information and also creating business charts of health care professionals working in the disaster area. With health care professionals' identification interface and with timeline, it's intended to record the information about professionals' that will serve in the disaster area. Also before disasters, assuming that a system of health care professionals' credentials that all units can use has been available, system is designed in an appropriate structure to be integrated. The reason for this is to service for personnel planning as using the credentials of voluntary health care professionals and also health care professionals that work close to the disaster area and provide their access to the area. Also it's intended to provide storing information about the personnel that takes part in all interventions on the victims. Physical medical examination interface including registration and reporting issues, pages of general interventions, medication order and drug treatment information are given as examples for data entry interfaces of medical practices related with the disaster victims. In designing processes of all interfaces, supports of process steps of paper-based recording practices, literature and expert opinions are taken. Also it's possible to use the system with mobile devices and tablet computers.

3. Discussion

With DISMM, it's intended to improve the speed and service quality in maintaining health care services in unusual cases. Developed web-based system will be a leading practice to collect all health care data under one roof in cases of disaster in our country [7].With this study, used information and communication technology is envisaged to contribute to the coordination of disaster hospital emergency department and pre-hospital emergency medical service team in terms of speed and service quality by transferring "right knowledge" to "right people" at the "right time"[8]. An information system that has whatever scale or purpose, it should be capable of collecting, editing and analyzing data and also communication and evaluation capacity. DISMM records that all units will collect and manage were developed among the literature and expert opinions [6]. In order to ensure the universal standards, system was designed in an integrated manner assuming that data that is likely needed was stored before the

disaster cases and was developed in standard forms ensuring the unity of language. In disaster-based medicine, according to the studies about the usage and efficacy of mobile technology in last ten years, studies can be gathered under five groups of remote monitoring of disaster victims, incident area management, medical image transmission, decision-support applications and field hospital information technology systems. Disaster Information System-Medical Module is developed to be run on stationary computers and mobile devices as smart phones as well; it was tested and observed that it can be run on all these devices [9-11]. Real test of the system in a disaster case couldn't be done. Thus, it's not known what kind of implementation problems may be faced in a real disaster case. The main reason of this condition is that human behaviors cannot be predicted in a usual situation in advance [12]. However, it's the superiority of the proposed system that can be run on mobile devices as minimizing data loss in pre-hospital operations compared to the paper-based processes [9]. In the literature, information system recommendations in unusual situations like disasters are available. With this study, a suggestion has been put forward how to use the disaster information systems in medical fields. Awareness has been developed on the issue that disaster information systems should not be perceived only as an early warning systems. Contents and differences of medical practices in disaster information systems were revealed. By the help of designed interfaces, a web application was developed to support the user to do the data entry and data query functions. In our future project we plan to simulate this application.

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