

Online Medical Record on the Obstetrics-Gynecology Sub Section

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Abstract

Nowadays many health institutions need a computer-based patients' medical record system. At the same time, when the number of patients and complexity of data increase, the demand for data to support hospital activities other than the direct handling of patients also increase. This subsection is also experienced in the Obstetric-Gynecology subsection at the hospital. The goal of this final project is to generate an online application that can meet the needs of the hospital in Obstetric-Gynecology subsection which can be accessed by a PC (web) and mobile devices (WAP).

The electronic medical record (computer based medical record) is the storage of electronic information on health status and health services throughout the patient's lifetime, can be stored in such a way to serve a variety of medical record users who need it. The methods which have been used are analysis and design methods. The application is built using Apache as a web server, PHP as the server side language, MYSQL as the database system, and XHTML which is used by the mobile devices.

The result of the this final research is an Electronic Medical Record application of the Obstetric-gynecology, which is the part of a greater hospital information system, which is accessible through a web browser from the desktop computer (PC) or via mobile devices such as PDAs and Smartphone. This application can display partograph which is used to monitor patient progress during labor, and produce reports in PDF form.

Keywords: medical record, web, WAP, partograph

Nowadays, quick information which can be accessed from anywhere has become a necessity. It has influence to the health service, including the obstetrics-gynecology sub-system of the hospitals. Many medical records applications have been developed, but most of them still handle the needs in common management of a hospital or medical institution, whereas the subsystems – including the obstetrics-gynecology – are also needed to be handled even more detail.

To provide more specific information, the EMR has to be divided into several sub-EMR which contain the medical record of the subsystems. In this paper we like to describe the medical record's requirements for OB/GYN subsystem.

This paper will describe about the electronic medical record in OB/GYN subsystem, generating patient's data reports and partograph.

This paper doesn't describe about the medical record in detail. It doesn't describe about the OB/GYN subsystem and partograph in detail. It doesn't describe about the hard wares which are used by the hospital or any health service. It doesn't describe about the system's security in computer network.

Medical Record

Medical record is a systematic documentation of a patient's medical history and care. The information contained in the medical record allows health care providers to provide continuity of care to individual patients. It usually contains the patient's identification information, the patient's health history, and the patient's medical examination findings. Other information may include lab test results, medications prescribed, etc.

Medical record has an important role in the medical or non-medical actions. It contains many information from administrative, educative, law, research, financial, and documentary point of view. Hence, every health service unit must make some documents about what have been done to the patient in a form of a medical record.

The purpose of the medical record for the patient is to protect the patient from the malpractice. For the health service unit, medical record is used to support of its services. Medical record also has a function as a resource to do more researches of a new disease and efforts of its prevention and cure.

From the explanation above, we may draw some conclusions that the medical record is:

1. a communication tool between health services
2. a basis for medical treatment
3. prove of all services/treatments/actions that had been done
4. resource to do more analysis, research and evaluation of a health service
5. a tool for education and research purpose
6. a basis for financial accounting

Electronic Medical Record

Until today, paper is the most common format of a medical record. But now, much different format had been developed to support paper format. There are a lot of health services that have laboratories and electronic pharmacy system that made it possible to monitor the patient online.

Electronic medical record or EMR (computer-based medical record) is a medical record in digital format. It can be used to store and process many formats of the medical record such as: video, audio, image (x-ray), and others.

Now, the EMR also has been developed into mobile medical record (MMR), to fulfil the necessity of fast information that can be accessed from anywhere.

Electronic Medical Record in OB/GYN Subsystem

As we know, the OB/GYN subsystem is part of a health service which has specialties dealing with the female reproductive organs such as the care of a woman and her offspring during pregnancy, childbirth and the *puerperium* (the period shortly after birth), health of the female reproductive system (uterus, vagina and ovaries), and as such are often combined to form a single medical specialty. In this paper, we try to describe the requirements of mobile medical record in OB/GYN during pregnancy.

Program Component

The system is meant to be accessed from both desktop PC and mobile devices, so it has to be built using tools that enable the mobile devices to access the internet network. Those tools are including XHTML (Extensible Markup Language), PHP (PHP Personal Homepage), MySQL, and web-server. Because it is built as a web-based system, it will run in different operating system.

In this case, Apache is used as the web-server, PHP as the programming language that runs in the server-side, and MySQL as the database system. These three tools had been used widely all over the world, because the collaboration between them is very good and easy to configure, most known as AMP (Apache-MySQL-PHP). Beside that, those tools are open source, so we can change or develop them according to our necessary without breaking the license.

Because the MMR in OB/GYN subsystem is part of larger medical record system, the information such as the Unit Numbering System is taken from the main database server. All information that has been updated also stored in the main database server.

For the mobile devices, we may use XHTML for the markup language. XHTML is a markup language that has the same depth of expression as HTML, but also conforms to XML syntax. It can be used both in web and mobile (WAP). Today, most of mobile devices had been included default web/WAP browser that can process WML or XHTML.

Program Flow

We know that medical record is a confidential document. Not anyone can access it freely. So, the medical record system has to be secure and closed. Not every user can view or update the system. For security reason, the system will require authentication of the username and password.

For authentication, it will request the username and the password every time any users access it. If the combination is not valid, he/she won't be allowed to access it. Otherwise, he/she will be able to access its services, depends on his/her group.

Below is the program flow which is implemented to the medical record system.

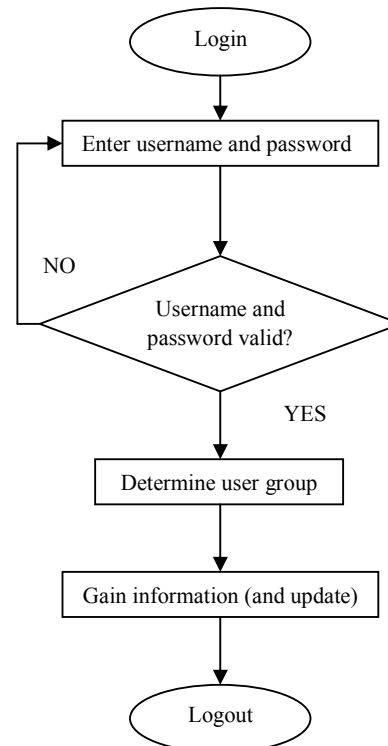


Fig 1 System flowchart

Program Overview

A. Web-based Medical Record

In order to use the application, a medical practitioner has to enter the right combination of

username and password. If the combination is right, then he/she will be allowed to access the system. Otherwise, if the combination is wrong, he/she will be asked to give the right combination. This is the standard protocol to keep the data private and safe.

After login is successful, the user will be able to access its services, depends on his/her group. The group of the user is divided into four types. Below are the screenshots and details of each type:



Fig. 1. Administrator's page

1. administrator
 - a. inserts new data of the patient
 - b. updates data of the patient
 - c. views and prints the report
 - d. deletes data of the patient
 - e. reads doctor's note
 - f. adds new users
 - g. deletes users

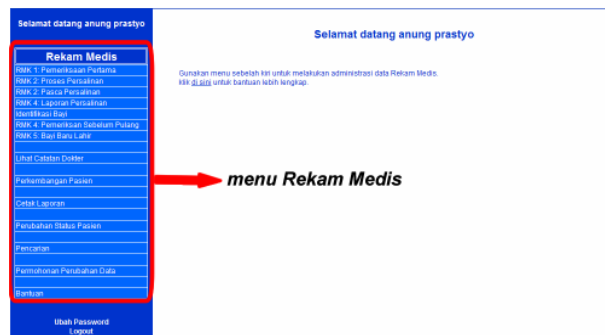


Fig. 2. Doctor's and nurse's page

2. doctor
 - a. inserts new data of the patient
 - b. views and prints the report
 - c. requests for data changes
 - d. adds doctor's note
3. nurse
 - a. inserts new data of the patient
 - b. views and prints the report
 - c. requests for data changes
 - d. reads doctor's note

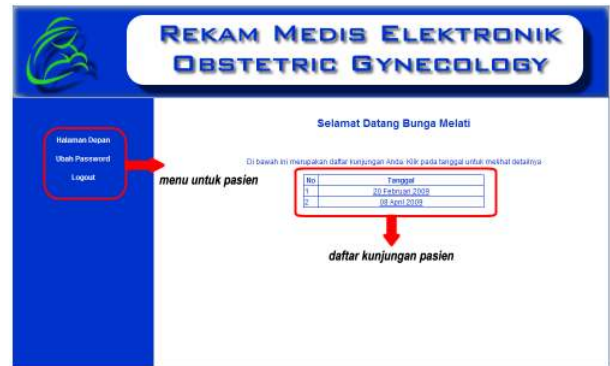


Fig. 3. Patient's page

4. patient
 - a. views her own records

The main purposes of the application are generating the partograph to show the information of the patient during the prenatal process and generating reports in PDF form.

The partograph is a graphical view of the information of the patient during the prenatal process. It contains information such as: pulse, blood pressure, temperature, contractions, fetal heart rate, cervix condition, and descent of head. By using GD Library which is provided by PHP, the system will automatically generate the partograph using the information which is stored in the database. Below is the example of a partograph.

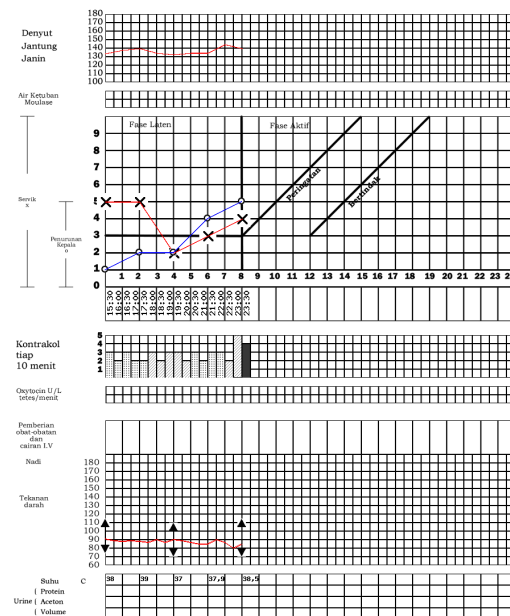


Fig. 4. Generated partograph

The reports are generated when the hospital or the patients need to see the information in the hardcopy form. The reports will be generated in PDF form. These reports are including the information of the patient in the early diagnose, prenatal process (including partograph), postnatal information, and the identification of the baby.

Below is the example of the report which is generated in PDF form.

BAGIAN KEBIDANAN									
LAPORAN		Ruang : mawar	No RM : 15011987						
PERSALINAN 1		NAMA : Kaori Mochida	Umur : 25 tahun						
Masuk Kamar Bersalin : Tgl : 1 Februari 2009 Jam : 15:49									
Tanggal	Jam	Nadi (menit)	Tensi (mmHg)	Suhu (C)	His	DJA (/menit)	Pembukaan	Kulit Ketuban	Penurunan
03 Februari 2009	15:30	91	115/74	38	3, < 20	134	5	utuh	1
03 Februari 2009	16:00	89			2, < 20			utuh	
03 Februari 2009	16:30	88			3, < 20	138		utuh	
03 Februari 2009	17:00	89			2, < 20			utuh	
03 Februari 2009	17:30	88		39	2, < 20	140	5	utuh	2
03 Februari 2009	18:00	87			3, 20-40			utuh	
03 Februari 2009	18:30	90			2, 20-40	135		utuh	
03 Februari 2009	19:00	87			3, 20-40			utuh	
03 Februari 2009	19:30	90	110/70	37	3, 20-40	133	2	utuh	2
03 Februari 2009	20:00	89			2, 20-40			utuh	

Fig. 5. Report of prenatal process

B. WAP-based Medical Record

The WAP-based Medical Record application is meant to be accessed from the mobile devices. Hopefully, it can be used by the doctors while they are away to watch the patient's information. Just as the web-based application, it also requires a valid username and password combination in order it can be accessed.

After login is successful, the user can start to view the data he/she wants to be shown. First thing to do is searching the patients by putting the name or the Unit Numbering System of the patient. Then, the user will be given a link to view the details of the patient.



Fig. 6. Searching page

Because the system is meant to be accessed from the mobile devices, only certain services will be provided. Some services like generating report in a hardcopy may not be able to be provided, but it is still possible to generate in a softcopy. The screen of a smart phone or a PDA is small and in particular its text input modalities are the key elements of the user interface that affect physician/health worker performance and user satisfaction. Unless text input modalities are improved, user interfaces on the PDA and smart phone should be designed in such a way

that text entry is minimized. So there are some limitations of the user interface.

There are two different ways to show the patient's data:

1. Table view

Table view will show the patient's data including pulse, blood pressure, temperature, contractions, fetal heart rate, cervix condition, and descent of head.

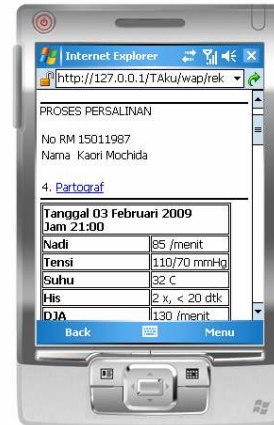


Fig. 7. Patient's data in table view

2. Partograph

Partograph is a method to show the patient's progress during pregnancy and prenatal process. There are several data which are shown in partograph and will be shown in a single graphic mode. Those data are: pulse and blood pressure, temperature, contractions, fetal heart rate, cervix and descent of head.

Because the PDA and many other mobile devices have small display, then the partograph will be viewed in separate several images. The user can view the image by selecting a link which is provided by the application.

Below is the example of an image that shows the contraction.



Fig. 8. Graphic of contraction

Then, after viewing the patient's data, the user - in this case, a doctor -- can give a note to the nurse

in the hospital in order to do some actions that have to do with the patient.

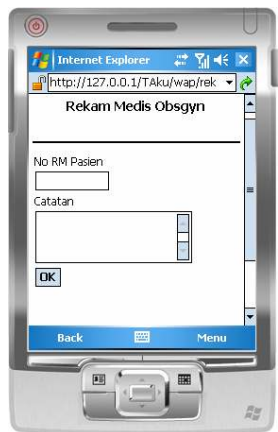


Fig. 9. Doctor's note

After that, the nurse at the hospital will read and do some actions to the patient according to this doctor's note.

System Performance

The main part of the system is about create-update-delete database, so it doesn't use much memory usage. The biggest part of the system which uses more memory usage is creating the partograph, because it is using image as the templates.

Table 1. System performance

System	Memory Usage (Kb)	Time (s)
<i>Web</i>	17797120	0.0970771312714
Mobile		
a. Fetal heart rate	12320768	0.0433270931244
b. Cervix condition	12742656	0.0343790054321
c. Contraction	12218368	0.0845019817352
d. Pulse and blood pressure	12505088	0.0851898193359
e. Temperature	12144640	0.0145189762115

Conclusions

From the explanations above, it can be drawn a conclusion that this application is a part of the biggest hospital medical-record system. The main purposes of the application are to generate the partograph which is used to monitor the patient's condition during the prenatal process and to generate reports in PDF form. This application can be accessed from the desktop PCs and from the mobile devices. This application is just processing data from the database. It cannot process data which are gained from a real time process. We hope that in the future there is a method to support it.

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