**Jewel’s First Maternity & Lying – In Clinic**

**Patient Record Management System**

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**Chapter 1**

**PROBLEMS AND ITS SETTINGS**

**Background of the Study**

As the technology age continuously grow, some of the small maternal clinics cannot keep up with the fast pace. Through the use of papers in recording information, piles of patient’s information and their medical records are stored in their respective filing cabinet. It causes a slow retrieval of files, and sometimes misplacement of some records due to overloading of files in the filing cabinet. The process of generating of report, too, takes time because the staff in-charge needs to retrieve a record and create a report using pen and paper.

The proponents recognized that there is a problem in the storage of the patient’s records and the generating of reports. It was believe that a dynamic patient record management system is needed to solve the problem on recording process.

The proponents aimed to develop a Patient Record Management System which is expected to automate most of the transactions and clinical services of the clinic giving emphasis to management, retrieval, storage and the creation of reports of the patient’s records.

**Objectives of the Study**

The general objective of the study is to develop a Patient Record Management System that automates most of the transactions and Pre-natal service of Jewel’s First Maternity and Lying-in Clinic.

Specifically, it aims to:

1. Design a Patient Record Management System with the following features:

a. Manages the confidential files of the patients

b. generate a correct and concise report of the patients

2. Create the system using PHP framework and MySQL

3. Test and improve the system in terms of Reliability and Functionality

**Scope and Limitation**

The study focused on the development of a Patient Record Management System specifically to pregnant patients, that allows users to manage, retrieve, and edit the patient’s records, create general profile reports, check-up results reports and statement of account, fasten-up the time of pre-natal check-up that includes examination of the Medical History and Physical Examination of the pregnant patient. The study also allows the user to create an appointment between the pregnant patient and doctor, manage the admission and discharge and it can manage also the profiles of the doctors in the clinic.

The study is limited only to the Jewel’s First Maternity and Lying-in Clinic where the system has been configured and can be also accessed by authorized clinic personnel. It does now support the clinic to handling newborn records, incident record sharing and generation of reports pertaining to newborn patients.

**Significance of the Study**

This study that we developed and will deploy can help the Jewel’s First Maternity and Lying-in Clinic on processing the Pre-natal check-up, profiling of the patient and the doctor, creating appointments between the patient and the doctor/nurse, can manage the admit and discharge of the patient. The system can also provide general and individual reports of the check-up results of the patients, their profile and the report of the Statement of Account.

**CHAPTER 2**

**CONCEPTUAL FRAMEWORK**

This chapter includes the review of related literature and studies, conceptual model of the study, and the operational definition of terms.

**Review of Related Literature**

This section contains the different concepts and ideas that guided the researchers in developing the conceptual framework of study. It contains topics about the management record of patients in clinics and hospitals.

**Computerized Systems**

A computerized system is a computer system with a purpose. When we talk about a computer system, we are simply referring to the hardware and software that comprise the computer system. But when we talk about a computerized system, we are referring to a function (process or operation) integrated with a computer system and performed by trained people.

There are two major components to a computerized system:

1. The computer system that controls the function (process or operation)
2. The function (process or operation) that is controlled by the computer system

The controlling computer system is comprised of hardware and software, but in the case of cloud computing the computer system is comprised of virtual hardware (the virtual machine) and software (system software and application software).

The controlled function is comprised of equipment to be controlled and operating procedures performed by trained people. In some cases, the controlled function may not require equipment other than the operation of the computer system in which case the controlled function consists entirely of operating procedures (of the computer system) performed by trained people. (https://www.ibm.com/developerworks/community/blogs/obidan/entry/what\_is\_a\_computerized\_system?lang=en)

**Scheduling**

Scheduling is the process of arranging, controlling and optimizing work and workloads in a production process. Companies use backward and forward scheduling to allocate plant and machinery resources, plan human resources, plan production processes and purchase materials.

* Forward scheduling is planning the tasks from the date resources become available to determine the shipping date or the due date.
* Backward scheduling is planning the tasks from the due date or required-by date to determine the start date and/or any changes in capacity required.

The benefits of production scheduling include:

* Process change-over reduction
* Inventory reduction, leveling
* Reduced scheduling effort
* Increased production efficiency
* Labor load leveling
* Accurate delivery date quotes
* Real time information

Production scheduling tools greatly outperform older manual scheduling methods. These provide the production scheduler with powerful graphical interfaces which can be used to visually optimize real-time workloads in various stages of production, and pattern recognition allows the software to [automatically create scheduling opportunities](https://en.wikipedia.org/wiki/Automated_planning_and_scheduling) which might not be apparent without this view into the data. For example, an airline might wish to minimize the number of airport gates required for its aircraft, in order to reduce costs, and scheduling software can allow the planners to see how this can be done, by analyzing time tables, aircraft usage, or the flow of passengers. (https://en.wikipedia.org/wiki/Scheduling\_(production\_processes))

**JavaScript**

JavaScript is a [programming language](http://techterms.com/definition/programming_language) commonly used in [web development](http://techterms.com/definition/web_development). It was originally developed by Netscape as a means to add dynamic and interactive elements to websites. While JavaScript is influenced by [Java](http://techterms.com/definition/java), the [syntax](http://techterms.com/definition/syntax) is more similar to [C](http://techterms.com/definition/cplusplus) and is based on ECMAScript, a scripting language developed by Sun Microsystems.

JavaScript is a client-side scripting language, which means the [source code](http://techterms.com/definition/sourcecode) is processed by the client's [web browser](http://techterms.com/definition/web_browser) rather than on the [web server](http://techterms.com/definition/web_server). This means JavaScript [functions](http://techterms.com/definition/function) can run after a webpage has loaded without communicating with the server. For example, a JavaScript function may check a web form before it is submitted to make sure all the required [fields](http://techterms.com/definition/field) have been filled out.

The JavaScript code can produce an error message before any information is actually transmitted to the server. Like server-side scripting languages, such as [PHP](http://techterms.com/definition/php) and [ASP](http://techterms.com/definition/asp), JavaScript code can be inserted anywhere within the [HTML](http://techterms.com/definition/html) of a [webpage](http://techterms.com/definition/webpage). However, only the [output](http://techterms.com/definition/output) of server-side code is displayed in the HTML, while JavaScript code remains fully visible in the source of the webpage. It can also be referenced in a separate [.JS](http://fileinfo.com/extension/js) file, which may also be viewed in a browser. (http://techterms.com/definition/javascript)

**PHP**

PHP (recursive acronym for PHP: Hypertext Preprocessor) is a widely-used open source general-purpose scripting language that is especially suited for web development and can be embedded into HTML. Instead of lots of commands to output HTML (as seen in C or Perl), PHP pages contain HTML with embedded code that does "something" (in this case, output "Hi, I'm a PHP script!"). The PHP code is enclosed in special [start and end processing instructions <?php and ?>](http://php.net/manual/en/language.basic-syntax.phpmode.php) that allow you to jump into and out of "PHP mode."

What distinguishes PHP from something like client-side JavaScript is that the code is executed on the server, generating HTML which is then sent to the client. The client would receive the results of running that script, but would not know what the underlying code was. You can even configure your web server to process all your HTML files with PHP, and then there's really no way that users can tell what you have up your sleeve.

The best things in using PHP are that it is extremely simple for a newcomer, but offers many advanced features for a professional programmer. Don't be afraid reading the long list of PHP's features. You can jump in, in a short time, and start writing simple scripts in a few hours.

Although PHP's development is focused on server-side scripting, you can do much more with it. Read on, and see more in the [What can PHP do?](http://php.net/manual/en/intro-whatcando.php) section, or go right to the [introductory tutorial](http://php.net/manual/en/tutorial.php) if you are only interested in web programming. (http://php.net/manual/en/intro-whatis.php)

**HTML**

HTML or HyperText Markup Language is the language of the web. All web pages are written in HTML. HTML defines the way that [images](http://webdesign.about.com/od/graphics/ht/image_code.htm), [multimedia](http://webdesign.about.com/od/multimedia/bb/multimedia-tips-for-web-pages.htm), and [text](http://webdesign.about.com/od/beginningtutorials/a/aa090800a.htm) are displayed in [web browsers](http://webdesign.about.com/od/browsers/p/bl_browsers.htm). It includes [elements](http://webdesign.about.com/od/htmltags/a/bl_index.htm) to connect your documents ([hypertext](http://webdesign.about.com/od/xhtml/g/bldefhypertext.htm)) and make your web documents interactive (such as with [forms](http://webdesign.about.com/od/forms/ss/html-forms-tutorial.htm)).

HTML is a defined standard markup language. That standard was developed by the [World Wide Web Consortium](http://webdesign.about.com/od/w3c/a/what_is_w3c.htm) (W3C). It is based upon [SGML](http://webdesign.about.com/od/xml/g/bldefsgml.htm) (Standard Generalized Markup Language). It is a language that uses [tags](http://webdesign.about.com/od/htmltags/g/bldeftag.htm) to define the structure of your text. Elements and tags are defined by the < and > characters.

But HTML is no longer the only [standard](http://webdesign.about.com/cs/html40/a/aa030303a.htm) for web development. As HTML was developed it got more and more complicated and the style and content tags combined into one language. Eventually, the W3C decided that there was a need for a separation between the style of a web page and the content.

A tag that defines the content alone, such as [H1](http://webdesign.about.com/od/htmltags/p/bltags_headings.htm), would remain in HTML while, tags that define style, such as [FONT](http://webdesign.about.com/od/htmltags/p/bltags_font.htm), are [deprecated](http://webdesign.about.com/od/htmltags/a/bltags_deprctag.htm) in HTML 4.01 [in favor of style sheets](http://webdesign.about.com/od/css/a/aa101706.htm). And the newest version of [HTML](http://webdesign.about.com/od/html5/qt/what_is_html5.htm) is [HTML5](http://webdesign.about.com/od/html5/qt/html-5-information.htm). HTML5 adds more features into HTML and removes some of the strictness that was imposed by XHTML. But HTML5 is still a markup language. (http://webdesign.about.com/od/htmlxhtmltutorials/p/what-are-markup-languages.htm)

**CSS**

CSS stands for Cascading Style Sheets. CSS describes how HTML elements are to be displayed on screen, paper, or in other media. CSS saves a lot of work. It can control the layout of multiple web pages all at once. (www.w3schools.com/css/css\_intro.asp)

**Markup language**

A markup language is a language that annotates text so that the computer can manipulate the text. Most markup languages are human readable because the annotations are written in a way to distinguish them from the text. For example, with HTML, XML, and XHTML, the markup tags are < and >. Any text that appears within one of those characters is considered part of the markup language and not part of the annotated text. The markup is the instructions for displaying or printing the text.

Markup doesn’t have to be computer readable. Annotations done in print or in a book are also markup. For example, many students in school will highlight certain phrases in their text books. This indicates that the highlighted text is more important than the surrounding text. The highlight color is markup.

Markup becomes a language when rules are codified around how to write and use the markup. That same student could have their own “note taking markup language” if they codified rules like “purple highlighter is for definitions, yellow highlighter is for exam details, and pencil notes in the margins are for additional resources.” But most markup languages are defined by an outside authority for use by many different people. (http://webdesign.about.com/od/htmlxhtmltutorials/p/what-are-markup-languages.htm)

**Web browser (Browser)**

Short for Web browser, a browser is a [software application](http://www.webopedia.com/TERM/A/application.html) used to locate, retrieve and display content on the [World Wide Web](http://www.webopedia.com/TERM/W/World_Wide_Web.html), including [Web pages](http://www.webopedia.com/TERM/W/web_page.html), images, video and other files. As a [client/server model](http://www.webopedia.com/TERM/C/client_server_architecture.html), the browser is the [client](http://www.webopedia.com/TERM/C/client.html) run on a computer that contacts the Web [server](http://www.webopedia.com/TERM/S/server.html) and requests information. The [Web server](http://www.webopedia.com/TERM/W/Web_server.html)s ends the information back to the Web browser which displays the results on the computer or other Internet-enabled device that supports a browser. (http://www.webopedia.com/TERM/B/browser.html)

**WAMP**

WAMP is sometimes used as an abbreviated name for the software stack Windows, Apache, MySQL, PHP. It is derived from LAMP which stands for Linux, Apache, MySQL, and PHP. As the name implies, while LAMP is used on Linux servers, WAMP is used on Windows servers. Because WordPress isn’t usually installed on Windows Servers, WAMP has become popular among developers as a method of [installing WordPress on their personal computers](http://www.wpbeginner.com/wp-tutorials/how-to-install-wordpress-on-your-windows-computer-using-wamp/).

The “A” in WAMP stands for Apache. [Apache](http://www.wpbeginner.com/glossary/apache/) is server software that is used to serve webpages. Whenever someone types in your WordPress website’s URL, Apache is the software that “serves” your WordPress site.

The “M” in WAMP stands for MySQL. [MySQL](http://www.wpbeginner.com/glossary/mysql/" \o "What is MySQL) is a database management system. It’s job in the software stack is to store all of your website’s content, user profiles, comments, etc.

The “P” in WAMP stands for PHP. PHP is the programming language that WordPress is written in. It is also the piece that holds the entire software stack together. It runs as a process in Apache and communicates with the MySQL database to dynamically build your webpages.

WAMP software stack can be downloaded from WAMP server project’s [download page](http://www.wampserver.com/en/). For Microsoft windows users, it comes in an easy installation package with a control panel. Launching the WAMP manager control panel starts Apache, PHP and MySQL web services on the local computer. WAMP and other software stacks with similar names and features are a good way to develop websites on a local machine without transferring the files to a live website. Theme designers and developers prefer to have this because it speeds up their development time. (http://www.wpbeginner.com/glossary/wamp/)

**MySQL**

MySQL is an open source relational database management system ([RDBMS](http://searchsqlserver.techtarget.com/definition/relational-database-management-system)) based on Structured Query Language ([SQL](http://searchsqlserver.techtarget.com/definition/SQL)).

MySQL runs on virtually all platforms, including [Linux](http://searchenterpriselinux.techtarget.com/definition/Linux), [UNIX](http://searchenterpriselinux.techtarget.com/definition/Unix), and [Windows](http://searchwindowsserver.techtarget.com/definition/Windows). Although it can be used in a wide range of applications, MySQL is most often associated with web-based applications and online publishing and is an important component of an [open source](http://searchenterpriselinux.techtarget.com/definition/open-source) enterprise stack called [LAMP](http://searchenterpriselinux.techtarget.com/definition/LAMP). LAMP is a Web development platform that uses [Linux](http://searchenterpriselinux.techtarget.com/definition/Linux) as the operating system, [Apache](http://searchcio-midmarket.techtarget.com/definition/Apache) as the Web server, [MySQL](http://searchenterpriselinux.techtarget.com/definition/MySQL) as the relational database management system and [PHP](http://searchenterpriselinux.techtarget.com/definition/PHP) as the object-oriented scripting language. (http://searchenterpriselinux.techtarget.com/definition/MySQL)

**Pre-natal Care**

* Medical care especially for pregnant woman
* Important for a healthy pregnancy
* Includes regular checkups and prenatal testing
* Best to begin as soon as you know you are pregnant

The key to having a healthy baby is taking good care of your own health. The healthier you are, the stronger you and your baby are likely to be.

We all want to be healthy, but sometimes it is hard to know what we should do. If you are pregnant, or thinking about becoming pregnant, you may have some questions. Here are some of the most commons questions we hear women ask about prenatal care. (https://www.plannedparenthood.org/learn/pregnancy/prenatal-care)

**Clinic**

* A class of medical instruction in which patients are examined and discussed
* A group meeting devoted to the analysis and solution of concrete problems or to the acquiring of specific skills or knowledge
* Facility that offers professional services or consultation usually at discounted rates

(http://www.merriam-webster.com/dictionary/clinic)

**Related Studies**

**Electronic Patient Record (EPR)**

Then explore the current healthcare system in India followed by the current scenario of paper-based medical records and benefits of EPR. It also throws the light on factors in design of EPR. This chapter concludes with different approaches for implementing EPR system in developing countries.

According to Karim (2008), different terms are used in the literature to explain electronic patient’s healthcare data such as Electronic Health Records (EHR), Electronic Patient Record (EPR), Electronic Medical Record (EMR), Computerized Patient Record (CPR), and Computerized Medical Record (CMR).  These names are given from time to time in different nations and in different healthcare environments.

Abdul (2008) argues that EHR is different from an EPR/EMR that is longitudinal and not site specific, in short EHR is patient centric while EPR/EMR are provider centric. An electronic health record defined by Murphy (1999) as any information relating to the past, present or future physical health of an patient existing in an electronic system, which is used to capture, transmit, receive, store, retrieve, and manipulate data for the main purpose of providing healthcare and health-related services.

EPR/EMR can be defined as the record of the periodic care provided mainly by one institution, as this will relate to healthcare provided to a patient by an acute hospital.  Other healthcare providers like mental health NHS Trust (RCGP, 1998) may also hold electronic Patient/Medical Record.  The schematic representation of EMR/EPR is given in figure (1).  The database of EPR consists of registration of patient, billing information, clinician’s diagnosis, laboratory information such as x-ray, pathology, blood results, etc.  The pharmacy information consists of information about medicines, supply of medicines, stock monitoring of drugs etc.  These systems are interconnected with the database and interoperable, which is easy to access for physicians, reduces cost, improves healthcare considerably.

**Indian healthcare system**

In India, healthcare is one of the largest service sectors, with more than 4 million people working in this industry. According to Koppar et al 2007, in Indian healthcare sector, pharmaceutical and health insurance services is estimated at US$ 22.2 billion at present, and is likely to be in the range of US$ 50 billion and US$ 69 billion at the end of 2012.

  The Indian healthcare industry is growing at a phenomenal rate, with private hospitals, government funds and foreign aid in the public health program steering this growth. The combination of high quality service at low cost is also making India a destination of health tourism as this mixes fun and leisure with necessary medical attention. The positive effects of all these endeavours is that the life expectancy of an average Indian has increased, however  this is not a reason to be satisfied as figures are still very modest when compared globally (Mukherjee et al., 2007).

  On the other side, 70 percent of the people live in rural areas and live below the poverty line. They are not able to access quality healthcare, as most of the quality hospitals are located in the cities and towns (Mukherjee et al, 2007). This is one of the reasons for implementing e-governance in healthcare and the use of EPR could be considered a useful starting point.

  The Indian healthcare system follows a three tier hierarchy systems starting with Periphery Health Centre (PHC) in remote areas, Secondary health centres that are District hospitals and Tertiary health centres which are located in the state’s capital cities. The PHC provides basic health support, if the patient needs examination, they will be referred to a district hospital and if the case needs more attention or is complex then they will be referred to the Tertiary hospitals.  This is the pattern followed by both public and private sectors, but the difference is that private sectors will offer more choices of treatment, depending on the paying capacity of the patient whereas public sector has single hospital (Mishra, 2008).

According to Mukherjee et al (2007), the Indian health industry is divided into two classifications public and private sectors, where private sector serves about 80 percent of health services and 20 percent by public sector.  The private sector can be further divided into

         Private dispensaries

         Private hospitals

         Charity hospitals managed by NGOs

         Corporate hospitals

At present, all the health providers work separately from one another thus providing no means for continuous care of the patients. Abdul (2007) feels that, there is a desperate need for network or continuous communication between both public and private sectors to share information about the patients.

**A computer-based medical record system**

The potential of health care information technology to support clinical and research activities has not been fully explored in developing countries. Proper assessment of the processes and outcomes of care is required before resources can be appropriately allocated and care interventions can be planned. Having reliable clinical data from community health centers would therefore be invaluable in making decisions and planning interventions.

Although electronic medical records are becoming increasingly prevalent in developed countries, they are still rare in developing countries. Using electronic medical records (EMRs) and personal digital assistants (PDAs) to identify patients for prospective investigations and collect outcomes data can increase the efficiency of such investigations. The feasibility of using PDAs for longitudinal data collection in poor rural settings has not been fully explored. Their portability and long-lasting batteries support structured data collection in a variety of geographic locations and may prove more useful for data collection in the field than laptop or tablet computers, especially in remote areas and in developing countries where electricity may not be available. However, their small screens, propensity to lose data when their batteries die, and lack of a wide range of programming tools can be disadvantages for using PDAs for field research.

In this article, we describe how we used an existing EMR in a rural Kenyan primary care center was used along with PDAs to assess the care and outcomes of one of the most prevalent conditions at the center: acute respiratory tract infections.

**Conceptual Model of the Study**

On the basis of the foregoing concepts, theories and findings or related literature, studies presented and insights taken from them, the conceptual model of the study was developed as shown below.

OUTPUT

Jewel’s First Maternity and Lying-in Clinic Patient Record Management System

PROCESS

System Design

System Development

System Testing and Improvement

INPUT

Knowledge Requirements

* Maternity Clinic
* Record Management System
* Database
* Dataflow Diagram
* Entity Relationship Diagram
* ISO 9126
* PHP
* HTML
* CSS

Software Requirements

* MySQL
* WAMP
* Photoshop
* Notepad++

Hardware Requirements

* Computer Unit
  + 2GB RAM
  + 400GB Hard Disk
  + Intel® Atom ™CPU N2600

EVALUATION

**INPUT**

The input part of the IPO model comprises of three parts: Knowledge, Software and Hardware Requirements. In the development of the study, the following knowledge requirements were necessary: Maternity Clinic; Record Management System; Database; Dataflow Diagram; ISO 9126; PHP; HTML; and CSS. The software requirements of the system are necessary: Notepad++; MySQL; Adobe Photoshop; and WAMP. The minimum hardware requirement that is needed for the system are as follow: 2GB RAM; 400GB Hard Disk; Intel® Atom ™CPU N2600.

**PROCESS**

The process part consists of the System Design, System Development, System Testing and Improvement. The first phase in the development of the study is the Project Design where it is compose of planning, gathering data, and analyzing the data gathered. Next phase was the Project Development where the writing of code for the system are written. The third phase for the development of this study was the System Testing and Improvement. This is the actual testing and debugging of the system. The last phase is the Evaluation, it is the phase where the system was evaluated in different categories by selected assessors to improve the quality of the system

**OUTPUT**

The final output of the study was the Jewel’s First Maternity and Lying-in Clinic Patient Record Management System.

**Operational Definitions of Terms**

For better and clearer understanding of this research, the following terms are defined in the context of this study.

**PATIENT -**

**CHAPTER 3**

**METHDOLOGY**

This chapter includes the project design, project development and testing procedure, and evaluation procedure.

**Project Design**

The project design is composed of the following: Data Flow Diagram, Normalized and Unnormalized tables, Use Case Diagram and Data Dictionary.