



RESEARCH ARTICLE

DESIGN OF A WEB BASED SYSTEM TO SUPPORT NURSING CARE PLANNING FOR WOLAITA  
SODO OUTONA REFERRAL HOSPITAL

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ABSTRACT

**Background:** Nursing process is a systematic problem solving approach used to identify, prevent and treat actual or potential health problems and promote wellness. It has five steps- assessment, diagnosis, planning, implementation, and evaluation. The nursing care planning and documentation of patient care needs are important. The use of Information and Communication Technology (ICT) can impact on the work that nurses carry out. Involvement of nurses in the analysis and design phases of a web based nursing care planning is necessary to properly encapsulate their care planning and documentation requirements.

**Objective:** This project attempted to design a Web Based System to Support Nursing Care Planning for Wolaita Sodo Outona Hospital (WSOH).

**Methodology:** The proposed project uses object oriented analysis and design system development technique approach and different data collection tools i.e. (interview, observation and relevant document review techniques) to collect sufficient data needed for the system to be developed. Analysis and design of the proposed system was performed using the object oriented analysis and design tools i.e. (class diagram, inheritance of the class, and association of the class, UML diagram, ER diagram), PHP and HTML, Java script for programming language and My SQL for database used.

**Result:** The developed design of a web based system to support nursing care planning for Wolaita Sodo Referral Hospital incorporates Register new/update repeat patient detailed information, Search patient detail, assesses the patient condition, to make nursing diagnosis, prepares care plan, implement goals, evaluate the outcome and prepared aggregate report information; nurses give care service at In Patient Department (IPD). To capture all of these data relational data base system was designed. Finally, the three tire system architecture also designed to give a high level view of the new system.

**Conclusion:** A web based system to support nursing care planning system used by nurses should make time-saving possible, be easily used with easy menus, save all applications exactly, have warning and alarm systems, display necessary interventions at appropriate times, be a guide for patient care.

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INTRODUCTION

Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. The enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, and political belief, economic or social condition. The health of all peoples is fundamental to the attainment of peace and security and is dependent upon the fullest co-operation of individuals and States. The achievement of any State in the promotion and protection of health is of value to all (Constitution of the World Health Organization,

2006). Web-based applications provide the power of desktop and server applications with the flexibility and accessibility of the web. Using web browsers, users can securely access applications from anywhere within the reach of the organization intranet or extranet. The special issue strives to explore the advanced web-based information systems and database applications in healthcare area. A web based system to support Nursing Care in healthcare organizations are undergoing major reorganizations and adjustments to meet the increasing demands of improved healthcare access and quality, as well as lowered costs. As the use of Information Technology (IT) to process medical data increases, much of the critical information necessary to meet these challenges is being stored in digital format. Web-enabled information technologies can provide the means for greater access and

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more effective integration of healthcare information system from disparate computer applications and other information resources (Athina Lazakidou, 2010). Most nursing care plan records are still paper-based, which means it is difficult to be used to properly and consistently coordinate care, routinely measure quality, or reduce medical errors due to challenges with storage and difficulties to easily access or retrieve information when it is needed (Ralph V. Carlone, 1991). Nevertheless, in developing countries, quite often, the nursing care plan is recorded as well documented on the basis of paper. The rationale behind is that the absence of the Information Communication Technology (ICT) infrastructure, professional in the area of health informatics, lack of utilization the existing electronic based system, not counting other factors. On top of this, the high commitment of the government in the process of implementation is commonly pronounced in the literature of health informatics. In similar fashion, in Ethiopia, the electronic based system is not commonly and widely observed when it is used by the health practitioners in general hospital as well as in referral hospitals (Federal Democratic Republic of Ethiopia Ministry of Health, 2010).

Though this is being the case, the existing government developed and starting to implement the Health Sector Development Plan (HSDP) since 1991 as part of democratization and decentralization of the health policy. Even after two decades, the electronic based system is not reaching remarkable stage. Being engulfed by such kinds of problem, it would be difficult to achieve or boost the health care services as per the standard of the government itself as well as per the standards of World Health Organization (WHO). HSDP-IV is a policy level strategic document that will guide the development of sub-national plans and set the rules of engagement in the health sector (Federal Democratic Republic of Ethiopia Ministry of Health, 2010). One of the strategies of health policy of Ethiopia is organizing Health Management Information System (HMIS) by: Managing the system appropriate and relevant for decision making, planning, implementation, monitoring and evaluation, maximizing the utilization of information of all levels and developing central and regional information documentation center. Ensuring communities have access to health facilities that are well equipped, supplied, maintained and ICT networked as per the standards and are well staffed with qualified and motivated employees (Federal Democratic Republic of Ethiopia Ministry of Health, 2010).

## **MATERIALS AND METHODS**

### **Study Area and period**

WolaitaSodoOutonaReferral Hospital was found in, SNNP Regional State of WolaitaSodo town which 395 km away from AddisAbaba in southern direction. The hospital was established in 1929 e.c by missionaries in 20 hectares of land and handover to local government by the year 1938. The institution was upgraded to referral hospital in 2004 E.C and currently serves to more than 2 million people by 361 employees (annex III). The study was conducted from January 1, 2015 to May, 2015 in WolaitaSodoWolaitaSodoOutona Referral Hospital.

### **Study Design**

This study employs Object Oriented (OO) methodology to design Web-based System to Support Nursing Care Planning

for the health facility. It is an appropriate method to develop the system hence there are different objects interacting within the system like patient, Nurses, and their service operation like assessment, diagnosis, Care plan, implementation or intervention and evaluation, report. This is because the focus of object oriented system development is on interacting Objects in the real-world (Craig Larman, 2004). Object Oriented (OO) analysis and design is a way to develop information system by building self-contained modules (Objects) that can be more easily replaced, modified and reused; that is why the investigator use this method to integrate the patient data that could be produced from the health facility during service delivery to users (Craig Larman, 2004; Douglas Baldwin and Greg W.Scragg, 2004).

## **DISCUSSION OF RESULTS**

### **Analysis and Design of the System**

#### **Analysis**

##### **Introduction**

In this chapter the current system, the business process, the functional and non-functional requirements, use cases, process models, data models, and the design of the system are presented.

##### **Current System**

Currently, in WolaitaSodo Referral Hospital used to record nursing care planning service information management system is a system that is been carried out in terms of manual operation, a system in which all the methods of care service administration is a manual approach. The approach is such that the hospital staff will record duty information on a paper or record and kept in a file. Critical analysis of this system reveals that it is a system prone to a lot of errors and it is not effective. Searching for workers duty information is time consuming and boring. The system is in such a way that the office is full of files. This tends to make the office untied. Careful analysis also shows that because of the complexities of the manual system, information stored is difficult to retrieve. Also because of the inconsistency of the manual system; at times files are lost because of mismanagement.

##### **Process Modeling**

A process model is a graphical way of representing how a business system should operate. It illustrates the processes or activities that are performed and how data move among them. A process model can be used to document the current system (i.e., as-is system) or the new system being developed (i.e., to-be system), whether computerized or not (Addison-Wesley, 2011).

##### **Contextual Diagram**

The context diagram shows the entire system in context with its environment. It shows the overall business process as just one process and also shows how a system that is being modeled is positioned in an environment with other systems and processes. They help define the boundaries of the system to be developed (Addison-Wesley, 2011).

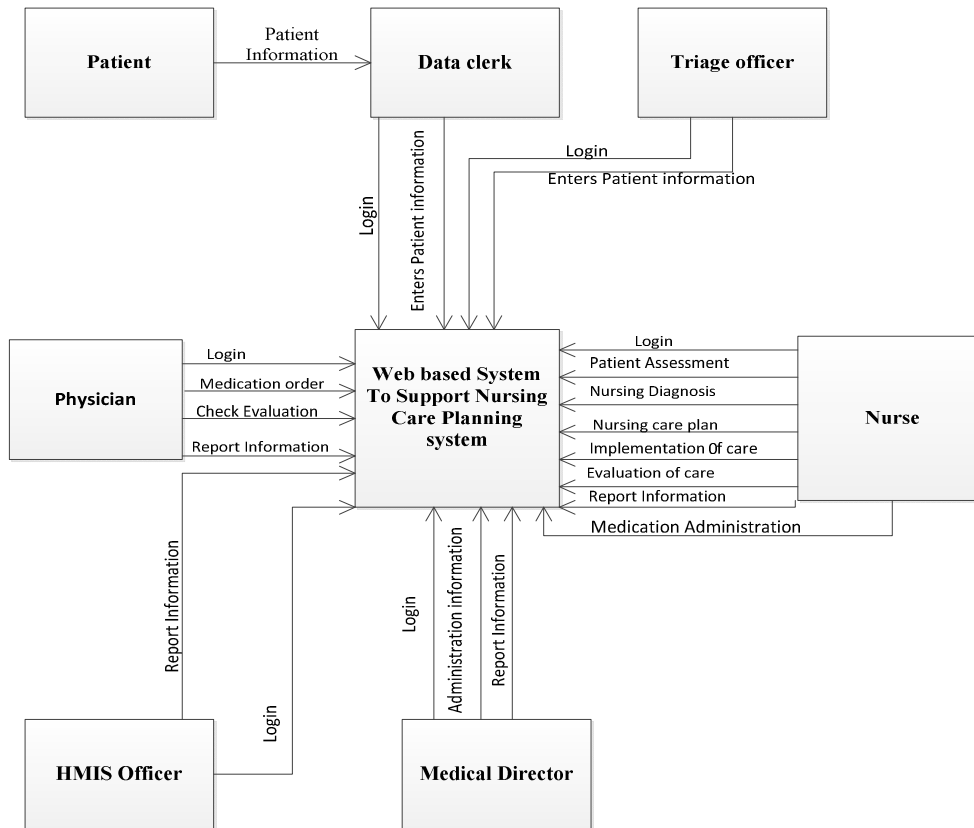


Figure 2. Contextual Diagram of the proposed system User Interface Designing / Prototype

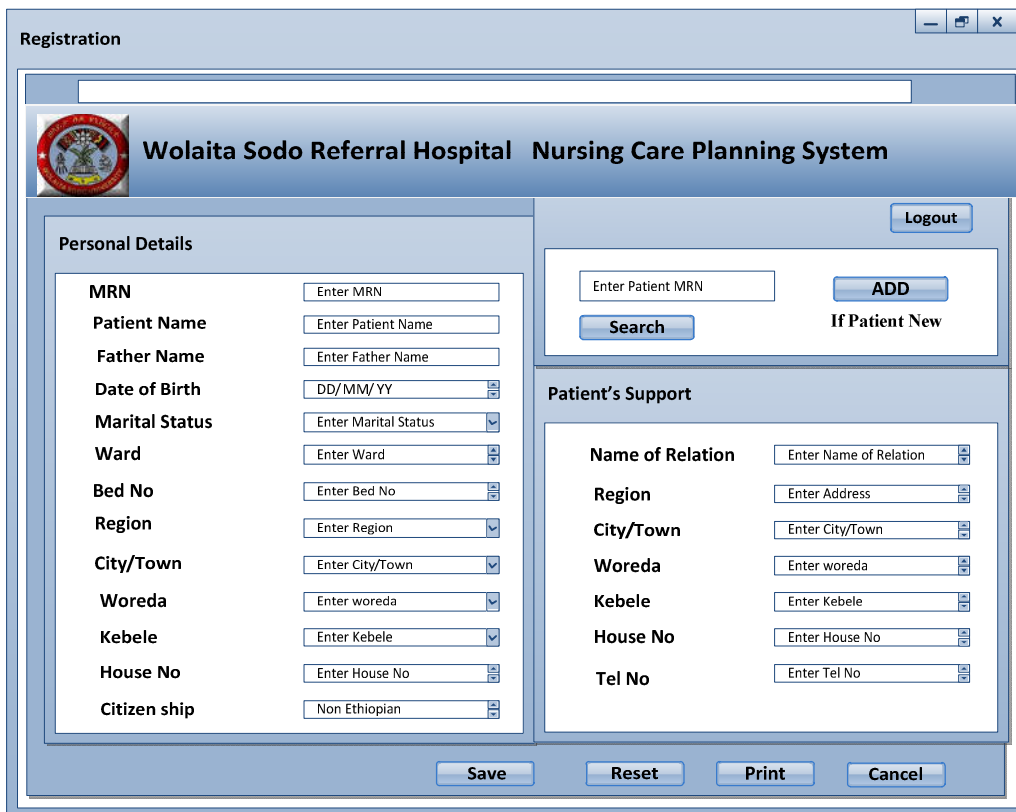


Figure 9. Registration User Interface Screen

A prototype is a working model that does not normally have all the required features or provide all the functionality of the final system. The main purpose of developing a prototype database system is to allow users to use the prototype to identify the features of the system that work well, or are inadequate, and if possible to suggest improvements or even new features to the

database system. In this way, we can greatly clarify the users' requirements for both the users and developers of the system and evaluate the feasibility of a particular system design. Prototypes should have the major advantage of being relatively inexpensive and quick to build (Thomas Connolly and Carolyn Begg, 2005).

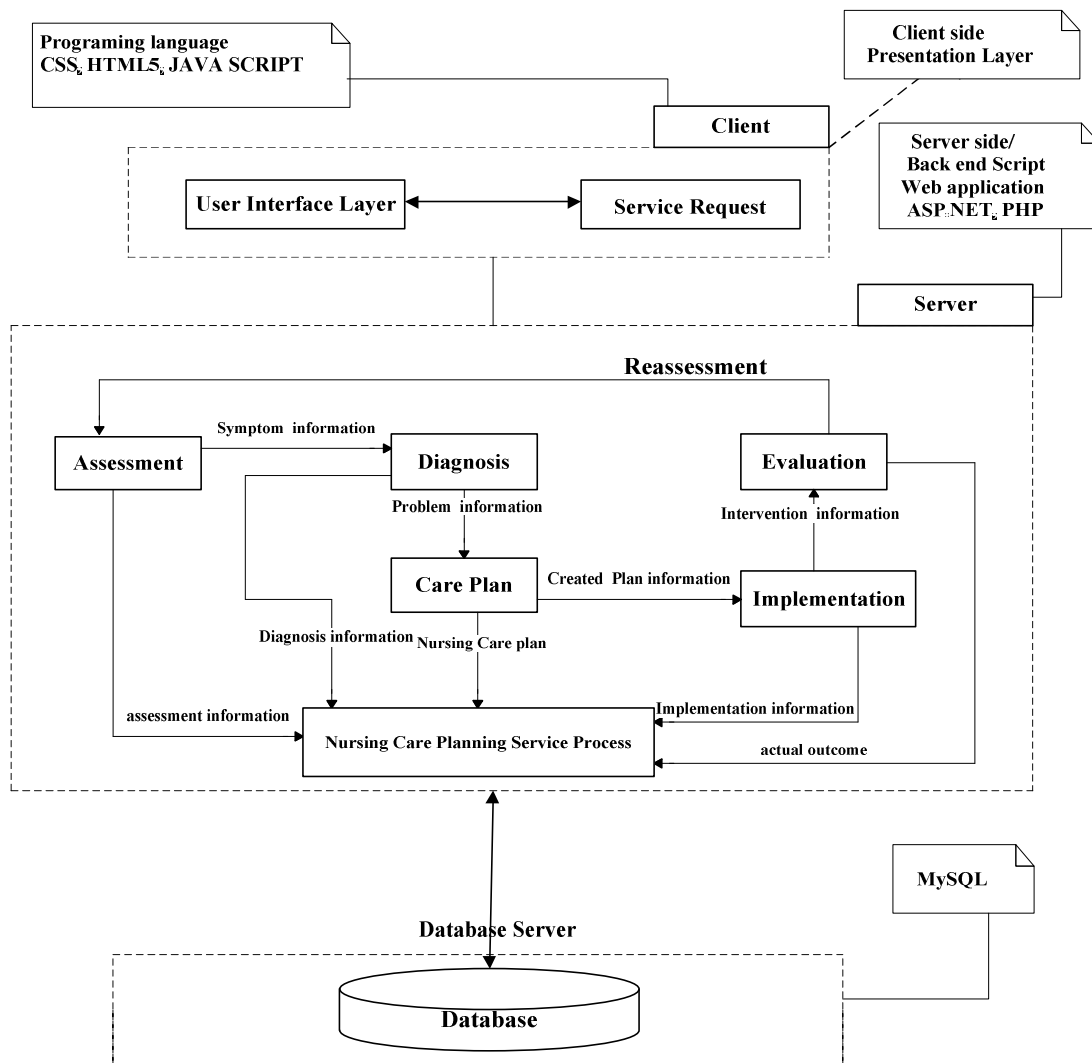


Figure 19. Proposed Web based System to Support Nursing Care Planning three tire System Architecture

**System Design**

**Object Oriented Design**

OOD is a phase which concerned with defining software objects their responsibilities and collaborations in nursing care planning system to fulfill the requirement independent of implementation details. There are a set of diagrams that are used to describe the design for software objects of nursing care planning system in object oriented design phases. This includes system architecture diagram and subsystem, software design class diagrams, sequence diagram also known as object interaction and diagrams entity relation diagram so forth (Craig Larman, 2004). This study used UML artifacts, sequence diagrams, along with class diagrams to design the system being designed, WSSNCP. Another task in this phase is designing UI which is based on nursing care planning and standard forms and other as described in UI flow diagramming section. The output of the design stage should specify clearly how the system should be constructed to satisfy the specified requirements (Addison-Wesley, 2011).

**System Architecture**

The architecture chosen for the system is three tier. The first layer runs on the client side, the second layer at the middle layer and the third layer will be the database system. The

system will run using web technology. This architecture provides greater application scalability, high flexibility, high efficiency, lower maintenance, and reusability of components. Since each tier runs on a separate machine, it improves systems performance. The system uses dynamic web technology, i.e., adding and retrieving data to and from the data store whenever requested is possible. It requires a client side program which is accessed by the Nurses, by the Physician, by HMIS officer and also an interface that communicate with the external system. It needs server side functions that implement the functional requirements and the database system that stores data.

**Proposed Web based 3-tier Architecture for Nursing Care Planning System**

In order to meet its design goals and be widely available for the existing Health Facility, the system is designed based on the architecture of web applications. It is known that Web applications can be made to be available throughout in Ethiopia. Moreover, Web applications can also be available during working hours.

**Conclusion**

Existing nursing care planning system in the health facility is kept manually using different paper based formats. Based on

the responses of participants, paper based recording management system has different problems like duplication of records, data quality and completeness, illegibility of records, difficulty for easy access, leading to lack of timely, reliable and relevant information and difficult to deliver comprehensive and timely health information to users. This project contributes to better understanding of using nursing care planning service process and solve the current problems. Identified essential requirements from the study area are assessment, diagnosis, care plan, intervention, evaluation and medications. In addition, respondents' revealed that even if national guidelines were present but due to different problems like lack of resource, inconvenient working environment and workload cannot address the above parameters. So, in this study the national standards and guideline were used as an input in order to determine the requirements for the new system. Following the required analysis, system use cases were used to describe the basic functions of system boundary and illustrate detailed description of the activities. In this project, system requirements are identified by consulting the users. Some of functional requirements are the system keep track of patient's medical history and basic information while non-functional one are the system available seven days in a week, scale up to accommodate this increasing need without a noticeable performance downgrading and protected from an unauthorized users and intruders. The design model transcribes the analysis model in such a way going to be implemented. A designing web based nursing care planning system was used object oriented approach to design the three tire system architecture models (adopted). The implantation of the model contributes to the effective and efficient nursing care service planning process and improves communication between different health professionals by accessing networked system through the web-based system. Finally user interface prototype design shows part of the system which the user interact to the system. It includes different components like screen displays that provide navigation through the system, forms that capture data and reports that the system produces. User evaluation also proves that the system meets users interface factors such as screen terminology, system capabilities, user behavioral factors, such as attitudes, intention to use; completeness,

timely available, and format of layout and perceived usefulness and delivered to the health workers of the study health facility. Therefore, regarding implementation of the system in the hospital and further researchers to extend the developed prototype are suggested in the recommendation section of the research project. Through all this, the study addresses the researcher problems and made a significant contribution to nursing care planning information system in Wolaita Sodo Outona Referral Hospital which improves the current nursing care service system.

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