Wellness Connect

SRS Document

Disclaimer

This Software Requirements Specification document is a guideline. The document details all the high level requirements. The document should be used as a guideline by the students to design the Solution Architecture for the project. The document also describes the broad scope of the project and high level logical object model. But while developing the solution if the developer has a valid point to add more details being within the scope specified then it can be accommodated after consultation.

Wellness Connect- Health Care Initiative

Introduction

The purpose of this document is to define scope and requirements of an automated Health Care system, Wellness Connect for BM Hospital, that is small in operations, with 105 employees, including medical, administrative and support personnel, this 37-bed facility services patients in the rural area in Mississippi.

This document should be used by the development team to architect the solution for the project. The requirements in Wellness Connect intends to provide an exposure to Compliance act that is mandatory for all the medical facilities in USA.

Management Summary

If you, or a loved one, are hospitalized today, countless hospital staff and doctors must locate your files and charts when medical care is required. These files contain critical health information, including admittance forms, medical history, doctor's notes and test results. This packet of lifesaving information is transported from room to room within the confines of the hospital in the hopes that the content remains in order, finds its way to the appropriate patient, and that health workers are able to quickly sift through the information to access the right information to administer the appropriate care.

BM hospital has relied on paper-based medical records for years, and this inefficient system has caused a variety of problems for patients and healthcare professionals. Paper files are not readily accessible, especially in an emergency room setting. They are laborious and costly, and oftentimes numerous copies must be made. The files are prone to misplacement, with the large number of healthcare providers who must interact with the data. Additionally, paper files make it difficult to comply with HIPAA stipulations for patient privacy.

1. Roles based Access to patient information
2. Prepare billing statements more quickly and accurately
3. Reduce operations costs
4. Eliminate paper file storage facilities
5. Achieve HIPAA compliance and patient privacy.

The proposed solution will be designed & developed to run on IBM WebSphere Application Server and IBM DB2 Universal Database in a 2-tier architecture.

Brief about HIPAA

The Health Insurance Portability and Accountability Act (HIPAA) - Privacy Rule provides federal protections for personal health information held by covered entities and gives patients an array of rights with respect to that information. At the same time, the Privacy Rule is balanced so that it permits the disclosure of personal health information needed for patient care and other important purposes. The Security Rule specifies a series of administrative, physical, and technical safeguards for covered entities to use to assure the confidentiality, integrity, and availability of electronic protected health information.

Its important to know, that lot of Indian companies process healthcare industry work using automated solutions that are designed to ensure HIPAA compliance. From developer perspective, its important to know about HIPAA for designing and developing an appropriate solution for healthcare industry projects of USA.

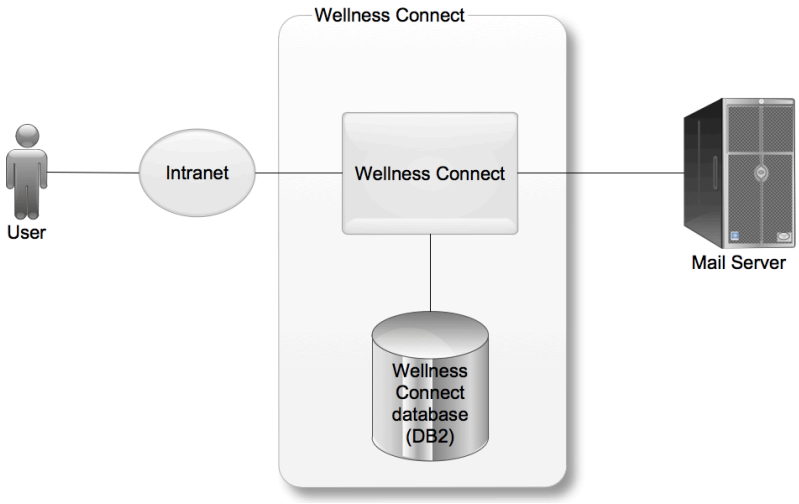
Key Assumptions

1. The project owner has read HIPAA Rules and understands the implications of non-compliance in the automated system.
2. The imaging software for all the LAB tests is outside the system. It generates images as jpegs and saves it a common location for the application to read the record.
3. The imaging record will have a patient id and procedure code with date time stamp in the name of jpeg file.
4. The software will provide a feature to attach it to patient record.

High Level Architecture

Wellness Connect's high level architecture is illustrated through the context diagram shown below. It will have following categories of users:

1. Front Office Officers (Registration and Billing)
2. LAB Officer (Clinical Tests & Reports)
3. Physician (Consulting Doctor who is seeing the patient)
4. Administrator (Master Maintenance)



Wellness Connect Context Diagram

Wellness Connect	The Wellness application is is responsible for activities like registration of patient (First time the patient visits for consultancy or admission), creation of patient record, provide interfaces for various users like physician, lab officer, front office to access patient information as per their roles.
Wellness Connect Database	The database for the Wellness connect shall store masters for procedure code with rates, patient demographics, insurance companies. Transactions for patient per visit and procedure in the hospital are captured along with outcome of received as images from the lab's imaging software.
CSV	Master data like Procedure codes, Charge Codes, Physicians, Front Officers, Lab Officers, Insurance Providers and other services shall be uploaded from the CSV.
Mail Server	All notifications shall be sent from the system via this mail server

Functional Requirements

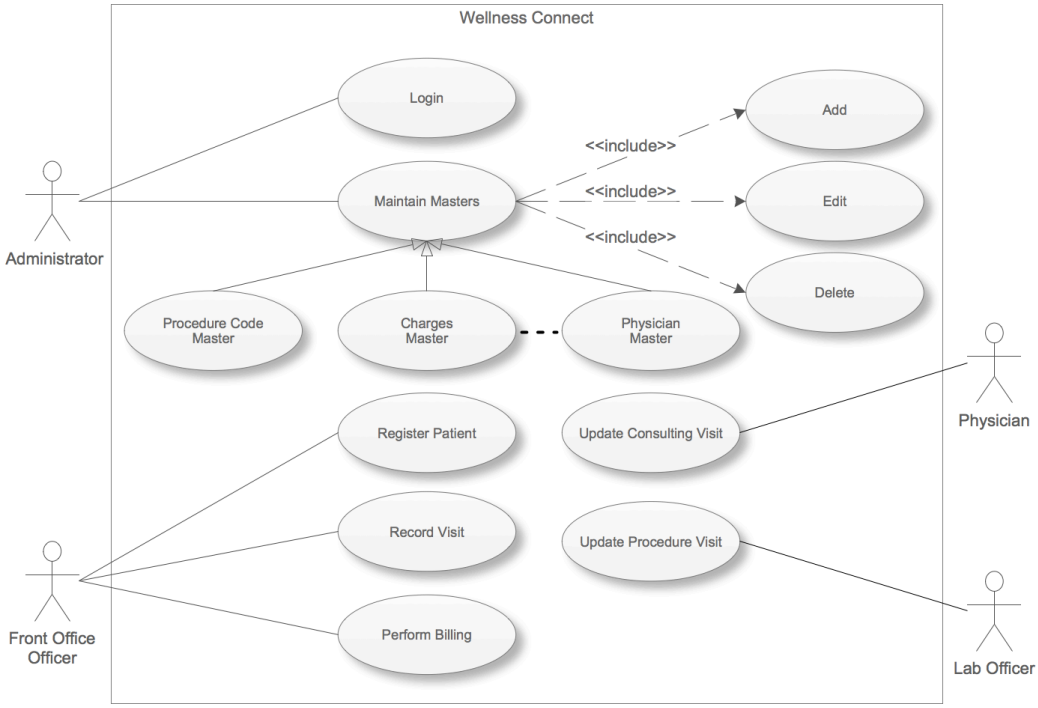
The high level functional requirements for the Wellness Connect are outlined in the Use Case diagram described in this section.

Wellness Connect application will provide a secure user-id/password based secured login mechanism to access its services. The details of this are not outlined here. The development team is expected to create these keeping in mind the general practices followed by the web applications. Login will be a prerequisite to use Wellness Connect. Internal users will be provided user id/password pair separately.

Once the user logs in, they are displayed menu options to select from based on their role. Eg. A Front office staff will not see an existing patient's history of physician recording or procedure outcomes.

Use Case Diagrams

The following figure illustrates the Use Case diagram for the system.



Use Case Diagram

Use Cases

Masters

Use Case Element	Description
Number	UC.01
Application	Master maintenance in terms of basic operations viz. **add**, **edit**, **delete** and **view**. All master maintenance i.e. Procedure Codes, Charges, Physicians, insurance Providers are all child use cases of this Use Case. • Procedure Code master contains Procedure code, Procedure Name, Charges • Charges Master contains Charge Code, Description, Charges • Physicians Master contains Physician Code, Last Name, First Name, e-mail id • Front office Billing contains FO Code, Officer Name, e-mail id • LAB Users contains LAB User Code, LAB officer name • Insurance Company Master contains Provider id, Insurance provider, e-mail id
Use Case Name	Maintain Masters
Primary Actor	Administrator
Secondary Actor	None
Pre-condition	None
Trigger	Administrator clicks on the **Maintain Masters** menu item on the admin interface page
Basic Flow	• System presents a list of masters that can be maintained. Administrator selects the desired master. • System displays a list *view* and links for *add*, *edit* and *delete*. 1. In case add, a new master record data entry form is presented. The master record is saved on clicking the save button provided form clears all the data validations (if any). The list view is updated accordingly. 2. In case of edit, from the list view user is prompted to select the desired record to edit, Selected record is opened for editing. The edited master record is updated on clicking the update button, provided form clears all the data validations (if any). 3. In case of delete, from the list view user selects the check box(s) against each record. Selected records are deleted up on clicking the delete button. However, user is presented a confirmation dialog before deleting the records.
Alternate Flow	• In event of any error, it is clearly displayed and user is asked to renter data or perform operation again.
Output	System displays the details of the successful operation.

Registration

Use Case Element	Description
Number	UC.02
Application	The patient record is created in the system for the first time.
Use Case Name	Registration
Primary Actor	Front Office Billing
Secondary Actor	None
Pre-condition	None
Trigger	The user clicks on **Registration** menu item on the landing page
Basic Flow	• System displays a form for filling patients demographics with the following data in sections such as 1)Patient Information, 2)Physician Reference, 3) Emergency Contact, 4) Insurance Information • Patient Information section requires the following data to be entered by the user. 1. Last Name, First Name, Middle Name, Date of Birth, Social Security Number, Gender [Male / Female], Marital Status [Married, Single, Divorced, Widowed], Home Address - Apartment #, City, State, Zip code, Phone - [Home, Work, Mobile], Email Address, Employment [Employed Full time, Part time, Student, Home maker, Self employed, Disable] Note: MD5 Hash of Social Security Number will be stored for ensuring no visibility or access to this critical information of the patient. The Physician Reference section requires the following information to entered. 1.Primary Physician - Pick list from the existing master of Physicians 2.Referring Physician - Select from the Pick list - can be same as the the primary physician also. The Emergency contact section requires the following information to entered. 1.Last Name 2.First Name 3.Relationship to Patient 4.Contact Number The Insurance section requires the following information to entered. 1.Insurance Provider - Select from a pick list of Provider master 2.Health Card Number - 10 Digit validation, cannot be zeros 3.Validity - Select from Date picker - mmddyyyy format. On Save the data is saved and patient id is generated. All the fields are mandatory.
Alternate Flow	User may click on cancel to abandon the data entry, no data gets saved in the database. The previous menu is displayed to the user.

Use Case Element	Description
Output	An email notification to Referring Physician is sent stating the registration of a patient. An email notification is sent to Insurance company stating registration of a patient.

Record Patient Visit /Admission

Use Case Element	Description
Number	UC.03
Application	Patients visit hospital to either consult a physician or for a procedure or get admitted. The front office staff enters the information for the patients visit and generates a record slip for the purpose of visit
Use Case Name	Record Patient Visit / admission
Primary Actor	Front office billing
Secondary Actor	None
Pre-condition	None
Trigger	The user clicks on the **Record Visit** menu item on the landing page
Basic Flow	• System displays the search box to enter the phone number of the patient. • The system pulls up the record, if not present then displays a message 'Please complete registration to create patient record' • The record displays has basic information like Patient first and last name, Date of birth, gender, Primary and Reference Physician Name. • The user selects purpose of the visit from a drop down [Consult a Physician, Procedure Appointment, Admission] • Consult a Physician choice displays the name of the primary physician or reference physician. the user selects one of the physician • Choice of Procedure appointment allows the user to select the procedure code • Choice of Admission allows user to assign a room number from list of [001 to 50] and selects the primary physician for communication purpose. • The slip is generated with charges based on the choice selected. • The patient visit gets recorded with date and time stamp along with the purpose of visit.
Alternate Flow	• In event of any error, it is clearly displayed and user is asked to renter data or perform operation again.
Output	System displays the details of the successful operation. An email is sent to selected physician for the appointment queue An email is sent to lab officer with the procedure information

Consulting Visit

Use Case Element	Description
Number	UC.04
Application	Physician enters the consulting feedback
Use Case Name	Consulting Feedback
Primary Actor	Physician
Secondary Actor	None
Pre-condition	None
Trigger	The user clicks on the **Consulting Visit** menu item on the landing page
Basic Flow	• System displays the list of patients in queue for consulting appointment. • The physician selects the patient record of the patient ready for consulting • The system displays demographic information and any previous visits and procedure outputs. • A text box to record the current observations and feedback is provided to the user. • A list of Procedure Codes are displayed for selection, multiple codes can be selected. • A list of charge codes is displayed for selection. The physician selects the applicable charge code. • The record is submitted for front office billing to conclude the consulting visit • The patient's consulting visit gets recorded with date and time stamp along with the details entered by the physician.
Alternate Flow	• In event of any error, it is clearly displayed and user is asked to renter data or perform operation again.
Output	System displays the details of the successful operation. Email is sent to lab officer with the procedures to be scheduled as per codes mentioned in the consulting record. Email is sent to the front office billing for charges applicable while billing as per the physicians record.

Update Procedure Visit

Use Case Element	Description
Number	UC.05
Application	The clinical procedures and their results are captured as patient record. In real life the appointments management is also a part of the system. This part is out of scope for the current project.
Use Case Name	Procedure Visit
Primary Actor	Lab Officer
Secondary Actor	None
Pre-condition	None
Trigger	The user clicks on the **Procedure Visit** menu item on the landing page
Basic Flow	• System displays the list of patients in queue for Procedure appointment for the current date. • The user selects the patient record of the patient ready for procedure • The system displays demographic information only along with the list of procedures to be done. • On completion of the procedure, the user may repeat the first two steps to access the patient record and view the list of procedures. The check box in front of the procedures are clicked. The user can open this record to attach the output of procedures for the checked options. • The record is submitted for front office billing to conclude the procedure record. • The patient's procedure history comprising of visit as well as report upload gets recorded with date and time stamp along with the procedure outcomes.
Alternate Flow	• In event of any error, it is clearly displayed and user is asked to renter data or perform operation again.
Output	System displays the details of the successful operation. Email is sent to front office billing with procedure codes

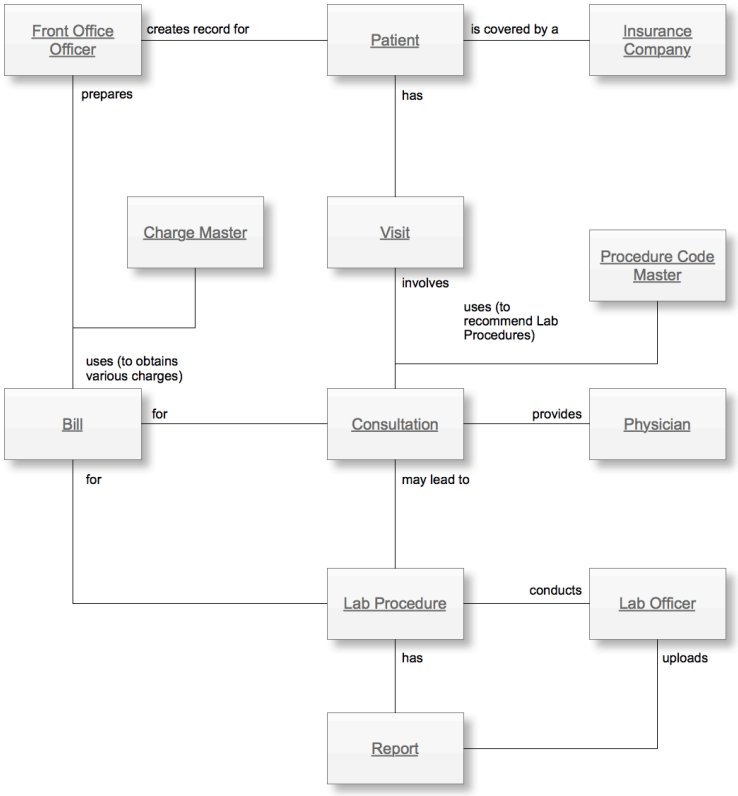
Perform Patient Billing

Use Case Element	Description
Number	UC.06
Application	The bills are raised by front office billing section at the end of consulting or procedure updates in the system
Use Case Name	Patient Billing
Primary Actor	Front Office Billing
Secondary Actor	None
Pre-condition	Patient's Consulting or Procedure record is available in the Ready for Billing queue.
Trigger	The user clicks on the **Patient Billing** menu item on the landing page

Use Case Element	Description
Basic Flow	• System displays the list of Consulting and Procedure visit records in queue for Billing **Consulting Charges** • The user selects Consulting record from the list. • The system displays a billing form for the patient with the details as follows: • Patient's Last Name, First Name, Consulting Date, [Insurance Provider, Health Card Number and Validity will come from Patient's master.] • The charge code entered by physician is displayed along with the charges from the charges master. • A bill number is generated for the Insurance Provider along with the due date stamp of current date +15. **Procedure Charges** • The user selects Procedure record from the list. • The system displays a billing form for the patient with the details as follows: • Patient's Last Name, First Name, Procedure Date, [Insurance Provider, Health Card Number and Validity will come from Patient's master.] • The charges for the procedure from procedure master is displayed along with procedure code • A bill number is generated for the Insurance Provider along with the due date stamp of current date +15. Note: One bill is generated per entry in the billing queue to minimize payments getting stuck for a particular charge in case insurance company does not pick up the charges. Data Security: The billing user can only view the patient visits for consulting and procedures, the details of these visits are not accessible to the front office billing personnel
Alternate Flow	• In event of any error, it is clearly displayed and user is asked to renter data or perform operation again.
Output	System displays the details of the successful operation. Email is sent to Insurance provider along with the bill copy.

Logical Object Model

A high level logical object model of the system is shown below. During technical design it will be transformed into a physical model covering all system entities. Such a diagram will include their relationship and its cardinality.



Logical Object Model

1. Hospital has physician consulting and Diagnostic facilities for the patients.
2. The consulting is charged on the basis of Charge code and fee structure allocated in the master.
3. The diagnostic billing is done based on the Procedure code that is internally mapped to a charge code for billing purposes.
4. On first time patients visit to the hospital a patient record is created in Wellness Connect system that will have information like Health Card Number, Insurance provider and date validity of health insurance.
5. The front office officer on duty records the patient information on arrival.
6. The front office officer on duty generates the bill at the time of patients departure post the Diagnostic or Consulting appointment.
7. The bill raised for the patient's charges is sent to the Insurance company as mentioned in the health card of the patient.
8. Lab officer conducts diagnostic procedure or lab procedure and uploads the report in the system for a patient record.
9. The lab procedure report gets attached to the billing information of the patient record.

Database Design Guidelines

This involves the transformation of the use cases, state diagrams, and logical object model into detailed and optimized physical database table designs.

Typically persistent classes will map to table(s) with their attributes as columns of the table. In some cases a high level object may map in to a master-child table. Invoice is one such example where it maps in to "invoice_header" and "invoice_line_item" table.

Associations between two persistent objects are realized as foreign keys to the associated objects. A foreign key is a column in one table that contains the primary key value of the associated object.

Similarly, a standard technique in relational modeling is to use an intersection entity to represent many-to-many associations. Following is a broad checklist for physical database database design:

1. Database must be properly normalized except those instances where de-normalization help improves performance. This option must be used with special care.
2. All persistent classes that use the database for persistency must map to database structures.
3. Many-to-many relationships must have an intersecting table.
4. Primary keys should be defined for each table, unless there is a performance reason not to define a primary key.
5. Indexes should be defined to optimize access.
6. Data and referential integrity constraints should be defined.

Testing Approach

Quality of the software can be achieved with basic hygiene and consistency followed during design and development of User Interface(UI), Navigation, Validations as per the business process requirement.

To ensure the project delivers acceptable quality to the customer, its important to create a checklist of the conventions to be followed across. Common checks as below are for your reference during design and development:

Common Checks	Validation Type
Page Title is valid for the feature being provided on the page	UI
Order of the Data Entry Fields is logical as per the functionality being provided by the feature	UI
Order of the Display only Fields makes viewing and understanding easy for the user	UI
Spellings and Correctness of Label for the Data Entry and Display fields	UI
The labels are not wrapping onto another row thereby adding a blank row on the page	UI
The fields with drop down are displayed in single row instead of drop down coming on the next row	UI
Data Entry field basic validations are working i.e Text field /Numbers / Dates allow data for their type only	Functional
The dates are following a standard format dd/mmm/yyyy on all forms	UI
The color scheme of all forms i.e headers labels , alerts, entry fields are uniform throughout the application	UI
The action buttons for a New Data Entry Form are uniform for all forms that is allowing data entry	UI

Common Checks	Validation Type
The action buttons are performing the desired action e.g. "submit" is creating a new record if there are no errors and recording all the input fields, whereas 'cancel' is not creating a new record in the database	Functional
The links provided on the forms are opening correctly.	Functional
The data feed mechanism for Read and Write files is generating a log with count of entries.	Navigation

Suggested Technical Reading

The project is aimed at making the student understand concepts of Design and Development using IBM Rational tools, Web Sphere Application Server and DB2 Database. The following reading reference is easy to understand and should be read to get a clear understanding of capabilities of the tools and how you would leverage them to execute a project.

Technical Reference	URL to access
RAD - Tackling challenges of software development with Rational Application Developer for WebSphere Software	http://www.ibm.com/developerworks/rational/library/08/0926_ackerman-mahate/index.html
IBM Education Assistant - Rational Application Developer 7.5	http://publib.boulder.ibm.com/infocenter/ieduasst/rtnv1r0/index.jsp?topic=/com.ibm.iea.rad_v7/rad/rad75.html
RSA-Overview of Rational Software Architect for WebSphere Software Version 7.5	http://www.ibm.com/developerworks/rational/library/08/0926_arnold/index.html
Using the new features of UML Modeler in IBM Rational Software Architect Version 7.5	http://www.ibm.com/developerworks/rational/library/08/0926_diu/index.html
Rational Technical Library	http://www.ibm.com/developerworks/rational/library/