SWENG 500 - Advanced Software Design Studio

User Manual for the Electronic Medical Record Management System

Rev. 0

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Revision History

Revision	Name	Reason for Changes	Date
0	Atul Kumar Singh Shushrut Kanetkar Vijay Kumar Adam Seefried Matthew Jarosh	Initial Release	9/5/2017

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Definitions

The following acronyms and glossary of terms are defined here and used throughout this document. Refer to this section when unsure about a specific term.

Acronyms

Acronym	Definition
EMRMS	Electronic Medical Record Management System
MPI	Master Patient index number
MRN	Medical Record Number

Glossary of Terms

Term	Definition
Java 8 JDK	Java 8 JDK is the platform in which this application was developed on.
MPI	The Master Patient Index number is a number assigned to the patient when they are first registered in the system. This number is unique to all clinics and is a global identification number.
MRN	The Medical Record Number is a number assigned to a patient at each clinic. A patient will have different MRNs at each clinic, sot he MRN is unique only to the clinic.
Tomcat	Apache Tomcat is the server in which the web application interacts with.

1. Introduction

1.1 Purpose

The purpose of this system is to provide hospitals/clinics a web application that allows them access to a central location for all patient information and medical information.

This document will be the technical manual and help for users of the system. It will provide instructions for any action within the system.

1.2 Product Scope

The Electronic Medical Record Management System (EMRMS) will be a web application consisting of a central server and database management system (DBMS). The EMRMS will allow doctors and nurses the ability to register patients, capture patient medical records, and log patient information.

1.3 Prerequisites

- User has a working username and password
- User is a doctor, nurse, or registration clerk
- User must have an internet connection
- User must have a working web browser (Firefox, Chrome, Safari, Internet Explorer)

2. Deployment

2.1 Accessing the System

The system shall be accessed through the deployment on Google Web Services. The user will simply launch the application which will be displayed in the web browser.

Accessing EMRMS from Google Cloud

Link to our Application: http://cameracookbook.duckdns.org/emrms/

Instructions:

1. Enter the link into your web browser
2. The login screen will be displayed. Enter the following information to login as an admin
    a. UserName: admin
    b. Password: emrms

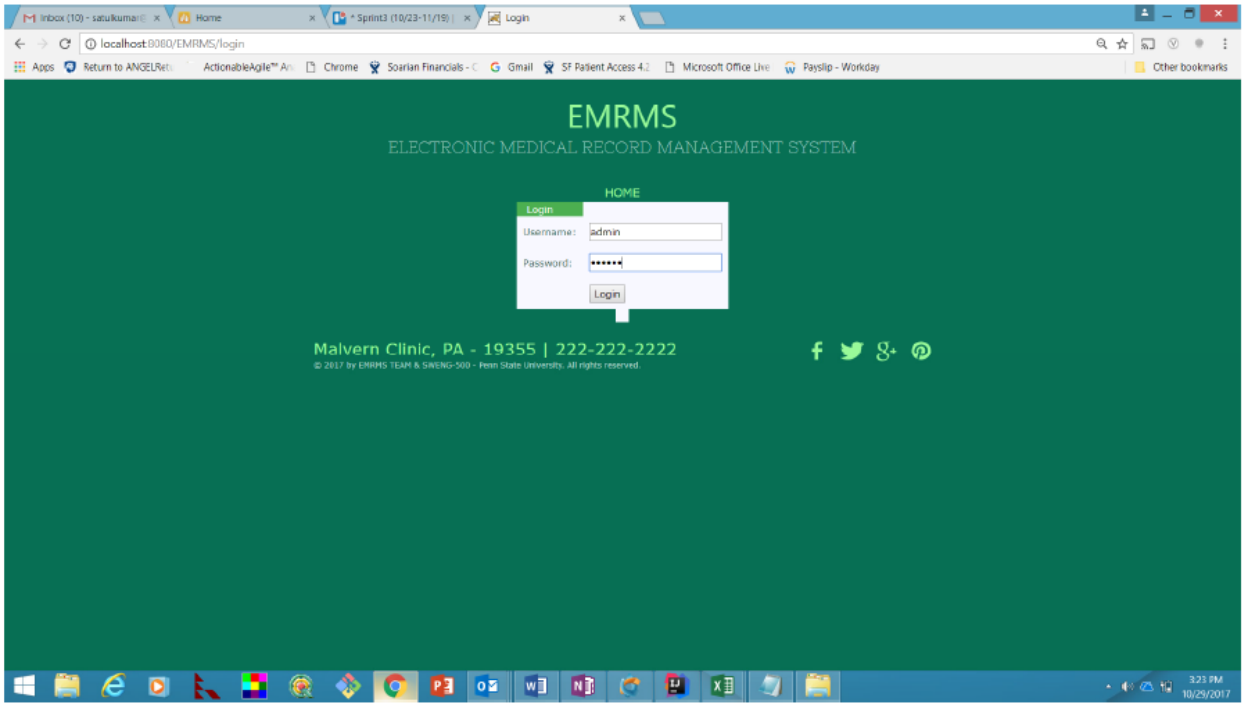
The server will be down daily sometimes between 9PM-9AM next morning for upgrade and maintenance

3. Healthcare Portal

3.1 Logging onto the System

Only doctors, nurses, and registration clerks have access to the healthcare portal. Each user is supplied with their own username and password. In order to log in, follow the following steps:

1. Launch the application
2. Upon launching the login screen, enter your username and password
3. Press the Login button
4. If the incorrect login information has been entered, the system will display a message saying “Invalid Login Credentials” and will allow you to re-enter your credentials.



3.2 Using the User Header

Upon successful login, a user header will be displayed on the top of the webpage. This user header will be displayed on the top of ach page the user navigates to. It will contain the following information:

- **System Name (EMRMS)**
- **User Name and Title**
- **Clinic Name**
  - The clinic name is a drop down selection. A user may be employed at different clinics and thus has different patient's between the clinics. In order to switch between clinics, the user will select the drop down and click the appropriate clinic. The system will reload the webpage with the appropriate patient information for the selected clinic.
- **Patient Locator Icon**
  - The patient locator icon will take the user to the patient locator screen. See Section3.4 for more information.
- **Census Button**
  - The Census button will take the user to the Patient Census. See Section 3.3 for more information.
- **Log Off Button**
  - This button will display a prompt asking if the user really wants to log off. Upon successful logoff, the system will display the login page.

3.3 Using the Patient Census

Upon successful login, the system will display the patient census page. This page will display a list of patients that are applicable to the clinic/hospital that the user is currently employed at. You can also access the Patient Census screen at any time by using the Patient Census button on the User Header.

The patient census is essentially a list box containing every patient registered in the clinics system. It is displayed in order of the patients MRN and contains the following columns:

Name	Patient's Last Name, Patient's First Name
DOB	Patient's Date of Birth in numerical format
Gender	Patient's gender (Male or Female)
Location	Name of clinic where patient is registered
MRN	The Medical Record Number that is used by the selected clinic. Each clinic will have a unique medical record number for the patient[1]
Encounter	A link to the patient's encounter. If the patient has an active encounter at the clinic, the link will say Active, if not the link is Inactive. See Section 3.7.1
Chart (Icon)	This icon is a link to the patient's chart assessment. See section 3.8

In order to scroll through the patients, you can either use the arrow buttons on the right side of the list or use the wheel on your mouse.

[1]Each patient will only have one MPI number, but can have multiple medical record numbers if they are registered at multiple clinics.

3.4 Locating a Patient

The Patient Locator can be accessed by clicking the patient locator icon on the User Header. The Patient Locator is a search entry grid to help the user locate a patient in the system quickly, rather than scrolling through the patient census.

There are two ways to use Patient Locator. One way is to search by name. In order to search by name, there are three fields that can be filled in:

Field	**Description**
First Name	Patient's First Name
Last Name	Patient's Last Name
Gender	Patient's gender (Male or Female)

A user can use the patient locator and search using any of these fields. Gender has three options: Male, Female, or Unknown in case the user is not sure what the gender of the patient is. Once the user has some (or all) fields filled in, click the *Find Patient* button and the system will bring up any results that have fit the match of the search query.

The results are displayed in the results table below the search entry box. It contains the following fields:

Field	Description
Name	Patient's Last Name, Patient's First Name
DOB	Patient's Date of Birth in numerical format
Gender	Patient's gender (Male or Female)
Location	Name of clinic where patient is registered
MRN	The Medical Record Number that is used by the selected clinic. Each clinic will have a unique medical record number for the patient[1]
Encounter	A link to the patient's encounter. If the patient has an active encounter at the clinic, the link will say Active, if not the link is Inactive. See Section 3.7.1

The other option to use patient locator is to search by MRN number. To search by MRN, click the MRN tab at the top of the page. Since the MRN number is related to the clinic, then the user can search for the patient within their own clinic by the unique MRN number assigned to them. Only one field is required for this search query, MRN. Like searching by name, once the search query is filled in, click the *Find Patient* button and the results will be displayed in the results table.

3.4.1 Admitting a Patient

There is an *Admit* button at the bottom of the page below the results table. It is disabled except for one condition. When a patient is found in the search results, the user is able to select that patient which highlights the table row and the *Admit* button will be enabled. The user can click the admit button to Admit the patient.

3.5 Registering a Patient

If a new patient is not in the system, they need to be registered. In order to do this, the user should be on the home page and select the *Register Patient* button. This will bring up a page with two panes, the *Encounter* pane and the *Registration* pane. For this process, disregard the *Encounter* pane. In the *Registration* pane, there are the following fields of information for the user to enter under the *Patient Demographics* tab:

Field	Description	Required
Last Name	Patient's Last Name	Yes
First Name	Patient's First Name	Yes
Middle Name	Patient's Middle Name	No
Gender	Patients Gender (Male or Female)	Yes
DOB	Patient's Date of Birth	Yes
Address	Patient's Home Address (Street, City, State, ZIP)	Yes
Home Phone	Patient's Home Phone Number	No
Cell Phone	Patient's Cell Phone Number	No

Email	Patient's Email Address	No
Organ Donor	Whether the Patient is a registered Organ Donor	No

If the user does enter the required information, the system will display a message saying "Not all required fields have been entered."

Once the required information has been entered, click the *Save* button. If a duplicate entry already exists, the system will display a message saying "Duplicate Entry exists". If no duplicate entry exists, the system will display a message saying "Save Successful".

3.5.1 Editing Patient Demographics

To edit the patient's information, the user must first locate the patient either using the Patient Census or Patient Locator options (Sections 3.3 and 3.4).

Once the patient is found using one of the two methods described above, The user can click the name of the patient in the table row and it will bring up the patient's demographic information (registration information). This page is displayed the same as the patient registration page and the fields are the same as well. The system will bring up all the fields described in section 3.5 with the information from the database and allow them to be editable.

The user just has to double click each field in order to edit them. Once the editing is done, the user just has to click Save and if the save is successful, then the system will display a message saying "Save Successful".

3.6 Using the Patient Header

When a registered patient is selected either using the Patient Census or Patient Locator options, a additional header will appear on the page, the Patient Header. This header will be displayed on every page while the patient is selected: Patient Information, Encounters, and Chart Assessment.

The patient header contains the following information:

Field	Description
Patients Name	Patient's Last Name, Patient's First Name
DOB	Patient's Date of Birth
Attending	This is the medical number of the attending physician.
MRN	Patient's MRN for that clinic
Encounter Number	This is the number automatically generated once an encounter has been created for the patient.
Allergies	This is where the patient's severe allergies are listed. The patient may have more allergies (minor), however only the severe allergies are listed in the patient header.
Diagnoses	This is the patient's diagnoses. In this field the diagnosis are listed as the diagnosis code number rather than the diagnosis name. Only the primary diagnosis is listed in this

	field, regardless if there are secondary diagnosis.
Encounter Start Date	This is the date the patient said the encounter started
Encounter Type	This is the type of encounter for the patient. It is either Inpatient or Outpatient.
Encounter Status	This is the status of the encounter. It can either be Active if the patient is still listed in the system for the encounter, or inactive if the patient has been discharged for the encounter.

In addition, there is a chart icon in the patient header. Clicking this icon will bring up the Chart Assessment for the selected patient (See Section 3.8).

3.7 Adding Encounter to Patient

The encounter is the reason the patient has come to visit. It's something that happened to the patient and needs to be recorded to correspond to a diagnosis. Adding an encounter is similar to Editing Patients Demographics (Section 3.5.3). First, the user must first locate the patient either using the Patient Census or Patient Locator options (Sections 3.3 and 3.4).

Once the patient is found using one of the two methods described above, the user can click the name of the patient in the table row and it will bring up the patient's demographic information (registration information). The left side of the *Patient's Demographic Information* screen is a *Encounter* pane. This pane will show all the encounters assigned to a patient. Above this pane is a button that states *Add Encounter*. To add an encounter, click the button.

The system will bring up the *Encounter Details* pane (goes over top of there the patient demographic information pane was). The pane will have three tabs: Encounter Details, transfer, Checkout.

Encounter Details

The Encounter Details tab contains the following information that must be filled in:

Field	Description
Encounter Type	Inpatient or Outpatient
Encounter Start Date	The date the patient first visited regarded this encounter
Clinic	The clinic the patient is currently at for the encounter
Chief Complaint	The primary reason for the encounter visit
Encounter ID	Automatically generated ID number for the encounter
Encounter Status	Active if it's ongoing or Inactive if the patient checked out
Attending Physician	ID number of the attending doctor regarding the encounter.

Once these fields are filled out, press the *Save* button to save the encounter for the patient. If one of the fields is incorrect, the system will display a message that states there is something wrong.

Once the encounter has been saved, it will appear on the left side in the Encounter Pane in the following format: Date, IP or OP (Inpatient or Outpatient), Clinic Name.

For example if the patient had an Inpatient encounter on 09/08/2017 at Easton Clinic then the encounter pane would display "09/08/2017 IP Easton Clinic".

Transfer

To *Transfer* a patient, select the *Transfer* tab. It will provide a selection box that lists the other clinics to transfer the patient to. Once a clinic has been selected, select the *Transfer Patient* button and the patient's information will be transferred over to the new clinic.

Note: the system will redirect the user back to the patient census screen since the patient is no longer under their clinic.

Checkout

To Checkout a patient, select the *Checkout* tab. The only thing on this tab is the *Checkout* button. To check out the patient, just click the *Checkout* button and the system will save the checkout information and the encounter will switch to Inactive.

If the patient has an active encounter, the Patient Header (Section 3.6) will display the following information such that the user doesn't have to go to the encounters tab if they need information:

- Encounter Number
- Encounter Start Date
- Encounter Type
- Encounter Status

3.7.1 Editing Patient's Encounter

Sometimes the patient's encounter details need to be edited. Just like adding an Encounter in Section 3.7, locate the patient and bring up their information. This time, the Encounter pane will show the list of Encounters assigned to the patient. In order to edit the information, just select the appropriate Encounter which will bring up the *Encounter Details* pane. From here, just edit the information and press *Save* when you are finished.

3.8 Chart Assessment

The Chart Assessment screen should be used to add allergies, problems, diagnosis, and a vital assessment of the patients. It can be accessed multiple ways. If a patient is selected, the user can select the Chart Icon in the Patient Header. If using the Patient Census, the user can find the patient and select the Chart Icon on the patient's row.

The Chart Assessment screen consists of a pane with four tabs:

- Allergies – Add Patient Allergies (Section 3.8.1)
- Assessment – Capture Vital Signs, Blood Pressure, Measurements, etc. (Section 3.8.2)
- Diagnosis – Add a new diagnosis for the patient's encounter (Section 3.8.3)
- Problems – Add any problems the patient is having (i.e. reason for visit) (Section 3.8.4)

Tab	Description	Section Number
Allergies	View/Add Patient Allergies	3.8.1
Assessment	View/Adding Vital Signs, Blood Pressure, Measurements, etc.	3.8.2
Diagnosis	View/Add a new diagnosis for the patient's encounter	3.8.3
Problems	View/Add any problems the patient is having (i.e. reason for visit)	3.8.4

3.8.1 Viewing/Adding Allergies

The first tab in the *Chart Assessment* table is allergies. In this screen, you are able to view any allergies the patient has, or add any allergies.

The first row of the pane consists of three checkboxes. These should be checked after an evaluation with the patient and checked accordingly.

- NKA – No Known Allergies
- NKDA – No Known Drug Allergies
- NKFA – No Known Food Allergies

Note: If the NKA checkbox is selected, the option to add allergies is disabled because the patient has already stated they have no allergies.

The allergy table displays the patient's allergies in four columns:

Allergy Name	The name of the allergy the patient has
Reaction	The type of reaction the patient has (hives, swelling, closed throat, sneezing).
Severity	The severity of the allergy (low, medium, high)
Type	The type of allergy (Food or Drug).

To add an allergy for the patient, select the *Add a New Allergy* button above the Allergy table. This button will bring up a popup with the fields from the table and selection boxes. Use the selection boxes to select the Allergy Name, Reaction, Severity, and Type. Once these are entered, press the *Save* button. The system will show a popup showing Save Successful and the allergy will be displayed in the table.

If you need to change an allergy, just double click the allergy's row in the table and the popup described above will open to edit the fields. Press *Save* when completed.

If a severe allergy is entered, this will be reflected in the Patient Header. Any severe allergies will be displayed in the Patient Header for the user's quick reference.

3.8.2 Viewing/Adding Assessment

The second tab in the *Chart Assessment* table is the Assessment tab. This will allow you to view/add/edit the patient's assessment. It contains the following fields for the nurse to fill out when the patient is first seen.

Field	Description
Collected Date & Time	The Date and Time when the assessment was last collected.
Status	The status of the assessment (complete or incomplete if some fields are missing)
Temperature	The temperature of the patient
Pulse	The pulse of the patient in beats/minute
Blood Pressure	The blood pressure of the patient (H over L)
Height	The height of the patient
Weight	The weight of the patient

Not all of these have to be entered to save the assessment. The system will allow the user to save whatever data has been entered.

The temperature field has a selection box to select either Fahrenheit or Celsius, and selected these will change the range limits of the temperatures allowed.(35-41 for Celsius and 95-106 for Fahrenheit).

When entered the blood pressure, there are two entry fields. The blood pressure should be measured as "High Over Low" (i..e 110 over 80). The left field is for the upper range and the right field is for the lower range.

The height field has a selection box to select from the following units to measure the height in either metric or imperial units: feet/inches, meters, or centimeters.

The weight field has a selection box to select from the following units to measure the weight in either metric or imperial units: kilograms or pounds

3.8.3 Viewing/Adding Diagnosis

The fourth tab in the *Chart Assessment* table is the Diagnosis tab. This will allow you to view/add/edit any diagnosis that the patient is having in regards to their encounter.

There is a Diagnosis table that will display the diagnosis code, the description of the diagnosis, and the type of diagnosis.

To add a problem for the patient, enter the SNOMED number (i.e. 112.456) code into the SNOMED field, and enter the description of the problem (i.e. Neck Pain) into the Problem Description field.

Once those fields have been filled in, click the *Add* button and the problem will be saved. The system will show a popup showing Save Successful and the problem will be added to the Problems table.

When a primary diagnosis has been added, the Patient header will be updated to reflect the code for any primary diagnosis.

3.8.4 Viewing/Adding Problems

The fourth tab in the *Chart Assessment* table is the Problems tab. This will allow you to view/add/edit any problems that the patient is having in regards to their encounter.

There is a Problems table that will display the SNOMED code and the description of the problems the patient is having.

To add a problem for the patient, enter the SNOMED number (i.e. 112.456) code into the SNOMED field, and enter the description of the problem (i.e. Neck Pain) into the Problem Description field.

Once those fields have been filled in, click the *Add* button and the problem will be saved. The system will show a popup showing Save Successful and the problem will be added to the Problems table.

3.9 Auditing

The final feature in the healthcare portal is auditing and generating an audit report. The auditing captures all of the interactions between the users and the following parts of the system:

- Login/Logoff
- Patient Census
- Patient Locator
- Patient Registration
- Add an Encounter
- View Patient Demographics
- View Encounter Details
- Chart Assessment
    - Add Allergy
    - Add Assessment

- Add Problem
- Add Diagnosis

The auditing process is done as a background task within the system. The user has no part in controlling what is audited. However, the user is able to generate an audit report.

In order to generate the audit report