MLKMC Electronic Healthcare System

Systems and Software Requirements Specification

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Preface

The purpose of this document is to define the functional and non-functional requirements associated with the details and behavior of the proposed software system. It will explain the processing and performance of the system as well as help in refining requirements as requested by stakeholders and potential users.

Version History

Date	**Description**	**Author(s)**
2-Oct-2010	Initial Draft	Everyone

Introduction

The Martin Luther King Memorial Clinic is a small medical practice located in Ghana, Africa where the staff is currently using paper to process and manage all their information. The information recorded on paper are patient records/charts, billing, appointments, and the management of supply and drug inventories. Many mistakes and errors can happen with this type of tracking system. For this reason a software system has been commissioned by the clinic to help improve the efficiency and accuracy of the staff and raise the quality of service for patients. The proposed Electronic Healthcare System (EHS) will be composed of the functional and non-functional requirements specified within this document. These requirements have been derived from the initial customer request and may require further expansion as we discover more requirements of the system.

User Requirements Definition

The proposed EHS software will allow doctors, nurses, and staff to manage clinic data as well as reference it in a timely fashion. The system will give the receptionist the ability to register new patients, modify their information, and manage appointments. It will also help nurses in recording initial encounter information such as vitals and other commonly recorded statistics. The doctor's job will be improved by allowing him to access and record a patient's medical history in order to help with a diagnosis. He will also be able to prescribe medicine to a patient and give them a printed prescription rather than a handwritten one to help reduce errors in fulfillment. Apart from a diagnosis and prescription the doctor will also have the ability to record notes about the patients and his concerns for their well-being. He will be able to record his plan of action that he intends to take and refer back to it in follow-up appointments made by the patient.

Clinic administration will also receive benefits from the EHS software. Users of the system will have the ability generate reports based on a variety of data. For instance a doctor will

be able to generate a report that shows the number of patients seen and get an overall view of the health of his patients. He will also be able to better estimate the number of supplies and drugs he will need on hand in the coming months based off of these reports. Another report that can be generated will be a balance sheet showing the debits and credits of the clinic, credits being income generated and debits being money spent on supplies and medicines, thus giving an overview of the clinic's general financial health.

System Requirements Specification

Functional Requirements

1. The system shall provide a user interface for doctors, nurses, and staff.
2. The system shall permit the scheduling of appointments.
3. The system shall allow for the scheduling of walk-in patients.
4. The system shall allow for the scheduling of follow-up appointments for patients.
5. The system shall have the ability to cancel appointments.
6. The system shall allow new patients to be added to the system.
7. The system shall allow a patient's personal information to be changed/edited.
8. The system shall allow a patient to be removed from the system by a doctor.
9. The system shall permit the receptionist to print a new patient information packet for the patient to fill out.
10. The system shall allow data entry of the information given to the receptionist by the patient via the patient information packet.
11. The system shall permit the receptionist to check-in a patient upon arrival.
12. The system shall permit the receptionist to maintain patient information at check in.
13. The system shall allow nurses to record the vitals of a patient.
14. The system shall have the ability to record a patient's medical history.
15. The system shall allow a doctor to review a patient's medical history.
16. The system shall allow a doctor to add information to a patient's medical history.
17. The system shall allow a doctor to edit information in a patient's medical history.

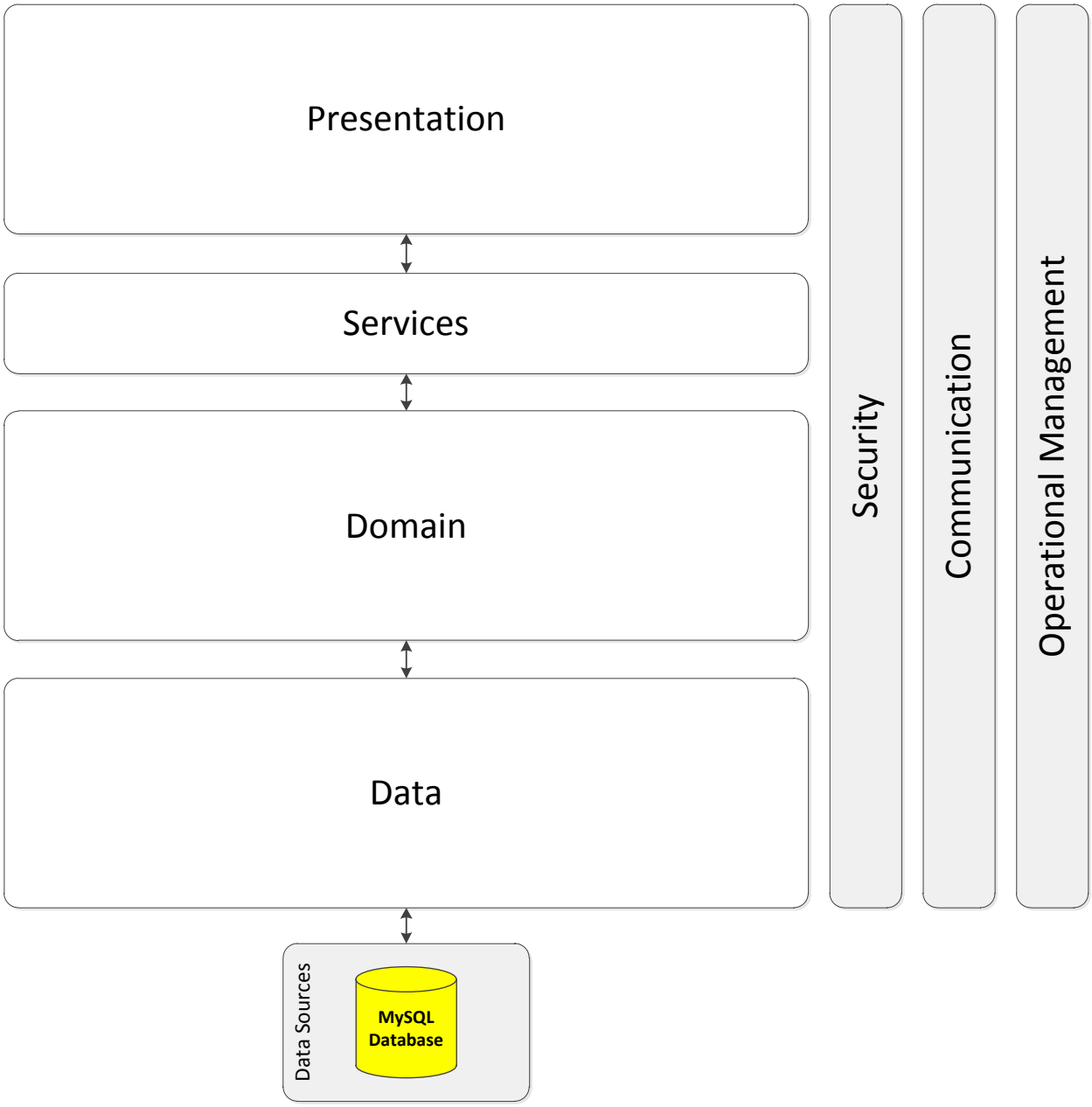
18. The system shall allow a doctor to remove information from a patient's medical history.
19. The system shall allow doctors to record diagnoses of patients.
20. The system shall allow doctors to record notes of a patient.
21. The system shall allow doctors to prescribe medicine to a patient.
22. The system shall allow the staff to pull up prescription orders to a patient.
23. The system shall allow a staff member to accept payments for services provided to a patient.
24. The system shall allow a staff member to accept payments for medicine sold to a patient.
25. The system shall allow a staff member to accept payments for supplies (i.e. bandages, etc.).
26. The system shall track pharmacy inventory.
27. The system shall track supplies inventory.
28. The system shall have the ability to generate and print reports on pharmacy inventory.
29. The system shall have the ability to generate and print reports on supplies inventory.
30. The system shall have the ability to automatically generate weekly pharmacy inventory reports.
31. The system shall have the ability to automatically generate weekly clinic supplies inventory reports.
32. The system shall allow for the generation of clinic activity reports.
33. The system shall allow for the generation of clinic income reports.
34. The system shall have the ability to automatically generate weekly activity reports.
35. The system shall have the ability to automatically generate weekly income reports.

Non-Functional Requirements

1. The system shall support different security roles and permissions for the doctors, nurses, and clerical staff.
2. The system shall be designed as an *n-tier* architecture for scalability.
3. The system shall have a *database* that will be used for information storage.

4. The system shall provide a server used to store *binaries* and related data.
5. The system shall be reliable. Crashes and critical errors will be rare or non-existent.
6. The system should be easy for non-technical users to learn and use.
7. The system shall respond to use command quickly, without *lag*.
8. The system shall have measures for ensuring data integrity in the case of *environmental* or *hardware failures*.
9. The system shall be designed to work in a networked environment of at least two computers.
10. The system shall have the ability to scale up to at least 10 *client computers*.
11. The system shall be compatible with an *operating system* of Windows XP or greater.
12. The system shall create a *backup* each day.

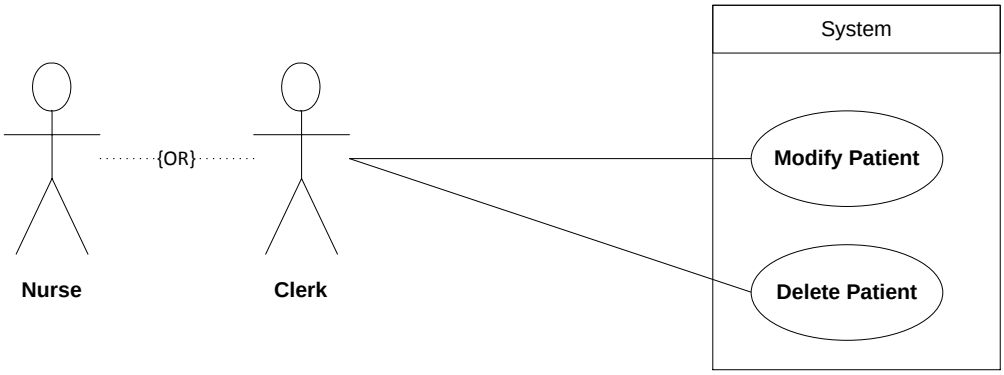
System Architecture



Use Case Diagrams

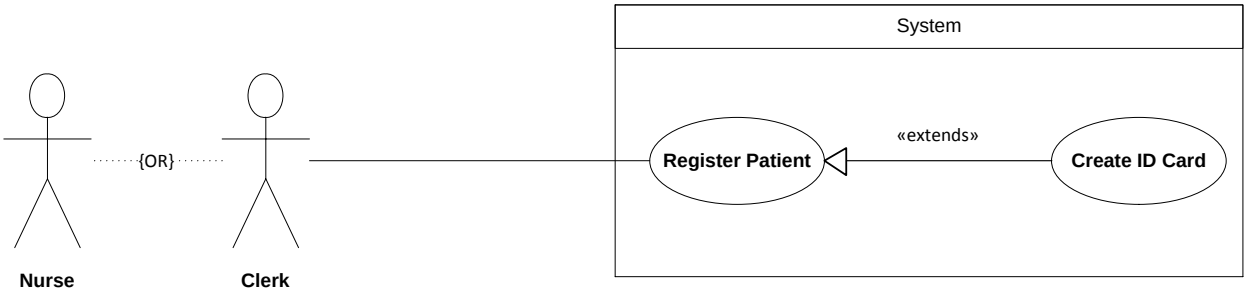
Maintain Returning Patient

UC-1



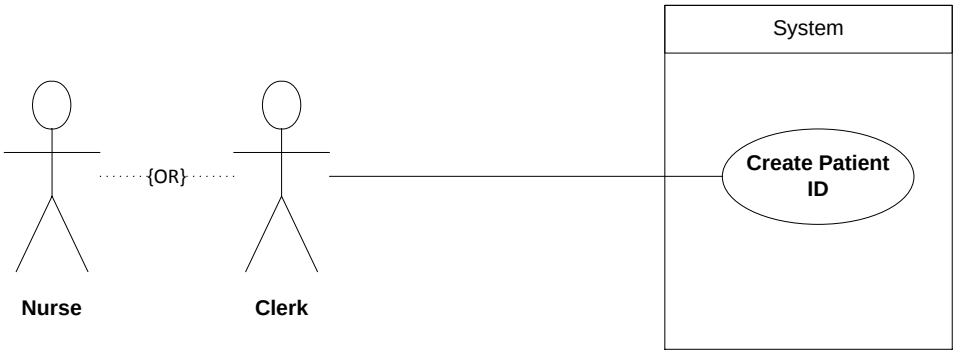
Register New Patient

UC-2



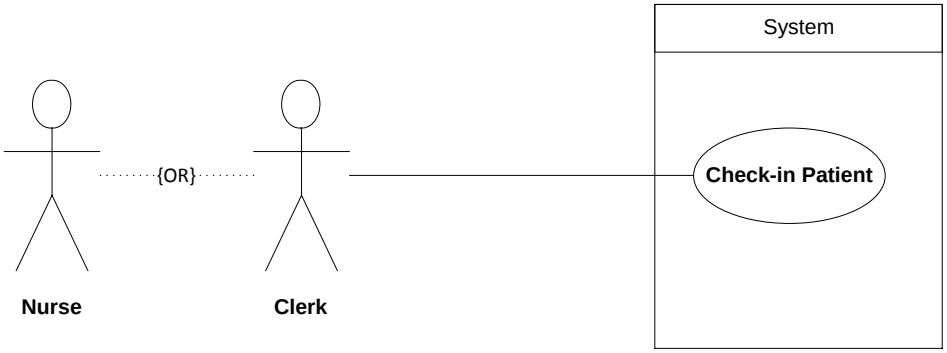
Create New Patient ID

UC-3



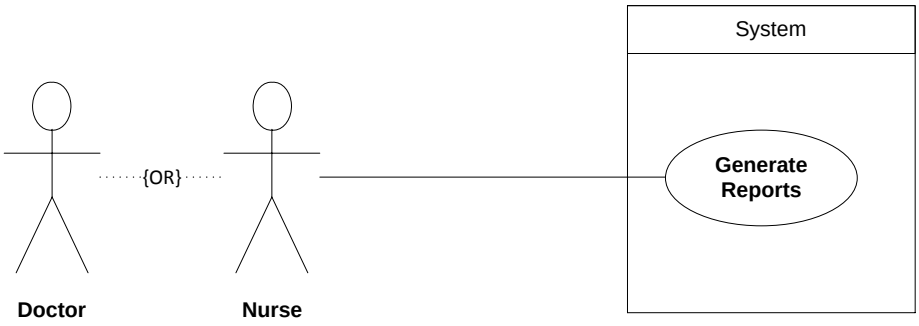
Check-in Patient

UC-4



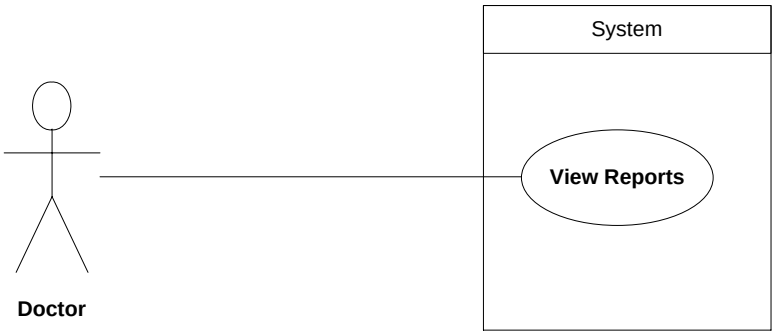
Generate Reports

UC-5



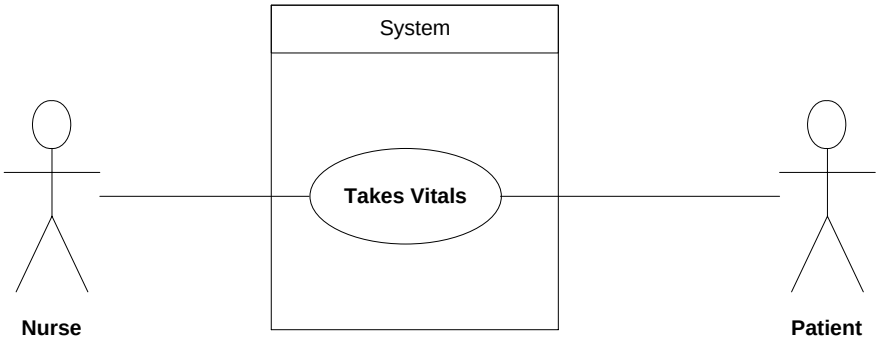
View Reports

UC-6



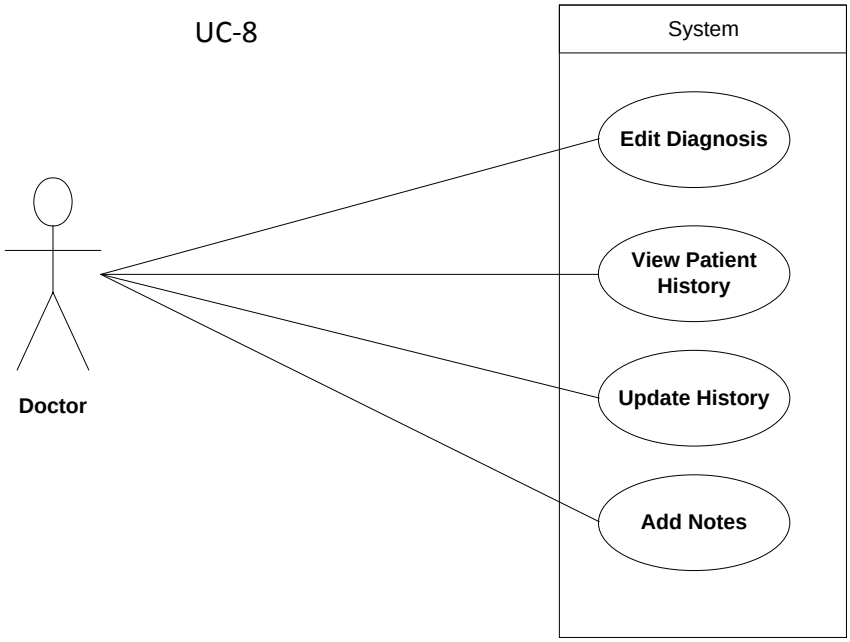
Record Vitals

UC-7



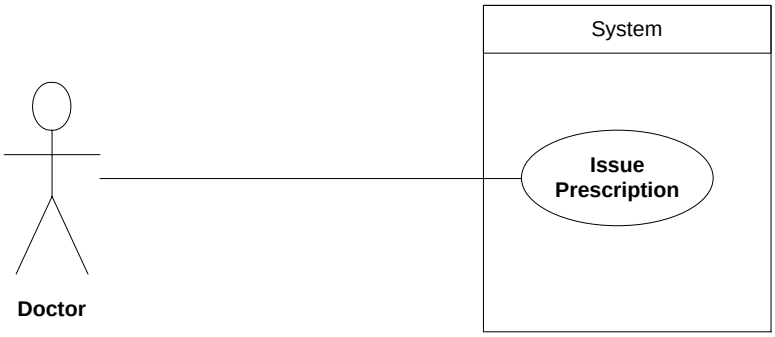
Patient Records

UC-8



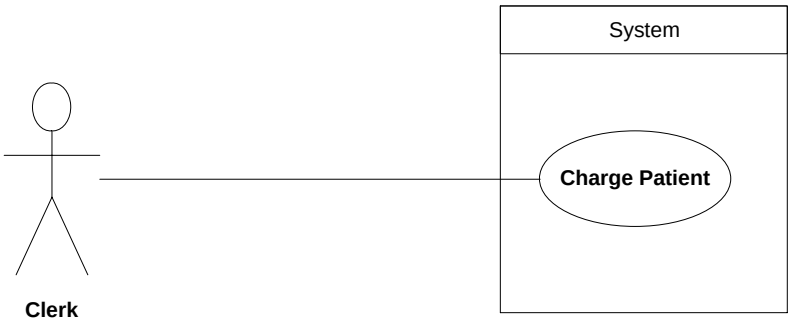
Issue Prescription

UC-9



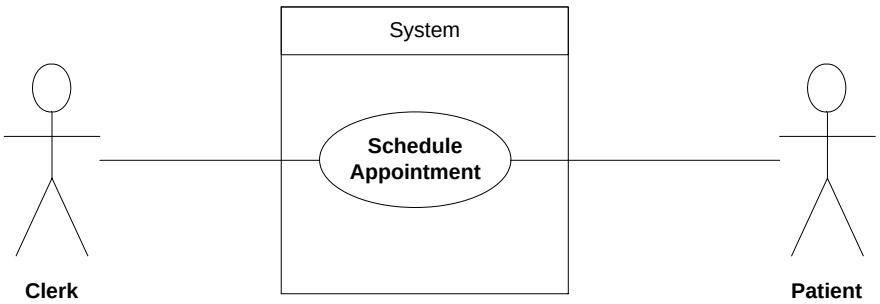
Patient Billing

UC-10



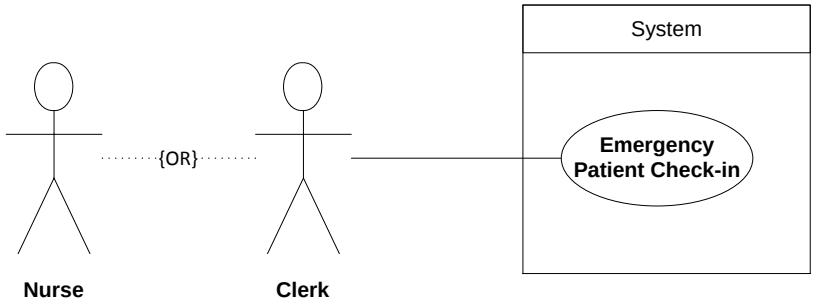
Schedule Appointment

UC-11



Emergency Patient Check-in

UC-12



Use Cases

Casual Descriptions

UC-1 Maintaining Returning Patient

The nurse/clerk at the front desk will be able to look up a patient when they enter the clinic. At this point, the patient's personal info can be updated in the system, and the patient is ready to be checked in. A patient may also be deleted from the system.

UC-2 Register New Patient

When a new patient arrives at the clinic, the nurse must first register the new patient to add him/her to the system. The nurse/clerk gathers all required personal information, and enters it into the system for saving.

UC-3 Create Patient ID

After a new patient is added to the system, they should receive a Patient ID card for the clinic. This ID will have basic personal info, a unique card number, and possibly a barcode which can be scanned into the system.

UC-4 Check in Patient

The clerk/nurse will check in the patient to the system, and they will be put on a waiting list. When their name is called, the patient can see the nurse to have vital statistics recorded, or for consultation.

UC-5 Generate Reports

System users will be able to generate various types of reports. The user specifies which report to generate, and if they want to save it to the system or print it.

UC-6 View Reports

For reports that are restricted to doctors only, the doctor can log on to the system, and browse the report

file for the specific report he wants to see.

UC-7 Take Vitals
The nurse will be able to record vital statistics into the system before the doctor sees a patient. The nurse takes all the measurements, along with recording the reason for the visit, and submits the information. The doctor may now view this information from his computer.

UC-8 Patient Records
The doctor may view patient records from the doctor's office at any time. After the patient's vitals have been recorded by the nurse, the doctor can have a patient come into his office. The doctor may view and update diagnosis, history, and add any appropriate notes to the patients record.

UC-9 Issue Prescription
After diagnosing the patient's illness, the doctor may issue some number of prescriptions. The doctor enters the prescription details and submits the prescription to the system. Any prescriptions may now be picked up at the front desk before leaving the clinic.

UC-10 Patient Billing
After receiving medical care and possibly prescriptions, the patient will need to make a payment on their bill. The bill details will be listed for the customer to view. After receiving the appropriate amount of money for the bill, the clerk/nurse records the payment into the system.

UC-11 Schedule Appointment
To schedule an appointment, the patient may request a certain day or time to come in, possibly based on the doctor's recommendations. The nurse/clerk will then check for available times, and settle on a date and time with the patient before saving the appointment to the system.

UC-12 Emergency Patient Check-in
If the nature of the patient's condition is an emergency, other check-in steps can be skipped and the patient can begin receiving immediate medical care. The nurse/clerk will attempt to get as much information as possible to put into the system.

Formal Descriptions

Maintaining Returning Patient	
Identifier	UC-1
Description	Process to maintain a patient.
Actor(s)	Nurse, Clerk
Preconditions	Patient is a returning patient to the hospital. Does not have state insurance.
Flow of Events	1. The patient meets with the *nurse/clerk* to update their information in the system. 2. The *nurse/clerk* proceeds to patient check-in
Post Conditions	*Patient* is updated Patient is ready to be checked in.

Register New Patient	
Identifier	UC-2
Description	Process to register a new patient.
Actor(s)	Nurse, Clerk
Preconditions	Patient is a new patient to the hospital. Does not have state insurance.
Flow of Events	1. The *nurse/clerk* asks for all required information from the patient. 2. The *patient* presents all required information to the *nurse/clerk*. 3. The *nurse/clerk* inputs all the information into the system. 4. The *nurse/clerk* proceeds to patient check in.
Post Conditions	*Patient* is now in the system and is ready to be checked into the system.
Alternate Flow	1. The *patient* does not have all required information to be added into the database. 2. The *nurse/clerk* does not create *patient* in system.
Post Conditions	The *patient* cannot be created in the system till all patient information is present.

Create New Patient ID	
Identifier	UC-3
Description	Process to create a patient id card.
Actor(s)	Nurse, Clerk
Preconditions	Patient was just created/added into the system.
Flow of Events	1. The *nurse/clerk* selects print patient ID card. 2. The card is printed. 3. The *nurse/clerk* gives the *patient* there new ID card.
Post Conditions	The *patient* now has a patient ID card for their next visit.

Check-in Patient	
Identifier	UC-4
Description	Process to check-in a patient.
Actor(s)	Nurse, Clerk
Preconditions	Patient is a returning patient. Patient has up to date information.

Flow of Events	1. The *nurse/clerk* asks if patient is state insured. 2. The *patient* says no. 3. The *nurse/clerk* validates that all previous information was completed. 4. The *nurse/clerk* submits patient to the system. 5. The *patient* sits and waits to be seen.
Post Conditions	The *patient* is now ready to see the *nurse*.
Alternate Flow	1. The *patient* says that they are state insured. 2. The *nurse/clerk* informs patient of requirement of payment for service. 3. The *patient* cancels seeing the doctor.
Post Conditions	The patient has decided to not see the doctor.

Generate Reports	
Identifier	UC-5
Description	Process to generate reports.
Actor(s)	Nurse, Doctor
Preconditions	Need a report generated before an automated report is scheduled.
Flow of Events	1. The *doctor* or *nurse* selects what type of report needed. 2. The doctor or *nurse* selects what type of output for the file (printed or saved to system). 3. The *doctor* or nurse submits report request.
Post Conditions	Report is generated and is printed or saved to the system.

View Reports	
Identifier	UC-6
Description	Process to view reports.
Actor(s)	Doctor
Preconditions	Report has already been submitted in the system.
Flow of Events	1. The *doctor* logs into the system. 2. The *doctor* browses the report file for the reports. 3. The *doctor* than can review and report submitted.
Post Conditions	The doctor can view all reports on the system.

Record Vitals	
Identifier	UC-7
Description	Process to take vitals.
Actor(s)	Nurse, Patient
Preconditions	Patient is checked in.
Flow of Events	1. The *nurse* takes all required vitals from the patient. 2. The *patient* explains reason for visit. 3. The *nurse* inputs all gathered information into the system.
Post Conditions	Patient is all ready to see the doctor.

Patient Records	
Identifier	UC-8
Description	Process to view and input into patient records.
Actor(s)	Doctor
Preconditions	Patient has been checked in. Patient has seen the nurse. The nurse has submitted vitals to doctor.
Flow of Events	1. The *doctor* logs into the system. 2. The *doctor* selects current patient. 3. The *doctor* views patient stats. 4. The *doctor* does his *patient* evaluation. 5. The *doctor* updates *patient* history, diagnosis, and adds any notes to the *patient* records.
Post Conditions	The doctors charting is complete.

Issue Prescription	
Identifier	UC-9
Description	Process to issue a prescription.
Actor(s)	Doctor
Preconditions	The *doctor* has seen the patient. The *doctor* has come up with a diagnosis.
Flow of Events	1. *Doctor* inputs prescription details. 2. *Doctor* validates prescription to patient. 3. *Doctor* submits prescription into system.
Post Conditions	Patient can go pick up prescription at the front clerk.

Patient Billing

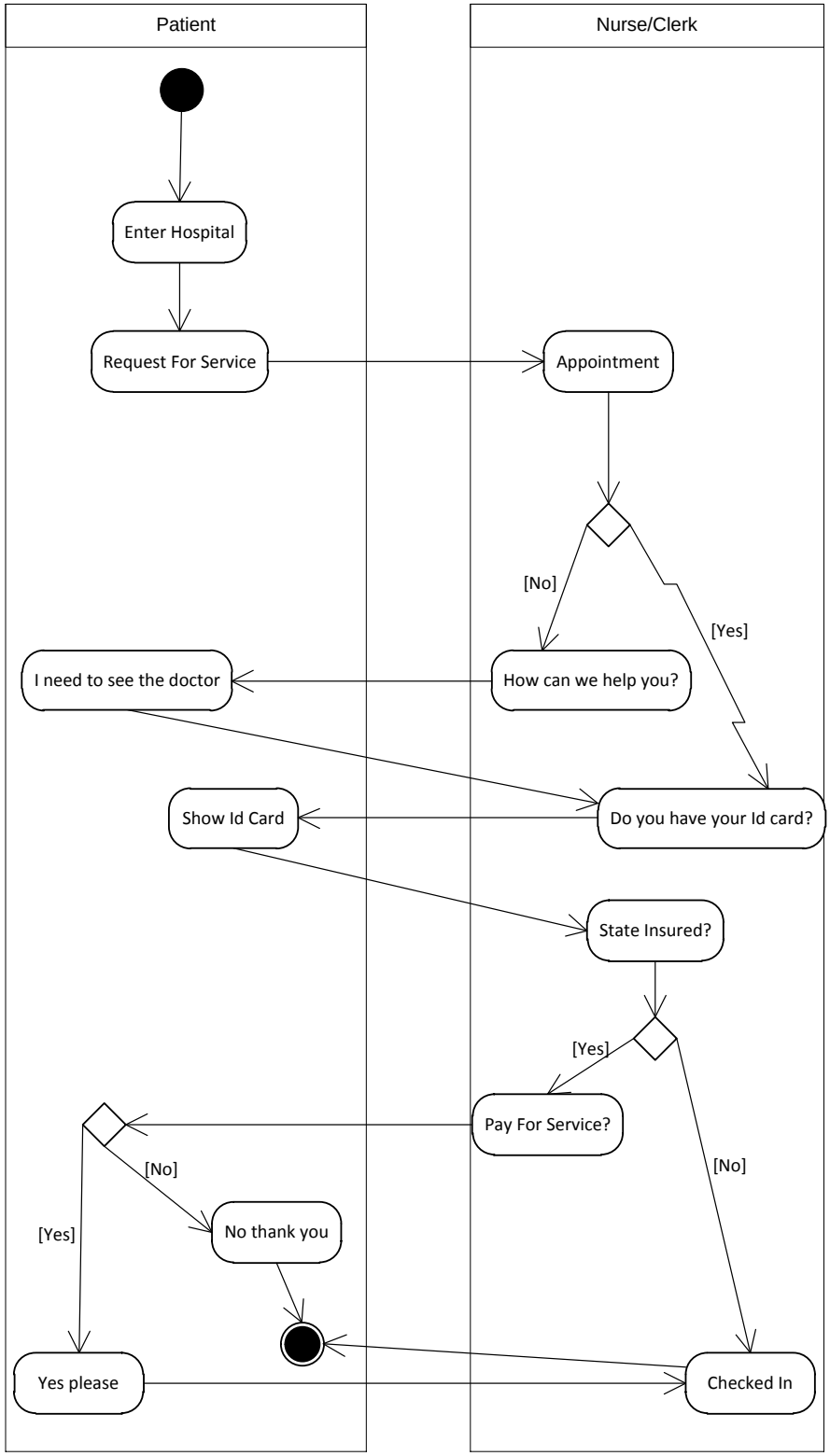
Identifier	UC-10
Description	Process to charge a patient for services.
Actor(s)	Clerk
Preconditions	Patient has seen the doctor
Flow of Events	
Post Conditions	The patient's bill is paid.

Schedule Appointment	
Identifier	UC-11
Description	Process to schedule an appointment.
Actor(s)	Clerk, Patient
Preconditions	Patient wants to set up an appointment
Flow of Events	1. *Patient* requests an appointment. 2. *Clerk* gives patient all times available for appointments. 3. *Patient* confirms date and time. 4. *Clerk* submits appointment into system.
Post Conditions	Patient is scheduled for an appointment.

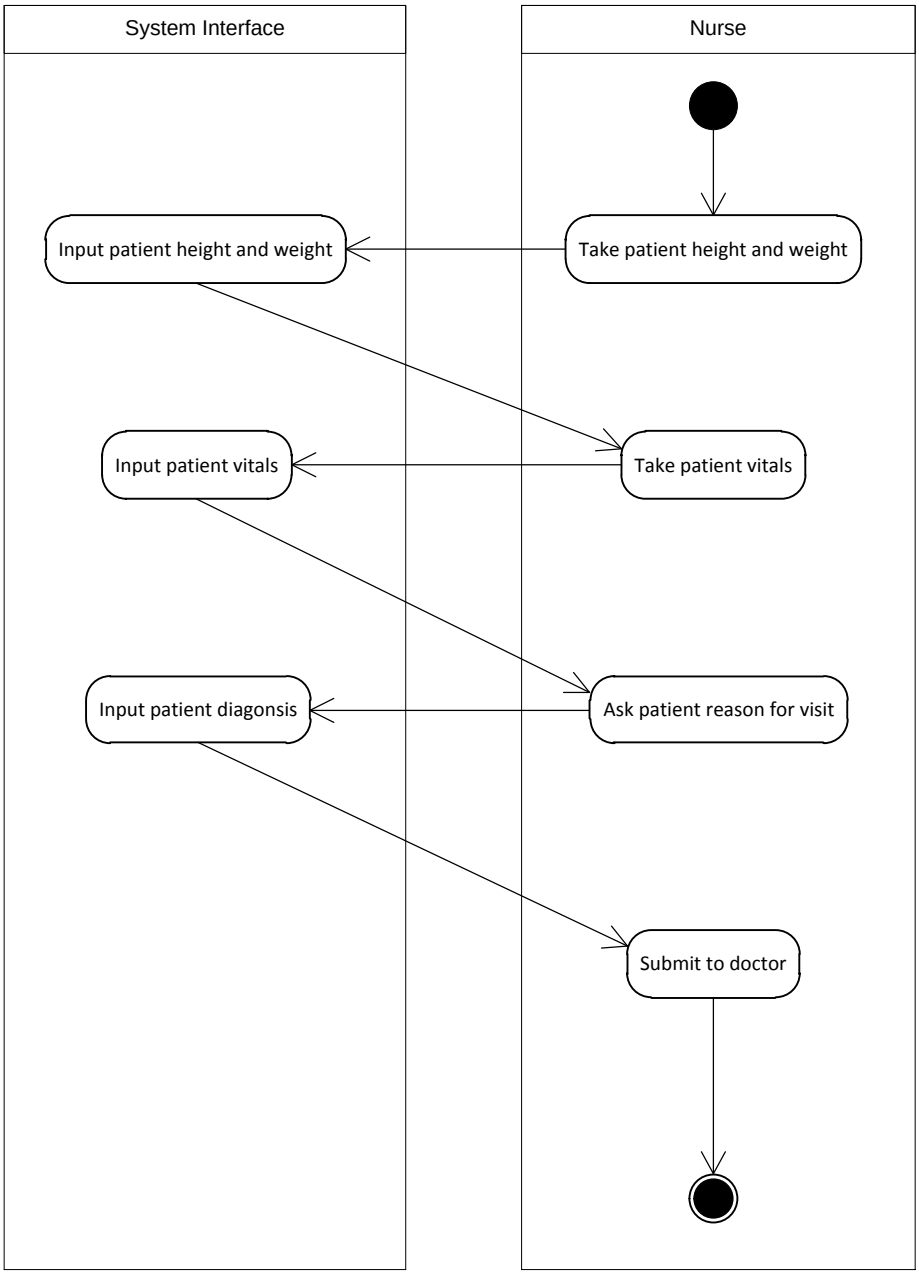
Emergency Patient Check-in	
Identifier	UC-12
Description	Process to check-in an emergency patient.
Actor(s)	Clerk, Nurse
Preconditions	Patient is rushed into hospital. Patient cannot go through the normal check-in process.
Flow of Events	1. *Patient* is rushed into the hospital. 2. *Nurse/clerk* rushes patient to nurse. 3. *Nurse/clerk* gathers any patient information as possible to enter into the system. 4. *Patient* proceeds without being checked into the system.
Post Conditions	Patient is rushed passes normal patient check-in.

System Models

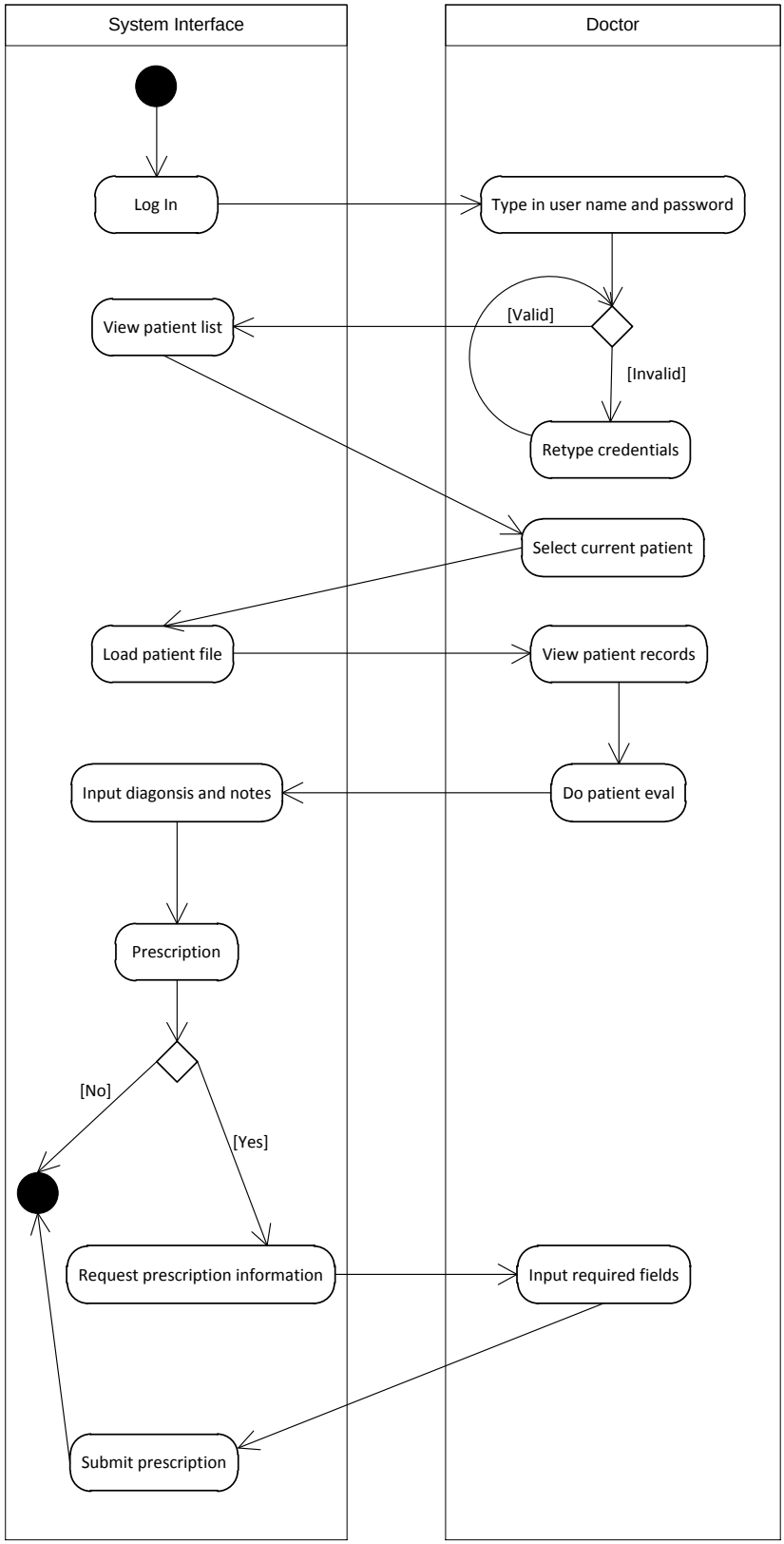
Registering a Patient



Take Patient's Vitals

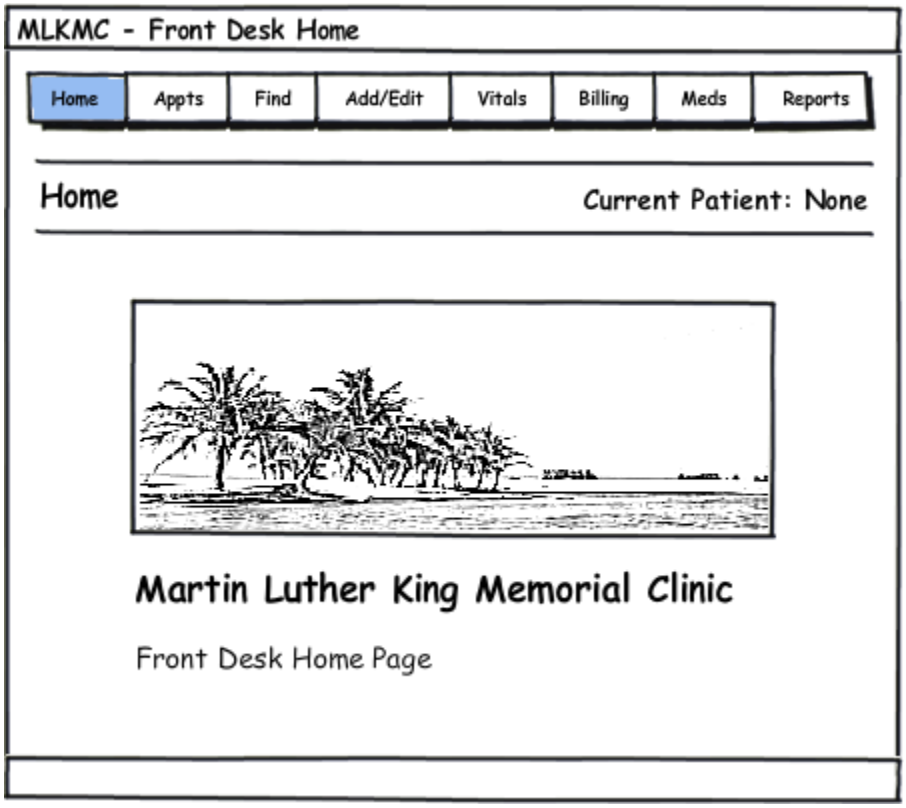


Visit with Physician

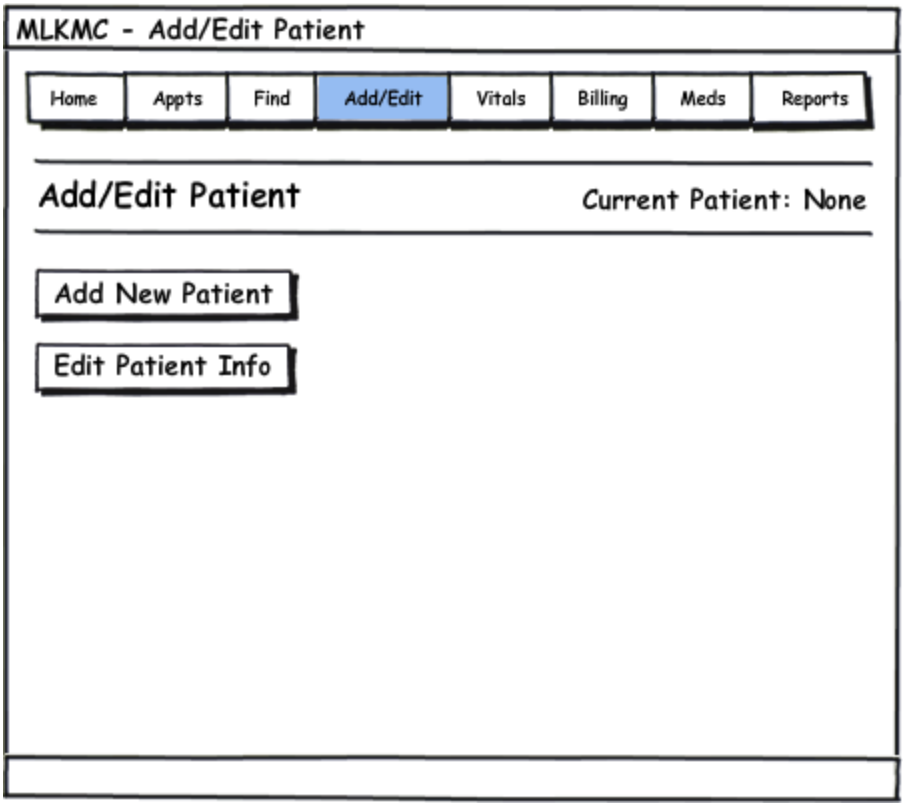


User Interface Mockups

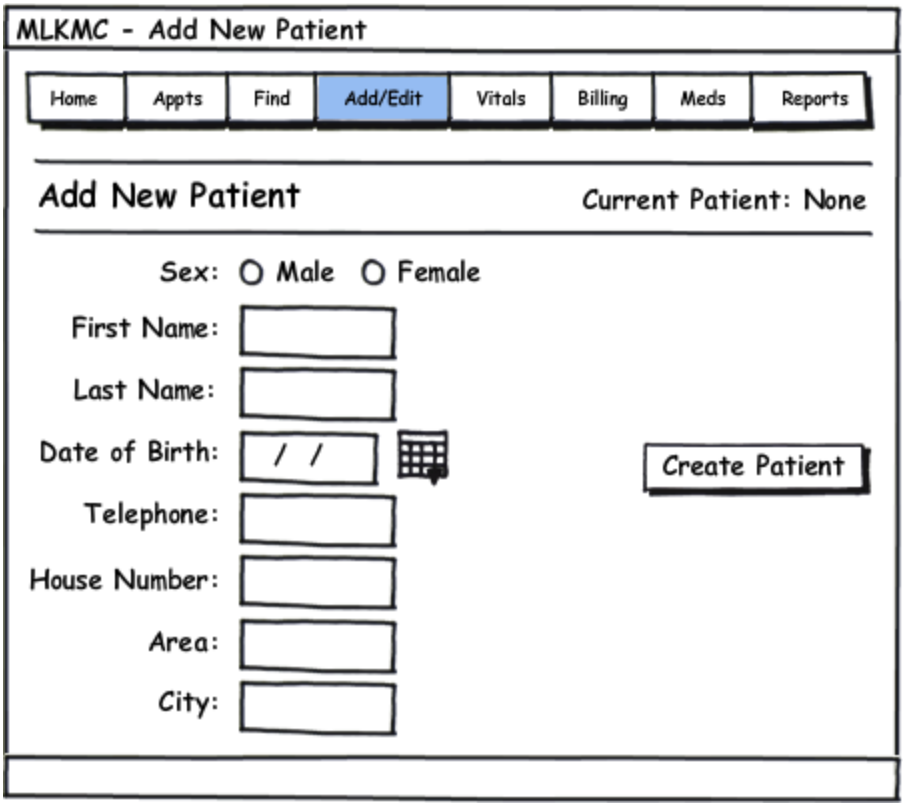
Add Patient to System



1. From the Front Desk Home Page, click the “Add/Edit” tab on the top of the screen.

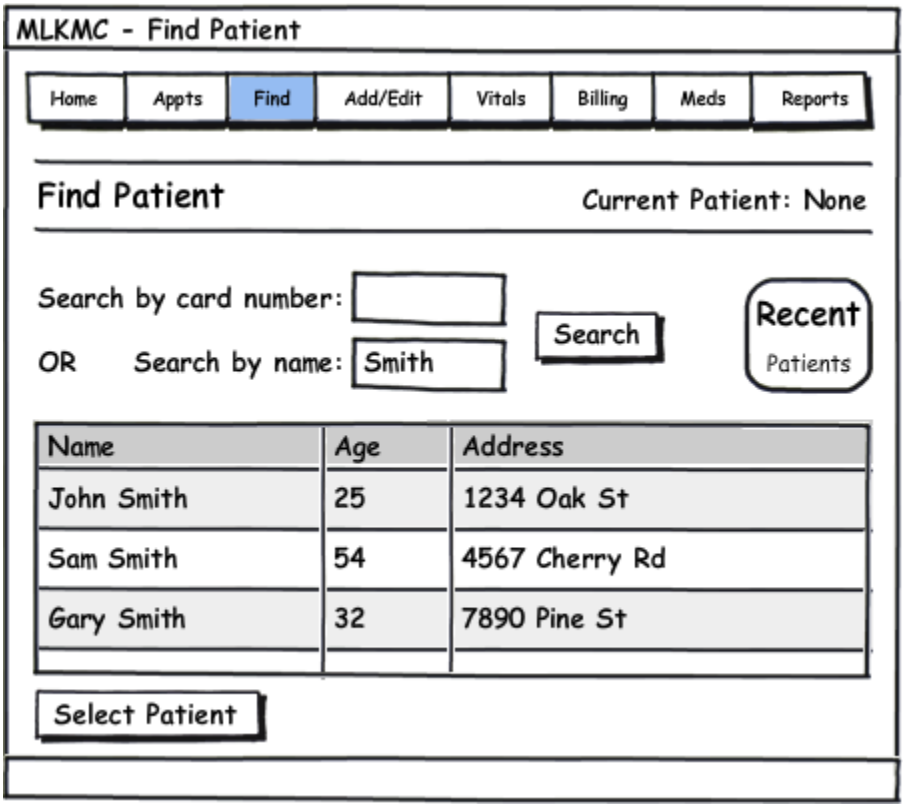


2. Click on “Add New Patient”.

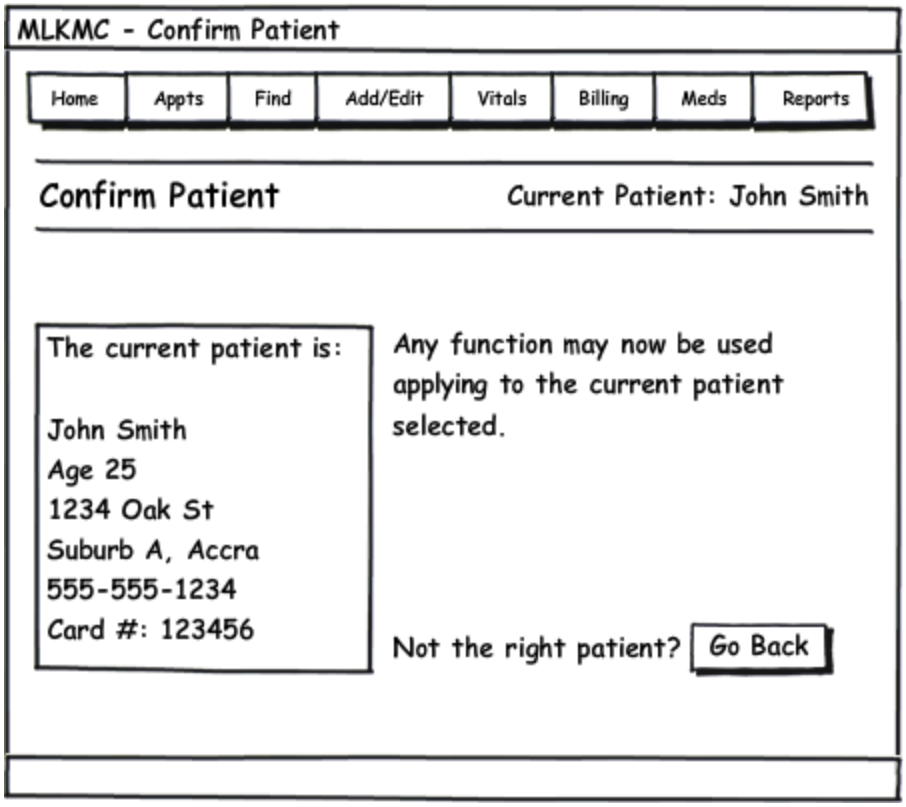


3. Fill out all the patient information.
4. Click “Create Patient” to finish adding a new patient.

Search for Patient

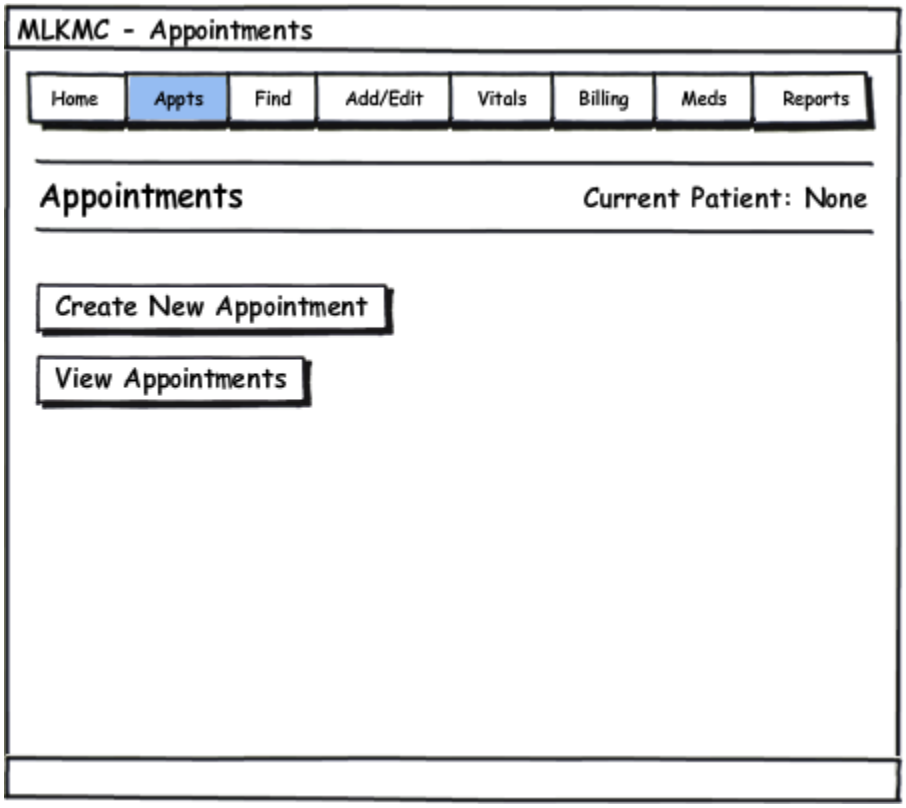


1. Click the “Find” tab to reach the Find Patient screen.
2. Enter a card number OR enter a first or last name.
3. Click “Search” to bring up matching results.
4. Highlight a patient by clicking the corresponding row.
5. Click “Select Patient” to select the patient.

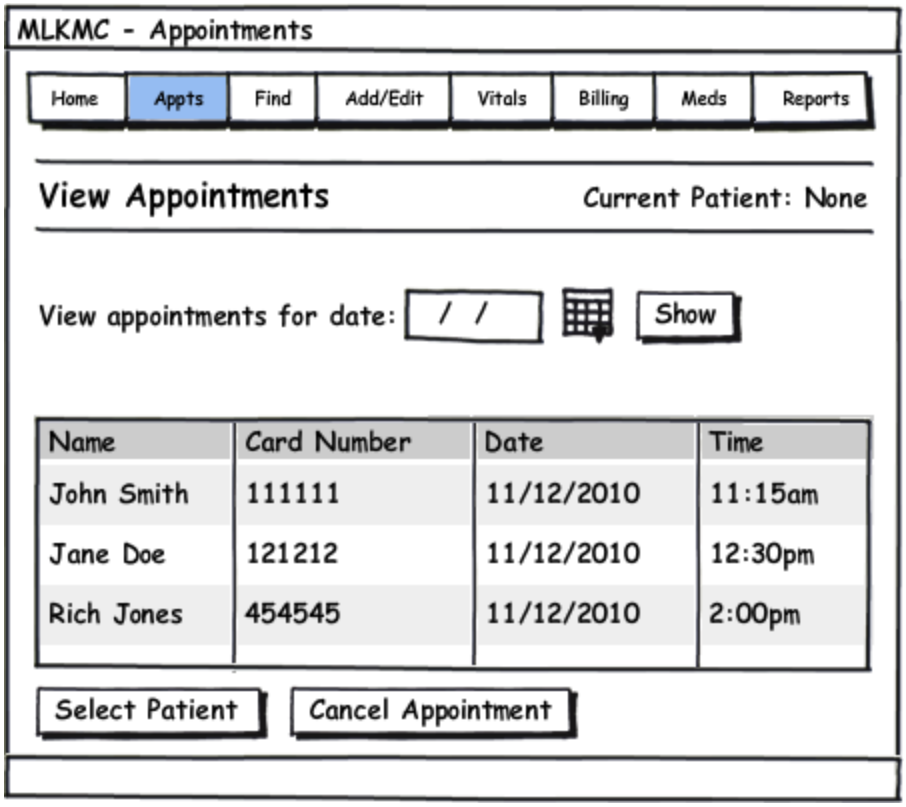


6. The current patient is now set to the user's selection. All system tasks, when performed, will be applied to the current patient listed on the upper portion of the screen.
7. If the wrong patient was selected, click "Go Back" to return to the "Find Patient" screen.

Fulfill an Appointment

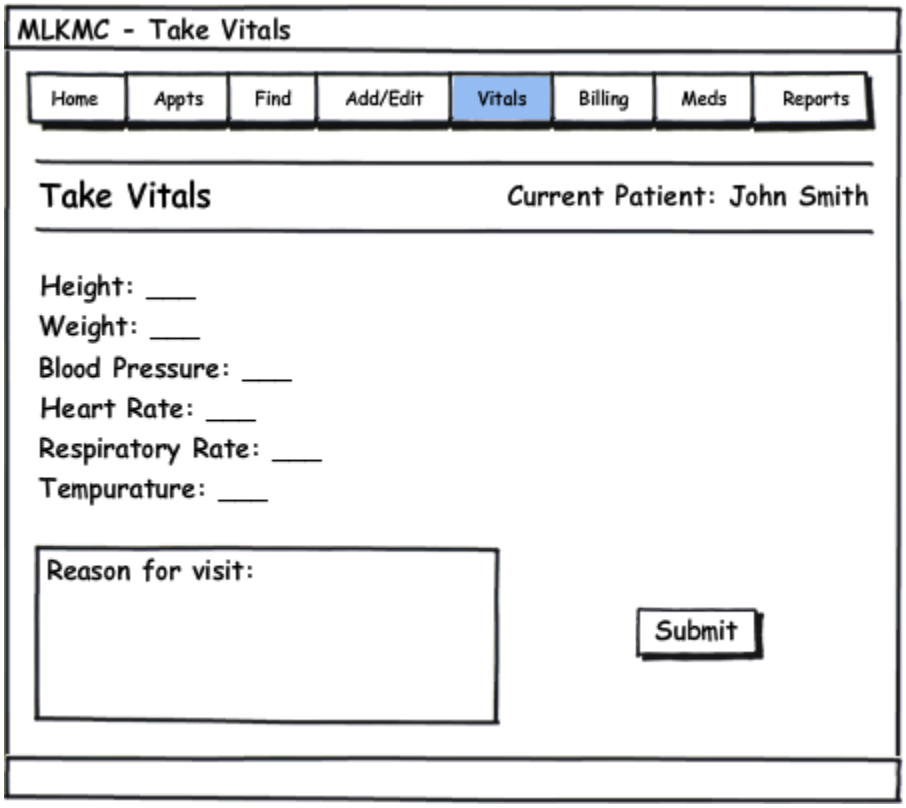


1. Click the “Appts” tab to reach the Appointments screen.
2. Click “View Appointments”.



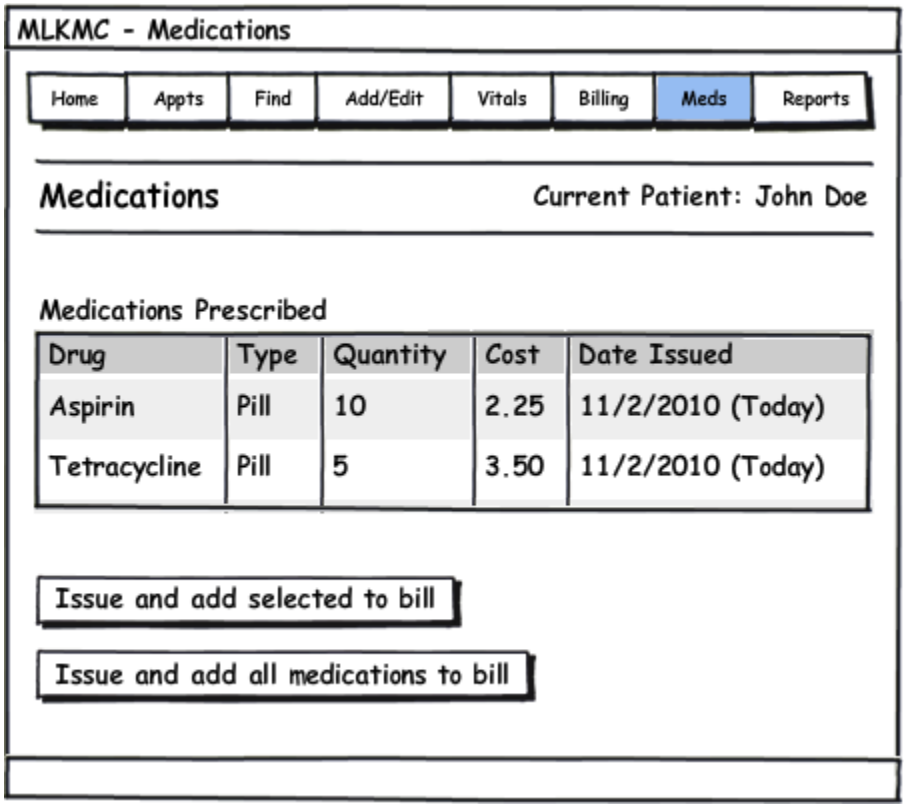
3. Today's unfulfilled (to be seen) appointments are automatically displayed. To view another day's appointments, enter the date and click "Show".
4. Click on a patient and then click "Select Patient" to take the patient off the unfulfilled appointments list. This also sets the current patient for other tasks to apply to.

Take Patient Vitals



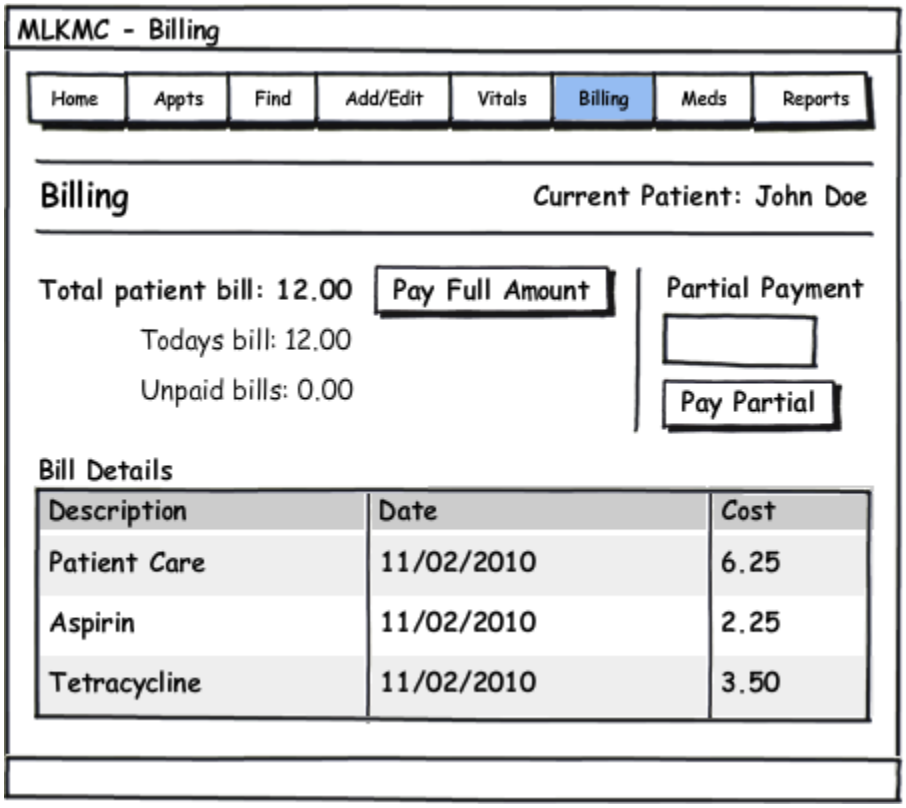
1. Click the “Vitals” tab to reach the Take Vitals screen.
2. Enter all the vital statistics, pressing Tab or clicking to reach the next field.
3. Enter a brief description of the reason for the patients visit if necessary.
4. Click “Submit” to save the information, which the doctor may see now from his computer.

Issue Medications



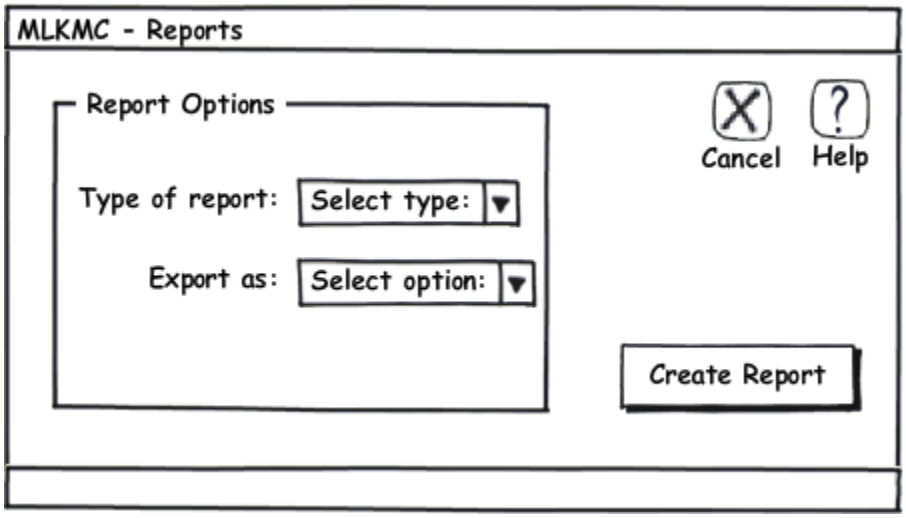
1. Click the “Meds” tab to reach the Medications screen.
2. A list of medications prescribed by the doctor will be listed.
3. Click on a medication to highlight it, then click “Issue and add selected to bill” after medication has been filled. This takes the quantity of drugs out from the inventory, and also adds the cost of the drugs to the patient’s bill to be paid.
4. Or click “Issue and add all medications to bill”.

Bill Patient



1. Click the “Billing” tab to reach the Billing screen.
2. Click “Pay Full Amount” if the patient has the money to pay the total bill.
3. Or enter an amount for partial payment, and click “Pay Partial”.

View Pharmacy Inventory Report



1. Click the "Reports" tab to reach the Reports screen.
2. Choose "Pharmacy Inventory Report" from the drop down list.
3. Choose a desired export option.
4. Click "Create Report".

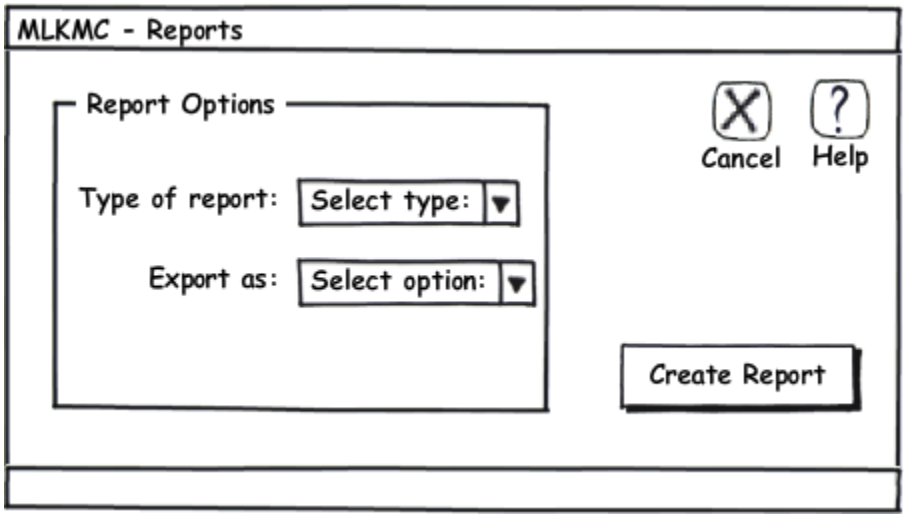
The report generated will be in the following form.

Pharmacy Inventory

As of 11/06/2010

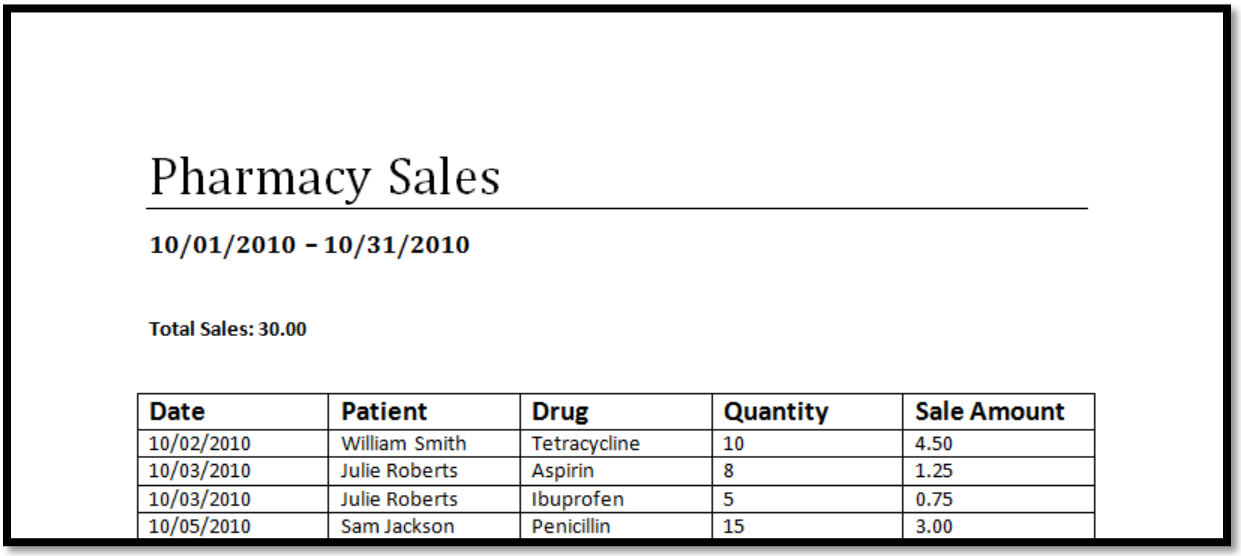
Name	Type	Remaining	Last Ordered
Aspirin	Pill	22	10/11/2010
Tetracycline	Pill	45	Never
Penicillin	Pill	64	10/19/2010
Ampicillin	Pill	12	Never
Quinacrine	Shot	5	9/16/2010

View Pharmacy Sales Report



1. Click the "Reports" tab to reach the Reports screen.
2. Choose "Pharmacy Sales Report" from the drop down list.
3. Choose a desired export option.
4. Click "Create Report".

The report generated will be in the following form.



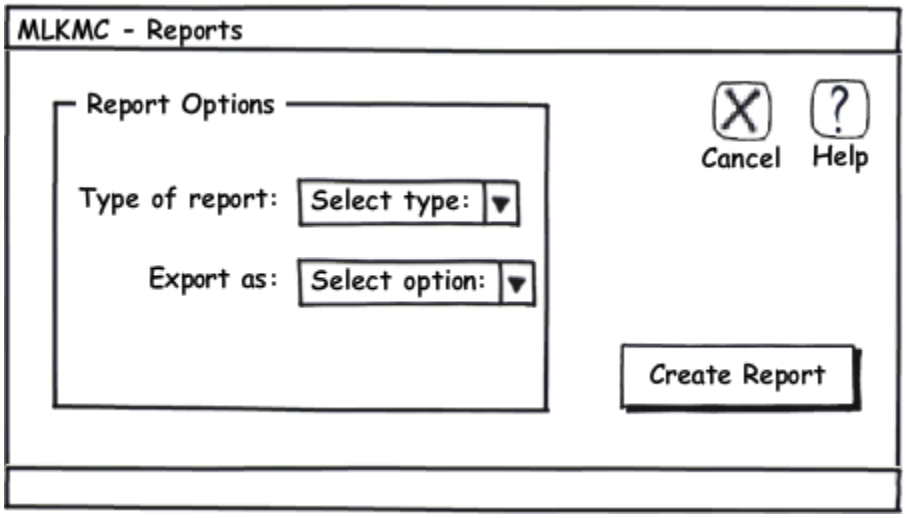
Pharmacy Sales

10/01/2010 – 10/31/2010

Total Sales: 30.00

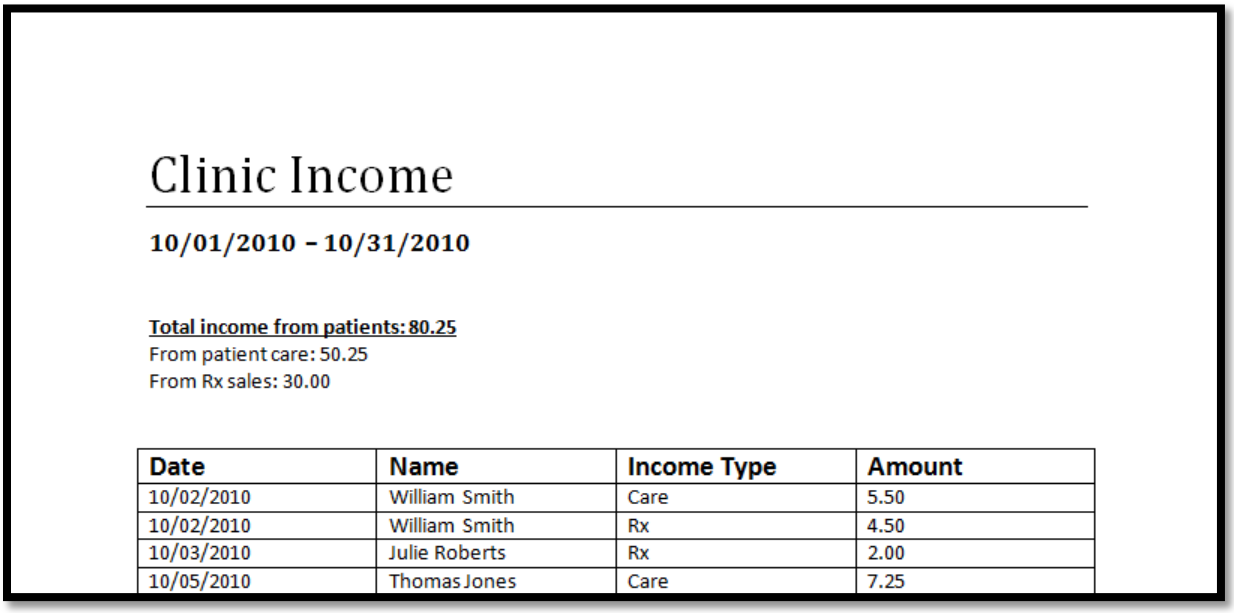
Date	Patient	Drug	Quantity	Sale Amount
10/02/2010	William Smith	Tetracycline	10	4.50
10/03/2010	Julie Roberts	Aspirin	8	1.25
10/03/2010	Julie Roberts	Ibuprofen	5	0.75
10/05/2010	Sam Jackson	Penicillin	15	3.00

View Clinic Income Report



1. Click the "Reports" tab to reach the Reports screen.
2. Choose "Clinic Income Report" from the drop down list.
3. Choose a desired export option.
4. Click "Create Report".

The report generated will be in the following form.



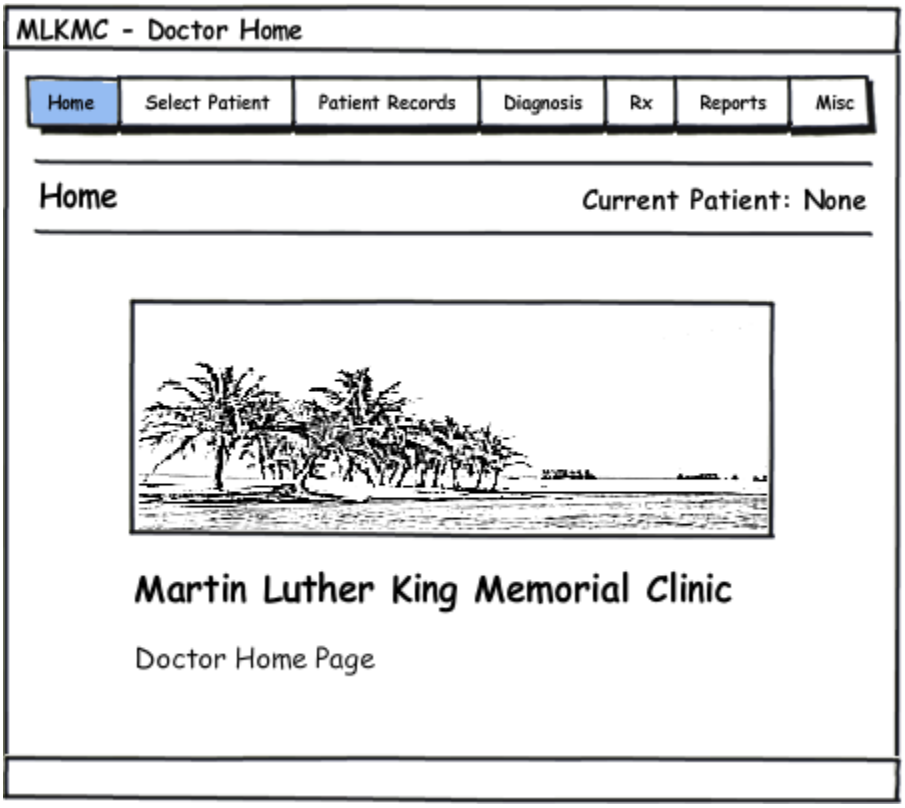
Clinic Income

10/01/2010 – 10/31/2010

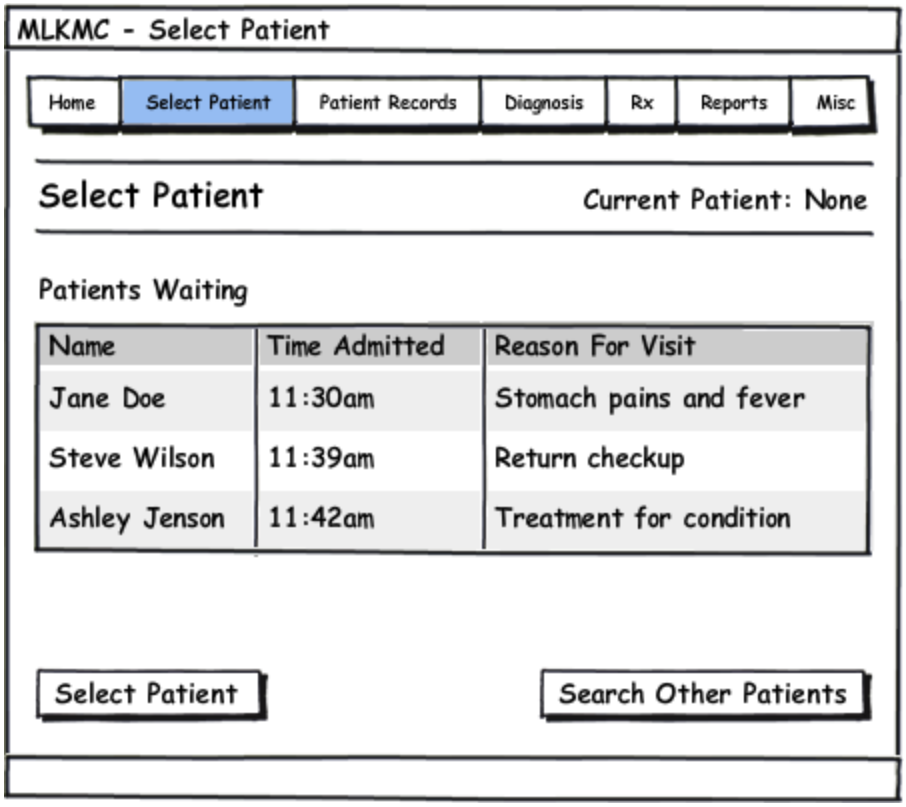
Total income from patients: 80.25
From patient care: 50.25
From Rx sales: 30.00

Date	Name	Income Type	Amount
10/02/2010	William Smith	Care	5.50
10/02/2010	William Smith	Rx	4.50
10/03/2010	Julie Roberts	Rx	2.00
10/05/2010	Thomas Jones	Care	7.25

Select Patient to See



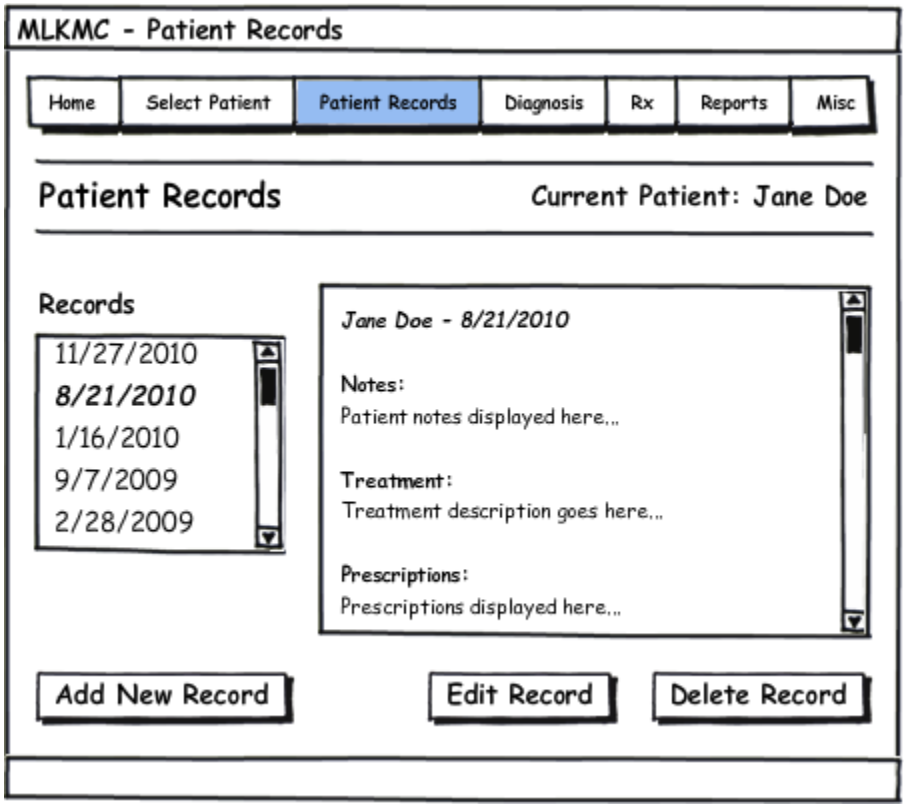
1. From the Doctor Home Page, click the “Select Patient” tab on the top of the screen.



2. The patient waiting the longest amount of time will be shown and selected automatically on the top of the list.
3. Another patient may be highlighted for selection by clicking the row corresponding to their name.

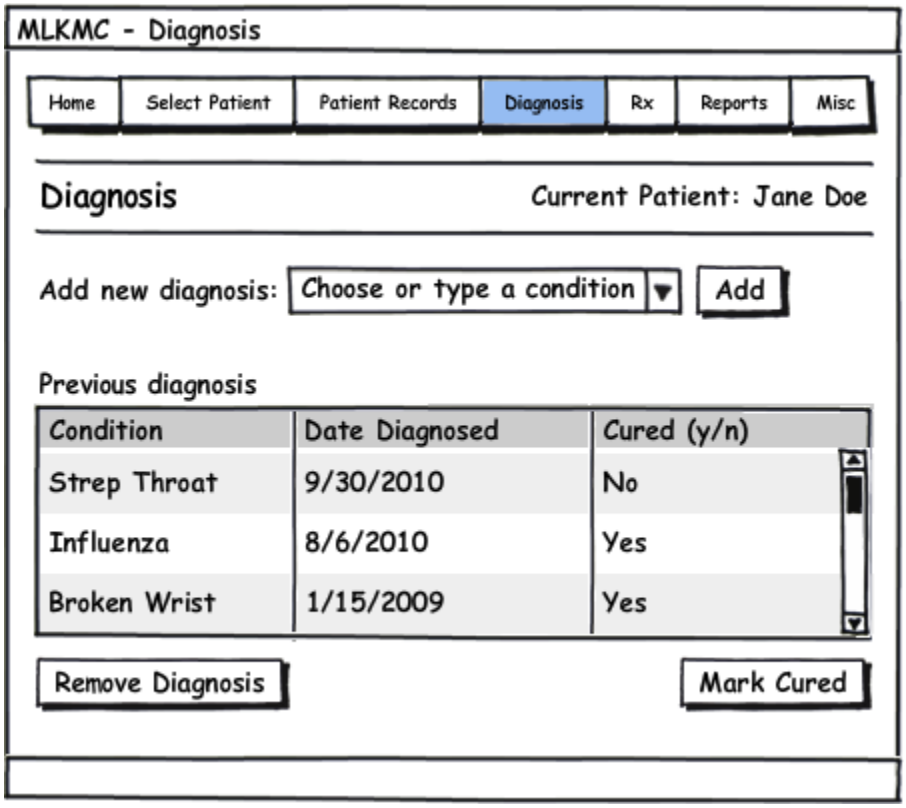
Click “Select Patient” to select the highlighted patient, and begin using other system functions on them as the Current Patient.

View/Add Patient Records



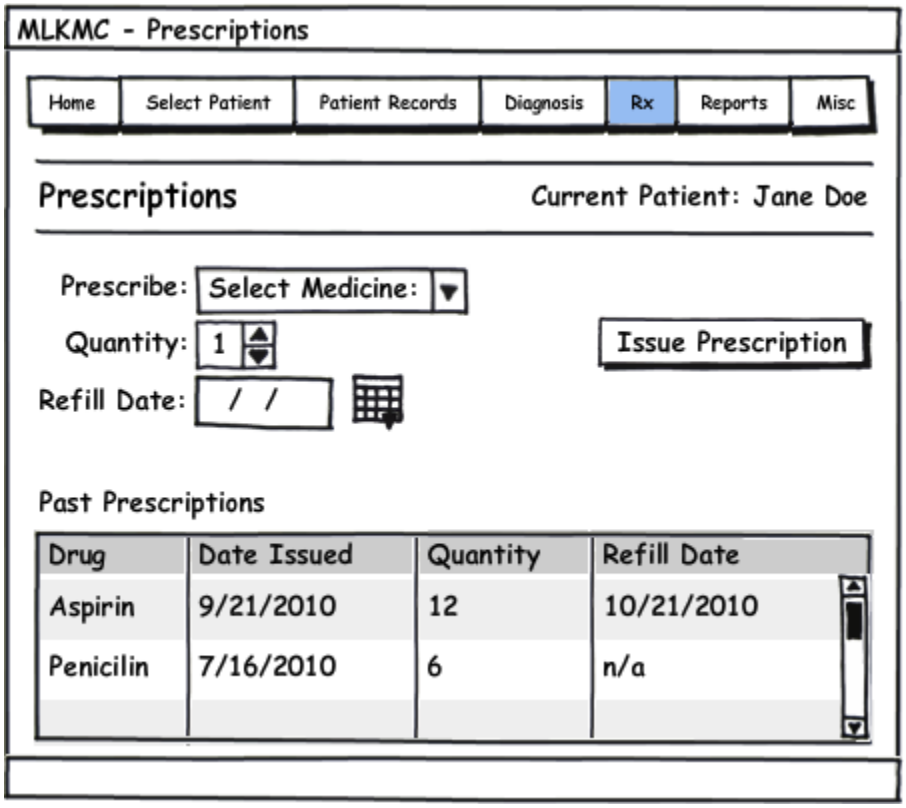
1. Click the "Patient Records" tab to reach the Patient Records screen.
2. Click the record to view from the list of dates.
3. To add a new record, click "Add New Record".
4. Enter notes for each section of the patient record.
5. Click "Save Record" to add a new record on today's date for the patient.

View/Make Diagnosis



1. Click the "Diagnosis" tab to reach the Diagnosis screen.
2. Any previous diagnosis can be removed, or toggled between cured and not cured with the two lower buttons.
3. To select a new diagnosis, choose a condition or disease from the list, or type the name of the condition or disease if it is not in the list.
4. Click "Add" to add the selected diagnosis to the patient's record.

Prescribe Medicine



1. Click the "Rx" tab to reach the Prescriptions screen.
2. Select a medicine to prescribe from the clinic inventory by clicking In the drop down list.
3. Choose a quantity of the medicine to prescribe.
4. Select a refill date for the prescription.
5. Click "Issue Prescription" to issue the prescription to the patient. The front desk will now be able to see this prescription when the patient comes to receive it.

User Effort Estimation

Search for Patient

Navigation events to data entry events ratio is **1:3**.

1. **NAVIGATION:** total 1 mouse click, as follows
    a. Click the "Find" tab.

2. **DATA ENTRY:** total 2 mouse clicks and 1 keyboard field entry, as follows
    a. Type in Patient Card Number (or Tab to name and type name).
    b. Click "Search" (or press Enter).
    c. Click "Select Patient".

NOTE: The above process of finding and selecting a patient can be circumvented by using the barcode scanner to simply scan the patient's ID card.

Add Patient to System

Navigation events to data entry events ratio is **2:16.**

1. **NAVIGATION:** total 2 mouse clicks, as follows
    a. Click the "Add/Edit" tab.
    b. Click "Add New Patient".

2. **DATA ENTRY:** total 2 mouse clicks, 7 Tabs to next field, and 7 keyboard field entries, as follows
    a. Click "Sex: Male or Female".
    b. Tab and enter first name.
    c. Tab and enter last name.
    d. Tab and enter date of birth.
    e. Tab and enter phone number.
    f. Tab and enter house number.
    g. Tab and enter area.
    h. Tab and enter city.
    i. Click "Create Patient".

Take Vitals

Navigation events to data entry events ratio is **1:14**

1. **NAVIGATION:** total 1 mouse click, as follows
    a. Click the "Vitals" tab.

2. **DATA ENTRY:** total 1 mouse click, 6 Tabs to next field, and 7 keyboard field entries, as follows
    a. Enter height.
    b. Tab and enter weight.
    c. Tab and enter blood pressure.
    d. Tab and enter heart rate.
    e. Tab and enter respiratory rate.
    f. Tab and enter temperature.
    g. Tab and enter the reason for visit.
    h. Click "Submit".

Bill a Patient

Navigation events to data entry events ratio is either **1:1** or **1:3**, depending on the flow of events.

1. **NAVIGATION:** total 1 mouse click, as follows
    a. Click the "Billing" tab.

2. **DATA ENTRY:** total 1-2 mouse clicks, and 0-1 keyboard field entries, as follows
    a. Click "Pay Full Amount".
    b. Or, if partial payment is allowed, type in the amount to pay.
    c. Click "Pay Partial".

Select Patient to See

Navigation events to data entry events ratio is **1:1** or **1:2**, depending on the flow of events.

1. **NAVIGATION:** total 1 mouse click, as follows
    a. Click the "Select Patient" tab.

2. **DATA ENTRY:** total 1-2 mouse clicks, as follows
    a. The patient waiting the longest is automatically highlighted at the top of the list. If the doctor wishes to see another patient first however, then click on that patient.
    b. Click "Select Patient" button.

Add a Patient Record

Navigation events to data entry events ratio is **2:8.**

1. **NAVIGATION:** total 2 mouse clicks, as follows
    a. Click the "Patient Records" tab.
    b. Click "Add New Record".

2. **DATA ENTRY:** total 1 mouse click, 3 Tabs to next field, and 4 keyboard field entries, as follows
    a. Enter patient notes.
    b. Tab and enter treatment description.
    c. Tab and enter prescription.
    d. Tab and enter follow up notes.
    e. Click "Save".

View/Make Diagnosis

Navigation events to data entry events ratio is **1:3.**

1. **NAVIGATION:** total 1 mouse click, as follows
    a. Click the "Diagnosis" tab (Diagnosis history is shown for viewing).

2. **DATA ENTRY:** total 3 mouse clicks, as follows
    a. Click on "New Diagnosis" drop down list.
    b. Click a condition or disease to select it or type in a new one.
    c. Click "Add".

Prescribe Medicine

Navigation events to data entry events ratio is **1:8.**

1. **NAVIGATION:** total 1 mouse click, as follows
    a. Click "Rx" tab.

2. **DATA ENTRY:** total 3 mouse clicks, 2 Tabs to next field, and 3 keyboard field entries, as follows
    a. Click on "Prescribe" drop down list.
    b. Click a listed drug to select it.
    c. Tab and enter quantity.
    d. Tab and enter refill date.
    e. Click "Issue Prescription".

Plan of Work

<<That goes here.>>