

EHR Analysis

1 Introduction

The United States Medical Industry makes up close to 18% of the total US GDP and is expected to grow at an average rate of 5.5 % for the next 10 years [4]. Within the past few years, this nearly 3.8 trillion dollar industry has been revolutionized by advances in the health IT technology. Once such revolutionary advancement was the creation of the Electronic Health Record System (EHR) which carried the potential to not only save the medical industry nearly 371 billion dollars over 15 years but also drastically increase access to healthcare information [5]. Adoption of the EHR has been pronounced with nearly 75% of Canadian doctors using some form of an EHR in a 2014 survey and 86.6% of US respondents in another 2014 study reporting that their healthcare provider maintained medical records in a computerized system. [2, 3].

2 Previous Work

Currently two companies, Epic and Cerner, dominate the EHR market with a combined market share of 85% [6]. These two companies have developed systems that work in large hospital settings and are often used in order to communicate information across large hospital chains. However, these system and lesser known competitors, for all of their worth, remain far from a perfect solution to healthcare problems. Issues such as the complexity of the system, inability of users to anticipate potential problems, safety concerns, and difficulty in system migration mitigate some of the supposed benefits of EHR's [1]. These concerns have placed a stain on the EHR industry.

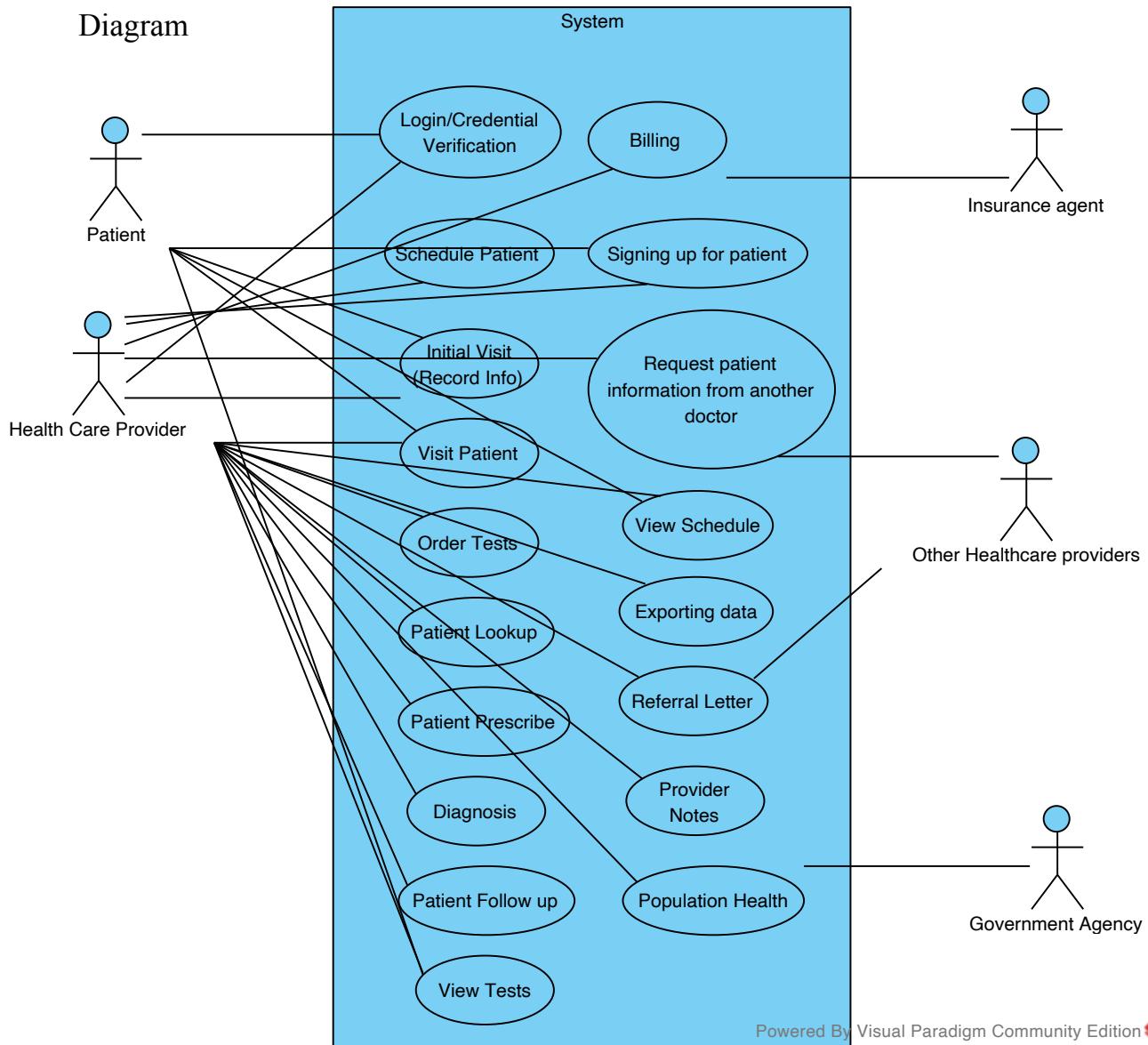
3 Proposition

Thus, our team goal for the course of this project is to develop an EHR specifically focused towards primary care and general practice physicians. In order to address preexisting concerns with existing EHRs, we plan on developing a system that focuses on ease of use for general and primary care healthcare providers and their patients. By developing a system with this goal in mind, we hope to create an EHR that fulfills the potential of an EHR system.

Requirements

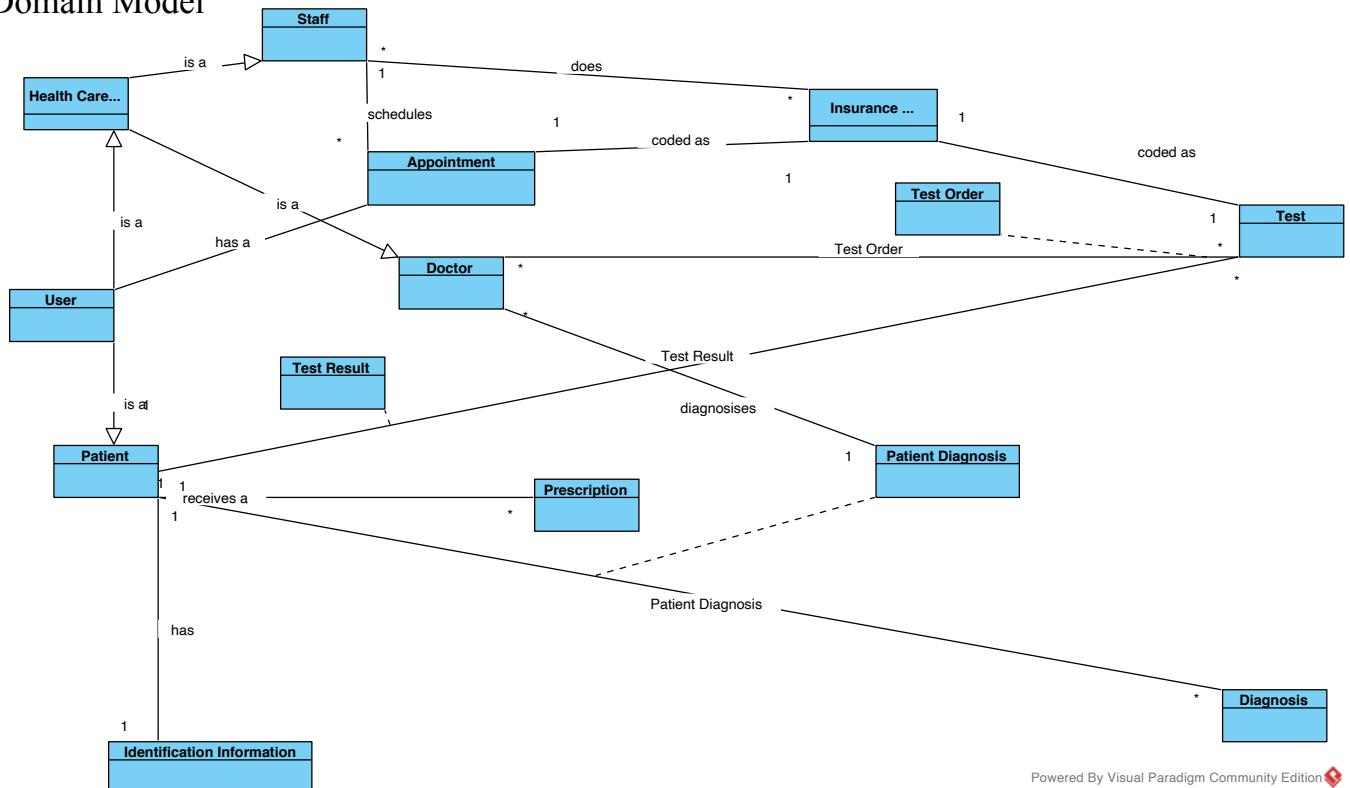
| | | |
|---|--|--|
| <p><<requirement>></p> <p>Different fields for different types of patient visits</p> <p>Text = "All patients must be accounted for - correct info for each patient (database)" ID = "REQ001" source = "" kind = "" verifyMethod = "" risk = "" status = ""</p> | <p><<requirement>></p> <p>Text = "Doctors have to be able to use the interface" ID = "REQ002" source = "" kind = "" verifyMethod = "" risk = "" status = ""</p> | <p><<requirement>></p> <p>Doctor-to-Patient</p> <p>Text = "Multiple doctors need to see each patient" ID = "REQ003" source = "" kind = "" verifyMethod = "" risk = "" status = ""</p> |
| <p><<requirement>></p> <p>Doctor Database</p> <p>Text = "Doctor Information - patients seeing" ID = "REQ004" source = "" kind = "" verifyMethod = "" risk = "" status = ""</p> | <p><<requirement>></p> <p>Time sheet</p> <p>Text = "Time sheet for doctors schedules" ID = "REQ005" source = "" kind = "" verifyMethod = "" risk = "" status = ""</p> | <p><<requirement>></p> <p>insurance code</p> <p>Text = "Each condition needs to be associated with an insurance code" ID = "REQ006" source = "" kind = "" verifyMethod = "" risk = "" status = ""</p> |
| <p><<requirement>></p> <p>Patient - User Interface</p> <p>Text = "" ID = "REQ007" source = "" kind = "" verifyMethod = "" risk = "" status = ""</p> | <p><<requirement>></p> <p>Clinical Test</p> <p>Text = "Orders and view clinical test being done" ID = "REQ008" source = "" kind = "" verifyMethod = "" risk = "" status = ""</p> | <p><<requirement>></p> <p>Orders</p> <p>Text = "Orders and prescriptions" ID = "REQ009" source = "" kind = "" verifyMethod = "" risk = "" status = ""</p> |
| <p><<requirement>></p> <p>Look up</p> <p>Text = "Fast lookup" ID = "REQ010" source = "" kind = "" verifyMethod = "" risk = "" status = ""</p> | <p><<requirement>></p> <p>Access</p> <p>Text = "System should be access specific (should only display patient name and condition to doctors)" ID = "REQ011" source = "" kind = "" verifyMethod = "" risk = "" status = ""</p> | <p><<requirement>></p> <p>Input</p> <p>Text = "Easy data input" ID = "REQ012" source = "" kind = "" verifyMethod = "" risk = "" status = ""</p> |
| <p><<requirement>></p> <p>Data consistency</p> <p>Text = "Managing data" ID = "REQ013" source = "" kind = "" verifyMethod = "" risk = "" status = ""</p> | <p><<requirement>></p> <p>Easy file sharing</p> <p>Text = "Easy file sharing between doctors" ID = "REQ014" source = "" kind = "" verifyMethod = "" risk = "" status = ""</p> | <p><<requirement>></p> <p>Population health</p> <p>Text = "stats of population health." ID = "REQ015" source = "" kind = "" verifyMethod = "" risk = "" status = ""</p> |

Use Case Diagram



Powered By Visual Paradigm Community Edition

Domain Model



Powered By Visual Paradigm Community Edition 

Billing

Information

| | |
|------------------------------|---------------------------------------|
| Rank | Unspecified |
| ID | |
| Status | Unspecified |
| Justification | |
| Primary Actors | Health Care Provider, Insurance agent |
| Supporting Actors | |

Scenarios

Scenario

1. Total cost for service rendered is calculated
2. Services rendered are included on bill with cost
3. Day by which bill must be payed is included
4. Bill is sent to necessary parties (i.e. insurance, government taxing, patient)
5. System records payments made

Extensions

- 1.a. Invalid values are entered
 1. System signals error and rejects entry
 2. Office accountant responds to error
 - 2.1. Data for charging is saved in human readable format
 - 2.1.1. Office accountant manually enters data
 - 2.1.2. System recalculates and displays results
 - 2.2. Necessary data is not saved
 - 2.2.1. Accountant reports error
 - 2.2.2. Operation is put on hold until correct data is recovered
 - 2.a. Services rendered are not available
 1. System reports error
 2. Accountant responds to errors
 - 2.1. Services are locatable
 - 2.1.1. Account enters data by hand
 - 2.2. Services are not locatable
 - 2.2.1. Accountant reports error
 - 2.2.2. Operation halted until correct data is recovered
 - 3.a. Patient receives payment extension for extenuating circumstances

- 3.a. Patient receives payment extension for extenuating circumstances
 - 1. The extension is noted on the bill
 - 2. The extension is saved in the system and reported to other necessary services (insurance, government taxing)
- 4.a. Bill is unable to be sent due to extenuating system errors
 - 1. System reports error
 - 2. Necessary attendant (i.e. office accountant) manually sends data

Details

| | |
|------------------------------|-----------------------------|
| Level | User goal |
| Complexity | N/A |
| Use Case Status | N/A |
| Implementation Status | N/A |
| Preconditions | Patient provided a service. |
| Post-conditions | N/A |
| Author | N/A |
| Assumptions | N/A |

Requirements

Different fields for different types of patient visits

Doctor Database

insurance code

Look up

Access

Data consistency

Easy file sharing

Diagnosis

Information

| | |
|------------------------------|----------------------|
| Rank | Unspecified |
| ID | |
| Status | Unspecified |
| Justification | |
| Primary Actors | Health Care Provider |
| Supporting Actors | |

Scenarios

Scenario

1. Doctor diagnoses patient
2. Doctor opens patient's file
3. System creates new diagnosis for patient
4. Doctor enters patient's diagnosis
5. System saves and stores diagnosis in patient folder and in other necessary files

Extensions

- 2.a. Patients file is unable to open
 1. Doctor restarts system
 2. System reports error and continues in clean state
- 2.b. Doctor does not have permission to access file
- 4.a. Patient has additional ailments and requires more than one diagnosis
 1. Doctor creates multiple diagnoses
 2. System records multiple diagnoses and stores data under same visit
- 5.a. Patient requests copy of diagnosis
 1. System provides available information
 2. Doctor prints or sends the information to the patient in a secure way
- #.a. At any time, System fails
 1. Doctor restarts system
 2. System reconstructs former state
 - 2.1. System detects anomaly
 - 2.1.1. Error is reported to doctor and IT and enters a clean state
 - 2.1.2. Doctor creates new diagnosis

Details

Page 1 of 2

Details

| | |
|------------------------------|---------------|
| Level | user goal |
| Complexity | N/A |
| Use Case Status | N/A |
| Implementation Status | N/A |
| Preconditions | Visit Patient |
| Post-conditions | N/A |
| Author | N/A |
| Assumptions | N/A |

Requirements

Different fields for different types of patient visits

Look up

Access

Input

Data consistency

Easy file sharing

Population health

Initial Visit (Record Info)

Information

Rank Unspecified

ID

Status Unspecified

Justification

Primary Actors Patient, Health Care Provider

Supporting Actors

Scenarios

Scenario

1. Patient walks into doctor's office for a consultation
2. Patient checks in with staff, identifying themselves
3. Staff check to see whether customer health sheet is complete
4. Patient health sheet is complete
5. Staff will check doctor's availability
6. Doctor is available
7. Patient is sent to doctor
8. Patient is evaluated by doctor
9. Doctor does not need to update health sheet

Extensions

- 2.a. Patient cannot identify themselves and is a walk-in
 1. Patient is refused
- 2.b. Patient cannot identify themselves but has an appointment
 1. Patient logs into the system
 2. Patient checks into appointment through the system
- 4.a. Patient health sheet is empty/incomplete
 1. Patient logs into system
 2. Patient fills any empty/incomplete sections of health sheet
- 6.a. Doctor is unavailable
 1. Staff gives patient estimate as to when doctor will be available
 2. Staff asks patient to wait in waiting room
- 9.a. Doctor needs to update health sheet
 1. Doctor gives staff the information necessary to update the health sheet
 2. Staff logs into the system

2. Staff logs into the system
 3. Staff makes necessary changes to the health sheet
- #.a. anytime system does not respond
1. Staff will restart system

Details

| | |
|------------------------------|----------------------------------|
| Level | User goals |
| Complexity | N/A |
| Use Case Status | N/A |
| Implementation Status | N/A |
| Preconditions | Login/Credential Verification |
| Post-conditions | Patient information is recorded. |
| Author | N/A |
| Assumptions | N/A |

Requirements

Doctor-to-Patient
insurance code
Patient - User Interface
Input
Data consistency

Login/Credential Verification

Information

| | |
|------------------------------|-------------------------------|
| Rank | Unspecified |
| ID | |
| Status | Unspecified |
| Justification | |
| Primary Actors | Health Care Provider, Patient |
| Supporting Actors | |

Scenarios

Scenario

1. Patient accesses system
2. System prompts client to enter their credentials
3. Patient enters their credentials
4. System checks e-mail username to see if an account is associated
5. Account is associated
6. System checks password to see if it matches the account password
7. Password is correct
8. System redirects patient to patient home page
9. After doing what is necessary, patient selects to sign out
10. System locks the user out, requiring credentials to sign in again

Extensions

- 3.a. Patient does not yet have an account
 1. Patient selects option to create an account
 2. System redirects patient to account creation
- 5.a. E-mail entered does not match an account
 1. System prompts patient to re-enter credentials
 - 1.1. Patient re-enters credentials until correct
 - 1.2. Patient does not have an account
 - 1.2.1. Patient chooses to create an account
 - 7.a. Password entered does not match account password
 1. System prompts patient to re-enter password
 - 1.1. Patient re-enters credentials until correct
 - 1.2. Patient does not have an account
 - 1.2.1. Patient chooses to create an account

1.2.1. Patient chooses to create an account

Details

| | |
|------------------------------|------------------------------------|
| Level | User goal |
| Complexity | N/A |
| Use Case Status | N/A |
| Implementation Status | N/A |
| Preconditions | N/A |
| Post-conditions | Patient gains access to the system |
| Author | N/A |
| Assumptions | N/A |

Requirements

Patient - User Interface

Look up

Input

Patient Database

Order Tests

Information

| | |
|------------------------------|----------------------|
| Rank | Unspecified |
| ID | |
| Status | Unspecified |
| Justification | |
| Primary Actors | Health Care Provider |
| Supporting Actors | |

Scenarios

Scenario

1. Doctor opens window to order test.
2. Doctor selects patient in need of test.
3. Doctor selects test to perform.
4. Doctor sends order to lab.
5. Lab receives order successfully.

Extensions

- 2.a. Doctor closes window while selecting patient.
 1. Window closes, patient data remains unchanged
 2. Doctor may reopen window and select patient again
- 5.a. Lab does not receive test order
 1. Doctor may send order again

Details

| | |
|------------------------------|--|
| Level | user goal |
| Complexity | N/A |
| Use Case Status | N/A |
| Implementation Status | N/A |
| Preconditions | Login/Credential Verification |
| Post-conditions | Necessary test for patient is determined. Doctor sends test order. Lab receives order. |
| Author | N/A |
| Assumptions | N/A |

Requirements

Doctor-to-Patient

Doctor Database

Time sheet

Orders

Interaction with a lab which will receive test orders

Patient Follow up

This use case details the EHR use of following up with a patient after their appointment in order to provide patients with information that they would need.

Information

| | |
|------------------------------|----------------------|
| Rank | Unspecified |
| ID | |
| Status | Unspecified |
| Justification | |
| Primary Actors | Health Care Provider |
| Supporting Actors | |

Scenarios

Scenario

1. Doctor concludes visit with patient
2. System prompts doctor to enter follow up information.
3. Doctor enters follow up information as well as other information doctor wishes to share with patient
4. System bundles doctors follow up notes with prescription information and test information
5. System sends message to patient to view their follow up information
6. Patient clicks on follow up panel
7. Patient views doctors notes
8. Patient exits follow up panel

Extensions

- 3.a. Follow up information has not all been created yet
 1. System notes that this information needs to be collected and is still waiting
 2. System displays blank information for these fields
 3. Once information has been collected, system updates record with proper information
- 6.a. Follow up panel is not updated
 1. System prints error message
- 7.a. Doctors notes are not complete
 1. System notes blanks in results and fills in information as it comes in
- #.a. At any time user chooses to exit program
 1. System saves information needed and returns to main screen

Details

| | |
|------------------------------|---|
| Level | N/A |
| Complexity | N/A |
| Use Case Status | N/A |
| Implementation Status | N/A |
| Preconditions | Visit Patient Diagnosis Order Tests Patient Prescribe Initial Visit (Record Info) Patient Lookup |
| Post-conditions | N/A |
| Author | N/A |
| Assumptions | N/A |

Requirements

Doctor-to-Patient

Patient - User Interface

Patient Lookup

Information

| | |
|------------------------------|----------------------|
| Rank | Unspecified |
| ID | |
| Status | Unspecified |
| Justification | |
| Primary Actors | Health Care Provider |
| Supporting Actors | |

Scenarios

Scenario

1. Doctor enters a patient name into search bar.
2. Doctor clicks on patient name.
3. Patient information is displayed.
4. Doctor exits window.

Extensions

- 1.a. Patient has no record in database
 1. System displays no results.
 2. Doctor may search a new name

Details

| | |
|------------------------------|-------------------------------|
| Level | user goal |
| Complexity | N/A |
| Use Case Status | N/A |
| Implementation Status | N/A |
| Preconditions | Login/Credential Verification |
| Post-conditions | N/A |
| Author | N/A |
| Assumptions | N/A |

Requirements

Page 1 of 2

Requirements

Look up

Patient Database

Simple to use UI for Doctor

Results must display quickly

Patient Prescribe

Information

| | |
|------------------------------|----------------------|
| Rank | Unspecified |
| ID | |
| Status | Unspecified |
| Justification | |
| Primary Actors | Health Care Provider |
| Supporting Actors | |

Scenarios

Scenario

1. Doctor determines prescription
2. Electronic prescription is created
3. Doctor stores details of prescription on patients file
4. System stores electronic prescription
5. Prescription is added to patients file
6. System prints out receipt or sends to corresponding pharmacy

Extensions

- 1.a. Patient does not receive prescription from diagnosis
 1. A prescription is not created
- 2.a. Electronic prescription does not generate
 1. Doctor closes system and restarts it
 2. Doctor reenters credentials and tries again
 - 2.1. If system still refuses to work, prior system state is loaded and necessary departments are notified
- 3.a. Patients file won't open
 1. Doctor closes system and restarts it
 2. If system still doesn't work notify necessary departments
 - 2.1. Store data on paper until system works correctly
- 4.a. System is unable to store electronic prescription correctly
 1. System state is saved
 2. Doctor is notified of error
 3. Doctor notifies correct department
 - 3.1. Data is saved on paper until system can save correctly
- 5.a. System stores patient data in wrong patient file

- 5.a. System stores patient data in wrong patient file
 - 1. System alerts doctor and IT of error
 - 2. Data is saved but removed from incorrect file
 - 3. Doctor reenters data or saves it on paper
- 6.a. Prescription is unable to be shared with pharmacy
 - 1. System lets doctor know error
 - 2. System restarts but saves current state
 - 2.1. Doctor's office manually calls in prescription if system is down for time being
- #.a. Anytime system fails
 - 1. Data is stored on paper to later be input to the system
 - 2. System is restart by IT
 - 3. System reconstructs to prior state
 - 3.1. If system detects anomalies in system, sends message to doctor and corresponding

Details

| | |
|------------------------------|-------------------|
| Level | user goal |
| Complexity | N/A |
| Use Case Status | N/A |
| Implementation Status | N/A |
| Preconditions | Patient Prescribe |
| Post-conditions | N/A |
| Author | N/A |
| Assumptions | N/A |

Requirements

Different fields for different types of patient visits

Clinical Test

Orders

Access

Data consistency

Easy file sharing

Population health

Population Health

This use case calculates population health parameters for reporting to government agencies and for statistical purposes.

Information

| | |
|------------------------------|---|
| Rank | Unspecified |
| ID | |
| Status | Unspecified |
| Justification | |
| Primary Actors | Health Care Provider, Government Agency |
| Supporting Actors | |

Scenarios

Scenario

1. User clicks on the population health parameter list
2. System displays a list of population health parameters for which the user can look for.
 - 2.1. Parameters include: Number of patients presenting with any particular condition, dates with a higher than normal number of patient visits, demographics of patients, vital signs, and test results for the population of patients.
3. System calculates results based on the parameters provided.
4. System displays results
 - 4.1. User can choose to adjust display options such as date ranges or graph coordinates.
 - 4.2. System will modify results to accommodate this
5. System allows for users to download/ save a copy of the results

Extensions

- 3.a. System fails to calculate results based on the parameters provided
 1. System prints an error message and returns to population health parameter list
- 4.a. System fails to display results
 1. System prints an error message and returns to the population health parameter
- 5.a. System fails to download correctly
 1. System prints an error.
- #.a. At any time the user can choose to leave this panel
 1. System will exit this panel without any data loss

Details

| | |
|------------------------------|-------------------------------|
| Level | N/A |
| Complexity | N/A |
| Use Case Status | N/A |
| Implementation Status | N/A |
| Preconditions | Login/Credential Verification |
| Post-conditions | N/A |
| Author | Sam Shenoi |
| Assumptions | N/A |

Requirements

Population health

All data is de-identified in order to protect patient privacy

Provider Notes

Information

Rank Unspecified
ID
Status Unspecified
Justification
Primary Actors Health Care Provider
**Supporting
Actors**

Request patient information from another doctor

Information

| | |
|------------------------------|--|
| Rank | Unspecified |
| ID | |
| Status | Unspecified |
| Justification | |
| Primary Actors | Health Care Provider, Other Healthcare providers |
| Supporting Actors | |

Scenarios

Scenario

1. Request for Doctor's name or id.
2. Enters correct information.
3. Display and ask whether the doctor the user are trying to access is correct.
4. User approves.
5. System retrieves the doctor information.
6. System parses and display readable information to user.

Extensions

- 2.a. user enters incorrect information
 1. Reply with an error message and to try again.
 2. User enters correct information.
 3. Go to 3 in main scenario.
- 4.a. user declines
 1. Take user back to the number 1 of the main scenario
- 5.a. an error occurs retrieving the information
 1. Send error message to technician.
 2. Tell user to try again later.

Details

| | |
|------------------------------|-------------------------------|
| Level | user goals |
| Complexity | N/A |
| Use Case Status | N/A |
| Implementation Status | N/A |
| Preconditions | Login/Credential Verification |
| Post-conditions | N/A |
| Author | N/A |
| Assumptions | N/A |

Requirements

Different fields for different types of patient visits

Doctor-to-Patient

Doctor Database

Look up

Access

Easy file sharing

Schedule Patient

Information

| | |
|------------------------------|----------------------|
| Rank | Unspecified |
| ID | |
| Status | Unspecified |
| Justification | |
| Primary Actors | Health Care Provider |
| Supporting Actors | |

Scenarios

Scenario

1. Patient asks to schedule appointment
2. Staff asks patient for credentials
3. Patient provides correct credentials to staff
4. Staff asks patient which time is convenient for appointment
5. Patient gives staff valid time for appointment
6. Staff enters new appointment into schedule at requested time
7. Schedule updated with new appointment

Extensions

- 2.a. This is patient's first visit
 1. Proceed with first visit protocol
- 3.a. Patient provides incorrect credentials
 1. If patient does not have account, patient signs up for one
 2. Patient tries again until correct credentials are provided
- 5.a. Appointment time given is invalid
 1. Patient is prompted for a new, available time until correct time is provided.

Details

| | |
|------------------------------|---------------------------------------|
| Level | User goal |
| Complexity | N/A |
| Use Case Status | N/A |
| Implementation Status | N/A |
| Preconditions | N/A |
| Post-conditions | Patient appointment added to schedule |
| Author | N/A |
| Assumptions | N/A |

Requirements

Different fields for different types of patient visits

Doctor Database

Time sheet

insurance code

Patient - User Interface

Input

Signing up for patient

Information

| | |
|------------------------------|-------------------------------|
| Rank | Unspecified |
| ID | |
| Status | Unspecified |
| Justification | |
| Primary Actors | Health Care Provider, Patient |
| Supporting Actors | |

Scenarios

Scenario

1. Patient arrives to sign up page.
2. Request patient's full name, email, DOB, sex, height, and weight.
3. Patient enters correct information.
4. Then request for patient contact number, marital status, and address.
5. Patient continues to enter correct information.
6. Then request for patient emergency contact information.
7. Patient enters emergency contact information.
8. Ask whether patient is taking any medication.
9. Patient answers no.
10. Ask whether patient has any current or past health conditions.
11. Patient answer no.
12. Request patient to make password.
13. Patient creates password.
14. Create patient id number.
15. Patient information is pushed onto the patient database.
16. Patient is then fully signed up.
17. Patient is then met with a sign-up completion window that shows their id.

Extensions

- 3.a. Patient enters invalid email address
 1. The system request patient to enter a correct email
 2. Patient enters correct email
- 9.a. Patient says yes
 1. Request medication patient is taking
 2. Patient enters medication

2. Patient enters medication
- 11.a. Patient says yes
1. Request for patients past or current health conditions
 2. Patient enters past or current health conditions

Details

| | |
|------------------------------|-----------|
| Level | User Goal |
| Complexity | N/A |
| Use Case Status | N/A |
| Implementation Status | N/A |
| Preconditions | N/A |
| Post-conditions | N/A |
| Author | N/A |
| Assumptions | N/A |

Requirements

Different fields for different types of patient visits

Patient - User Interface

Access

Input

Data consistency

Easy file sharing

View Schedule

Information

| | |
|------------------------------|-------------------------------|
| Rank | Unspecified |
| ID | |
| Status | Unspecified |
| Justification | |
| Primary Actors | Health Care Provider, Patient |
| Supporting Actors | |

Scenarios

Scenario

1. Ask whether user is a doctor or patient.
2. User enters type.
3. System then prompt user to enter id number and password.
4. User enters correct credentials
5. System fetches schedule information
6. Display schedule information.

Extensions

- 4.a. User enters wrong credentials
 1. Prompt user to enter credentials again.
 2. User enters correct credentials
 3. Go to 5 in main scenario.
- 5.a. user is a doctor.
 1. Doctor information is fetched.
 2. Doctor schedule and information is displayed.
- 5.b. user is a patient
 1. Patient information is fetched.
 2. Patient schedule and information is displayed

Details

| | |
|------------------------------|---|
| Level | user goal |
| Complexity | N/A |
| Use Case Status | N/A |
| Implementation Status | N/A |
| Preconditions | Login/Credential VerificationSchedule Patient |
| Post-conditions | N/A |
| Author | N/A |
| Assumptions | N/A |

Requirements

Different fields for different types of patient visits

Doctor Database

Time sheet

Patient - User Interface

Access

Data consistency

Easy file sharing

View Tests

This use case determines how a patient or a provider can view test results that were previously conducted.

Information

| | |
|------------------------------|-------------------------------|
| Rank | Unspecified |
| ID | |
| Status | Unspecified |
| Justification | |
| Primary Actors | Health Care Provider, Patient |
| Supporting Actors | |

Scenarios

Scenario

1. User clicks on view tests.
2. System displays list of test dates
3. User selects test date
4. System displays all of the test results of all tests associated with that test date
5. User unselects test date
6. System returns to previous state

Extensions

- 3.a. User selects view test results over time
 1. System displays a graph of each type of test results over time
 2. User decides to minimize the range of test results viewed
 - 2.1. System redraws graph to accommodate this
- #.a. At any time, user decides to exit test result panel
 1. System gracefully leaves panel without doing anything to the data

Details

| | |
|------------------------------|--|
| Level | N/A |
| Complexity | N/A |
| Use Case Status | N/A |
| Implementation Status | N/A |
| Preconditions | Login/Credential VerificationOrder Tests |
| Post-conditions | N/A |
| Author | N/A |
| Assumptions | N/A |

Requirements

Patient - User Interface

Orders

Look up

Data consistency

Visit Patient

Information

| | |
|------------------------------|-------------------------------|
| Rank | Unspecified |
| ID | |
| Status | Unspecified |
| Justification | |
| Primary Actors | Patient, Health Care Provider |
| Supporting Actors | |

Scenarios

Scenario

1. Doctor clicks to open up a window for recording the patient's data and condition.
2. Doctor asks the patient about his/her condition.
3. Doctor records information in the open window.
4. Doctor saves the file.
5. Doctor exits the window.

Extensions

- 3.a. Doctor exits window while recording data
 1. Doctor will be prompted to save the file before exiting
- 4.a. File fails to save correctly
 1. Information remains unchanged
 2. Doctor may attempt to save again

Details

| | |
|------------------------------|---|
| Level | user goal |
| Complexity | N/A |
| Use Case Status | N/A |
| Implementation Status | N/A |
| Preconditions | Initial Visit (Record Info)Schedule PatientLogin/Credential Verification |
| Post-conditions | Record of visit is saved. Doctor is aware of the patient's condition and can diagnose accurately. |
| Author | N/A |
| Assumptions | N/A |

Requirements

Window with fields for patient data followed by text boxes to enter information

Different fields for different types of patient visits

Doctor-to-Patient

Time sheet

Exporting data

Information

| | |
|--------------------------|----------------------|
| Rank | Unspecified |
| ID | |
| Status | Unspecified |
| Justification | |
| Primary Actors | Health Care Provider |
| Supporting Actors | |

Scenarios

Scenario

1. User will select the information that they wish to export
2. User will click the export button
3. User will select the type of file that they wish to have produced
4. User will select the OK button
5. User will select where they would like the file to be stored
6. User will select the OK button
7. The file will be exported to the specified location

Extensions

- 3.a. Desired file type is not available
 1. User will select cancel
- 5.a. Desired file location cannot be found
 1. User will select cancel
- 7.a. Error is saving the file
 1. User will be notified of the error
 2. System will not have saved the file to the location

Details

| | |
|------------------------------|--|
| Level | user goal |
| Complexity | N/A |
| Use Case Status | N/A |
| Implementation Status | N/A |
| Preconditions | Login/Credential Verification Initial Visit (Record Info) Provider Notes |
| Post-conditions | Desired file will be exported to the specified location |
| Author | Jordan Hurt |
| Assumptions | N/A |

Requirements

- Patient Database
- Data consistency
- Easy file sharing

Referral Letter

Information

| | |
|--------------------------|--|
| Rank | Unspecified |
| ID | |
| Status | Unspecified |
| Justification | |
| Primary Actors | Health Care Provider, Other Healthcare providers |
| Supporting Actors | |

Scenarios

Scenario

1. Provider will select the "Referral" Button
2. Provider will select the reason for referral
3. Provider will select Continue
4. Provider will select the provider the patient is being referred to
5. Provider will select continue
6. Provider will select continue
7. Provider will enter a name for the file
8. Provider will select the location to save the file
9. Provider will select the type of file that they want generated
10. Provider will select "Create"

Extensions

- 2.a. Multiple reasons for referral
 1. Provider selects all reasons for referral
- 4.a. Provider desired is not an option
 1. Provider selects other
 2. Provider types in the name of the provider into the system
- #.a. Provider wants to stop creating the file
 1. Provider selects cancel button

Details

| | |
|------------------------------|--|
| Level | user goal |
| Complexity | N/A |
| Use Case Status | N/A |
| Implementation Status | N/A |
| Preconditions | Preformatted referral letters loaded into the system |
| Post-conditions | Generate file for referral letter |
| Author | N/A |
| Assumptions | N/A |

Requirements

Patient Database
Access
Data consistency
Easy file sharing

Provider Notes

Information

| | |
|--------------------------|----------------------|
| Rank | Unspecified |
| ID | |
| Status | Unspecified |
| Justification | |
| Primary Actors | Health Care Provider |
| Supporting Actors | |

Scenarios

Scenario

1. Provider selects the Patient Visit tab
2. Provider enters in the chief complaint into the box labeled "Chief Complaint"
3. Provider enters in patient's vitals into the appropriate input boxes
4. Provider enters in their notes from the physical exam into the input box labeled "Physical Exam Notes"
5. Provider enters in their recommendations for the patient's next steps into the "Next Steps" input box

Extensions

- 2.a. If a complaint is not a reason for the visit
 1. Enter in the reason for the visit into the box labeled "Chief Complaint"
- 4.a. If no physical exam is needed
 1. Enter in the conversations had between the patient and the provider
- #.a. After completing step 1, all other steps maybe done in any order

Details

| | |
|------------------------------|--|
| Level | user goal |
| Complexity | N/A |
| Use Case Status | N/A |
| Implementation Status | N/A |
| Preconditions | Provider already is within the patient's profile |
| Post-conditions | Information will be saved in the patient's file |
| Author | N/A |
| Assumptions | N/A |

Requirements

Input

Easy file sharing

Wireframes

| EHR Staff Scheduling Screen | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|------------------------------------|---|--|--------|--------|--------|----|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--------------|-----------------|--|--|--|--|
| Home | | Logout | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Staff Name | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>Manage Billing</p> <p>Scheduling</p> <p>« February 2017 »</p> <table><tr><td>Mo</td><td>Tu</td><td>We</td><td>Th</td><td>Fr</td><td>Sa</td><td>Su</td></tr><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr><tr><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td></tr><tr><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td></tr><tr><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td><td>27</td><td>28</td></tr></table> | Mo | Tu | We | Th | Fr | Sa | Su | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | Patient Name | Provider's Name | | | | |
| | Mo | Tu | We | Th | Fr | Sa | Su | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 8 | 9 | 10 | 11 | 12 | 13 | 14 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 15 | 16 | 17 | 18 | 19 | 20 | 21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 22 | 23 | 24 | 25 | 26 | 27 | 28 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <input type="text" value="Luigi"/> | | <input type="text" value="Dr. Speegle"/> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Select Date | | <input type="text" value="12 May 2016"/> <input type="button" value="Calendar"/> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | <input type="button" value="Schedule Appointment"/> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Provider's Schedule | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 12 May | 13 May | 14 May | 15 May | 16 May | 17 May | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | Booked | Booked | Open | Booked | Open | Open | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | Open | Open | Open | Open | Booked | Open | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | Lunch | Lunch | Lunch | Lunch | Lunch | Lunch | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Open | Open | Open | Open | Open | Open | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | Open | Open | Booked | Booked | Open | OFO | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Booked | Booked | Booked | Booked | Open | OFO | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | OFO | OFO | OFO | OFO | OFO | OFO | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

O O O

EHR Staff Home Screen

[Home](#)[Logout](#)

Staff Name

Manage Billing

Scheduling

View Patient Records

< February 2017 >

Mo Tu We Th Fr Sa Su

| | | | | | | |
|----|----|----|----|----|----|----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| 22 | 23 | 24 | 25 | 26 | 27 | 28 |

| | First Name | Last Name | Date of Visit | Bill Sent | Date Bill Sent | Bill Paid |
|--------|-------------|------------|---------------|------------|----------------|-----------|
| John | Doe | 12-34-5678 | Yes | 12-34-5678 | No | |
| Bill | Gates | 12-34-5678 | No | n/a | n/a | |
| Tim | Horten | 12-34-5678 | Yes | 12-34-5678 | Yes | |
| Brad | Livingstone | 12-34-5678 | Yes | 12-34-5678 | Yes | |
| Linda | Livingstone | 12-34-5678 | No | n/a | n/a | |
| Pac | Man | 12-34-5678 | Yes | 12-34-5678 | No | |
| Super | Mario | 12-34-5678 | Yes | 12-34-5678 | Yes | |
| Sam | Smith | 12-34-5678 | Yes | 12-34-5678 | Yes | |
| Taylor | Swift | 12-34-5678 | Yes | 12-34-5678 | Yes | |

Pac-Man

Patient Information

Name: Pac Man
 Address: 1234 Arcade Way
 Waco, TX 98765

Provider's Name: Dr. Bill Booth
 Primary Care Physician

Insurance Information

Name of Company: Namco Networks
 Coverage Type: Repair Level Insurance
 Group Code: ILOVP4CM4N
 Co-Pay: 10% - PCP Fees

| | | | | | | | | | | |
|----------------------|-----------------------|--------------|-----------------|--------------|----------------|--|--|--|--|--|
| O O O | EHR Staff Home Screen | | | | | | | | | |
| < Home | | | Logout | | | | | | | |
| Staff Name | | | | | | | | | | |
| Office Schedule | | | | | | | | | | |
| Manage Billing | | | | | | | | | | |
| Scheduling | Dr. Cerny | Dr. Baker | Dr. Mauer | Dr. Song | Dr. Speegle | | | | | |
| View Patient Records | 8:00 | John Smith | Johny AppleSeed | <no patient> | Cinderella | | | | | |
| | 9:00 | <no patient> | Pac-Man | Pac-Women | <no patient> | | | | | |
| « February 2017 » | 10:00 | <no patient> | <no patient> | Luigi | <no patient> | | | | | |
| Mo Tu We Th Fr Sa Su | 11:00 | <no patient> | John Doe | Jane Doe | <no patient> | | | | | |
| 1 2 3 4 5 6 7 | | | | | Asher Catch'em | | | | | |
| 8 9 10 11 12 13 14 | | | | | | | | | | |
| 15 16 17 18 19 20 21 | | | | | | | | | | |
| 22 23 24 25 26 27 28 | 12:00 | Lunch | Lunch | Lunch | Lunch | | | | | |

| | | | | | |
|----------------------|-----------------------|--------------|-----------------|--------------|------------------------|
| O O O | EHR Staff Home Screen | | | | |
| Home | | | | | Logout |
| Staff Name | | | | | |
| Manage Billing | Office Schedule | | | | |
| Scheduling | | | | | |
| View Patient | 8:00 | John Smith | Johny AppleSeed | <no patient> | Cinderella |
| | 9:00 | <no patient> | Pac-Man | Pac-Women | <no patient> |
| « February 2017 » | 10:00 | <no patient> | <no patient> | Luigi | <no patient> |
| Mo Tu We Th Fr Sa Su | 11:00 | <no patient> | John Doe | Jane Doe | <no patient> |
| 1 2 3 4 5 6 7 | | | | | Asher Catch'em |
| 8 9 10 11 12 13 14 | | | | | |
| 15 16 17 18 19 20 21 | | | | | |
| 22 23 24 25 26 27 28 | 12:00 | Lunch | Lunch | Lunch | Lunch |

Provider Request a Test View

< Home Logout

Patient Name: [Redacted]

Sex: [Redacted] DOB: [Redacted] PCP: Dr. Rae Smith Allergies: None

Patient Overview

Patient Visit

Prescribe

Request a Test

View Test Results

Referrals

Test Name: [Search Bar] Date: 12 May 2016 [Calendar Icon]

Reason for Test: [Text Area]

Lab: Select Lab for Test [Dropdown] Fasting?: [Switch]

Note: [Text Area]

Generate Order

O O O

Provider View Test Results View

 [Home](#)[Logout](#)

Patient Name

| | | | |
|-----|------------|---------------|-----------|
| Sex | DOB | PCP | Allergies |
| - | MM-DD-YYYY | Dr. Rae Smith | None |

| Patient Overview | Test Name | Date of Test | Last Viewed | Specimen |
|-------------------|-----------------------|--------------|-------------|----------|
| Patient Visit | Food Sensitivity | 12-34-5678 | 12-34-5678 | Blood |
| Prescribe | Complete Blood Count | 12-34-5678 | 12-34-5678 | Blood |
| Request a Test | Prothrombin Time | 12-34-5678 | 12-34-5678 | Blood |
| View Test Results | Basic Metabolic Panel | 12-34-5678 | 12-34-5678 | Blood |

Food Sensitivity

.....

Provider Referrals View

< Home Logout

Patient Name

| | | | |
|-----|------------|---------------|-----------|
| Sex | DOB | PCP | Allergies |
| - | MM-DD-YYYY | Dr. Rae Smith | None |

Patient Overview

Patient Visit

Prescribe

Request a Test

View Test Results

Referrals

Specialty

Select

Provider's Name

Select

Additional Notes

Reason for Referral

Diagnosis 1

Diagnosis 2

Diagnosis 3

Diagnosis 4

Other (enter below)

Input

Refer

Provider Prescribe View

Home Logout

Patient Name: Sex: DOB: PCP: Allergies:

- MM-DD-YYYY Dr. Rae Smith None

Patient Overview Medication Name:

Patient Visit

Prescribe

Request a Test

View Test Results

Referrals

Medication Name:

Dosage: times a day for days

Day Week Bi-Weekly Month

Days Weeks Months

Notes to Pharmacist:

Print Prescription

OOO

Provider Patient Visit View

< Home Logout

Patient Name

Sex DOB PCP Allergies

- MM-DD-YYYY Dr. Rae Smith None

| | | |
|-------------------|-----------------|------------------|
| Patient Overview | Chief Complaint | Vitals |
| Patient Visit | | Body Temp. |
| Prescribe | | Pulse Rate |
| Request a Test | | Respiration Rate |
| View Test Results | | Blood Pressure |
| Referrals | | Next Steps |
| | | |

Provider Patient Overview View

< Home Logout

Patient Name

| | | | |
|-----|------------|---------------|-----------|
| Sex | DOB | PCP | Allergies |
| - | MM-DD-YYYY | Dr. Rae Smith | None |

Patient Overview

Patient Visit

Prescribe

Request a Test

View Test Results

Referrals

Next Appointment

Diagnosis

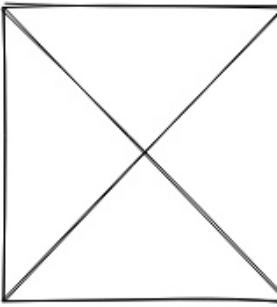
Current Medications

Item 1
Item 2
Item 3
Item 4

Patient History

Tests and Results

Item 1
Item 2
Item 3
Item 4



O O O

EHR Provider Home Screen



Logout

Provider's Name

Next Appointment at: MM--DD--YY HH:mm

Room: 123

Today's Schedule

February 12, 2017

View All My Patients

< February 2017 >

Mo Tu We Th Fr Sa Su

1 2 3 4 5 6 7
8 9 10 11 12 13 14
15 16 17 18 19 20 21
22 23 24 25 26 27 28

| | | |
|-----------|--------------------------------------|---|
| 10:15 | Diagnosis: mm mm mm mm mm | Reason for Visit: mm mm mm mm mm |
| Patient A | | |
| 11:15 | Diagnosis: mm mm mm mm mm | Reason for Visit: mm mm mm mm mm |
| Patient B | | |
| 1:15 | Diagnosis: mm mm mm mm mm | Reason for Visit: mm mm mm mm mm |
| Patient C | | |
| 2:15 | Diagnosis: mm mm mm mm mm | Reason for Visit: mm mm mm mm mm |
| Patient D | | |

OOO

EHR View Test Results



Logout

Patient Name

Next Appointment at: MM--DD--YY HH:mm

| Patient Intake Form | Test Name | Date of Test | Last View | Specimen |
|---|--------------------------|--------------|------------|----------|
| | Food Sensitivity | 12-34-5678 | 12-43-5678 | Blood |
| | Complete Blood Count | 12-34-5678 | 12-43-5678 | Blood |
| | Lactose Intolerance | 12-34-5678 | 12-43-5678 | Blood |
| | Complete Metabolic Panel | 12-34-5678 | 12-43-5678 | Blood |
| Food Sensitivity | | | | |
| XXXXXXXXXXXX XXXXXXXX XXXXXXXX XXXXXX XXXXXXXX XXXXXXXX XXXXXXXX | | | | |

○ ○ ○

EHR Patient Home Screen

< Logout

Patient Name

Next Appointment at: MM--DD--YY HH:mm

Patient Intake Forms

View Test Results

Current Diagnosis

| |
|---------------------|
| mmmm mmmm mmmm mmmm |
| mmmm mmmm mmmm mmmm |
| mmmm mmmm mmmm mmmm |

Current Medications

| Prescription | Dosage |
|---------------|---------------------------|
| Acetaminophen | 1 pill 2xs a day |
| Doxycycline | 2 pills a day for 10 da.. |
| Tamiflu | 2 pills a day for 10 da.. |
| | |
| | |
| | |
| | |

Current Providers

| Provider Name |
|---------------|
| Dr. Cerny |
| Dr. Booth |
| Dr. Baker |
| Dr. Song |
| Dr. Donahoo |
| Dr. Fendt |
| Dr. Hamerly |
| Dr. Maurer |
| Dr. Speegle |

○ ○ ○

EHR Patient Intake Forms

[Logout](#)

Patient Name

Next Appointment at: MM--DD--YY HH:mm

Patient Intake Form

View Test Results

First Name Middle Initial Last Name

DOB Address

Phone City State ZIP
 Cell Phone
 Home Phone
 Work Phone

Emergency Contact

Name Phone Number

Allergies

List all Allergies Here

Medical History (select all that apply)

Lifestyle
 Alcohol Tobacco
 E-Cigarettes Exercise

Allergies
Appendicitis
Cancer
Diabetes
Heart Disease

○ ○ ○

EHR Login Screen

Login

Username

Password

CShare

Gantt Diagram

Feb 9, 2020

2

Tasks

| Name | Begin date | End date |
|-------------------------|------------|----------|
| Iteration 1 | 1/31/20 | 2/11/20 |
| Requirements | 1/31/20 | 2/11/20 |
| Use Cases | 1/31/20 | 2/11/20 |
| Operations | 1/31/20 | 2/11/20 |
| User Interface sketches | 1/31/20 | 2/11/20 |
| Domain Model | 1/31/20 | 2/11/20 |
| SSD | 1/31/20 | 2/11/20 |
| Iteration 2 | 2/12/20 | 3/24/20 |
| Diagrams | 2/12/20 | 2/21/20 |
| Git | 2/21/20 | 3/24/20 |
| Maven | 3/2/20 | 3/24/20 |
| GUI | 3/9/20 | 3/24/20 |
| Prototype 2 | 3/9/20 | 3/24/20 |
| Testing | 3/16/20 | 3/24/20 |
| Iteration 3 | 3/25/20 | 4/30/20 |
| Maven | 3/25/20 | 4/30/20 |
| Git | 3/25/20 | 4/30/20 |
| GUI | 3/25/20 | 4/30/20 |
| Prototype | 3/25/20 | 4/17/20 |
| Testing | 4/17/20 | 4/30/20 |

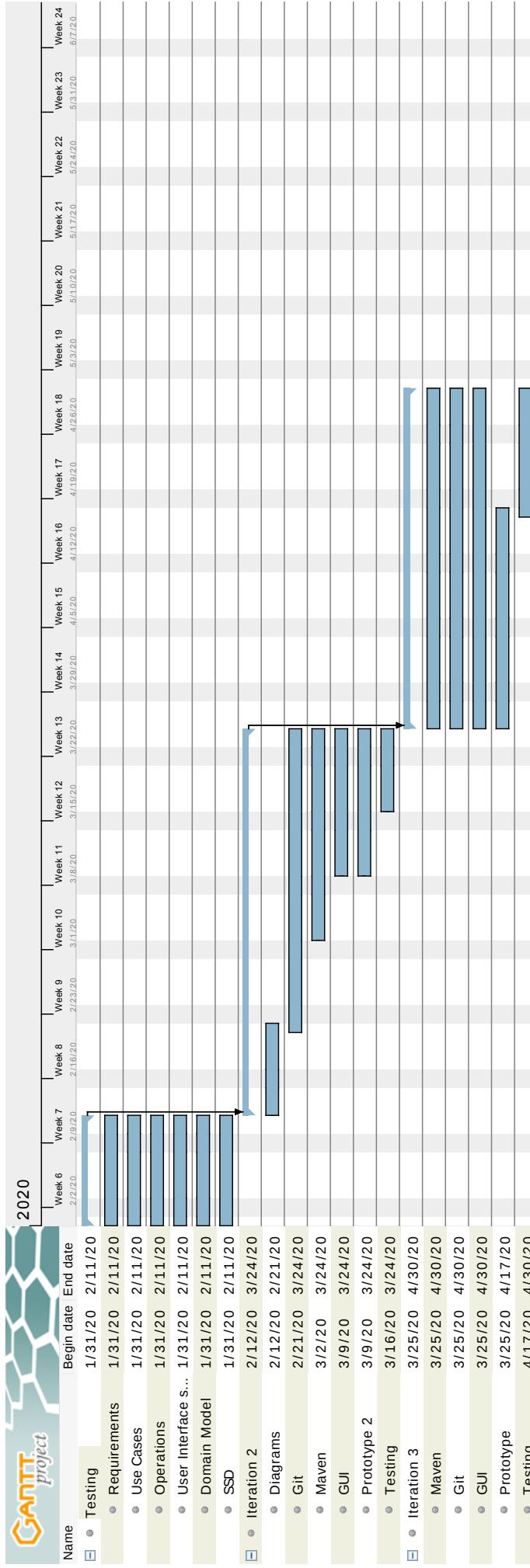
CShare

Resources

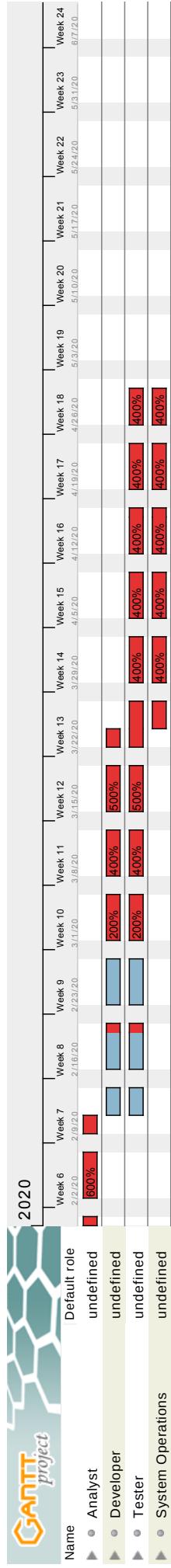
| Name | Default role |
|-------------------|--------------|
| Analyst | undefined |
| Developer | undefined |
| Tester | undefined |
| System Operations | undefined |

Feb 9, 2020
3

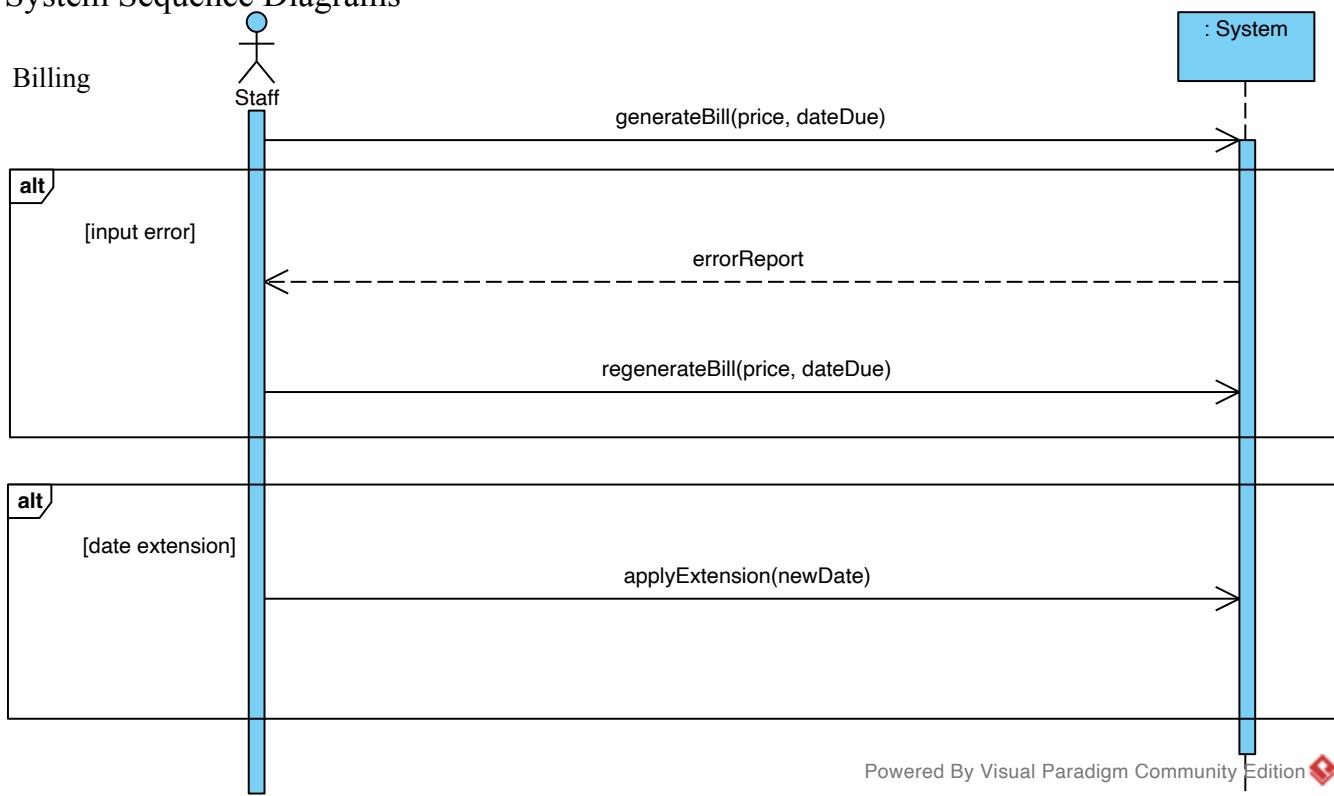
Gantt Chart



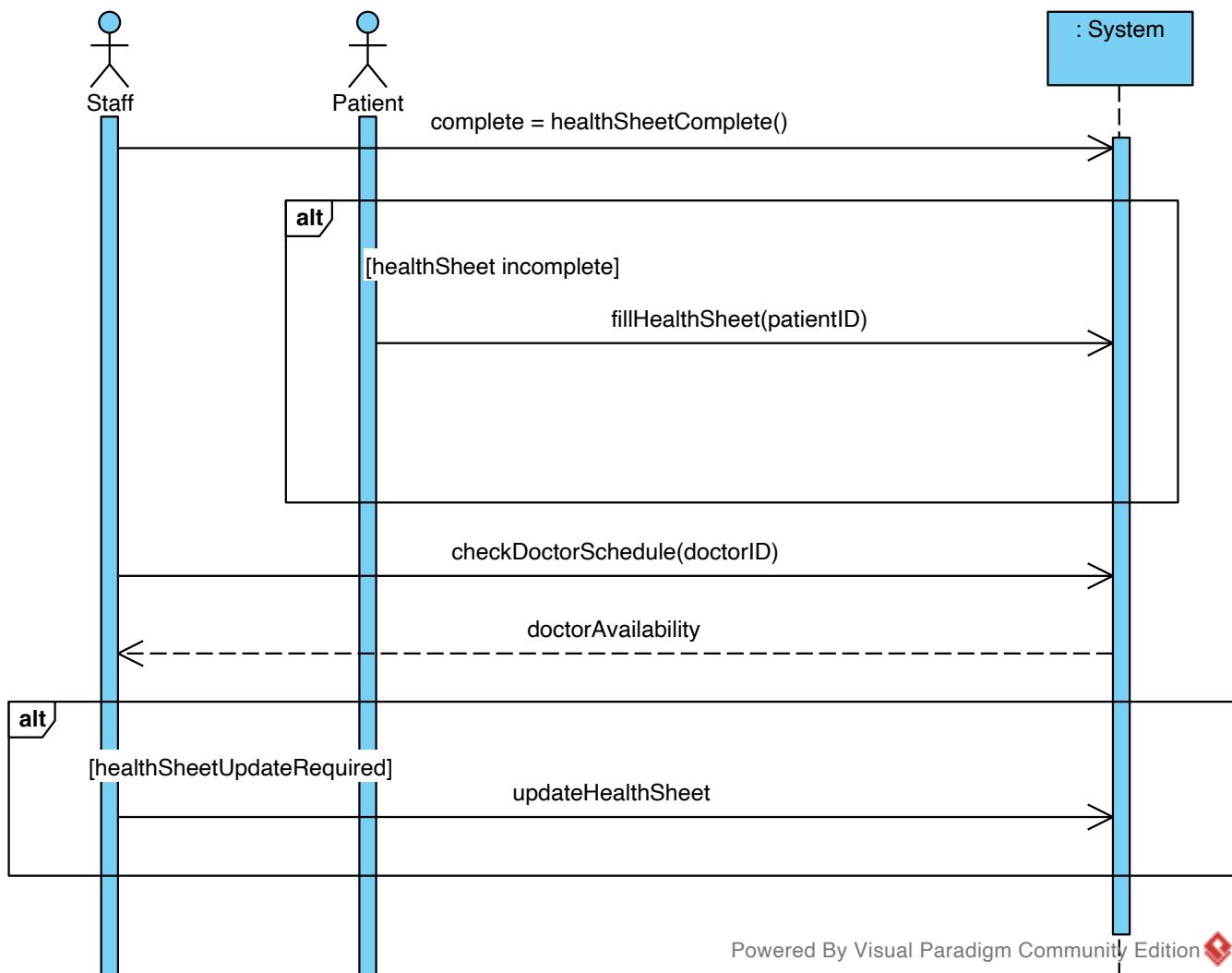
Resources Chart



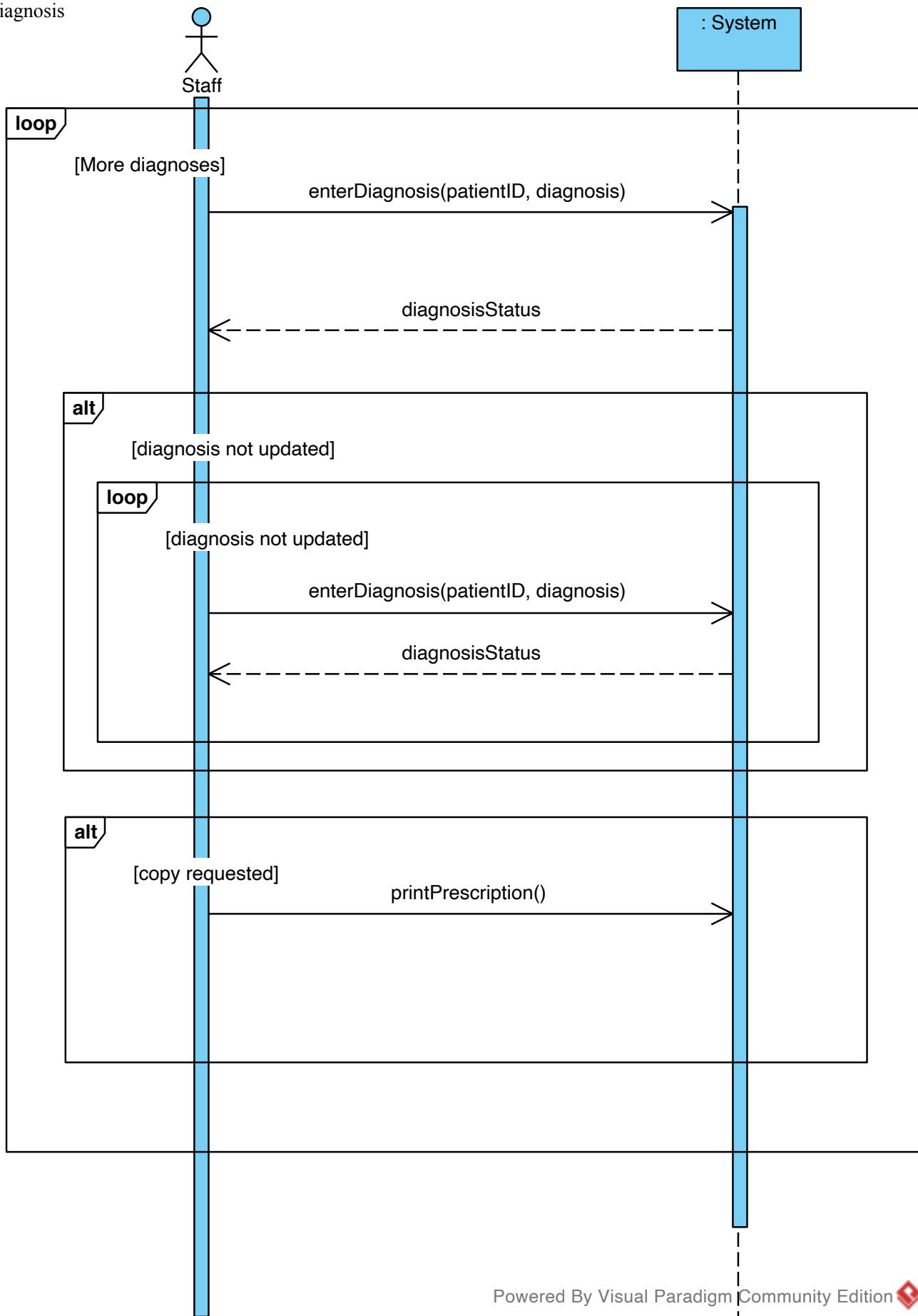
System Sequence Diagrams



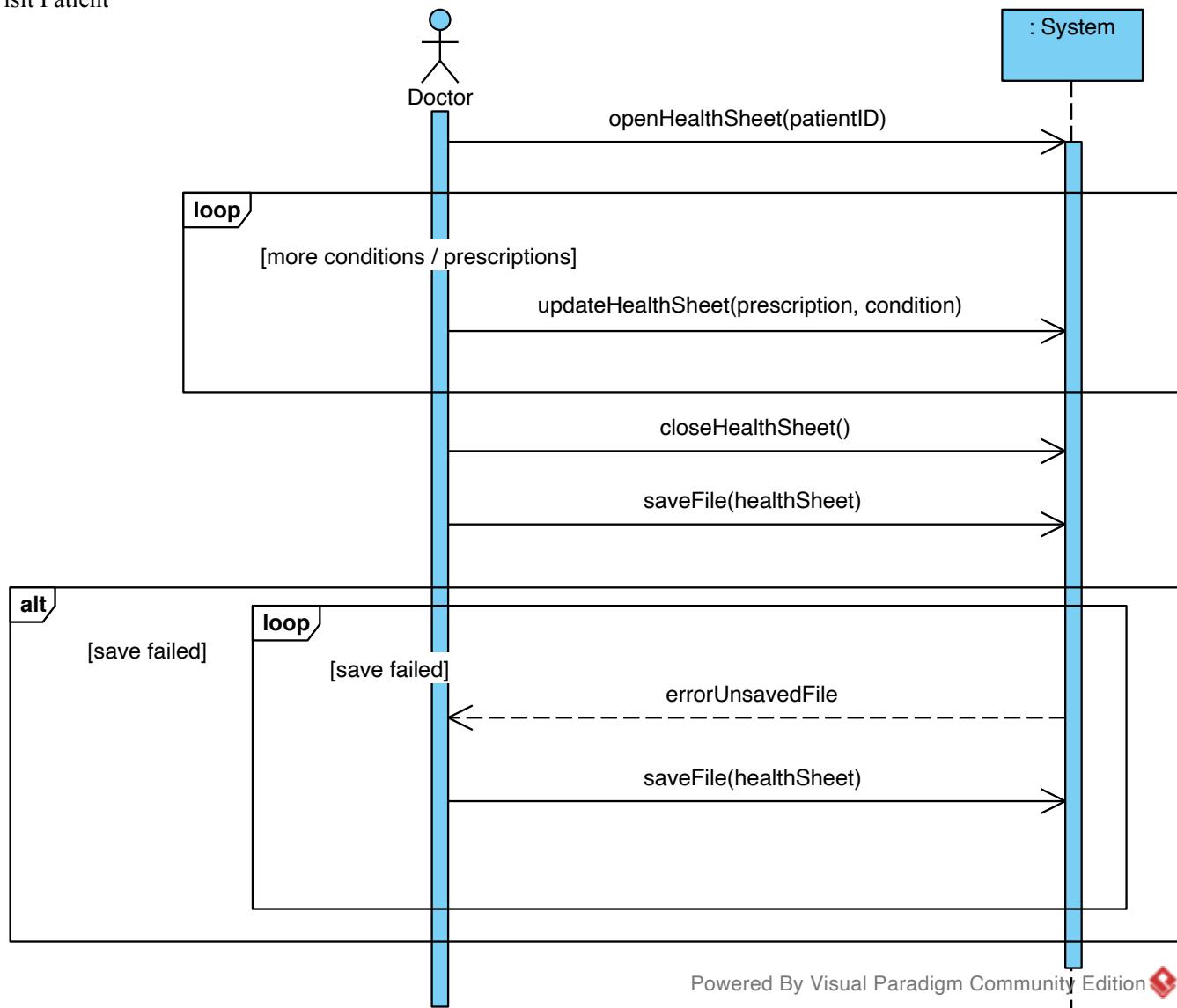
Initial Visit



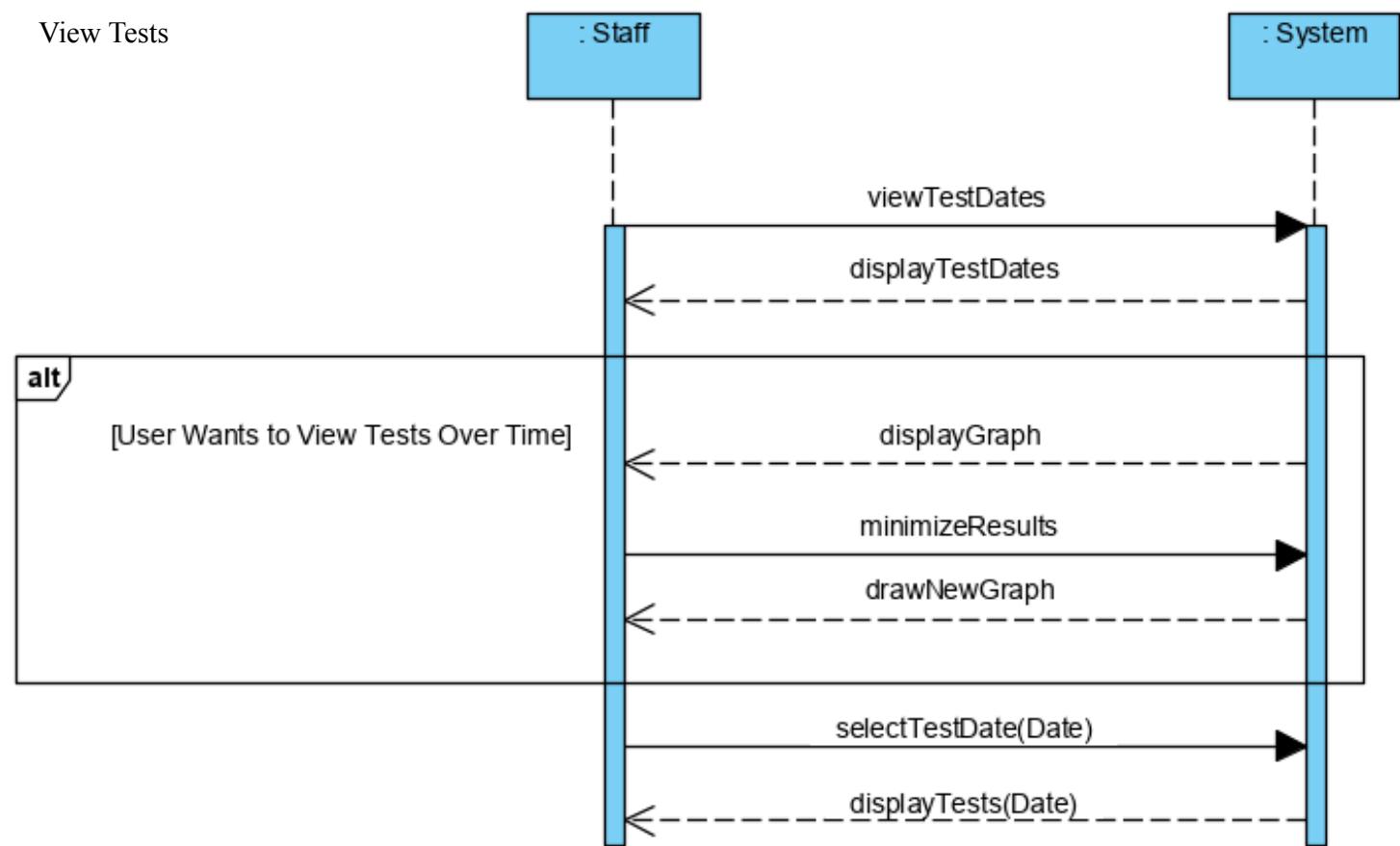
Diagnosis



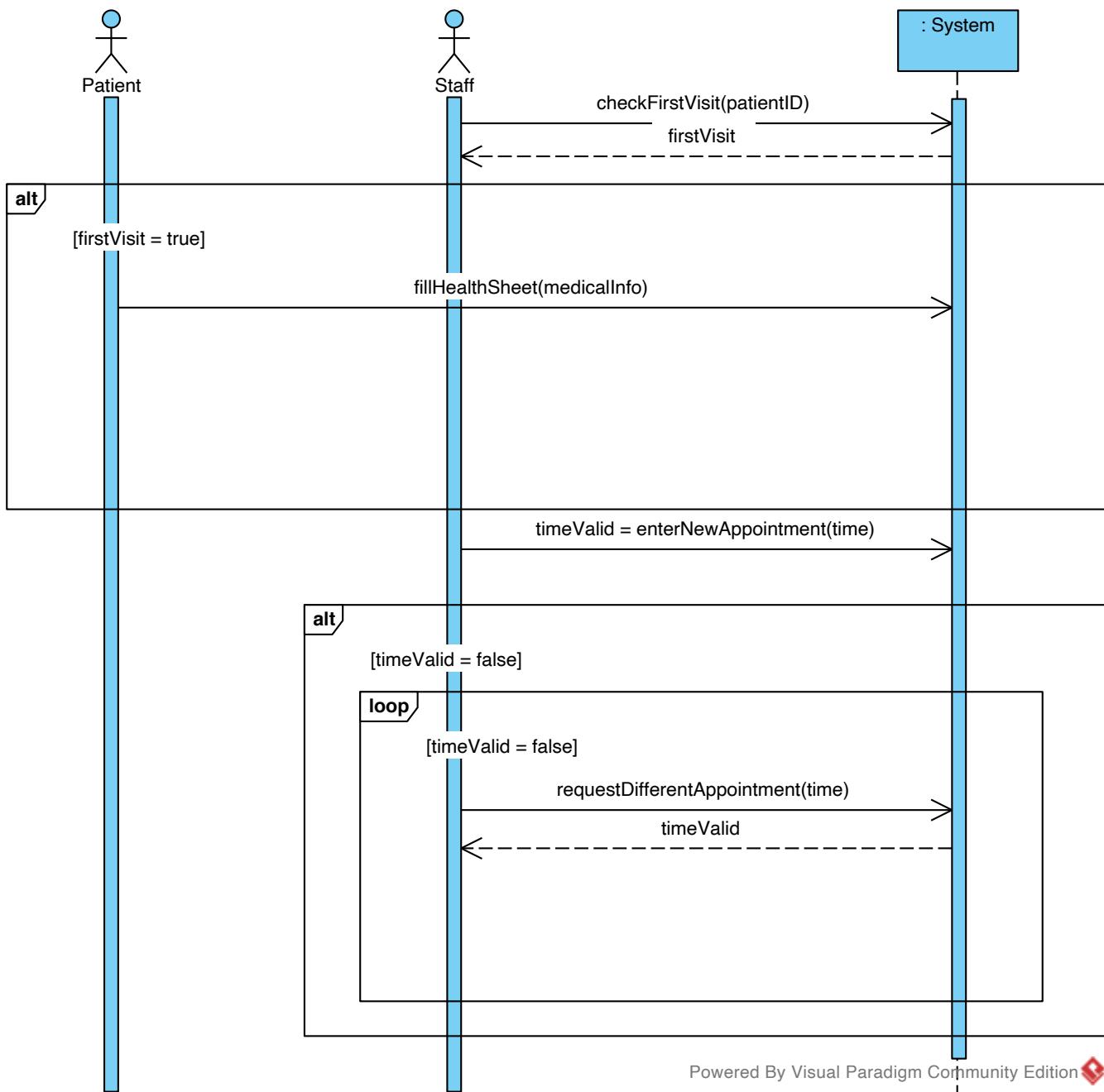
Visit Patient



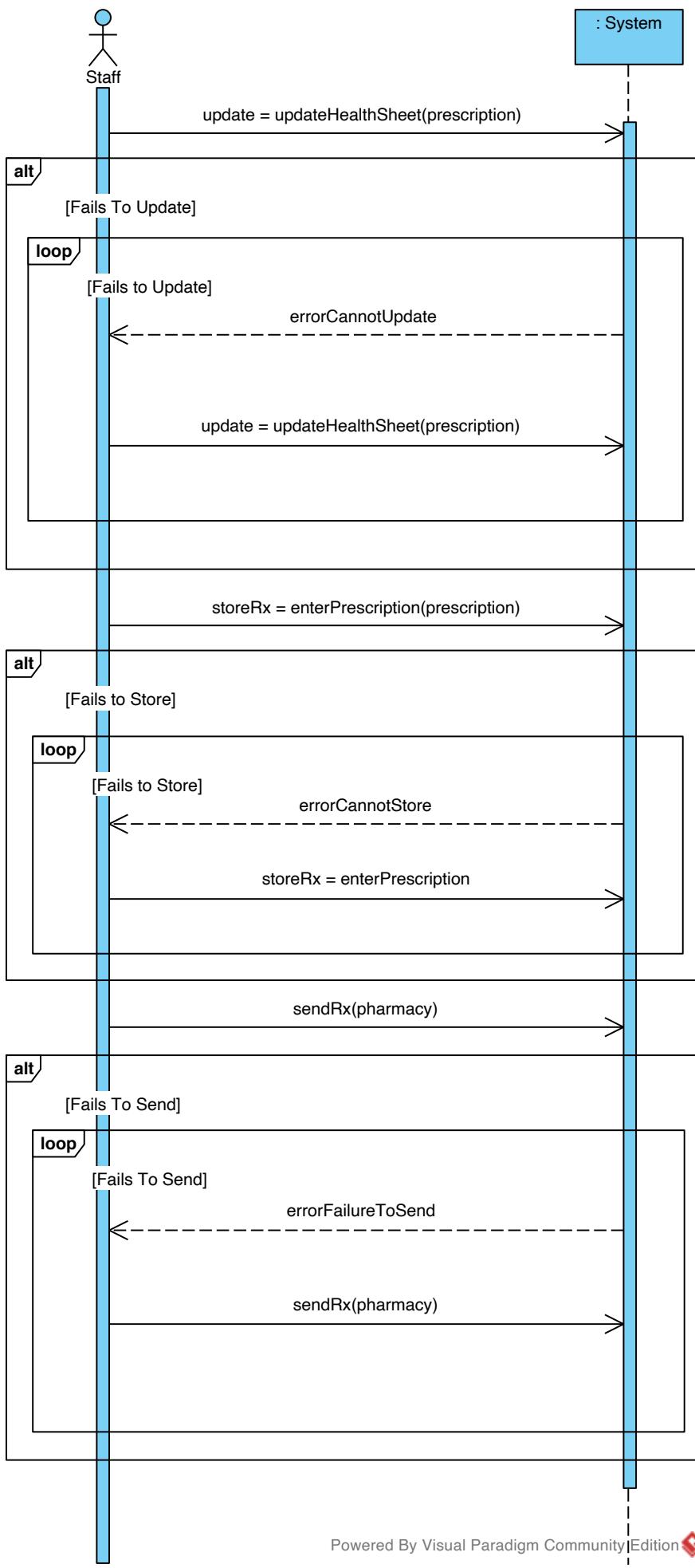
View Tests



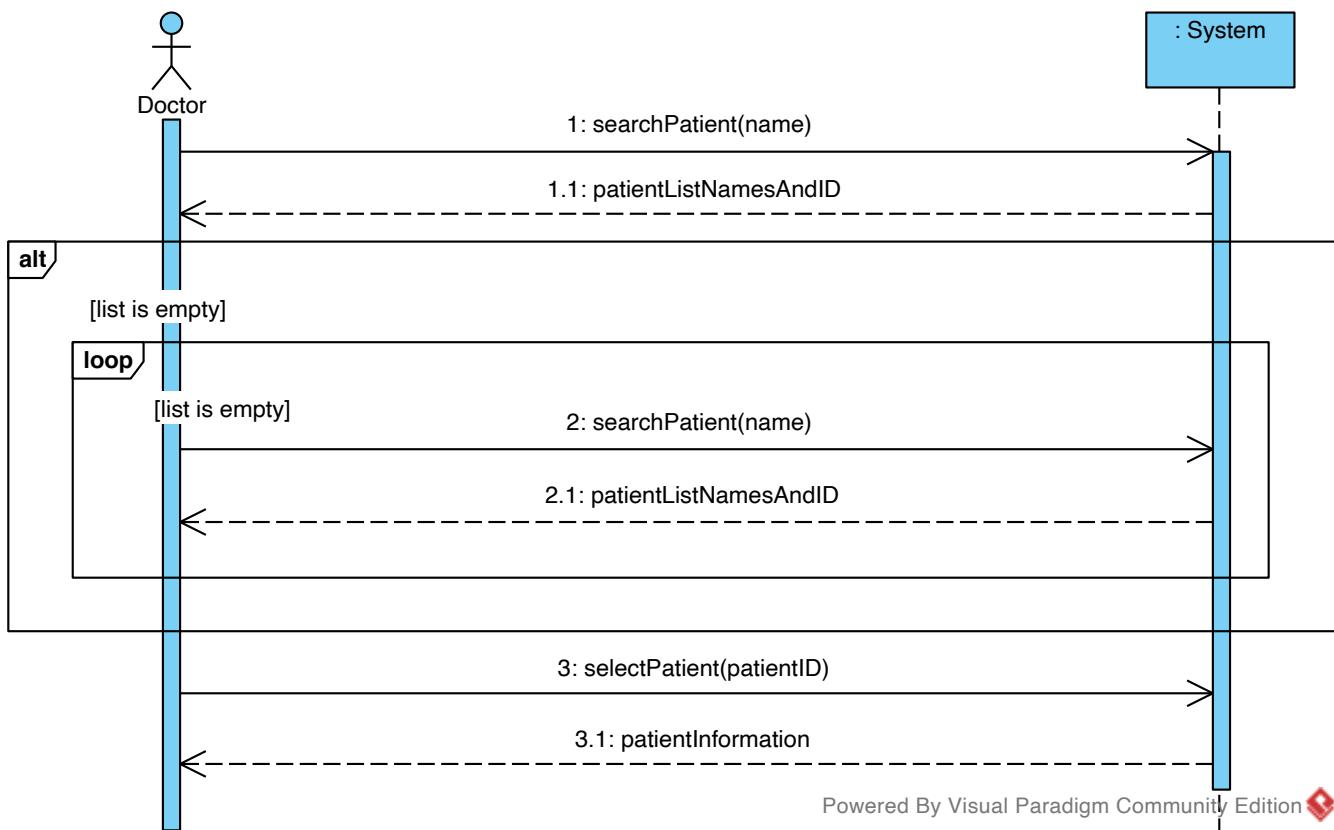
Schedule Patient



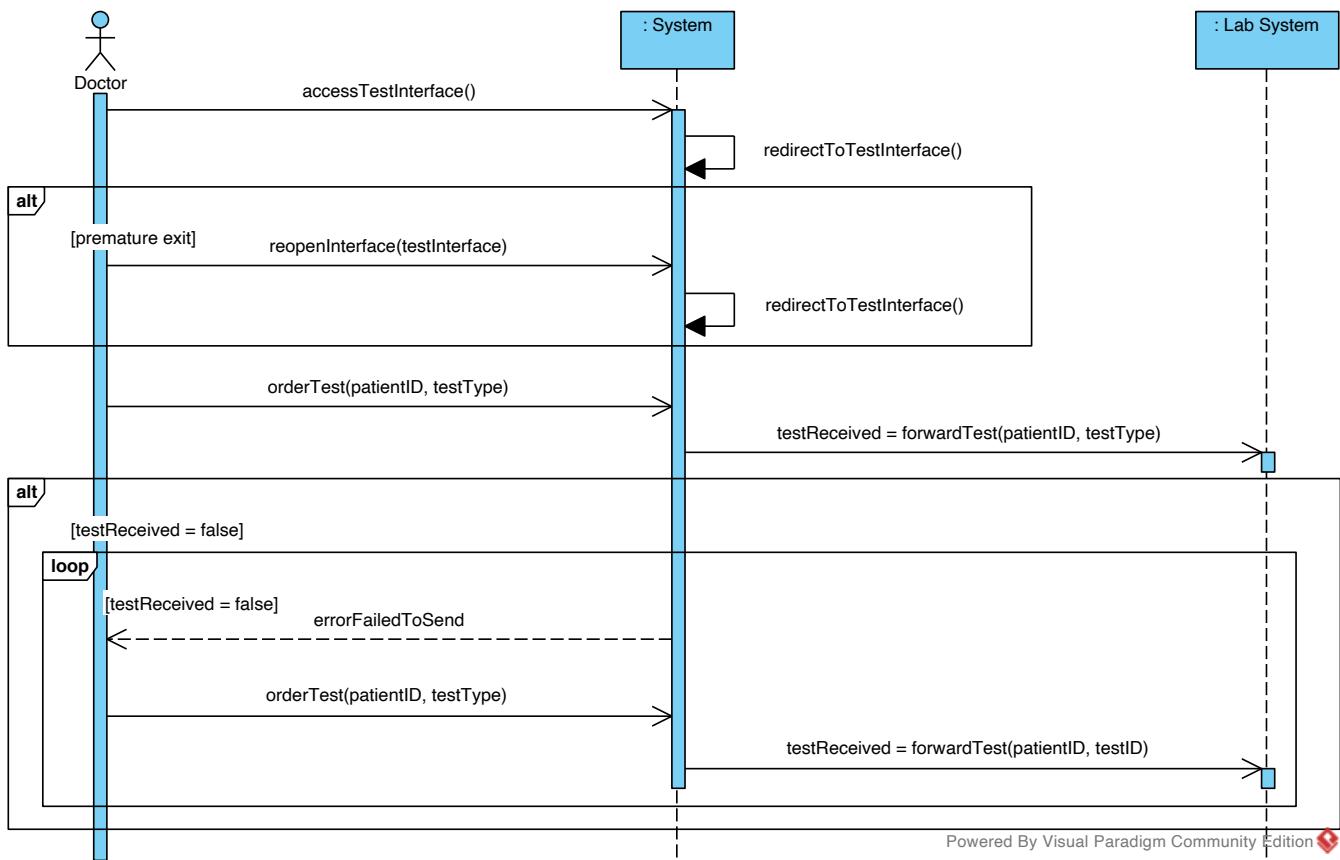
Patient Prescribe



Patient Lookup

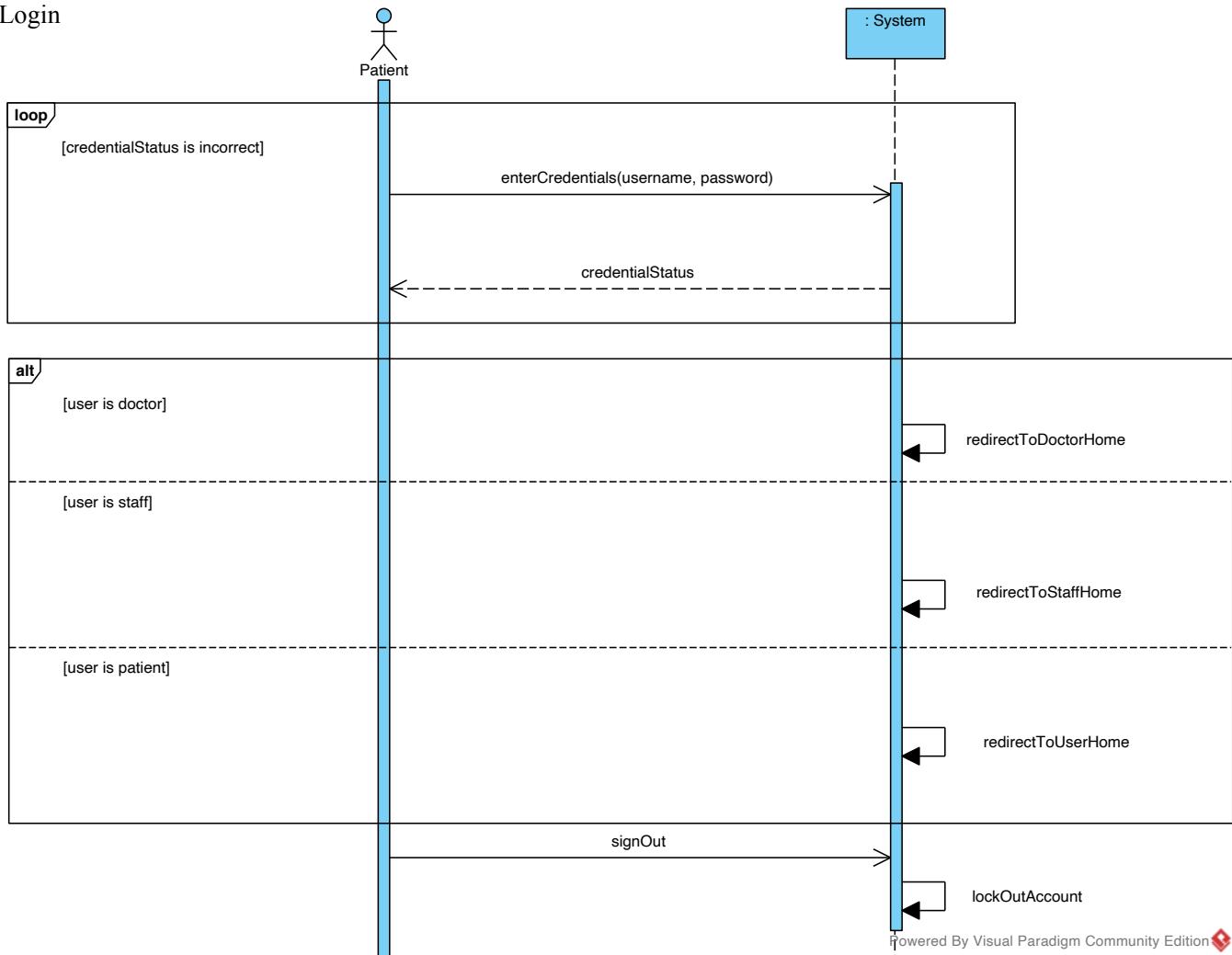


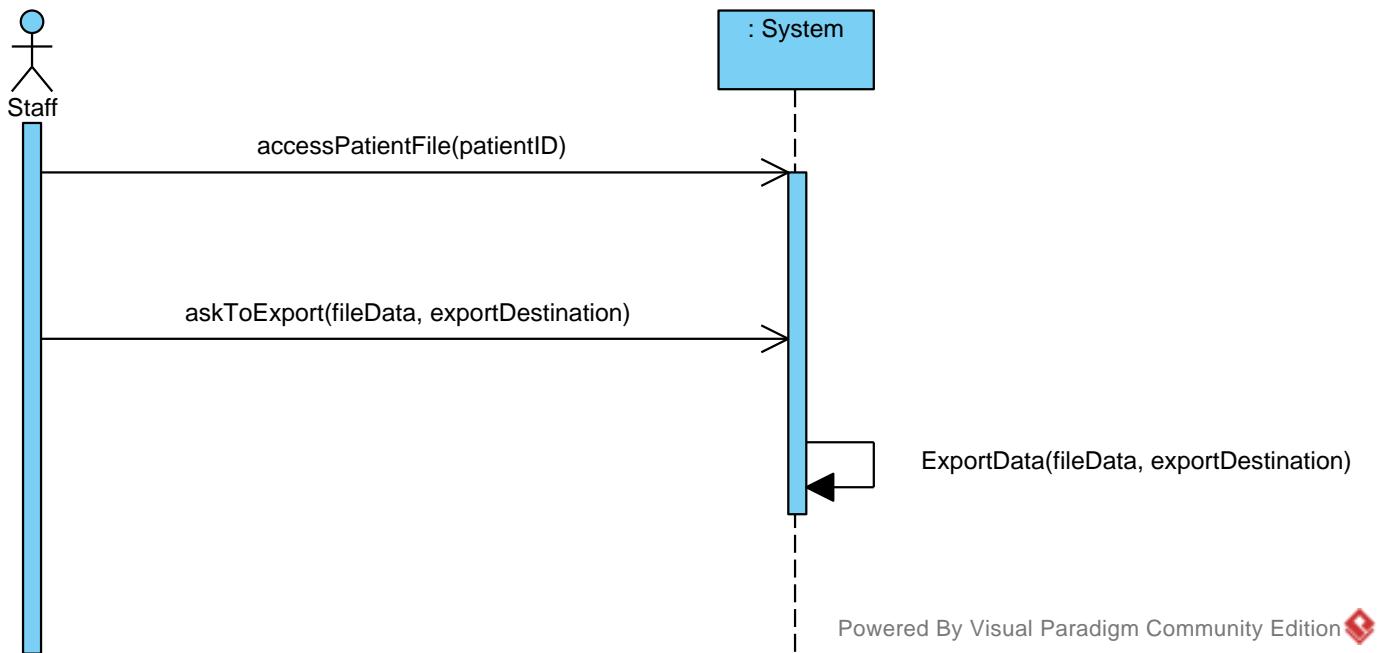
Order Tests

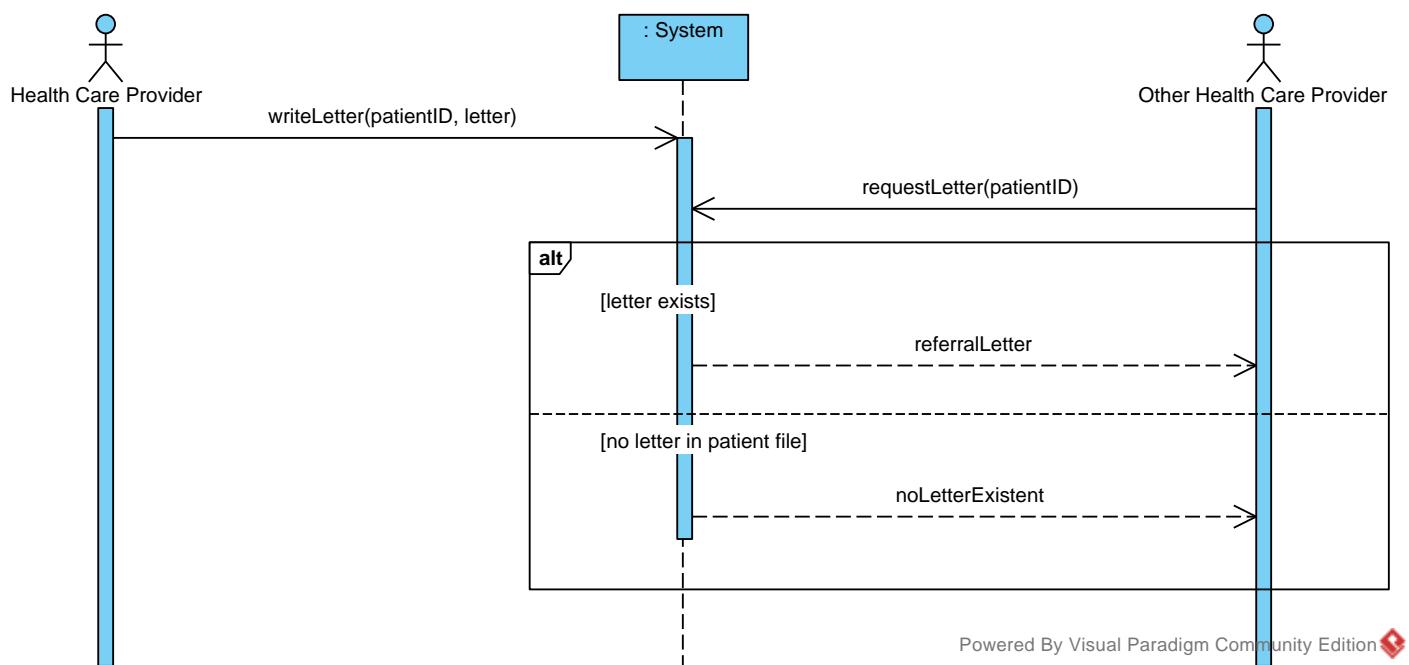


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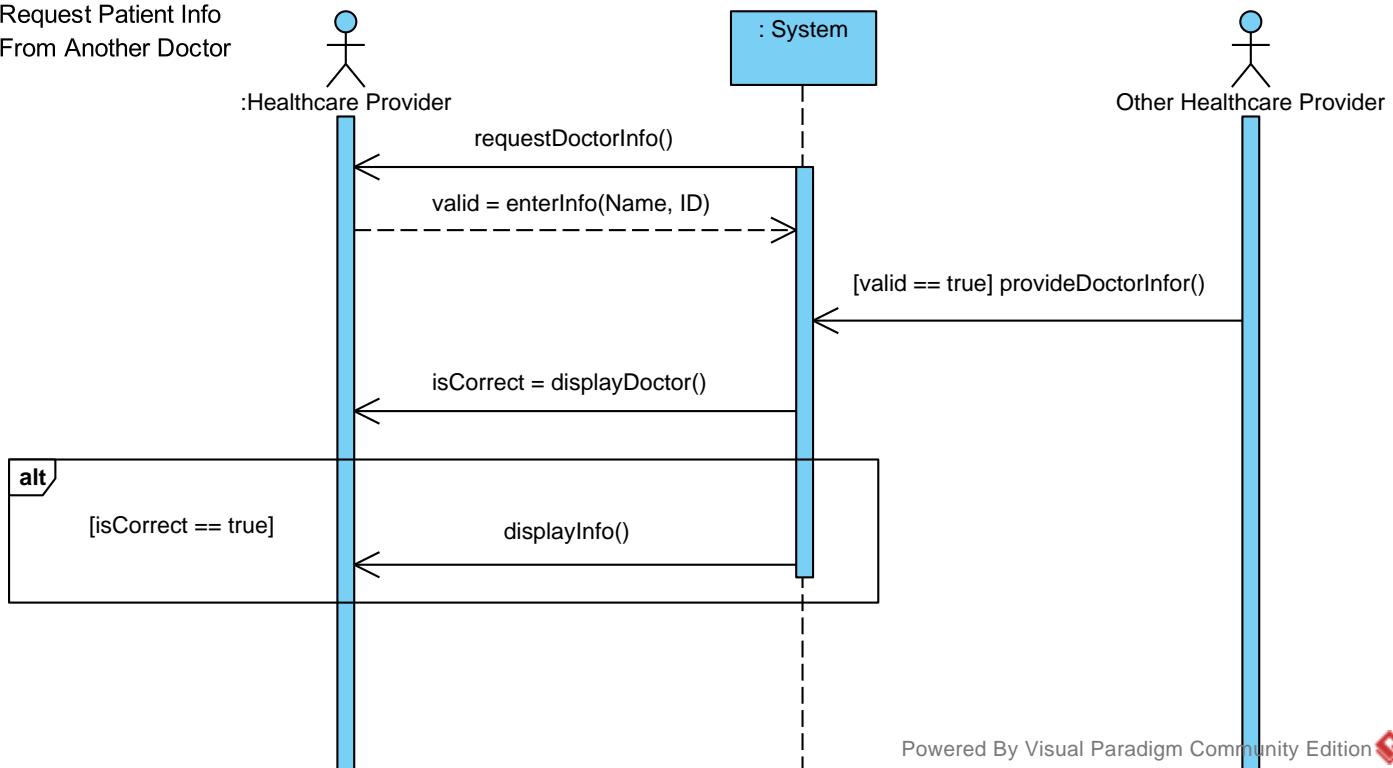
Login



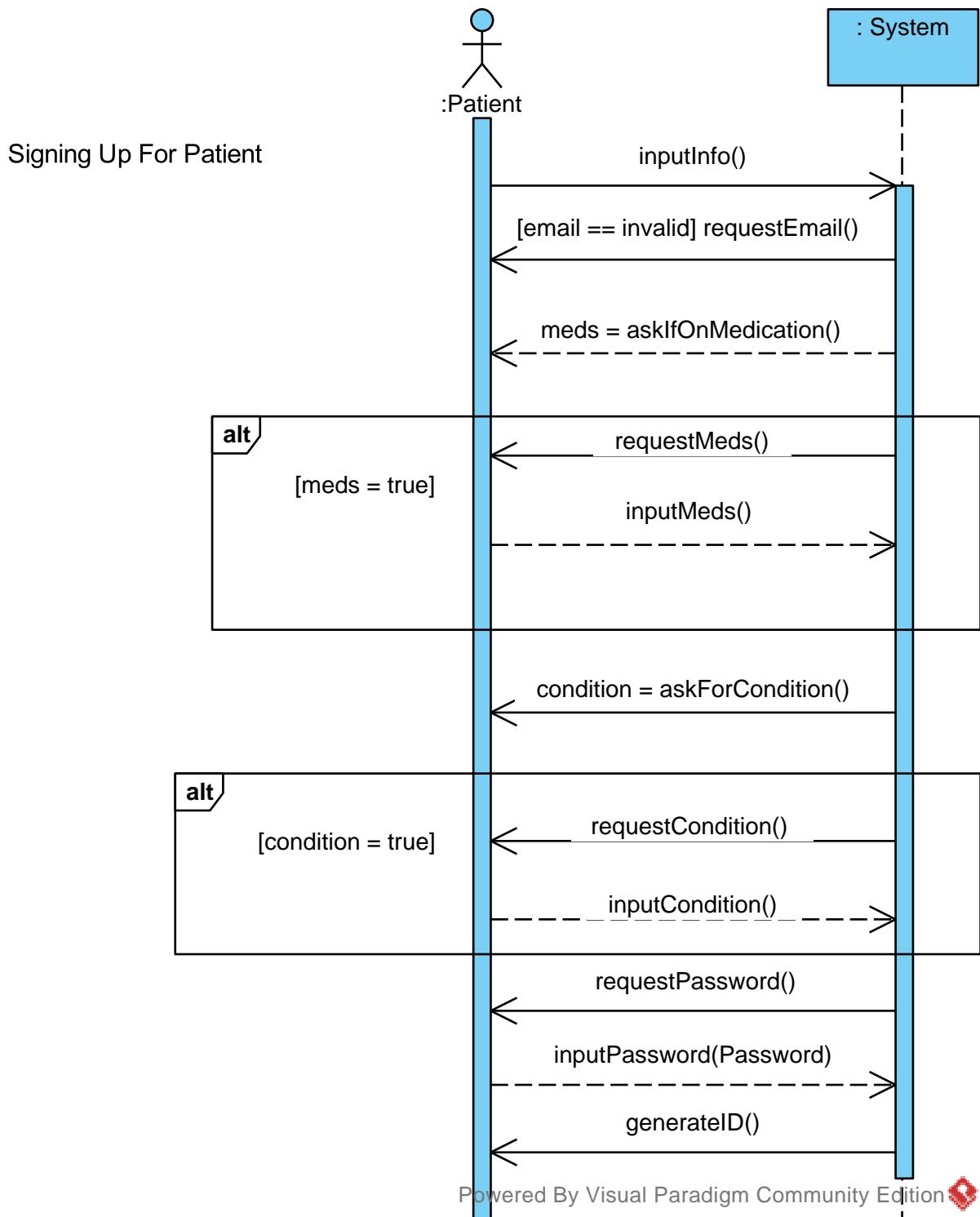




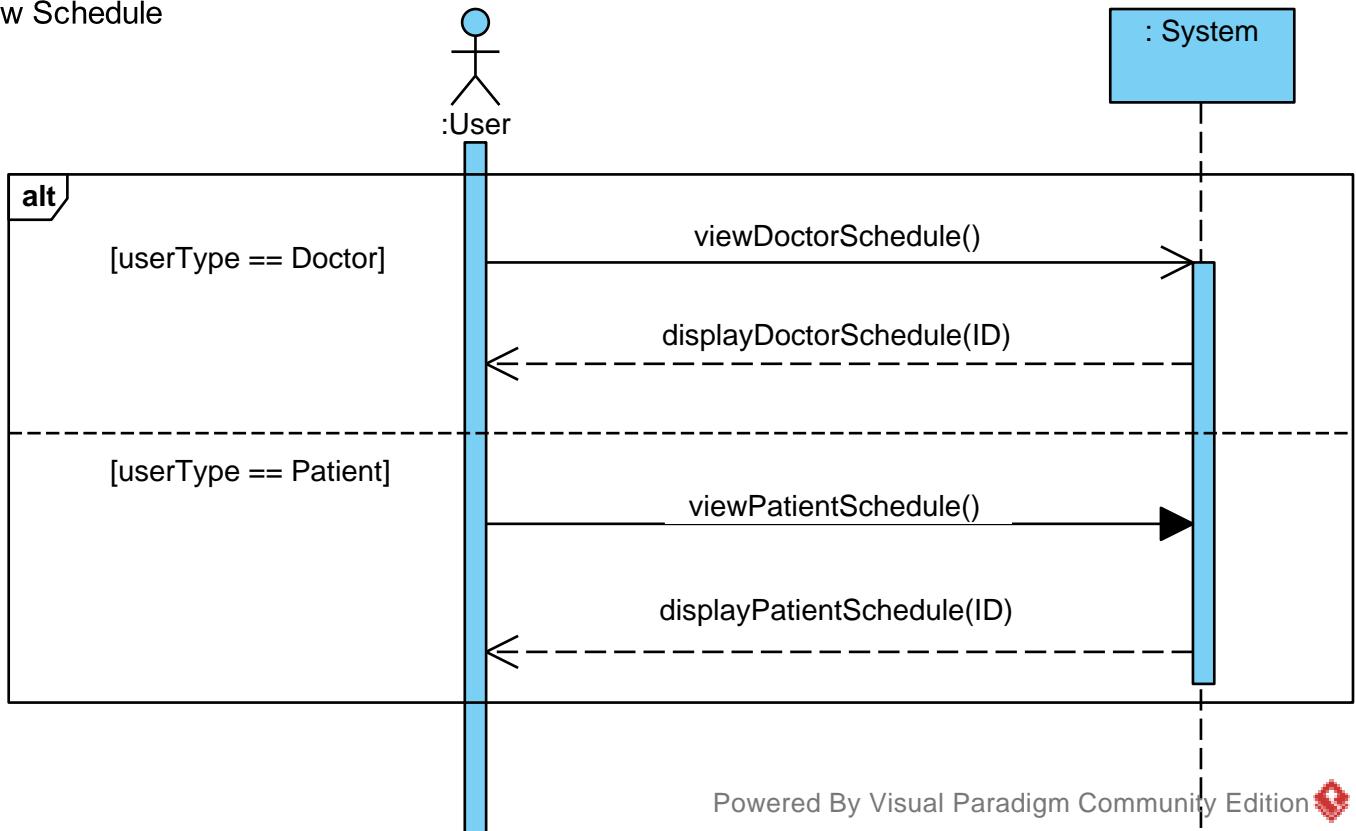
Request Patient Info
From Another Doctor

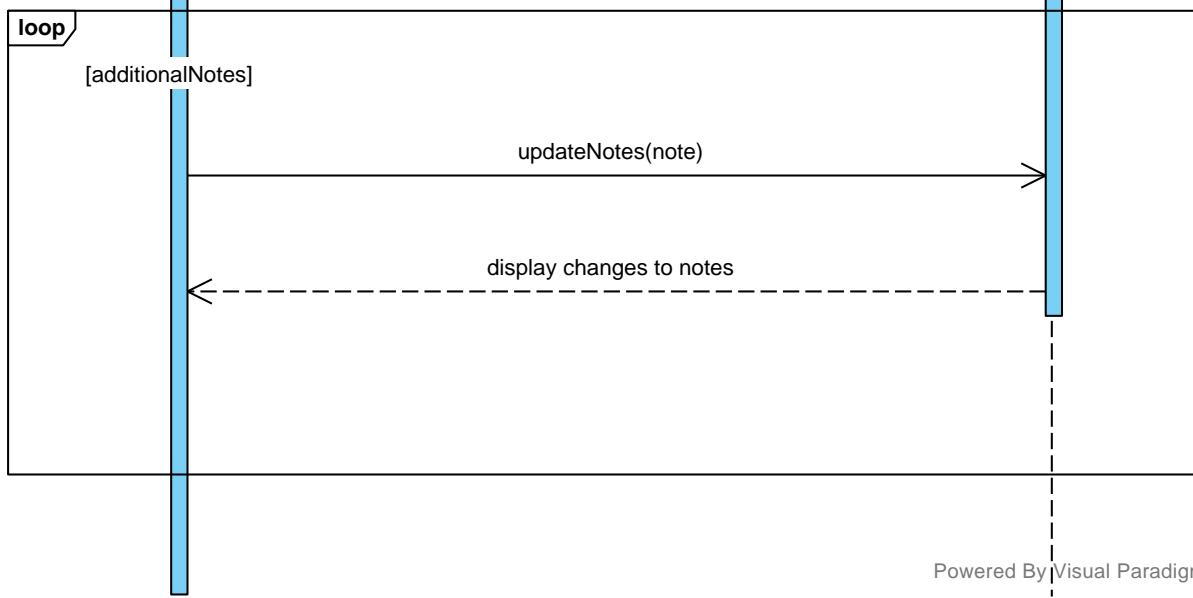
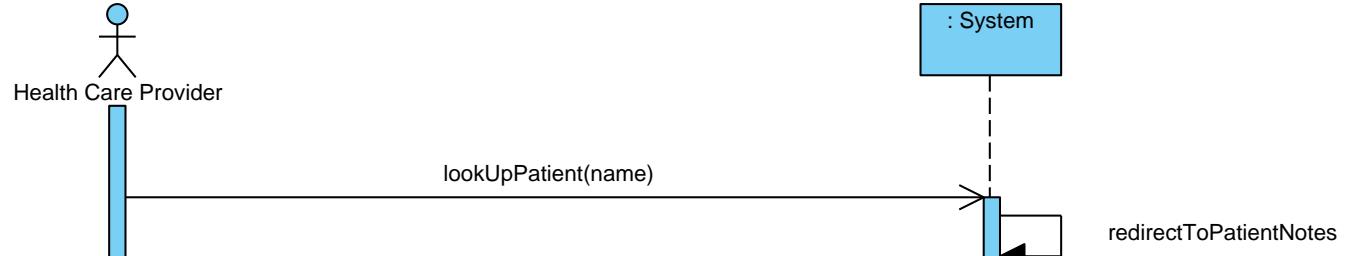


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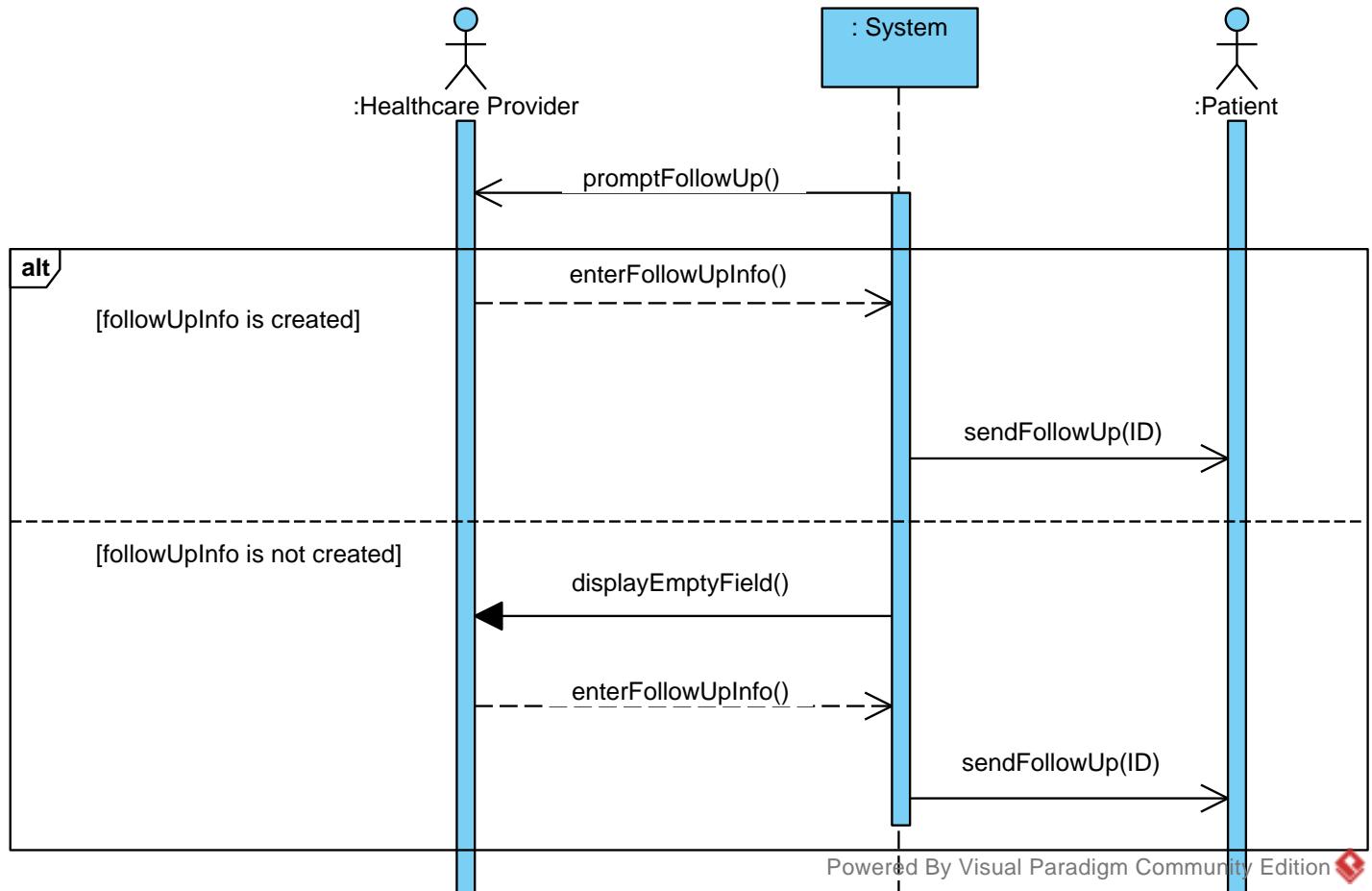
View Schedule

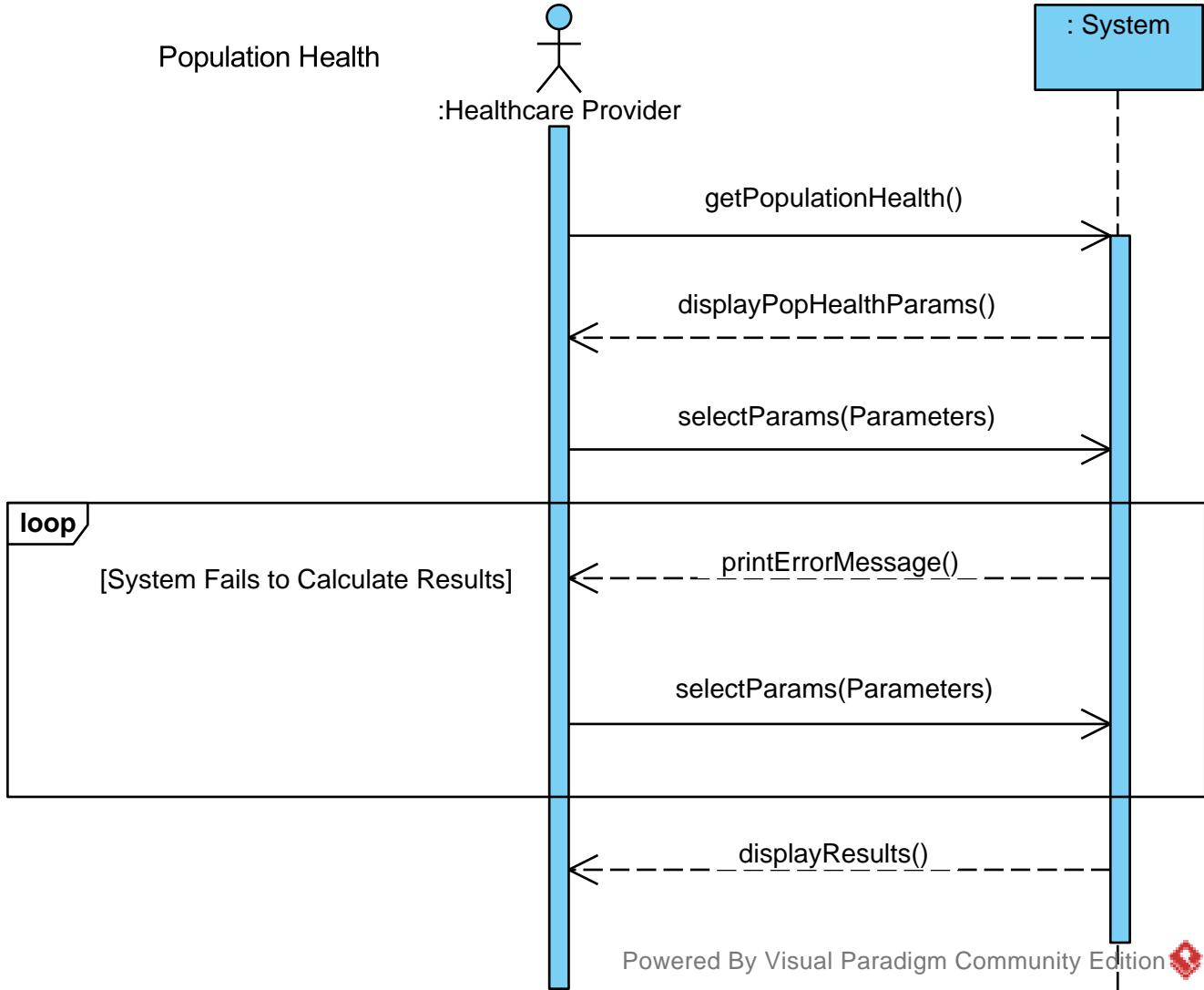




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Patient Followup





4 Glossary

EHR. Electronic Health Record System. A system that assists **health care providers** organize **patient** information, correctly assign **insurance codes** for health care billing, and manages a **medical practice's** schedule.

Health care provider. A person or group of individuals who deliver a **health care service** to a **patient**. May comprise of **doctors** and **staff**.

Health care service. A service in which a **patient** receives some attention toward a specific ailment or medical problem from a **health care provider**.

Patient. A person who is suffering from some specific ailment or medical problem and seeks medical attention.

Doctor. A healthcare provider who specifically treats a **patient's** ailment or medical problem. Works as part of a **medical practice**.

Staff. Auxiliary health care professionals who assist **doctor's** treat a **patients** ailment or medical problem. Main responsibilities include assigning **insurance codes** for health care billing. Works as part of a **medical practice**.

Medical practice. A group of healthcare providers.

Insurance codes. A code corresponding to a specific ailment or medical problem used for medical billing purposes with medical insurance companies.

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