

# **Pressure Perfect Monitoring System**

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## **Abstract**

In an attempt to bring commercial blood pressure monitors up to speed with current technology, we wish to design a monitoring system that will wirelessly connect patients with their healthcare professionals. PPMS (Pressure Perfect Monitoring System) will not only provide patients with hypertension a means of tracking their blood pressure on a day-to-day basis, but it will also allow them instant communication and information sharing with their physicians, pharmacists, and nutritionists. Patients will be able to track their daily blood pressure, access and comment on their daily diet and exercise plan, and view their medication information and comment on side effects they are experiencing. Medical professionals will be able to upload this information to their office or home computers and perform daily patient check-ups without requiring a patient visit . Also, urgent information (I.e. drug recalls, prescription changes, etc), which requires the immediate attention of the patient and the patient's medical network, will now be shared instantaneously via PPMS. This system, by no means, will replace the annual/semi-annual face-to-face check-ups between a patient and their medical professionals; however, it is designed to augment and facilitate medical communication between all parties involved in monitoring the health of a patient, patient included, on a continuous basis.

## **Background**

Living with hypertension requires a change in lifestyle. Blood pressure must be monitored daily, and reading must be taken at the same time each day. Blood pressure readings must be recorded on a day-to-day basis in order to track progress. Patients with hypertension are usually prescribed medication. There are several different brand name medications currently available, and new medications require close monitoring. One drug might be good for one patient and not for another. Some patients go through several trial periods with medications in an attempt to find one that works for them.. During these trial periods, it is important to not only be monitoring the effects of the drug on the patients blood pressure, but also the effects of the drug on the patient's health. Since one of the main causes of hypertension is high cholesterol (high cholesterol leads to arteriosclerosis, which causes a narrowing of the blood vessels, restricting blood flow, and therefore increasing the pressure within them), physicians, or nutritionists, usually mandate that the patient adhere to a new diet and exercise regime. With new changes in eating and exercise habits, patients must be monitored in order to make sure the changes do not cause an excessive strain on the body. Also, patients may be required to monitor their daily calorie intake, as well as tracking their physical activities. These lifestyle changes can be overwhelming for a patient. Since it is not conducive to visit with medical professionals on a daily basis to discuss progress and concerns about this new lifestyle, using PPMS will help alleviate patient concerns and help facilitate easier monitoring by medical professionals.

## Methods

This new system will have separate interfaces for the patient, physician, pharmacist, and nutritionist. The patient will be able to download their daily blood pressure readings from their digital in-home blood pressure monitor or enter them manually. PPMS will store this information in a database in order to facilitate easy viewing (for the patient) and easy uploading (for the physician). Information about their prescriptions, provided by the pharmacist, will be accessible through PPMS. The patient will also be able to access their diet and exercise plan, provided by the nutritionist, and keep track of their day-to-day calorie intake and physical activities electronically. Patients will also have the opportunity to communicate directly to their health professionals via the “message center”.

The physician, pharmacist, and nutritionist will have their own separate (but similar) interface. Each healthcare professional will be able to send and receive messages to each other and/or the patient (with the option of sending messages on “alert” status-for those messages that need immediate reading). The PPMS interface for the medical professionals will allow them to access their patients database and download and upload information. This will help them keep track of their patient's progress, and also provide them with a means of sharing pertinent information with their patients instantaneously.

## Results

The following results represent a top-down design of the PPMS vision. Here is an analysis of the necessary classes involved in creating such a system.

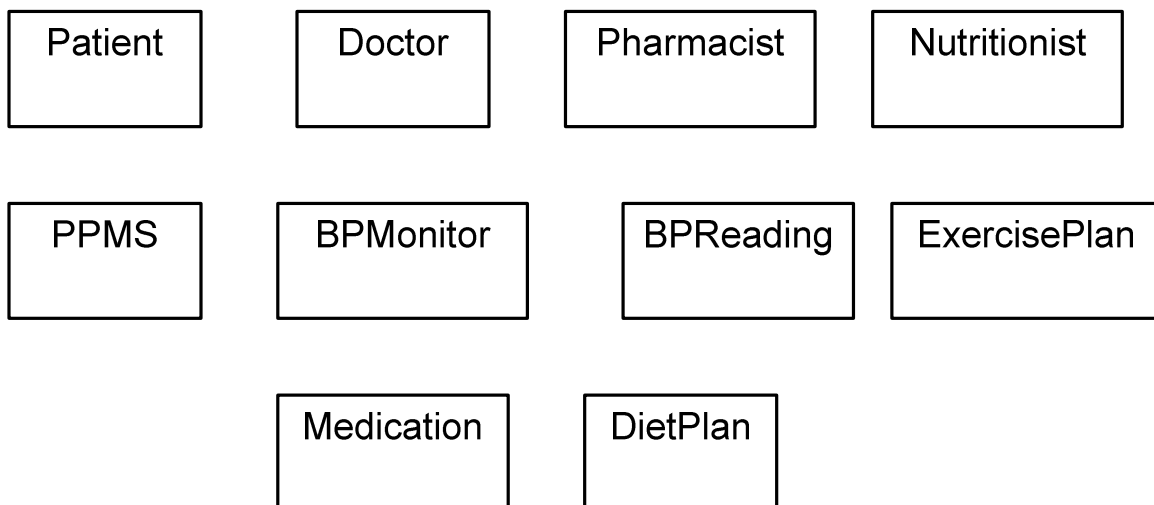


Fig 1: Classes for the PPMS System

These individual classes relate to each other (form associations with each other) in very specific ways. The patient class relates to every other class. Although one of the goals of PPMS is to facilitate communication between patients and the medical world, it is important that PPMS focuses on the needs of the patient. The patient is going to be ultimately responsible for keeping track of their own progress; therefore, we have geared PPMS to be a system which primarily assists the patient's needs. For this reason, the patient class will associate with every other class.

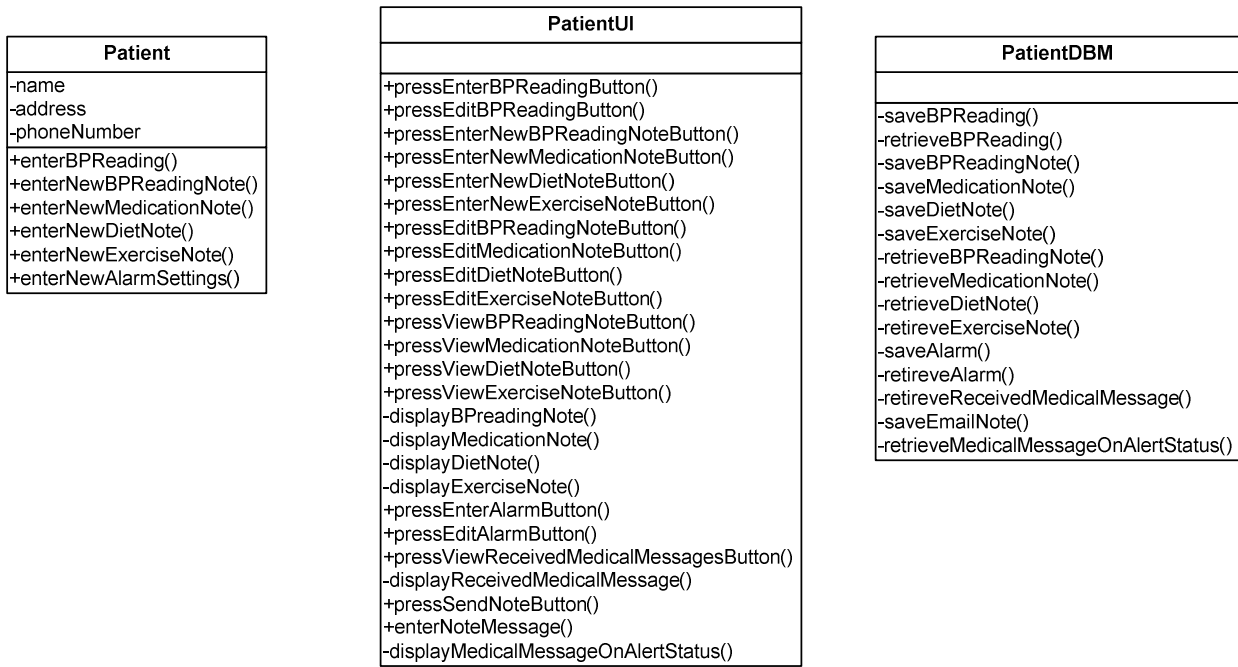


Fig 2: The Patient Class

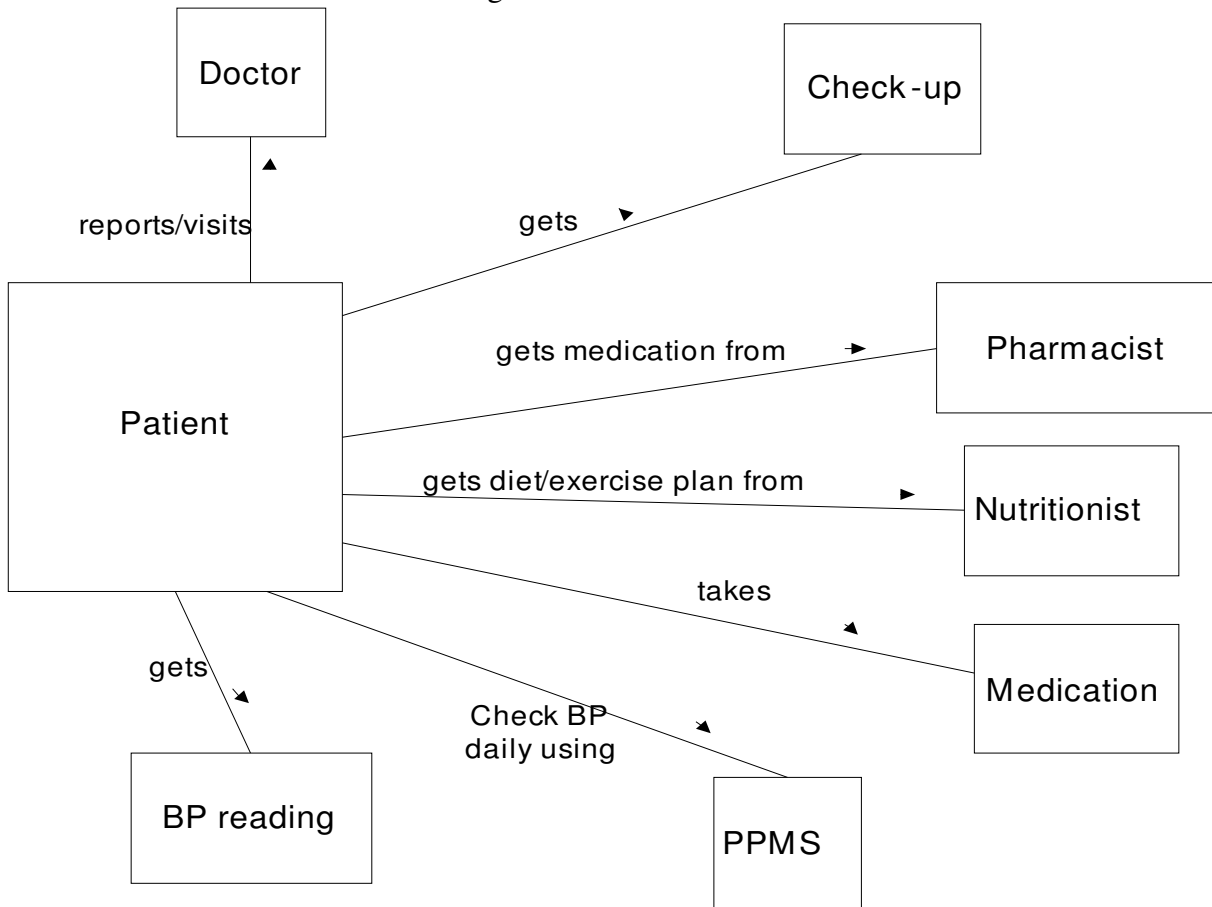


Fig 3: Patient Class and it's Associations

Also, other class associations need to be considered. A plan is comprised of a diet plan and an exercise plan. When considering the medication class, we need to also consider the negative effects and the side effects. Also, since we are allowing a wired download from the in-home electrical blood pressure monitoring device, PPMS and this device also have an association.

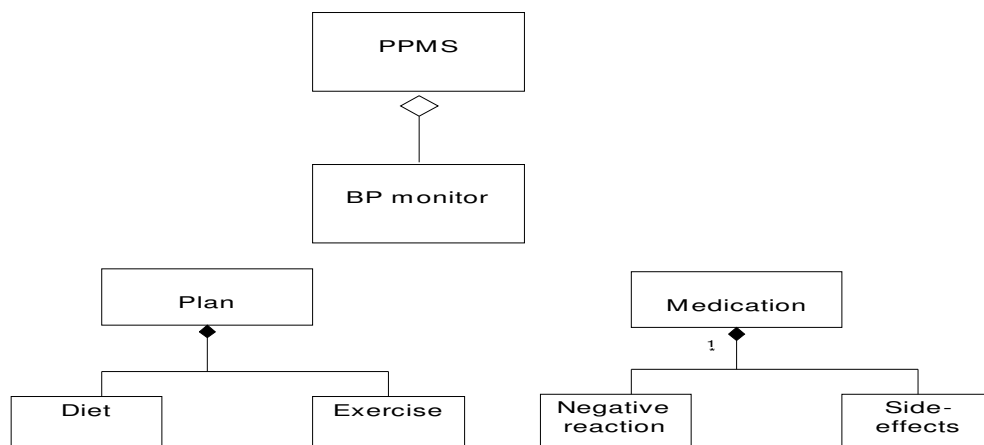


Fig 4: Class Associations

There are three main medical professionals that PPMS will target: the physician, the pharmacist and the nutritionist. Together, they all play an integral role in the patient's wellbeing, and they are all part of the abstract class, Medical Professional, as shown below.

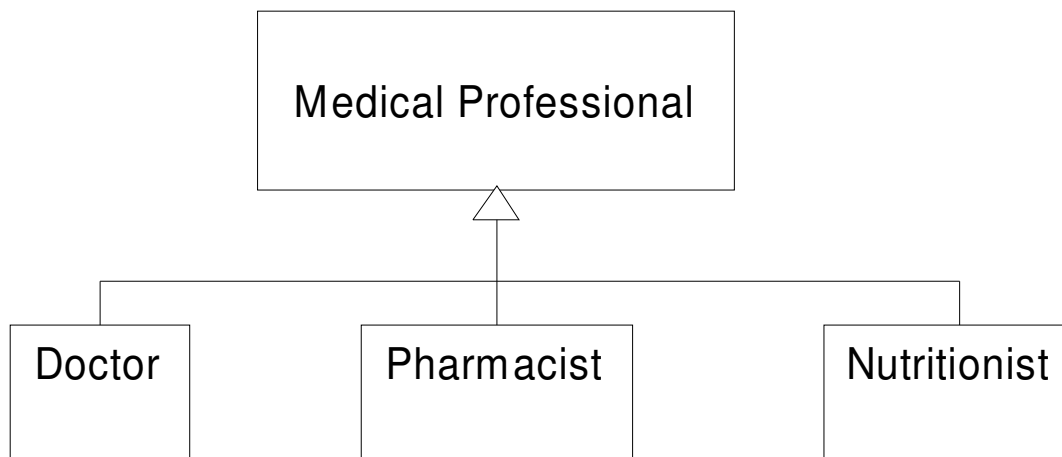


Fig 5: Medical Professional Abstract Class

There are several functions that each medical professional will inherit from its abstract class. Also, there are functions that will only be specific to that particular class. For clarification, please view the two figures below.

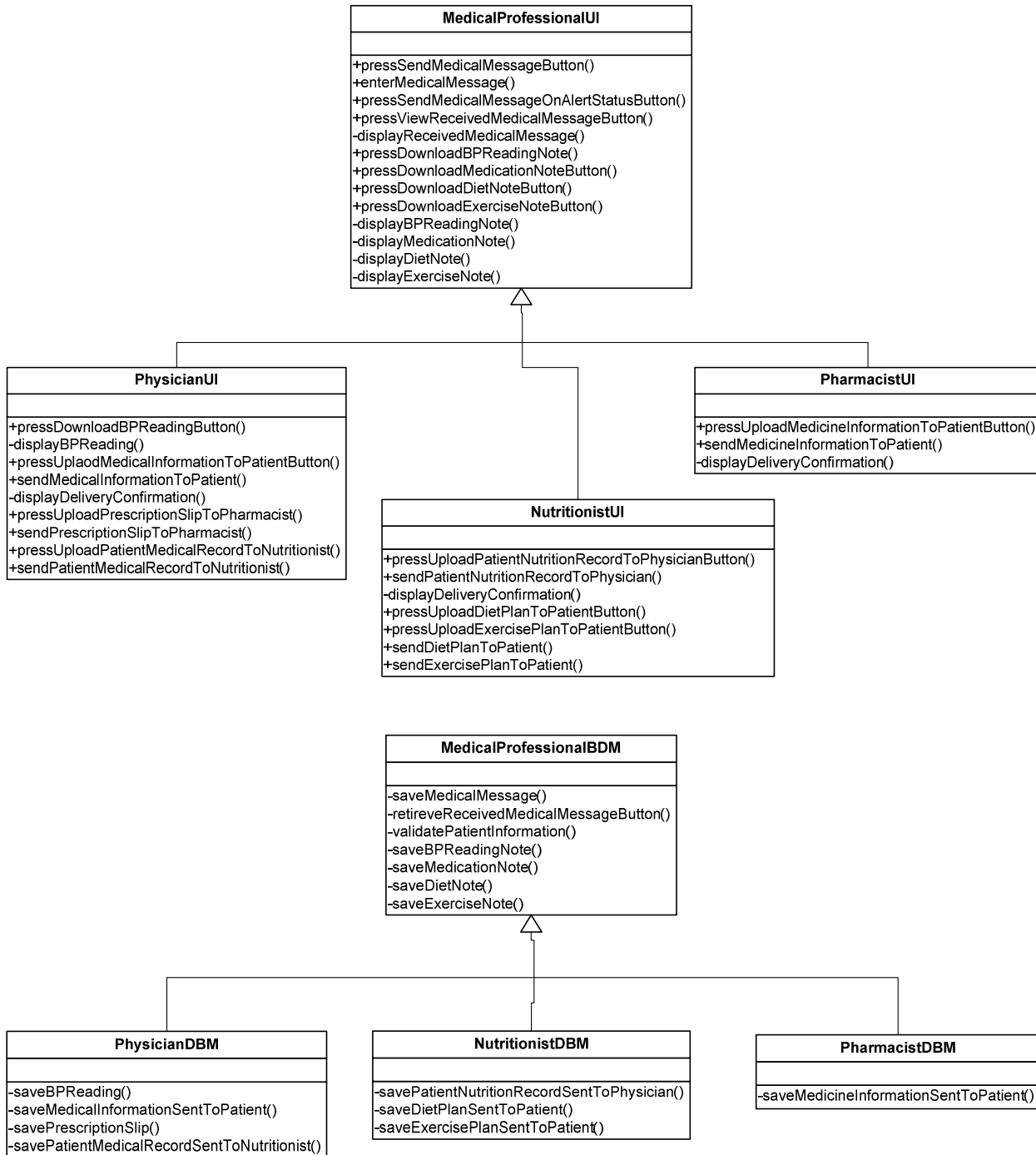


Fig 6: Medical Professional Abstract Class with Functions

Below is the Activity Diagram for the PPMS system and its six main actors. This helps visualize how the system will be used by each actor and how it will interact with each actor.

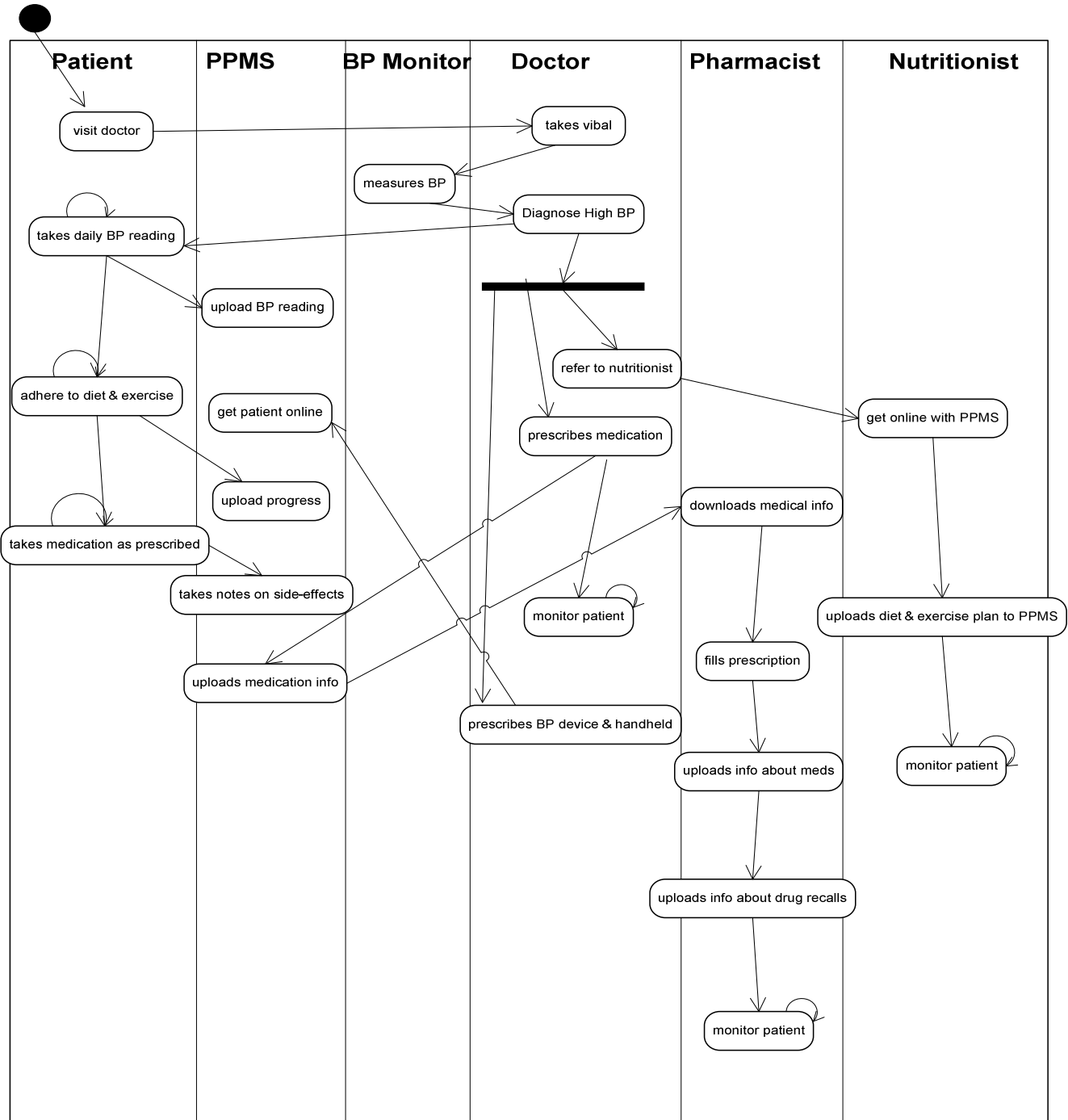


Fig 7: Activity Diagram

This activity diagram, along with the class association diagrams, helped provide us with a solid foundation in designing the PPMS system. This foundation allows us to move forward to developing use cases. Using the activity diagram, it is clearly visible how each actor will interact with the PPMS system. Although, from Figure 8, PPMS and the blood pressure monitor are derived as “actors”, they are not the users of the system and therefore will not have an interface.

There will be four main interfaces within PPMS: one for the patient, the physician, the pharmacist, and the nutritionist.

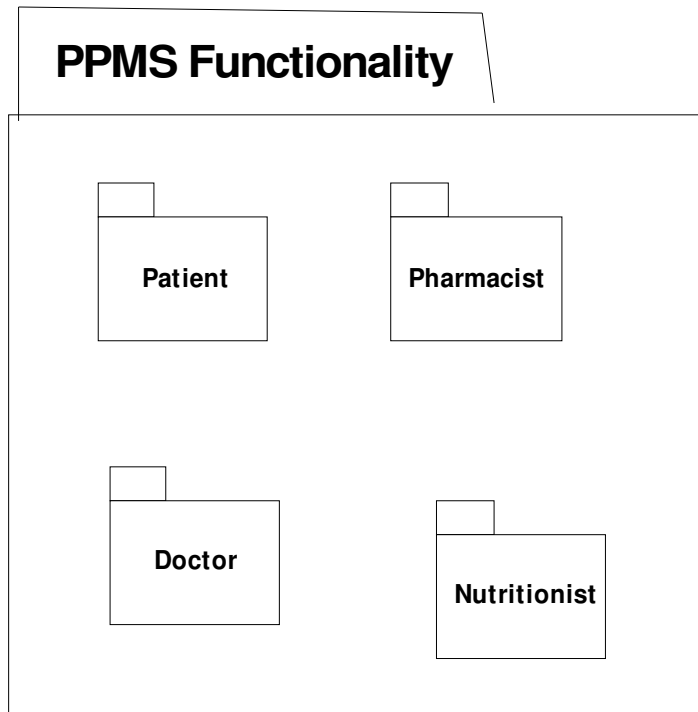


Fig 8: PPMS Package

Here is a closer look at each individual sub-packages within the PPMS package.

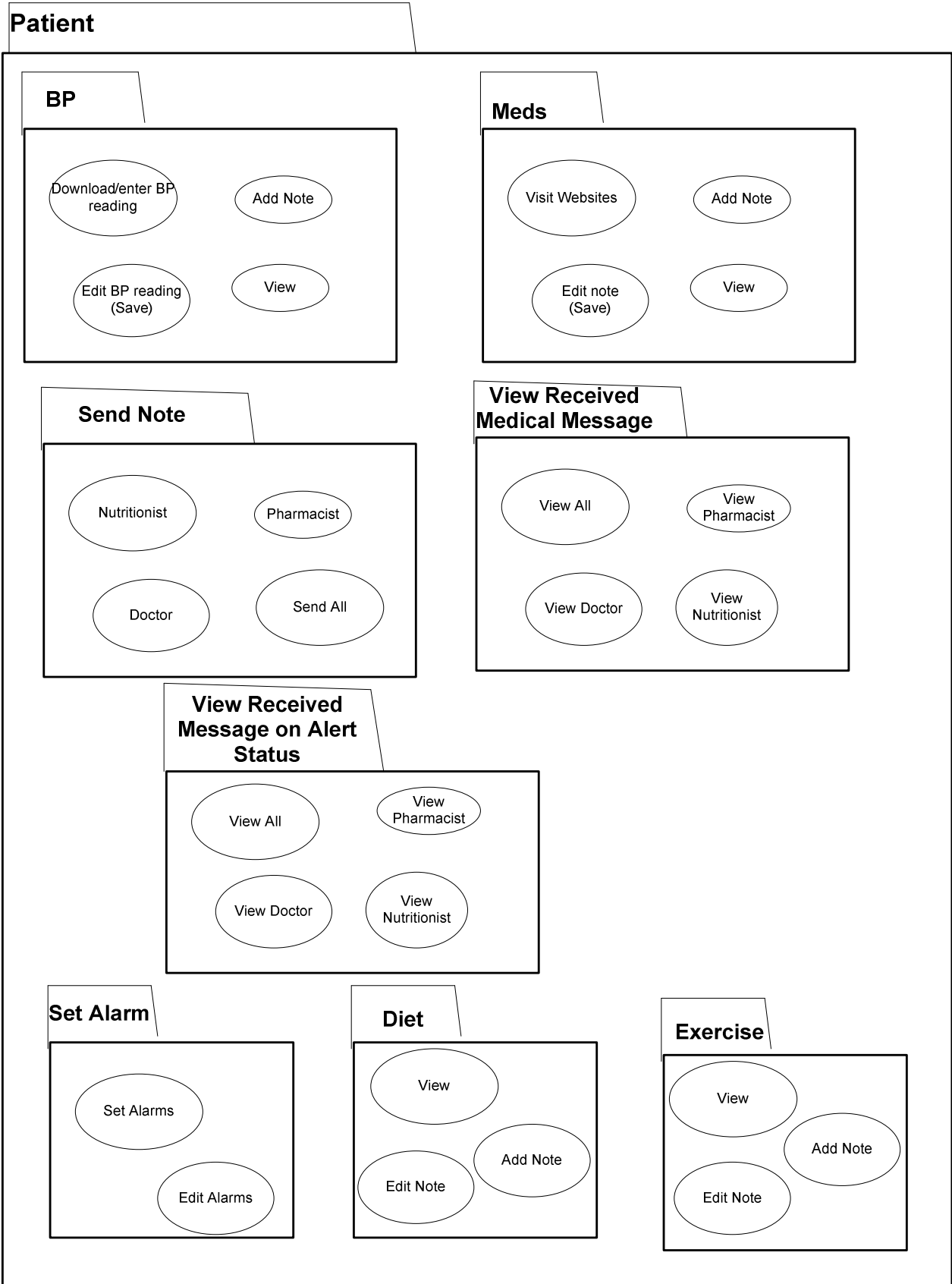


Fig 9: Patient Subpackage



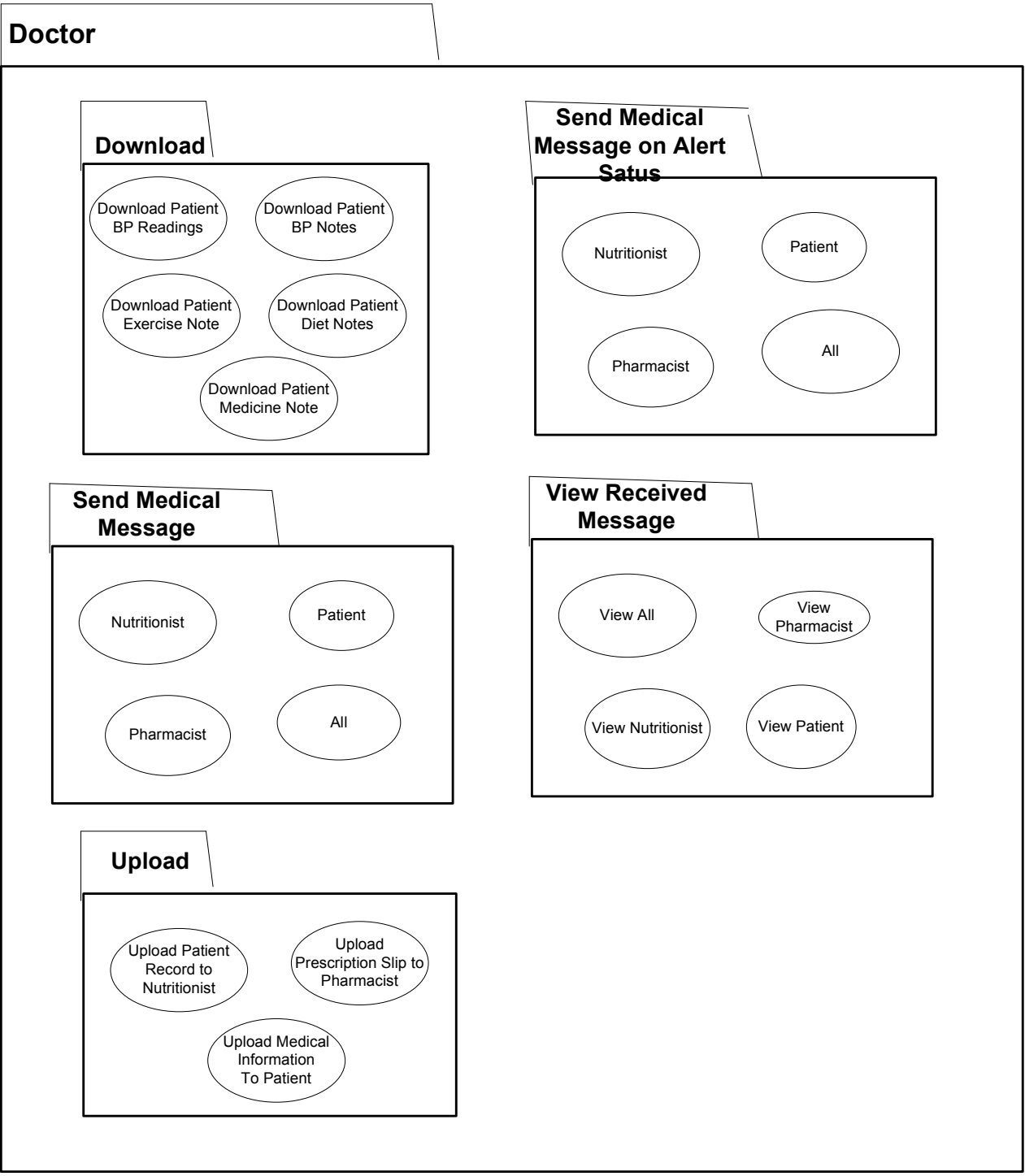


Fig 10: Physician Subpackage

# Pharmacist

### Download

Patient  
Medicine  
Note

### Send Medical Message on Alert Satus

Nutritionist      Patient

Doctor              All

### Send Medical Message

Nutritionist      Patient

Doctor              All

### View Received Message

View All              View  
Pharmacist

View Doctor          View Patient

### Upload

Pateint Medicine  
Information

Fig 11: Pharmacist Subpackage

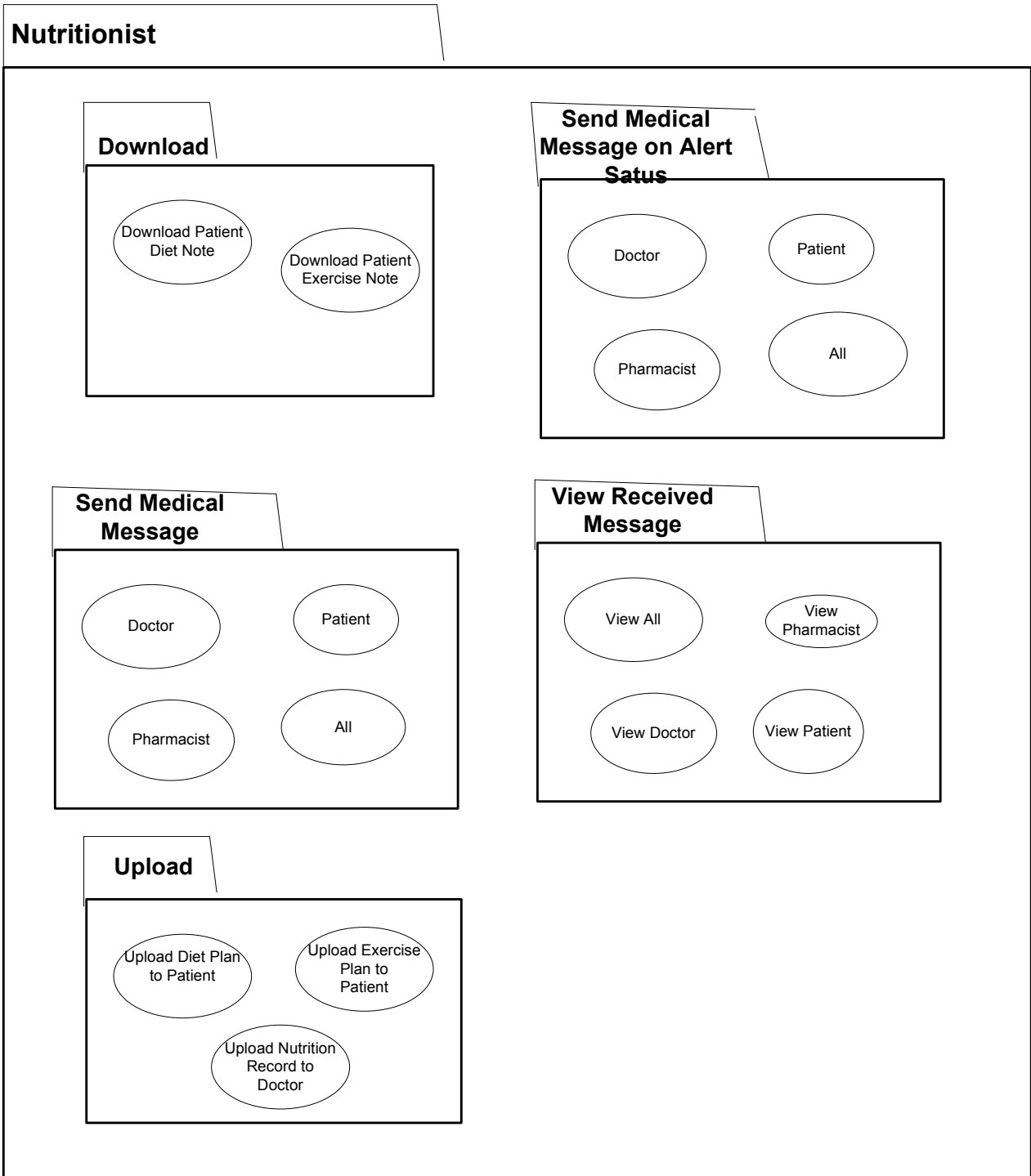


Fig 12: Nutritionist Subpackage

The remainder of this report takes a closer look at what each sub-package within the PPMS system will operate. These use case diagrams are analyzed individually to provide a comprehensive and thorough analysis of the functionality of the PPMS system.

## Use Cases for Patient Interface in PPMS

### Enter Blood Pressure Reading

#### Description

- patient enters their daily blood pressure reading which they received from their in-home blood pressure monitor

#### Assumptions

- there is a patient interface on PPMS that allows for input data
- patient has taken their blood pressure
- patient has an in-home blood pressure device

#### Precondition

- patient has taken their daily blood pressure reading

#### Postcondition

- Daily blood pressure reading has been entered into the database and saved

#### Steps

- patient brings up user interface for entering blood pressure on PPMS
- patient enters the reading manually or selects to download it from the electronic in-home BP device
- reading automatically saves to database following a successful entry/download

#### Benefiting Actor

- Patient

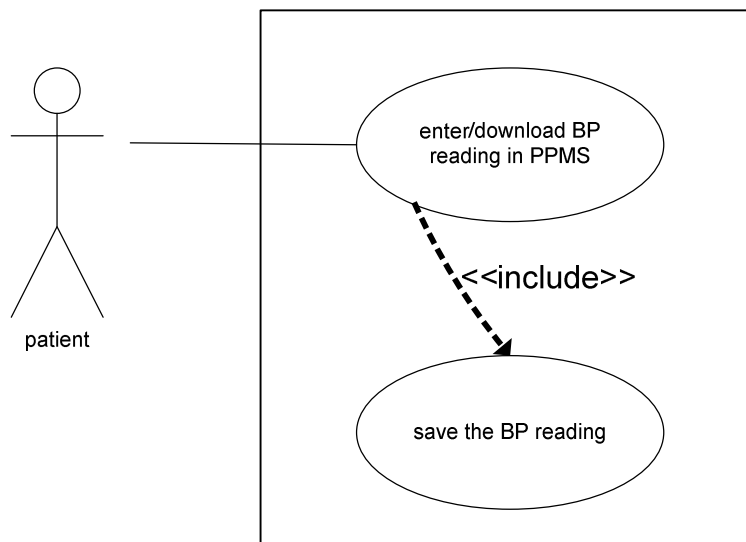


Fig 13: Use Case: Patient Enter Blood Pressure

## Add Note to BP Reading

### Description

-patient enters note or comment in regards to their BP reading

### Assumptions

-there is a patient interface on PPMS that allows for input data

-patient has entered their blood pressure

### Precondition

-patient has entered their daily blood pressure reading

### Postcondition

-a note in regards to the daily blood pressure reading has been entered into the database and saved

### Steps

-patient brings up user interface for entering a note about the blood pressure on PPMS

-patient types in note that they wish to add

-note will automatically save once patient exits this screen

### Benefiting Actor

-Patient

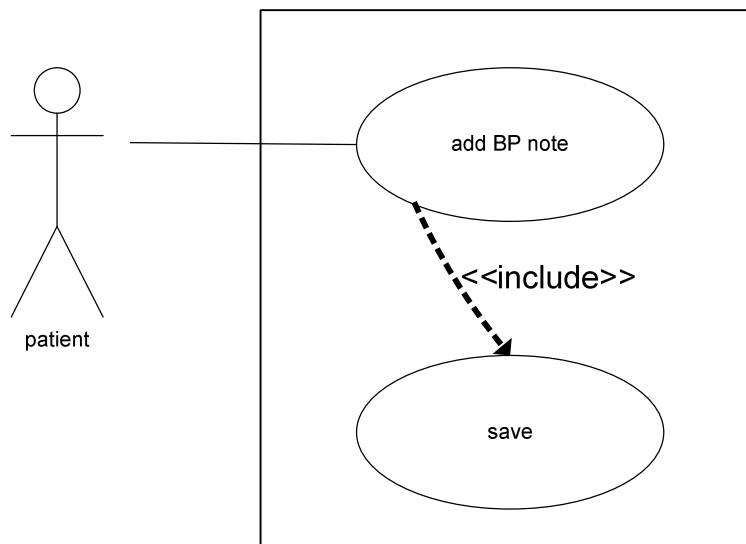


Fig 14: Use Case: Patient Add Note to Blood Pressure

## Edit Note to BP Reading

### Description

-patient edits note or comment in regards to their BP reading

### Assumptions

-there is a patient interface on PPMS that allows for input data

-patient has entered a note about their blood pressure

### Precondition

-patient has entered a note about their daily blood pressure reading

### Postcondition

-a note in regards to the daily blood pressure reading has been modified and saved

### Steps

-patient brings up user interface for editing a note about the blood pressure on PPMS

-patient types in corrections to the note

-note will automatically save once patient exits this screen

### Benefiting Actor

-Patient

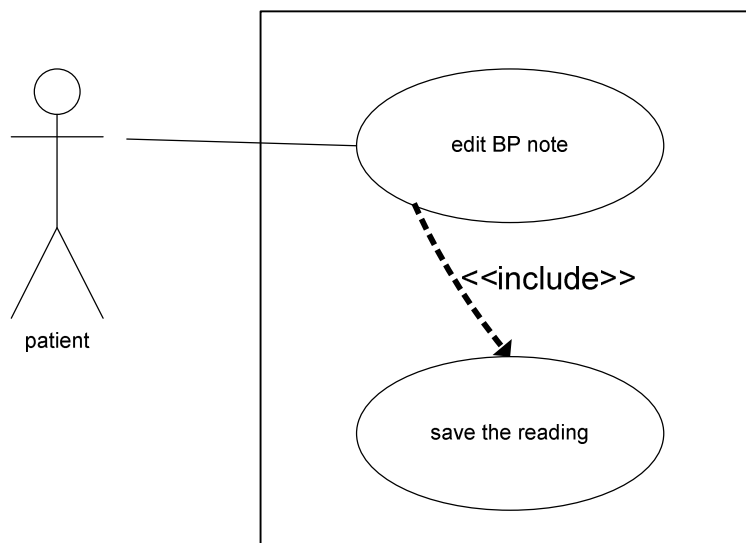


Fig 15: Use Case: Patient Edit Note to Blood Pressure

## View Blood Pressure Reading

### Description

-patient views BP reading, either by day, week or month

### Assumptions

-there is a patient interface on PPMS that allows for viewing data

-patient has taken their blood pressure and entered it into PPMS

### Precondition

-patient has entered at least one blood pressure reading

### Postcondition

-BP readings display, either by day, week, or month

### Steps

-patient brings up user interface for viewing blood pressure readings on PPMS

-patient chooses whether to view this information by day, week or month

-BP trends display to screen in appropriate format

### Benefiting Actor

-Patient

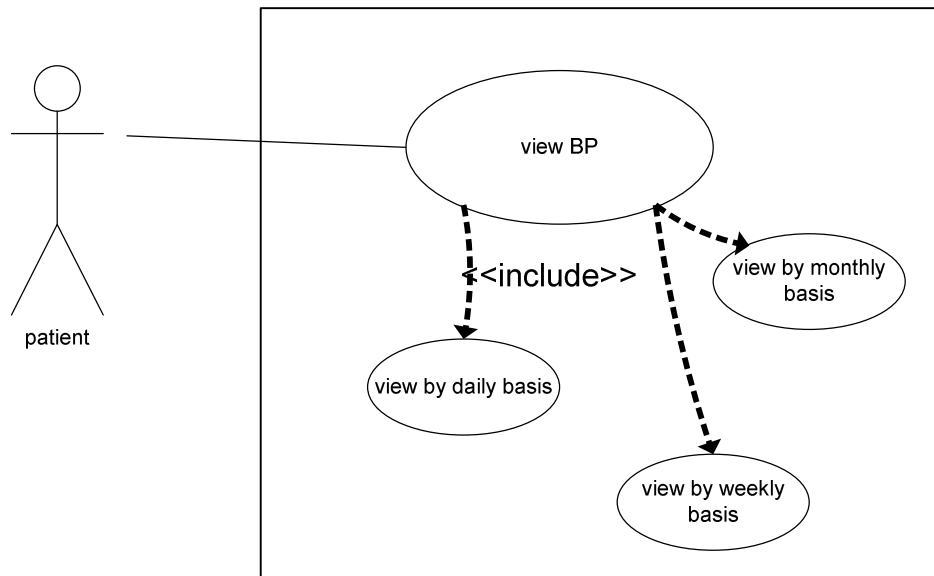


Fig 16: Use Case: Patient Views Blood Pressure

## View Medication Information

### Description

-patient views information on their current prescriptions

### Assumptions

-there is a patient interface on PPMS that allows for viewing data

-patient has been prescribed medications

-pharmacist has uploaded current prescription medication

### Precondition

-patient has been prescribed medications, has had them filled, and the pharmacist has uploaded current prescription information to patient's PPMS

### Postcondition

-patient is informed about their medications

### Steps

-patient brings up user interface for viewing prescription information on PPMS

-patient chooses to either view pharmacist notes or view their prescription company's websites

-information is displayed in the format chosen by patient

### Benefiting Actor

-Patient

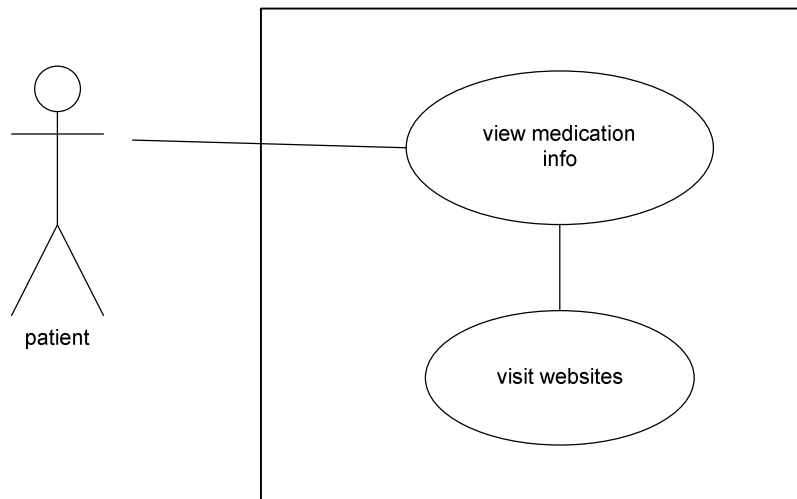


Fig 17: Use Case: Patient Views Medication Information



## Add Note about Medications

### Description

-patient enters note or comment in regards to their medications

### Assumptions

-there is a patient interface on PPMS that allows for input data

-patient has been prescribed medications

### Precondition

-patient has been prescribed and/or has taken their medication

### Postcondition

-a note in regards to their medication has been entered into the database and saved

### Steps

-patient brings up user interface for entering a note about their medication on PPMS

-patient types in note that they wish to add

-note will automatically save once patient exits this screen

### Benefiting Actor

-Patient

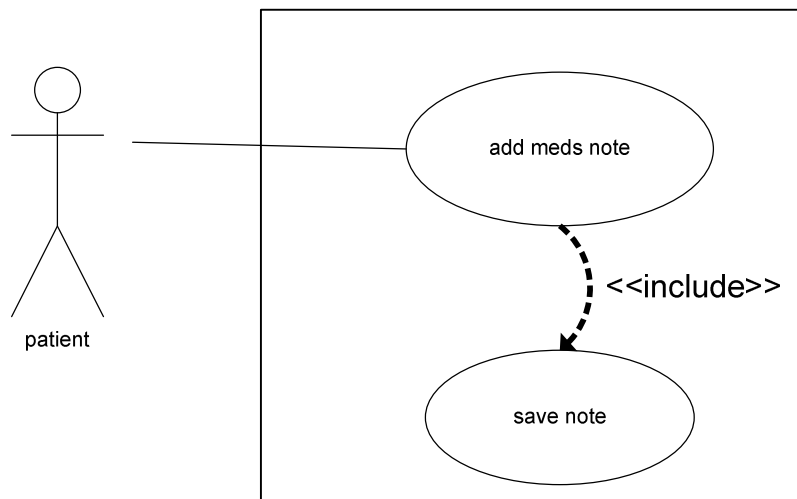


Fig 18: Use Case: Patient Adds Note to Medication Information

## Edit Note to Medication

### Description

-patient edits note or comment in regards to their medication

### Assumptions

-there is a patient interface on PPMS that allows for input data

-patient has entered a note about their medication

### Precondition

-patient has entered a note about their medication

### Postcondition

-a note in regards to their medication has been modified and saved

### Steps

-patient brings up user interface for editing a note about their medication on PPMS

-patient types in corrections to the note

-note will automatically save once patient exits this screen

### Benefiting Actor

-Patient

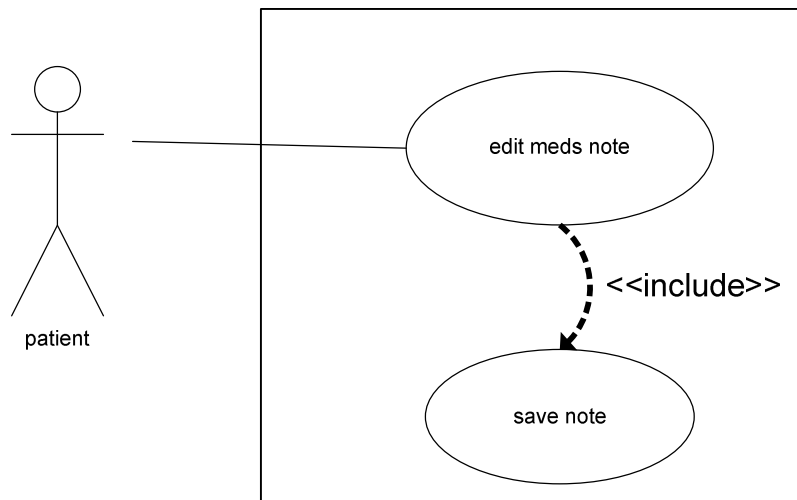


Fig 19: Use Case: Patient Edits Note to Medication Information

## View Diet and/or Exercise Plan

### Description

-patient views information on their diet or their exercise plan

### Assumptions

-there is a patient interface on PPMS that allows for viewing data

-patient has been placed on a diet or exercise plan

-nutritionist has uploaded diet or exercise information

### Precondition

-patient has been prescribed a diet and/or exercise plan

### Postcondition

-patient is informed about their diet and/or exercise plan

### Steps

-patient brings up user interface for viewing diet and/or exercise information on PPMS

-patient chooses to view either their diet plan or their exercise plan

-information is displayed in the format chosen by patient

### Benefiting Actor

-Patient

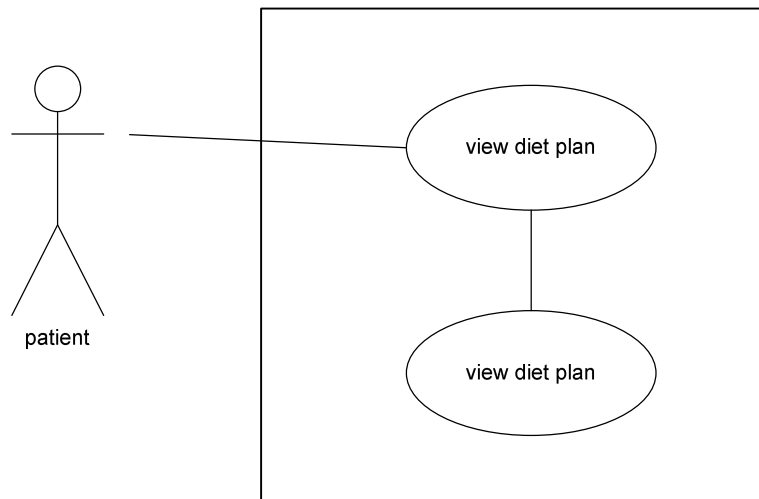


Fig 20: Use Case: Patient Views Diet and/or Exercise Plan

## Add Note about Diet and/or Exercise Plan

### Description

-patient enters note or comment in regards to their diet and/or exercise plan

### Assumptions

-there is a patient interface on PPMS that allows for input data

-patient has been prescribed a diet and/or exercise plan

### Precondition

-patient has participated in their diet and/or exercise regime

### Postcondition

-a note in regards to their diet and/or exercise plan has been entered into the database and saved

### Steps

-patient brings up user interface for entering a note about their diet and/or exercise plan on PPMS

-patient chooses whether to add a note to either the diet plan or the exercise plan

-patient types in note that they wish to add

-note will automatically save once patient exits this screen

### Benefiting Actor

-Patient

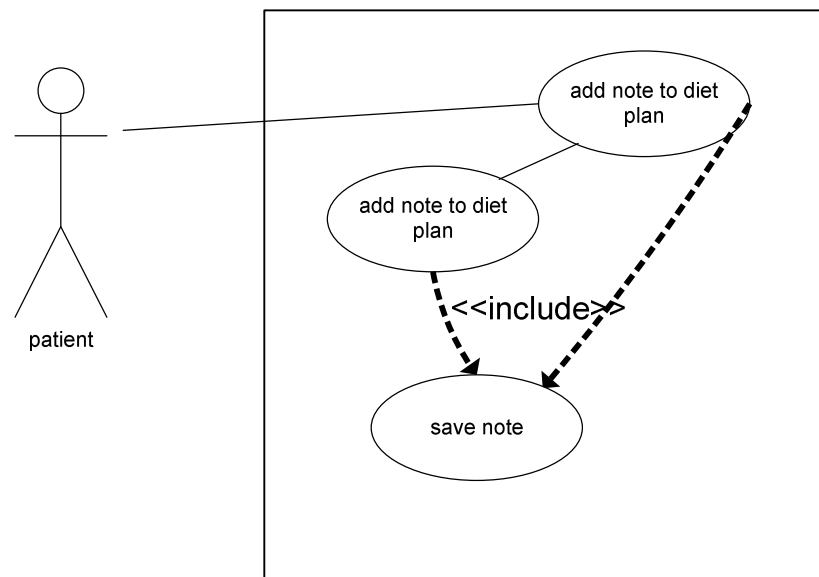


Fig 21: Use Case: Patient Adds Note to Diet and/or Exercise Plan

## Edit Note to Diet and/or Exercise Plan

### Description

-patient edits note or comment in regards to their diet and/or exercise plan

### Assumptions

-there is a patient interface on PPMS that allows for input data

-patient has entered a note about their diet and/or exercise plan

### Precondition

-patient has entered a note about their diet and/or exercise plan

### Postcondition

-a note in regards to their diet and/or exercise plan has been modified and saved

### Steps

-patient brings up user interface for editing a note about their diet and/or exercise plan on PPMS

-patient chooses whether to modify a note to either the diet plan or the exercise plan

-patient types in corrections to the note

-note will automatically save once patient exits this screen

### Benefiting Actor

-Patient

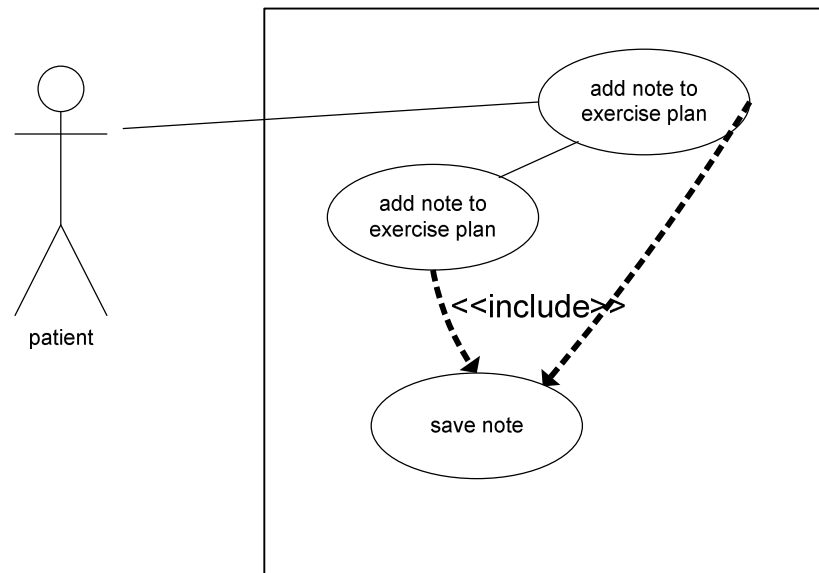


Fig 22: Use Case: Patient Edit Note to Diet and/or Exercise Plan

## Set Alarm

### Description

-patient sets a reminder alarm

### Assumptions

-there is a patient interface on PPMS that allows to set an alarm

### Precondition

-patient has a need to set a reminder alarm

### Postcondition

-an alarm has been set

### Steps

- patient brings up user interface for setting an alarm on PPMS
- patient chooses name of alarm
- patient chooses time of the alarm
- patient chooses how to repeat alarm (daily, daily except weekends, etc)
- alarm settings will automatically save once patient exits this screen

### Benefiting Actor

-Patient

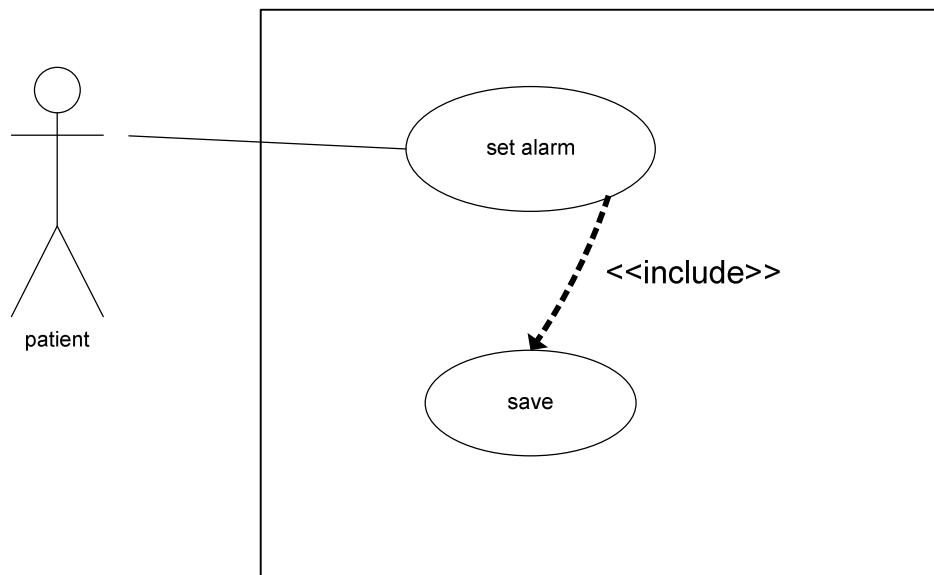


Fig 23: Use Case: Patient Sets Alarm

## Edit Alarm

### Description

-patient changes settings to an alarm

### Assumptions

-there is a patient interface on PPMS that allows to modify settings to an alarm

### Precondition

-patient has set a reminder alarm

### Postcondition

-an alarm setting has been modified

### Steps

-patient brings up user interface for setting an alarm on PPMS

-patient modifies name of alarm (if needed)

-patient modifies time of the alarm (if needed)

-patient modifies how to repeat alarm (if needed)

-alarm settings will automatically save once patient exits this screen

### Benefiting Actor

-Patient

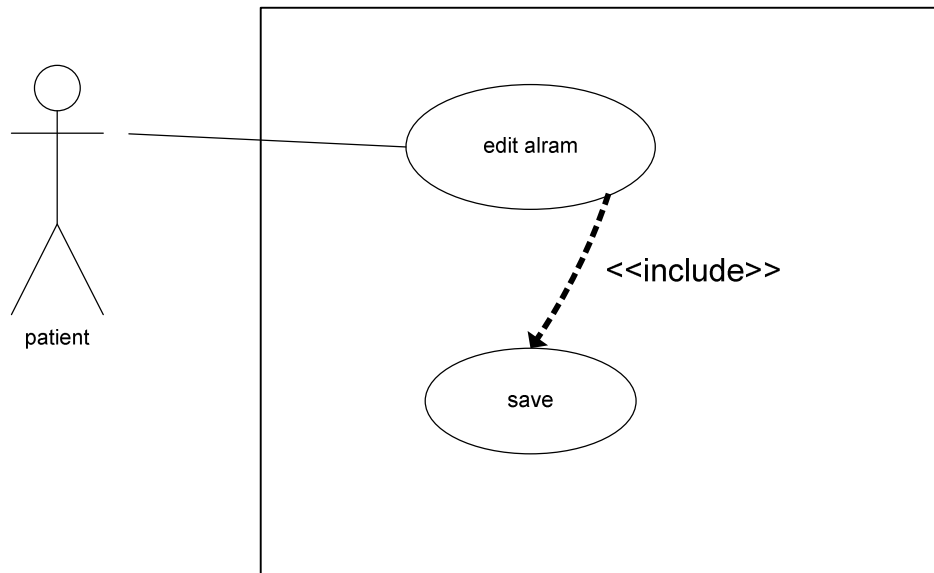


Fig 24: Use Case: Patient Edits Alarm Settings

## Send Note

### Description

-patient enters and sends a message to their physician/pharmacist/nutritionist

### Assumptions

-there is a patient interface on PPMS that allows for message sending

-patient has been linked on PPMS with their physician/nutritionist/pharmacist

### Precondition

-patient has entered a message that needs to be sent to their physician/nutritionist/pharmacist

### Postcondition

-a message from the patient has been sent to their physician/nutritionist/pharmacist and patient has received acknowledgment

### Steps

-patient brings up user interface for sending a message to their physician/nutritionist/pharmacist on PPMS

-patient chooses whether to send message to either their physician, nutritionist, pharmacist, or all

-patient types in the message they wish to send

-patient sends message

-confirmation of successful delivery is received

### Benefiting Actor

-Patient

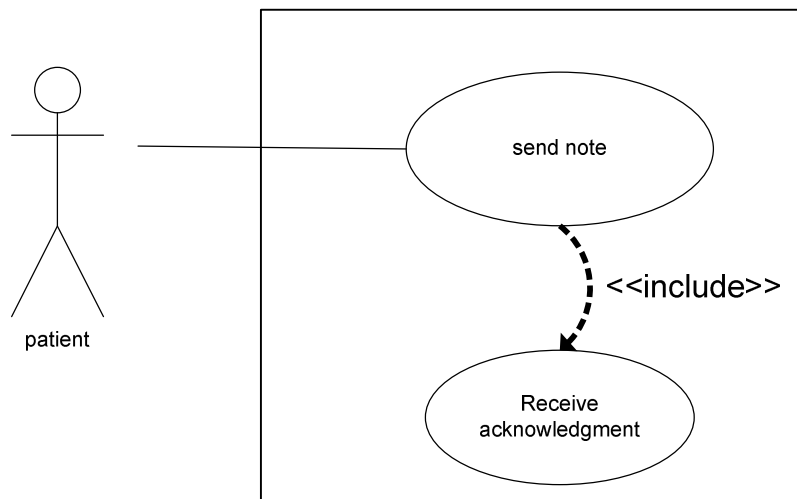


Fig 25: Use Case: Patient Sends Note



## View Medical Note

### Description

-patient views message from their physician/pharmacist/nutritionist

### Assumptions

-there is a patient interface on PPMS that allows for message viewing

-patient has been linked on PPMS with their physician/nutritionist/pharmacist

### Precondition

-physician/nutritionist/pharmacist has sent a message to their patient

### Postcondition

-patient views message

### Steps

-patient brings up user interface for viewing a message from their physician/nutritionist/pharmacist on PPMS

-patient chooses whether to view message from either their physician, nutritionist, pharmacist, or all

-patient views message

-patient has option to reply, delete or archive message

### Benefiting Actor

-Patient

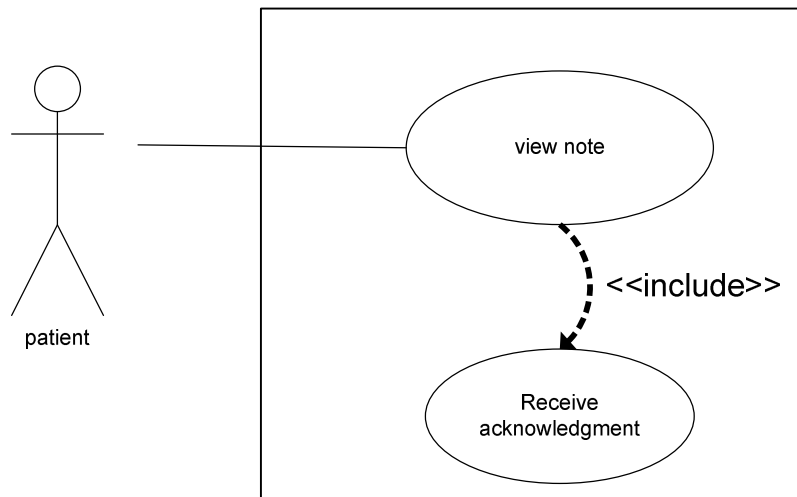


Fig 26: Use Case: Patient Views Medical Note

## View Received Medical Note on Alert Status

### Description

- patient receives a message from physician/pharmacist/nutritionist on alert status, and PPMS will allow no other system functionality until message is read

### Assumptions

- there is a patient interface on PPMS that allows for message receiving on alert status
- patient has been linked on PPMS with their physician/pharmacist/nutritionist

### Precondition

- physician/pharmacist/nutritionist has sent a message to the patient on alert status

### Postcondition

- a message from physician/pharmacist/nutritionist has been received, viewed, and either replied to, deleted, or archived

### Steps

- patient is automatically directed to alert message on PPMS
- patient views message
- patient has option to reply, delete or archive message

### Benefiting Actor

- Patient

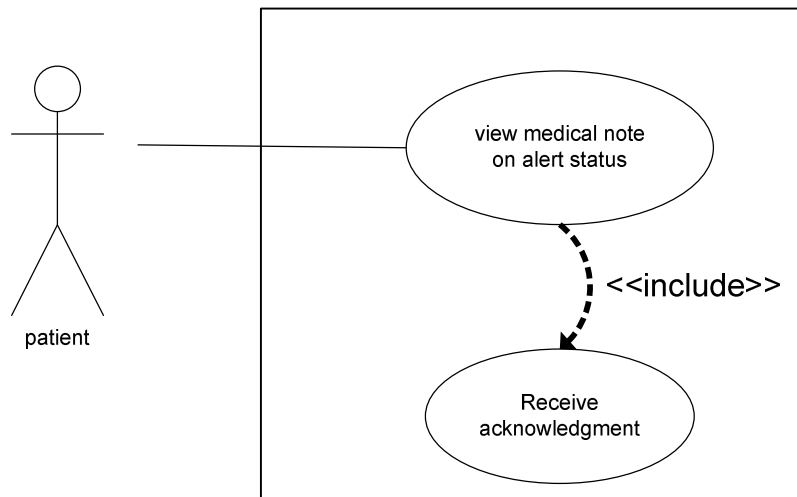


Fig 27: Use Case: Patient Views Received Medical Note on Alert Status

## Use Cases for Physician/Pharmacist/Nutritionist Interface in PPMS

### Send Medical Message

#### Description

- physician/pharmacist/nutritionist enters and sends a message to recipients of choice

#### Assumptions

- there is a physician/pharmacist/nutritionist interface on PPMS that allows for message sending
- physician/pharmacist/nutritionist has been linked on PPMS with their patients and their patient's network

#### Precondition

- physician/pharmacist/nutritionist has entered a message that needs to be sent to recipients of choice

#### Postcondition

- a message from the physician/pharmacist/nutritionist has been sent to recipients of choice and physician/pharmacist/nutritionist has received acknowledgment

#### Steps

- physician/pharmacist/nutritionist brings up user interface for sending a message on PPMS
- physician/pharmacist/nutritionist chooses whether to send message to either their patient or to their patient's other medical professionals, or all
- physician/pharmacist/nutritionist types in the message they wish to send
- physician/pharmacist/nutritionist sends message
- confirmation of successful delivery is received

#### Benefiting Actor

- Message recipients

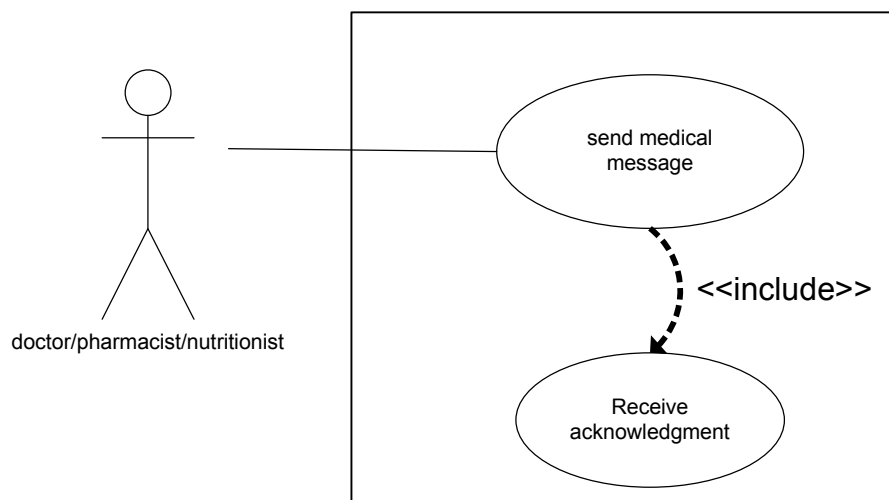


Fig 28: Use Case: Physician/Nutritionist/Pharmacist Sends Medical Message

## View Received Medical Message

### Description

- physician/pharmacist/nutritionist receives a message from patient and/or patient's network

### Assumptions

- there is a physician/pharmacist/nutritionist interface on PPMS that allows for message receiving
- physician/pharmacist/nutritionist has been linked on PPMS with their patients and their patient's network

### Precondition

- patient and/or someone in the patient's network has sent a message to the physician/pharmacist/nutritionist

### Postcondition

- a message from the patient and/or someone in the patient's network has been received, viewed, and either replied to, deleted, or archived

### Steps

- physician/pharmacist/nutritionist brings up user interface for viewing a message from their patient and/or someone in the patient's network on PPMS
- physician/pharmacist/nutritionist chooses whether to view all or individual messages sorted by sender name
- physician/pharmacist/nutritionist views message
- physician/pharmacist/nutritionist has option to reply, delete or archive message

### Benefiting Actor

- Message recipients

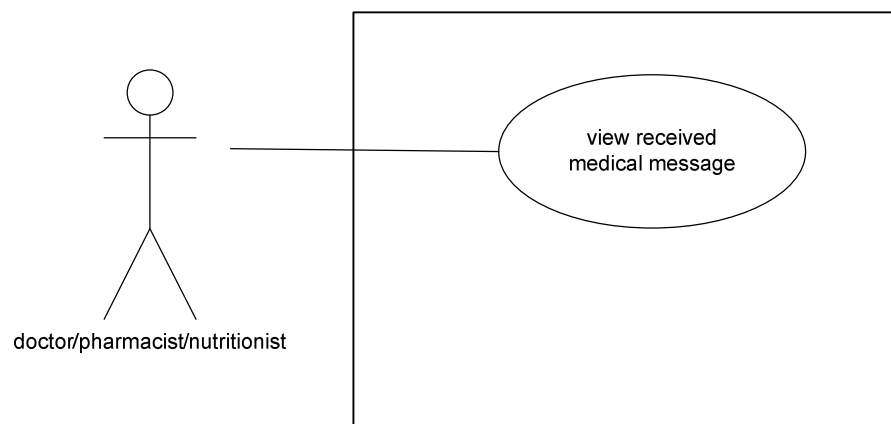


Fig 29: Use Case: Physician/Nutritionist/Pharmacist Views Received Medical Message

## Send Medical Message on Alert Status

### Description

- physician/pharmacist/nutritionist enters and sends a message to recipients of choice on alert status

### Assumptions

- there is a physician/pharmacist/nutritionist interface on PPMS that allows for message sending on alert status
- physician/pharmacist/nutritionist has been linked on PPMS with their patients and their patient's network

### Precondition

- physician/pharmacist/nutritionist has entered a message that needs to be sent to recipients of choice on alert status

### Postcondition

- a message from the physician/pharmacist/nutritionist has been sent to recipients of choice on alert status and physician/pharmacist/nutritionist has received acknowledgment

### Steps

- physician/pharmacist/nutritionist brings up user interface for sending a message on alert status on PPMS
- physician/pharmacist/nutritionist chooses whether to send message to either their patient or to their patient's other medical professionals, or all, on alert status
- physician/pharmacist/nutritionist types in the message they wish to send on alert status
- physician/pharmacist/nutritionist sends message on alert status
- confirmation of successful delivery is received

### Benefiting Actor

- Message recipients

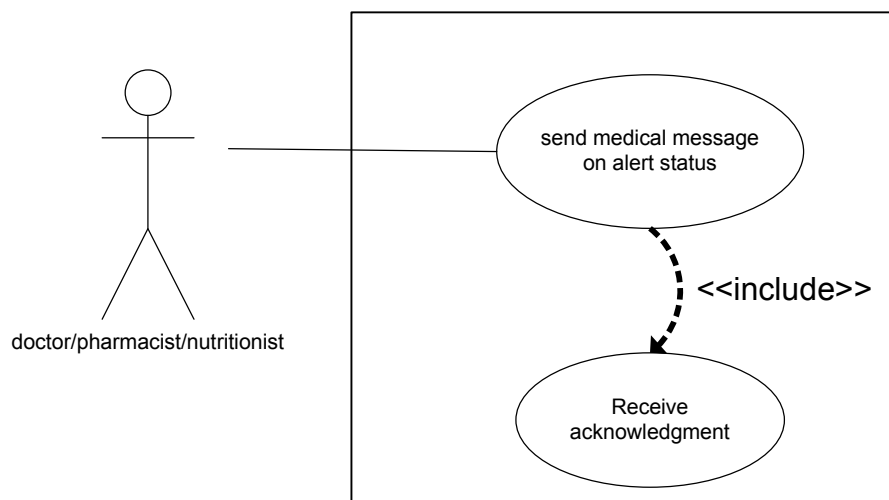


Fig 30: Use Case: Physician/Nutritionist/Pharmacist Sends Medical Message on Alert Status

## View Receive Medical Message on Alert Status

### Description

- physician/pharmacist/nutritionist receives a message from someone in patient's network on alert status, and PPMS will allow no other system functionality until message is read

### Assumptions

- there is a physician/pharmacist/nutritionist interface on PPMS that allows for message receiving on alert status
- physician/pharmacist/nutritionist has been linked on PPMS with their patient's network

### Precondition

- someone in patient's network has sent a message to the physician/pharmacist/nutritionist on alert status

### Postcondition

- a message from someone in the patient's network has been received, viewed, and either replied to, deleted, or archived

### Steps

- physician/pharmacist/nutritionist is automatically directed to alert message on PPMS
- physician/pharmacist/nutritionist views message
- physician/pharmacist/nutritionist has option to reply, delete or archive message

### Benefiting Actor

- Message recipients

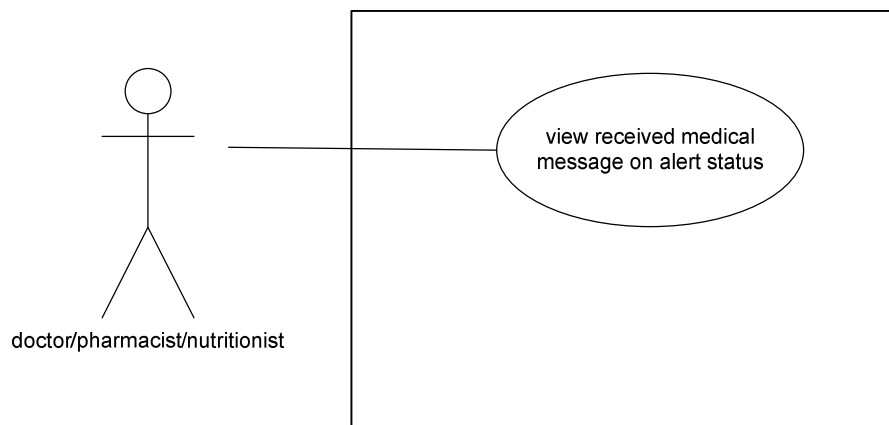


Fig 31: Use Case: Physician/Nutritionist/Pharmacist Views Received Medical Message on Alert Status

## Physician Upload Medical Information To Patient

### Description

-physician uploads medical information to patient

### Assumptions

-there is a physician interface on PPMS that allows for upload of information  
- physician has been linked on PPMS with their patient

### Precondition

-information needs to be uploaded to patient

### Postcondition

-information has been uploaded to patient or to someone in patient's network

### Steps

-physician brings up user interface for uploading information on PPMS  
-physician chooses which information will be uploaded  
-physician uploads the information  
-confirmation of successful delivery is received

### Benefiting Actor

-Patient

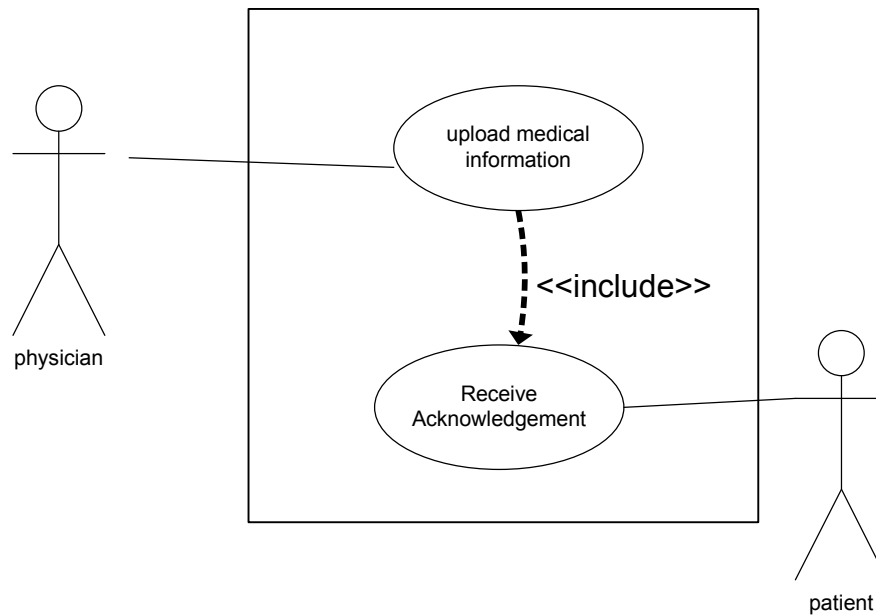


Fig 32: Use Case: Physician Upload Medical Information To Patient

## Physician Downloads BP Readings From Patient

### Description

-physician downloads BP readings from patient

### Assumptions

-there is a physician interface on PPMS that allows for downloading of information  
- physician has been linked on PPMS with their patient

### Precondition

-physician needs to download BP readings from patient

### Postcondition

-BP readings have been downloaded from patient and are saved

### Steps

-physician brings up user interface for downloading BP readings on PPMS  
-physician chooses patient name from which s/he wishes to download from  
-physician downloads BP readings  
-BP readings are saved

### Benefiting Actor

-Patient

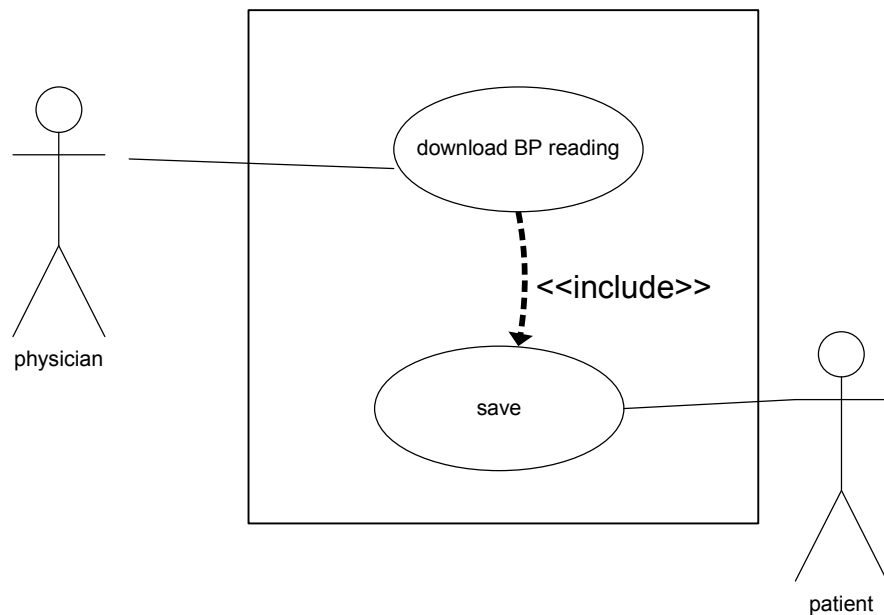


Fig 33: Use Case: Physician Downloads BP Readings From Patient



## Physician Downloads Medicine Note From Patient

### Description

-physician downloads medicine note from patient

### Assumptions

- there is a physician interface on PPMS that allows for downloading of information
- physician has been linked on PPMS with their patient

### Precondition

-physician needs to download medicine note from patient

### Postcondition

-Medicine notes have been downloaded from patient and are saved

### Steps

- physician brings up user interface for downloading medicine note on PPMS
- physician chooses patient name from which s/he wishes to download from
- physician downloads medicine note
- Medicine notes are saved

### Benefiting Actor

-Patient

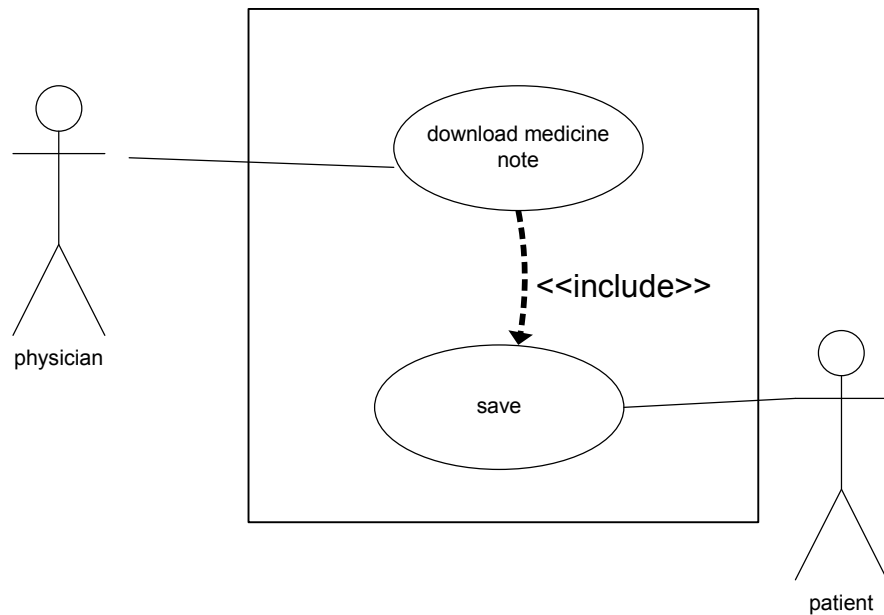


Fig 34: Use Case: Physician Downloads Medicine Notes From Patient

## Physician Downloads Diet Notes From Patient

### Description

-physician downloads diet note from patient

### Assumptions

-there is a physician interface on PPMS that allows for downloading of information

-physician has been linked on PPMS with their patient

### Precondition

-physician needs to download diet note from patient

### Postcondition

-Diet note have been downloaded from patient and are saved

### Steps

-physician brings up user interface for downloading diet note on PPMS

-physician chooses patient name from which s/he wishes to download from

-physician downloads diet notes

-Diet notes are saved

### Benefiting Actor

-Patient

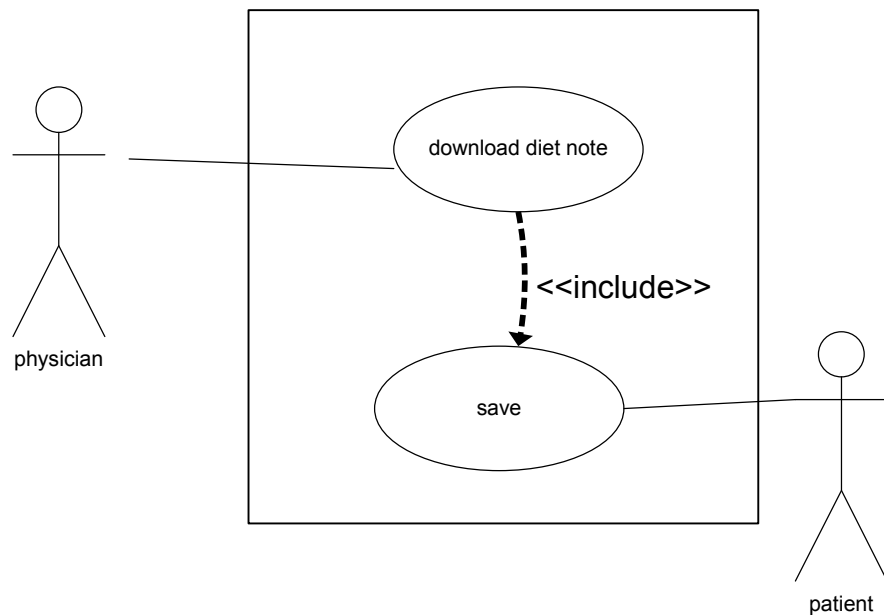


Fig 35: Use Case: Physician Downloads Diet Notes From Patient

## Physician Downloads Exercise Notes From Patient

### Description

-physician downloads exercise notes from patient

### Assumptions

-there is a physician interface on PPMS that allows for downloading of information

-physician has been linked on PPMS with their patient

### Precondition

-physician needs to download exercise note from patient

### Postcondition

-Exercise notes have been downloaded from patient and are saved

### Steps

-physician brings up user interface for downloading exercise notes on PPMS

-physician chooses patient name from which s/he wishes to download from

-physician downloads exercise notes

-Exercise notes are saved

### Benefiting Actor

-Patient

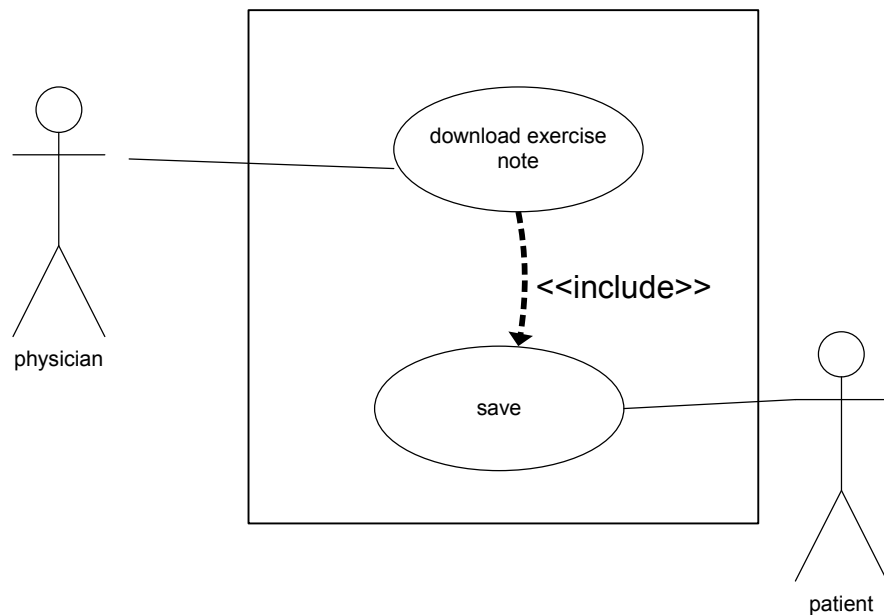


Fig 36: Use Case: Physician Downloads Exercise Notes From Patient

## Physician Downloads BP Notes From Patient

### Description

-physician downloads BP notes from patient and information is saved

### Assumptions

-there is a physician interface on PPMS that allows for downloading of BP notes from patient

- physician has been linked on PPMS with their patient

### Precondition

-physician wishes to download BP notes from a patient

### Postcondition

-BP notes from patient has been downloaded and saved

### Steps

-physician brings up user interface for downloading BP notes on PPMS

-physician chooses from which patient the BP readings will be downloaded

-physician downloads the BP notes

-BP notes are saved

### Benefiting Actor

-Patient

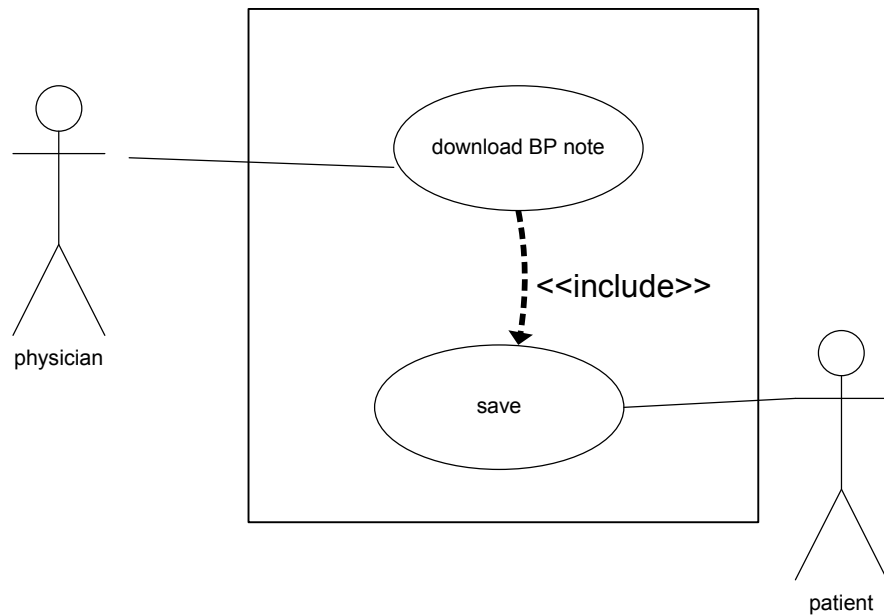


Fig 37: Use Case: Physician Downloads BP Notes From Patient

## Physician Sends Prescription Slip To Pharmacist

### Description

-physician sends prescription slip to pharmacist for filling

### Assumptions

-there is a physician interface on PPMS that allows for sending prescription information to pharmacist

- physician has been linked on PPMS with their patient's pharmacist

### Precondition

-physician has prescribed medication to patient; patient needs prescription filled

### Postcondition

-new prescription has been sent to pharmacist

### Steps

-physician brings up user interface for sending prescription slip to pharmacist on PPMS

-physician chooses which script will be sent to which pharmacist

-physician sends the prescription

-confirmation of successful delivery is received

### Benefiting Actor

-Patient

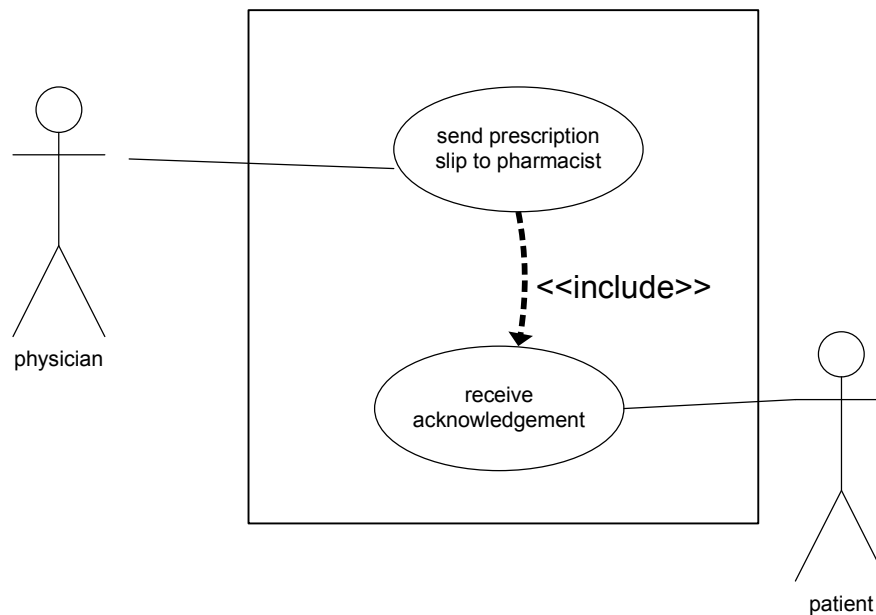


Fig 38: Use Case: Physician Sends Prescription Slip To Pharmacist

## Physician Send Patient Record to Nutritionist

### Description

- physician sends patient record to nutritionist

### Assumptions

- there is a physician interface on PPMS that allows the physician to send patient record to nutritionist
- physician has been linked on PPMS with their patient's nutritionist

### Precondition

- physician has sent patient to see a nutritionist

### Postcondition

- physician has sent patient record to nutritionist

### Steps

- physician brings up user interface for sending patient record to nutritionist on PPMS
- physician chooses which patient record will be sent to which nutritionist
- physician sends the patient record
- confirmation of successful delivery is received

### Benefiting Actor

- Patient

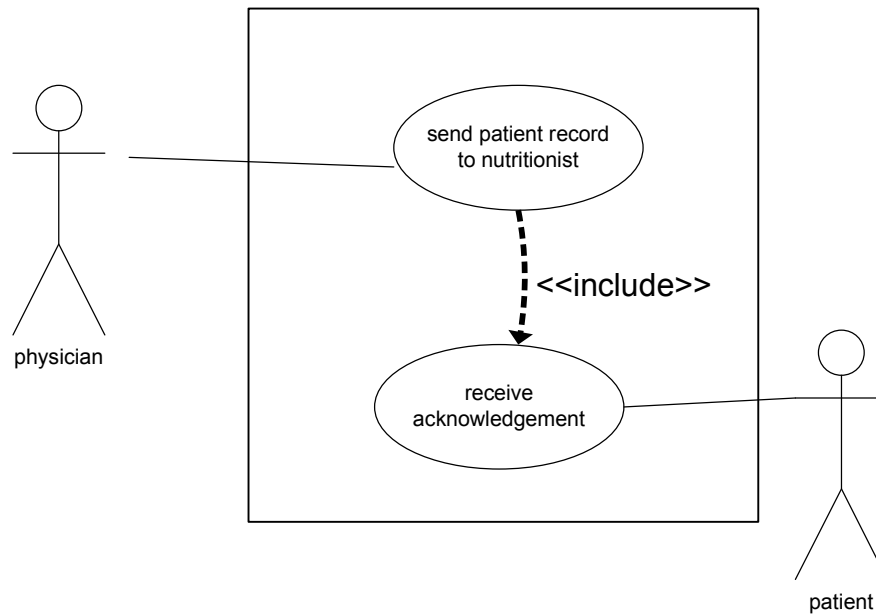


Fig 39: Use Case: Physician Send Patient Record to Nutritionist

## Physician View Nutrition Record (From Nutritionist)

### Description

-physician views nutrition report about the patient from the patient's nutritionist

### Assumptions

-there is a physician interface on PPMS that allows for physician to view nutrition report

-physician has been linked on PPMS with their patient's nutritionist

### Precondition

-physician receives nutrition report on patient from patient's nutritionist

### Postcondition

-physician views nutrition report on patient from patient's nutritionist

### Steps

-physician brings up user interface for viewing nutrition report on PPMS

-physician chooses which report on which patient to view

-physician views report

### Benefiting Actor

-Patient

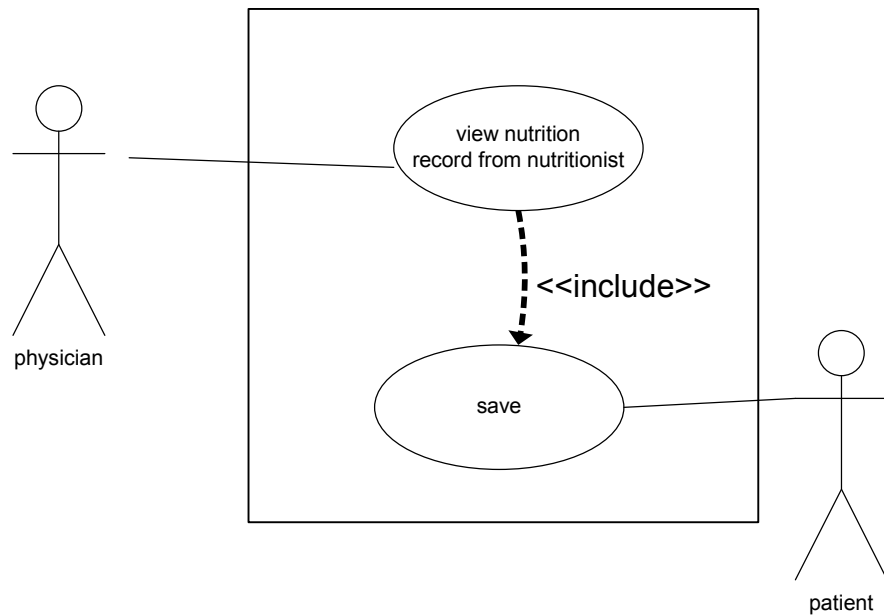


Fig 40: Use Case: Physician View Nutrition Record (From Nutritionist)

## Use Cases for Nutritionist Interface in PPMS

### Nutritionist Upload Diet/Exercise Plan to Patient

#### Description

-nutritionist uploads diet or exercise plan to patient

#### Assumptions

-there is a nutritionist interface on PPMS that allows for upload of information

-nutritionist has been linked on PPMS with their patient and their patient's network

#### Precondition

-diet and/or exercise plan needs to be uploaded to patient

#### Postcondition

-diet and/or exercise plan has been uploaded to patient

#### Steps

-nutritionist brings up user interface for uploading diet and/or exercise plan on PPMS

-nutritionist chooses which information will be uploaded to which patient

-nutritionist uploads the information

-confirmation of successful delivery is received

#### Benefiting Actor

-Patient

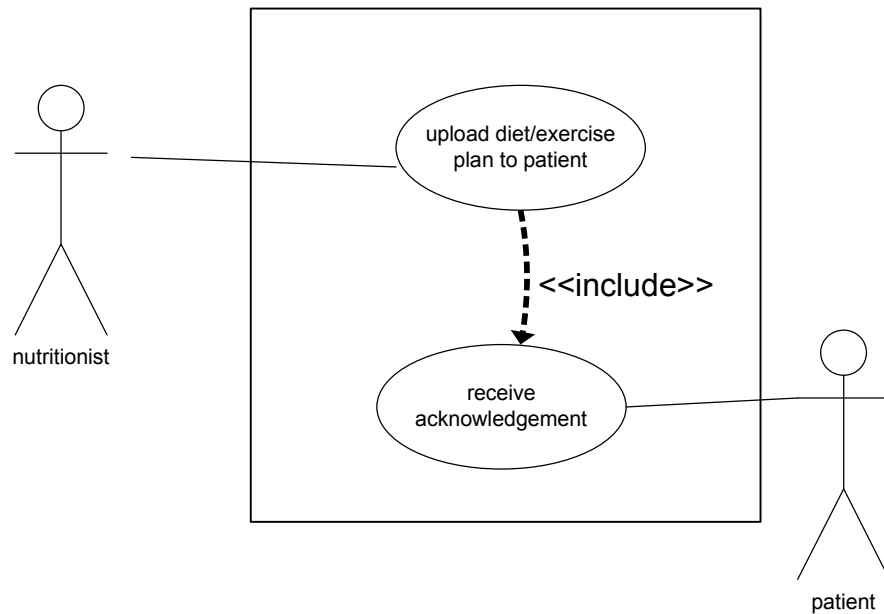


Fig 41: Use Case: Nutritionist Upload Diet/Exercise Plan to Patient



## Nutritionist Download Diet/Exercise Note from Patient

### Description

-nutritionist downloads diet and/or exercise note from patient

### Assumptions

-there is a nutritionist interface on PPMS that allows for download of patient diet/exercise note

-nutritionist has been linked on PPMS with their patient

### Precondition

-diet and/or exercise note needs to be downloaded from patient for patient monitoring purposed

### Postcondition

-diet and/or exercise note has been downloaded from patient

### Steps

-nutritionist brings up user interface for downloading diet and/or exercise note on PPMS

-nutritionist chooses from which patient to download from

-nutritionist downloads the information

### Benefiting Actor

-Patient

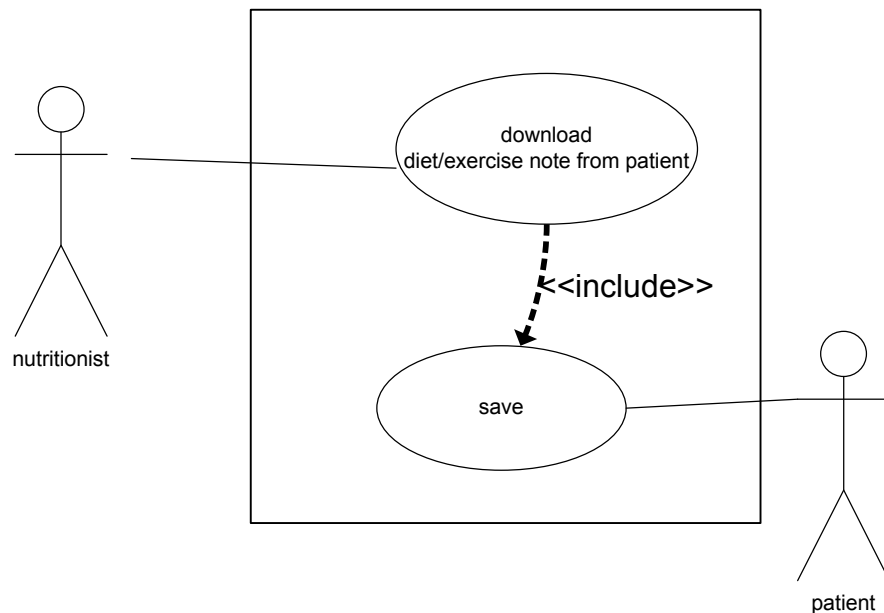


Fig 42: Use Case: Nutritionist Download Diet/Exercise Note from Patient

## Nutritionist Sends Nutrition Record to Physician

### Description

- nutritionist sends nutrition record to physician

### Assumptions

- there is a nutritionist interface on PPMS that allows for sending a record to a physician
- nutritionist has been linked on PPMS with their patient and their patient's physician

### Precondition

- nutritionist needs to send physician the patient's nutrition record in order to keep physician and nutritionist in sync with patient treatment

### Postcondition

- patient's nutrition record has been sent to their physician

### Steps

- nutritionist brings up user interface for sending nutrition record to physician on PPMS
- nutritionist chooses which record will be sent
- nutritionist sends the record to the patient's physician
- confirmation of successful delivery is received

### Benefiting Actor

- Patient

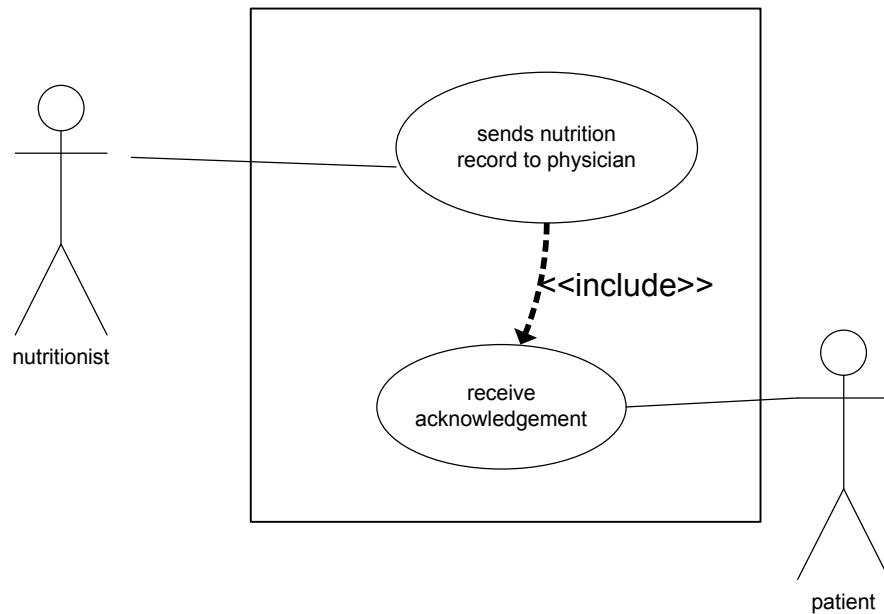


Fig 43: Use Case: Nutritionist Sends Nutrition Record to Physician

## Nutritionist Receives and Views Patient Record from Physician

### Description

- nutritionist receives patient record from patient's physician in order to start treatment and prescribe appropriate diet and exercise plan

### Assumptions

- nutritionist has been linked on PPMS with their patient and their patient's physician

### Precondition

- physician has sent nutritionist patient's record

### Postcondition

- nutritionist has received patient's record from physician

### Steps

- nutritionist brings up user interface for viewing patient record on PPMS
- nutritionist chooses which patient
- nutritionist view patient's medical record

### Benefiting Actor

- Patient

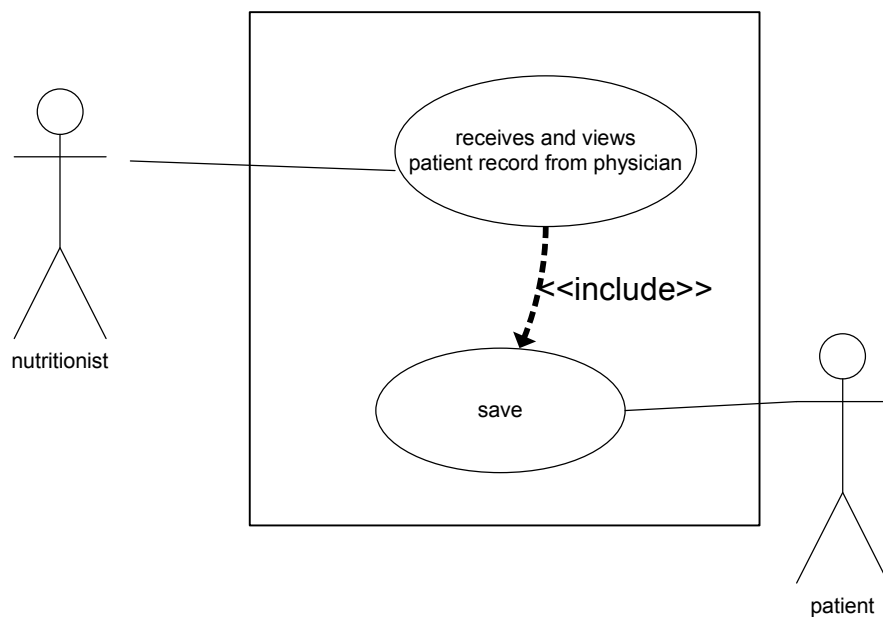


Fig 44: Use Case: Nutritionist Receives and Views Patient Record

## Use Cases for Pharmacist Interface in PPMS

### Pharmacist Views Prescription Slip from Physician

#### Description

-pharmacist views prescription slip from physician

#### Assumptions

-pharmacist has been linked on PPMS with their patient's physician

#### Precondition

-physician has sent patient's prescription(s) to pharmacist

#### Postcondition

-pharmacist has received and viewed patient's prescription(s) slips

#### Steps

-pharmacist brings up user interface for viewing prescription slips

-pharmacist selects patient name

-pharmacist chooses which prescription slip to view from that given patient

#### Benefiting Actor

-Patient

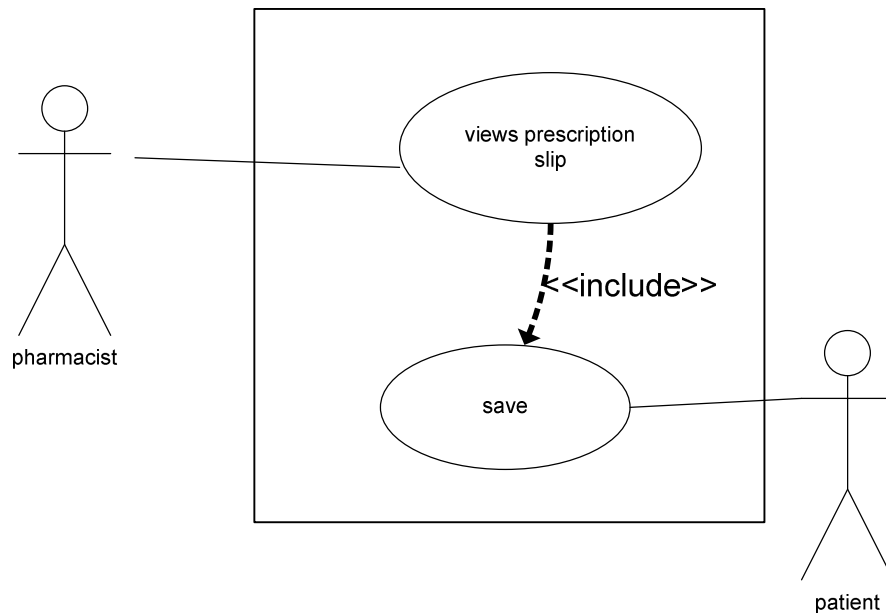


Fig 45: Use Case: Pharmacist Views Prescription Slip from Physician

## Pharmacist Download Patient Medicine Note

### Description

-pharmacist downloads medicine note from patient

### Assumptions

-there is a pharmacist interface on PPMS that allows for downloading patient medicine notes

-pharmacist has been linked on PPMS with their patient

### Precondition

-pharmacist, as per monitoring the patient, wishes to download patient medicine notes

### Postcondition

-pharmacist downloads and views patient medicine notes

### Steps

-pharmacist brings up user interface for downloading patient medicine note on PPMS

-pharmacist chooses from which patient to download

-pharmacist downloads the medicine notes from patient

### Benefiting Actor

-Patient

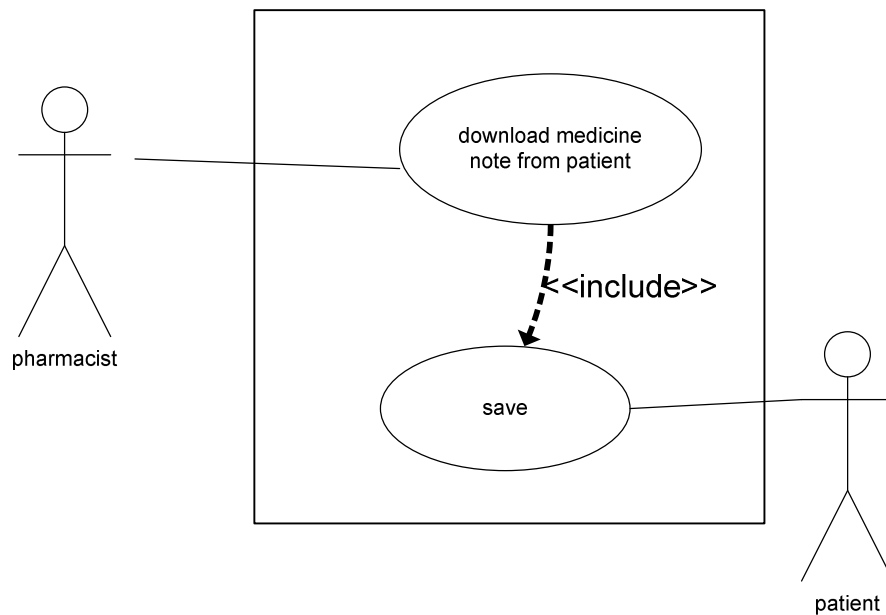


Fig 46: Use Case: Pharmacist Downloads Medicine Note from Patient

## Pharmacist Uploads Medicine Information to Patient

### Description

-pharmacist uploads medicine information to patient

### Assumptions

-patient has been prescribes medication(s)

-there is a pharmacist interface on PPMS that allows for upload of medicine information

-pharmacist has been linked on PPMS with their patient

### Precondition

-medicine information needs to be uploaded to patient

### Postcondition

-medicine information has been uploaded to patient

### Steps

-pharmacist brings up user interface for uploading medicine information on PPMS

-pharmacist chooses which patient to upload information to

-pharmacist uploads the patient's medicine information

-confirmation of successful delivery is received

### Benefiting Actor

-Patient

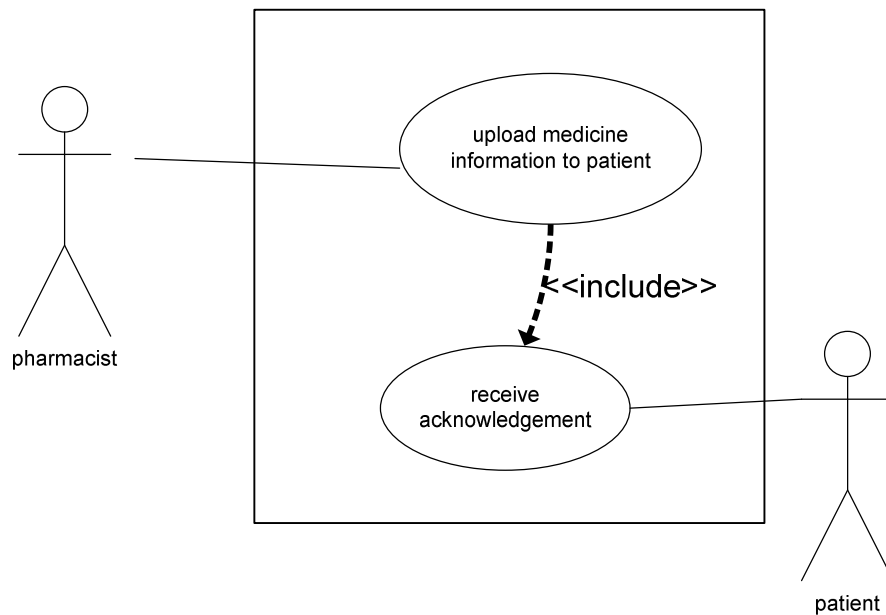


Fig 47: Use Case: Pharmacist Uploads Medicine Information to Patient

## Sequence Diagrams for Patient Interface in PPMS

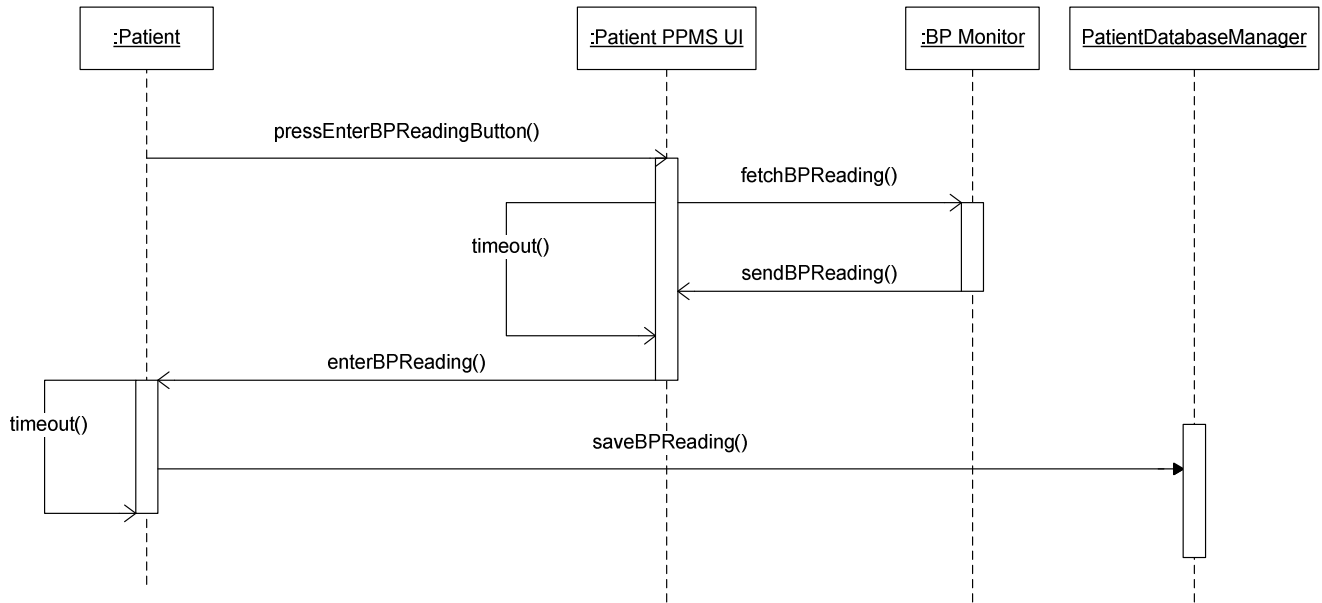


Fig 48: Sequence Diagram: Patient Enter Blood Pressure Reading

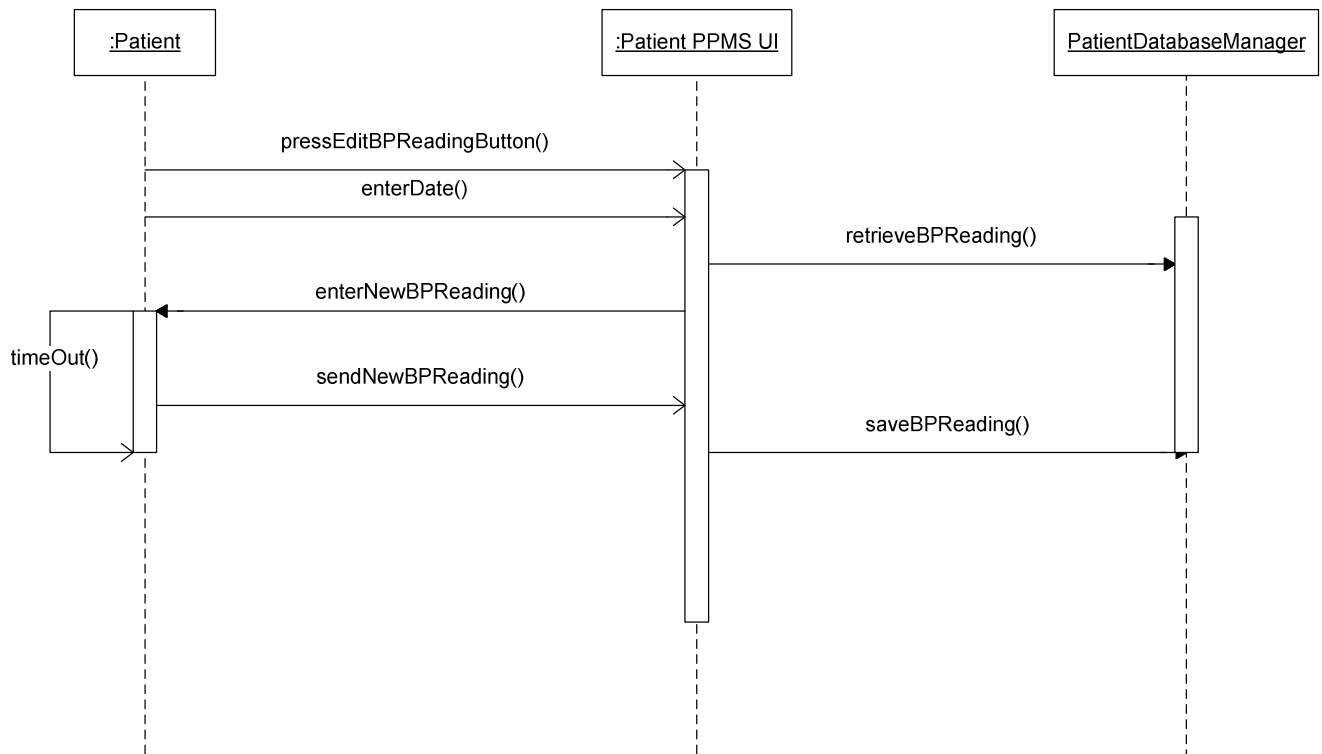


Fig 49: Sequence Diagram: Patient Edit Blood Pressure Reading

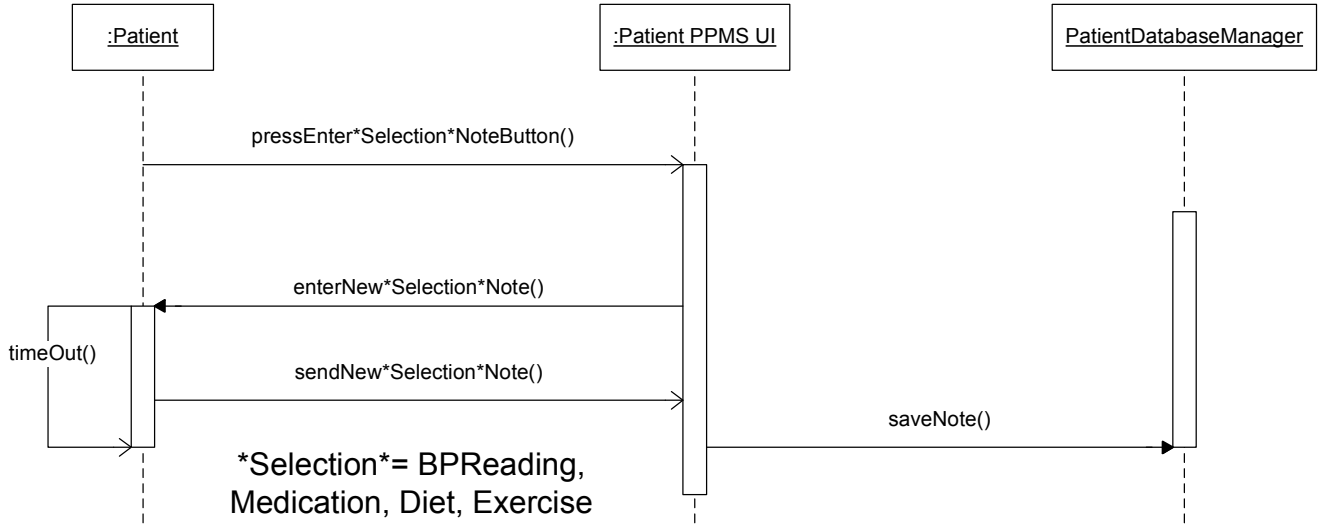


Fig 50: Sequence Diagram: Patient Enter \*Selection\* Note

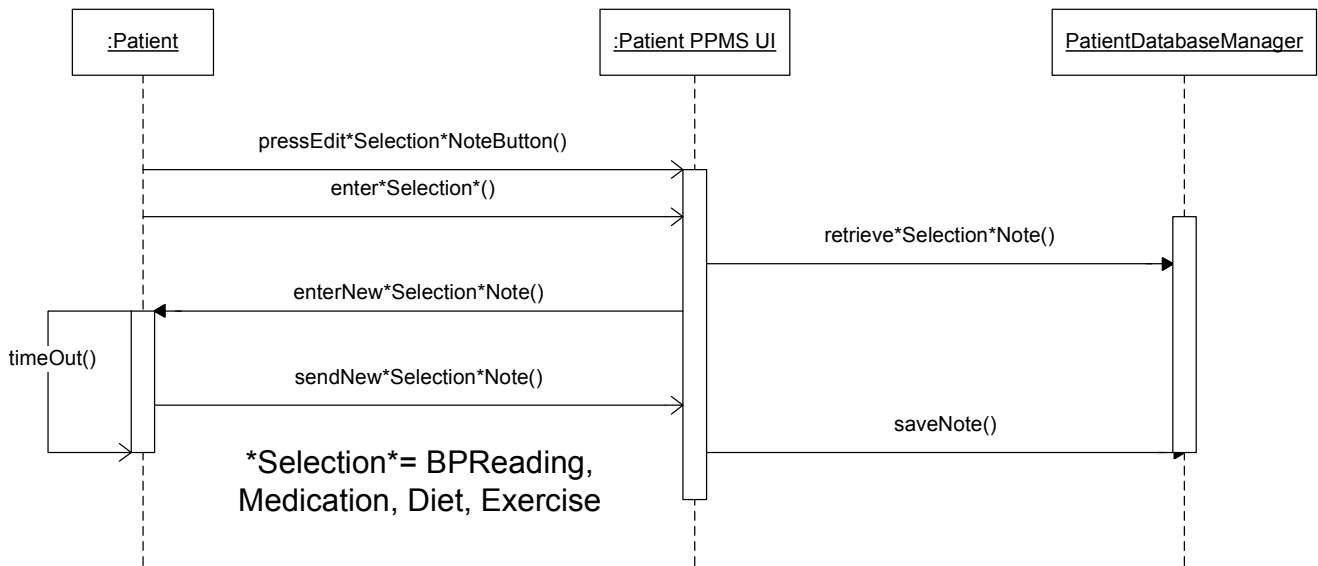


Fig 51: Sequence Diagram: Patient Edit \*Selection\* Note



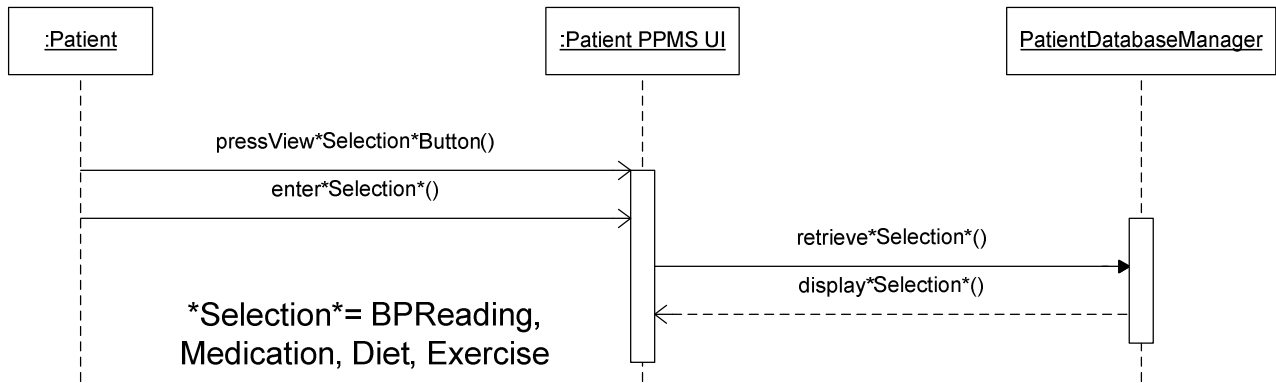


Fig 52: Sequence Diagram: Patient View \*Selection\* Note

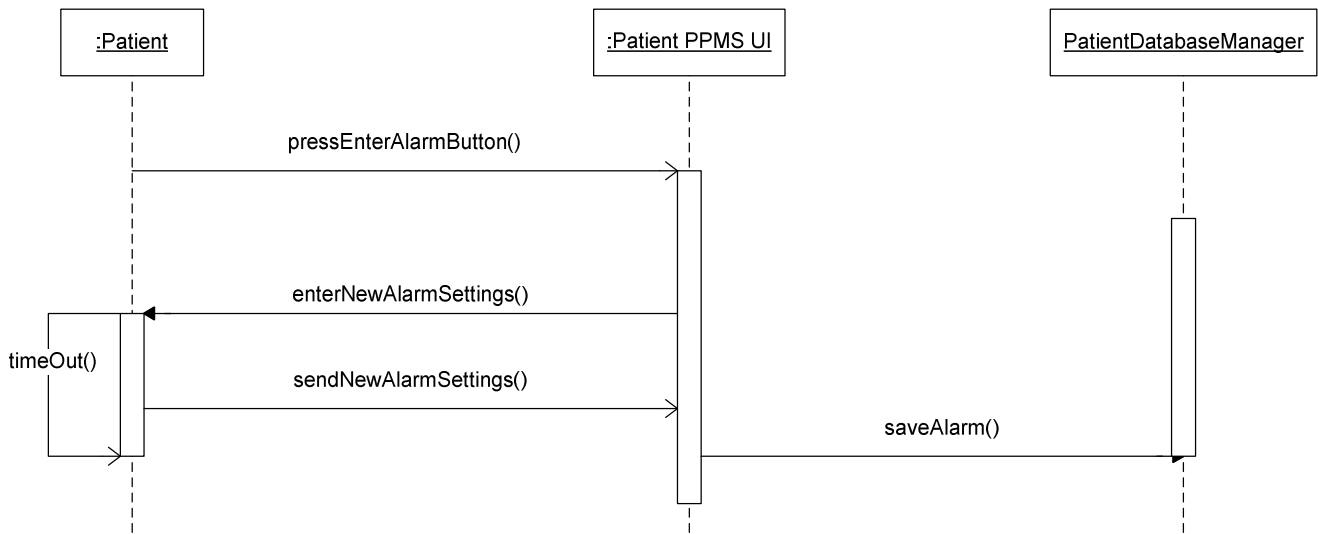


Fig 53: Sequence Diagram: Patient Enter Alarm Settings

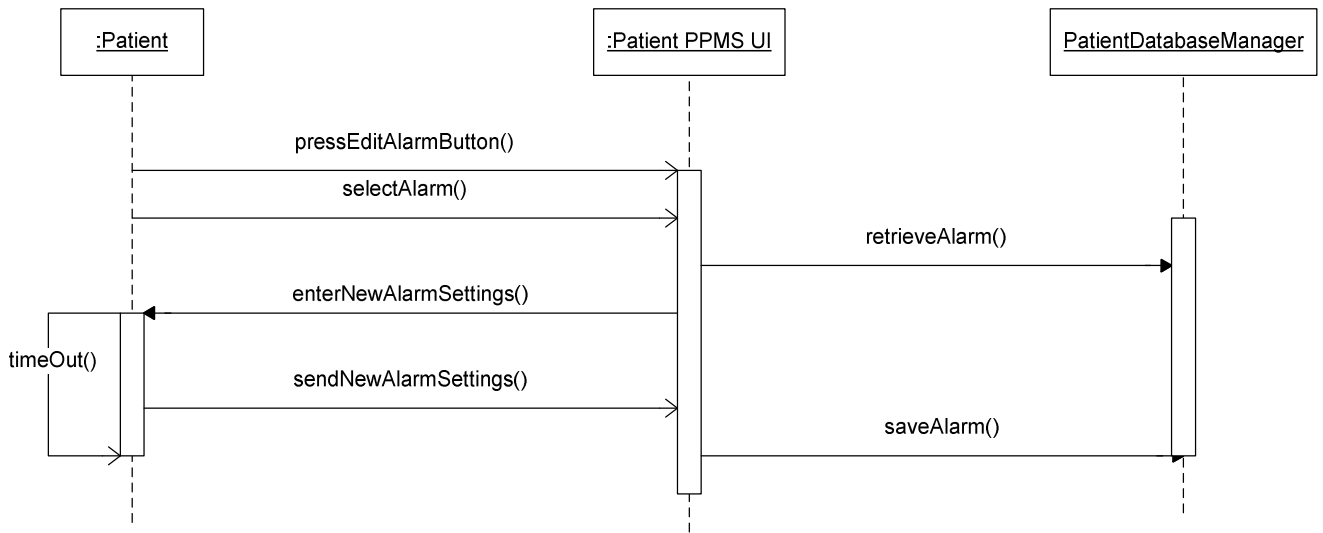


Fig 54: Patient Edit Alarm Setting

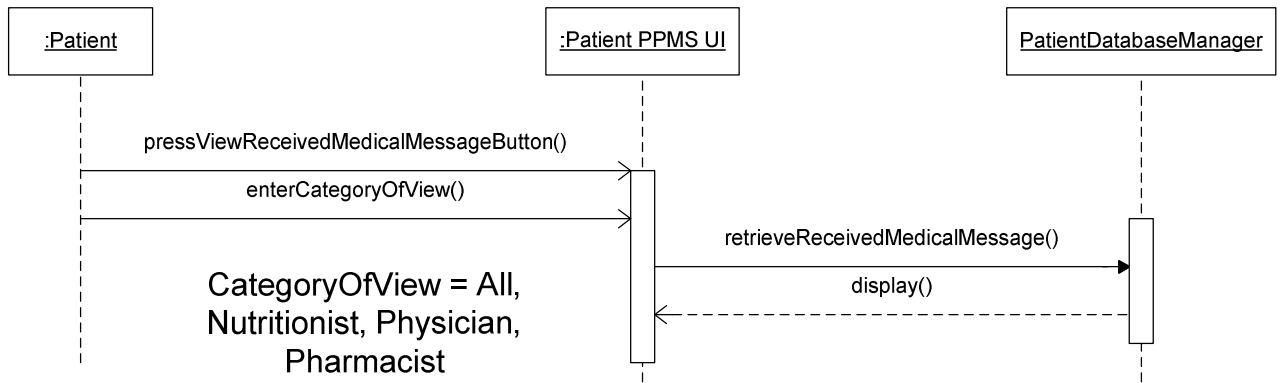


Fig 55: Patient View Received Medical Message

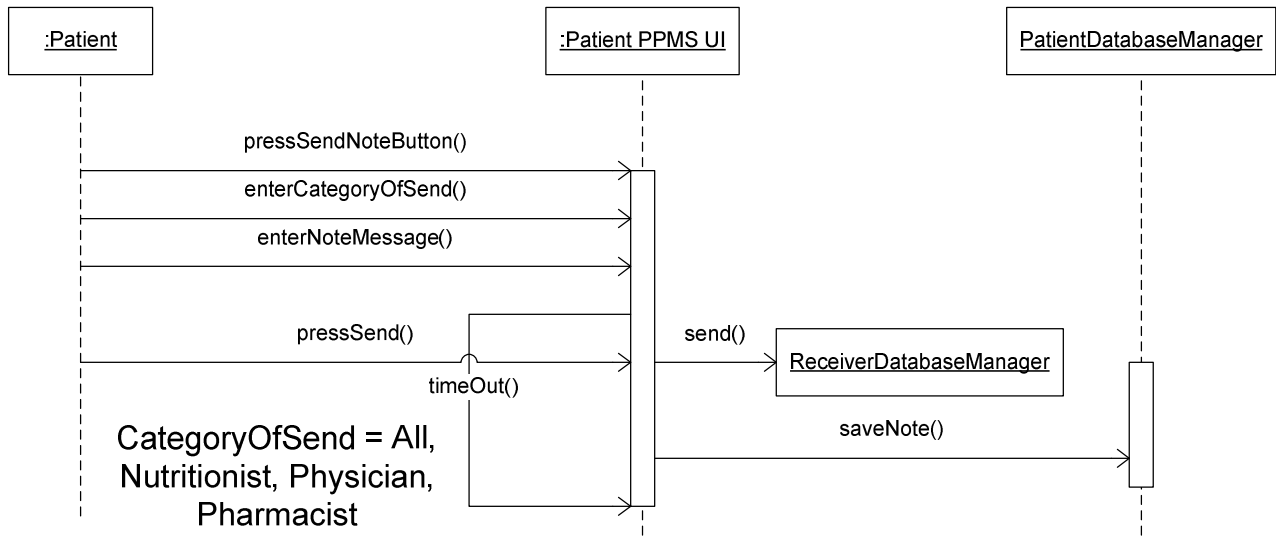


Fig 56: Patient Send Note to Medical Professional

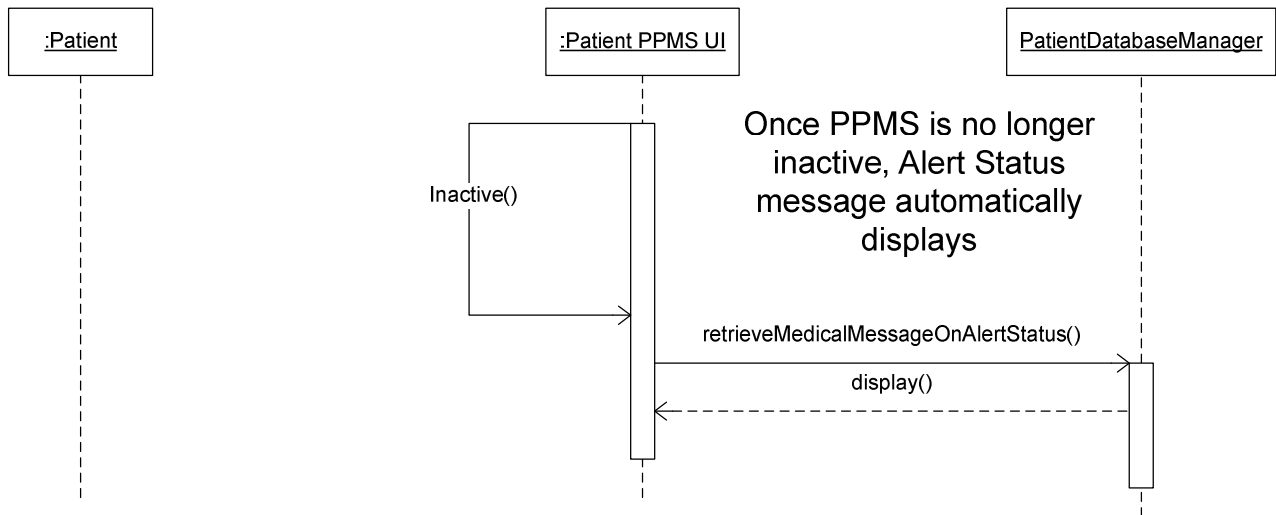


Fig 57: Patient View Medical Message on Alert Status

Medical Professional Sequence Diagram:

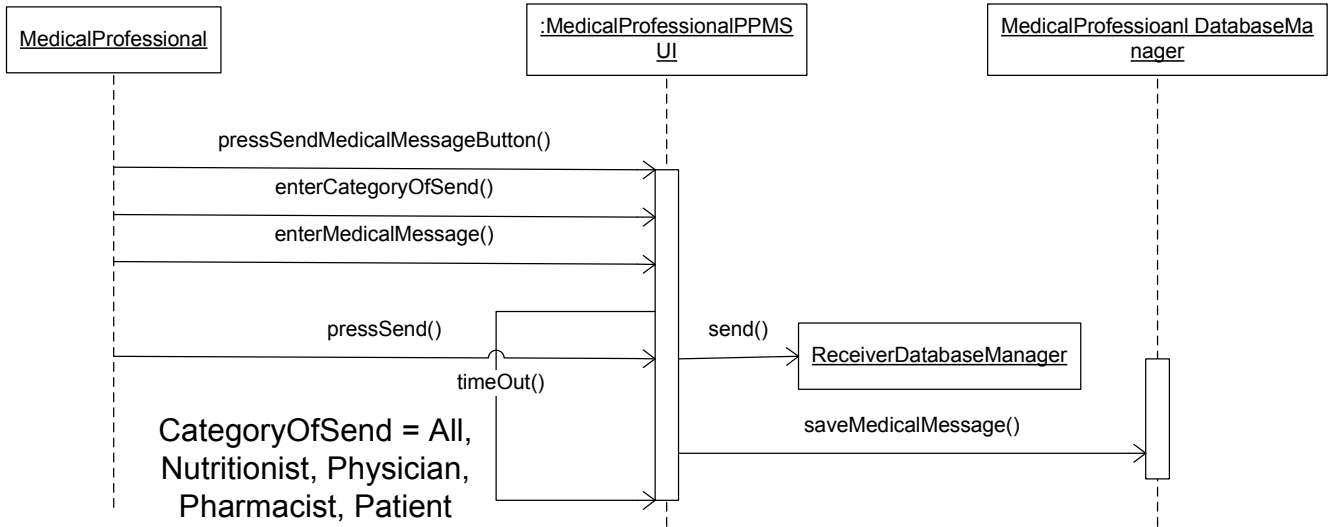


Fig 58: Medical Professional Send Medical Message

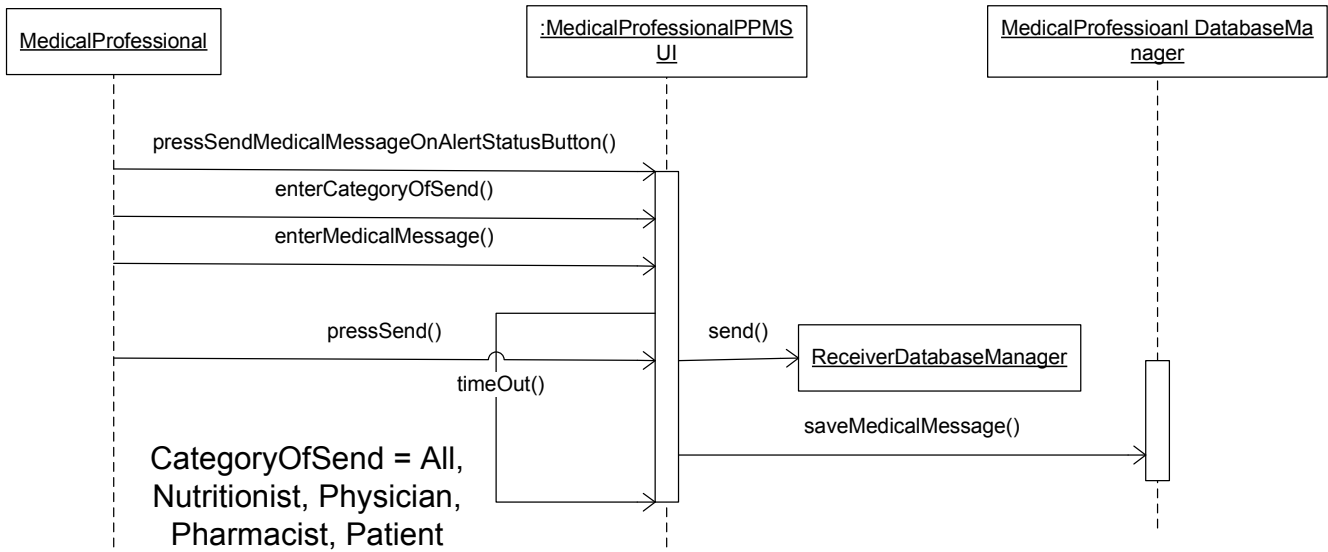


Fig 59: Medical Professional Send Medical Message on Alert Status

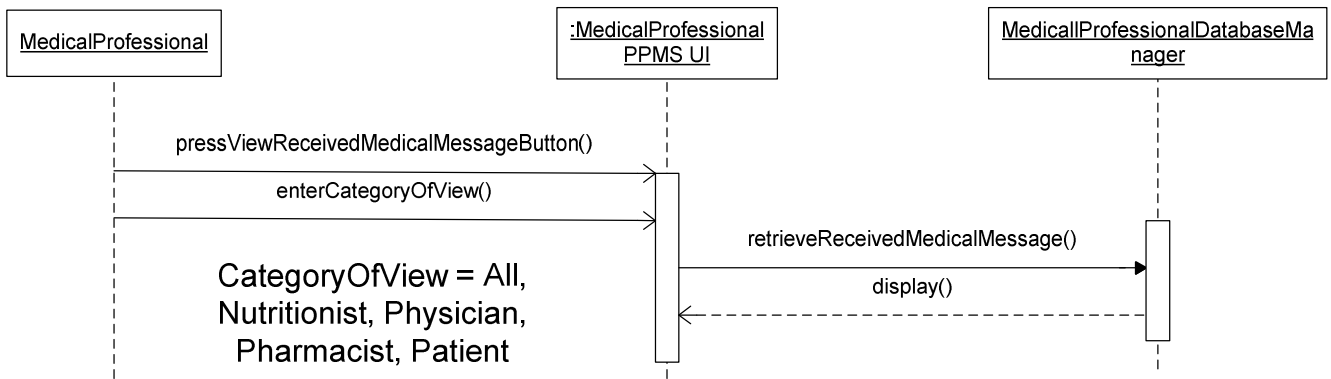


Fig 60: Medical Professional View Medical Message

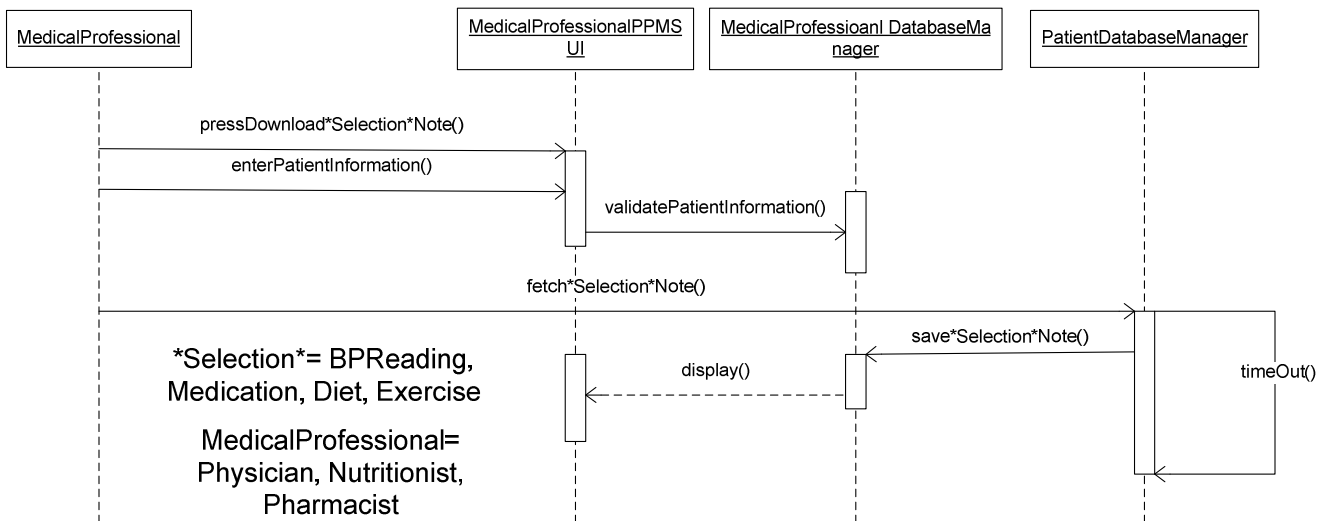


Fig 61: Medical Professional Download \*Selection\* Note

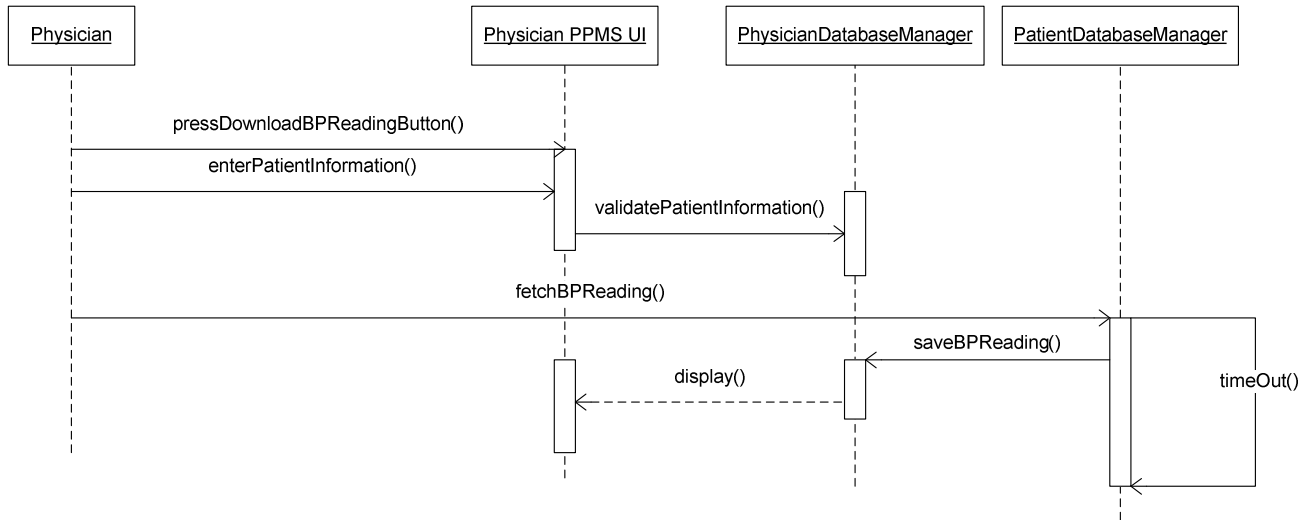


Fig 62: Physician Download BP Reading from Patient

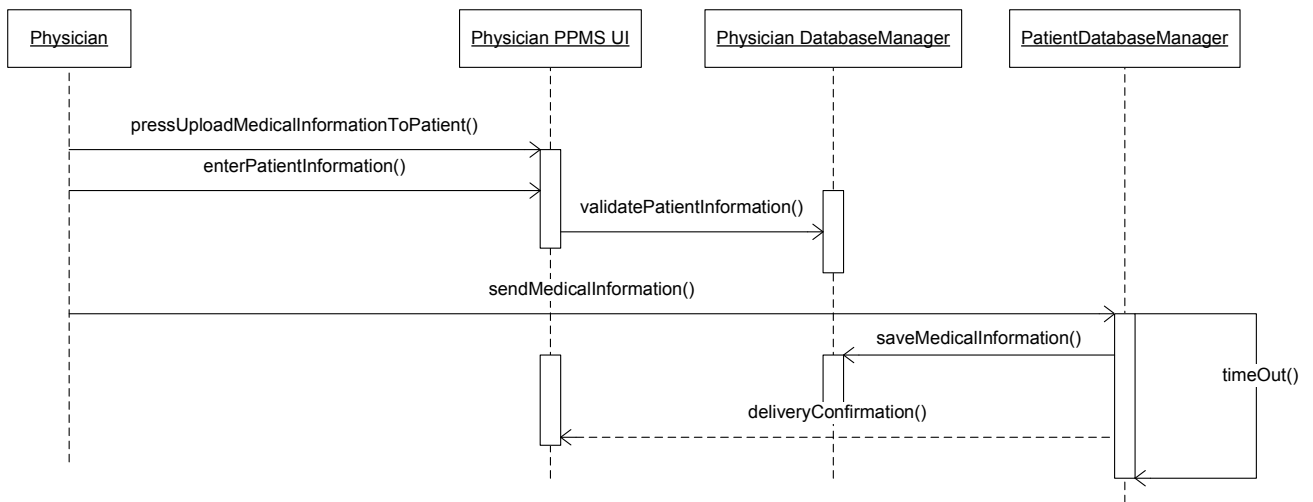


Fig 63: Physician Upload Medical Information to Patient

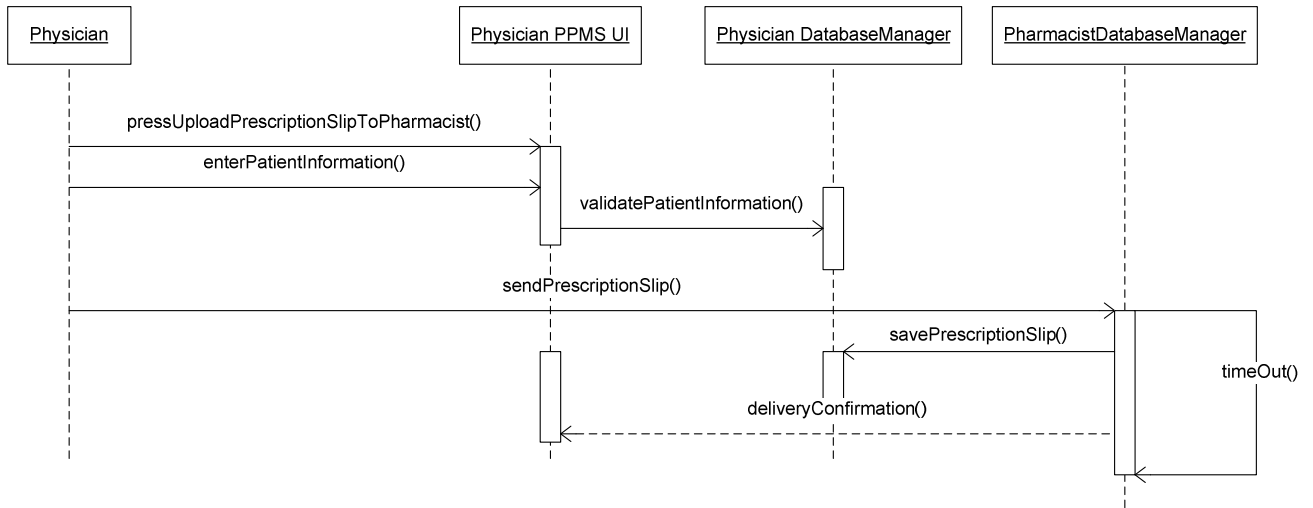


Fig 64: Physician Upload Prescription Slip to Pharmacist

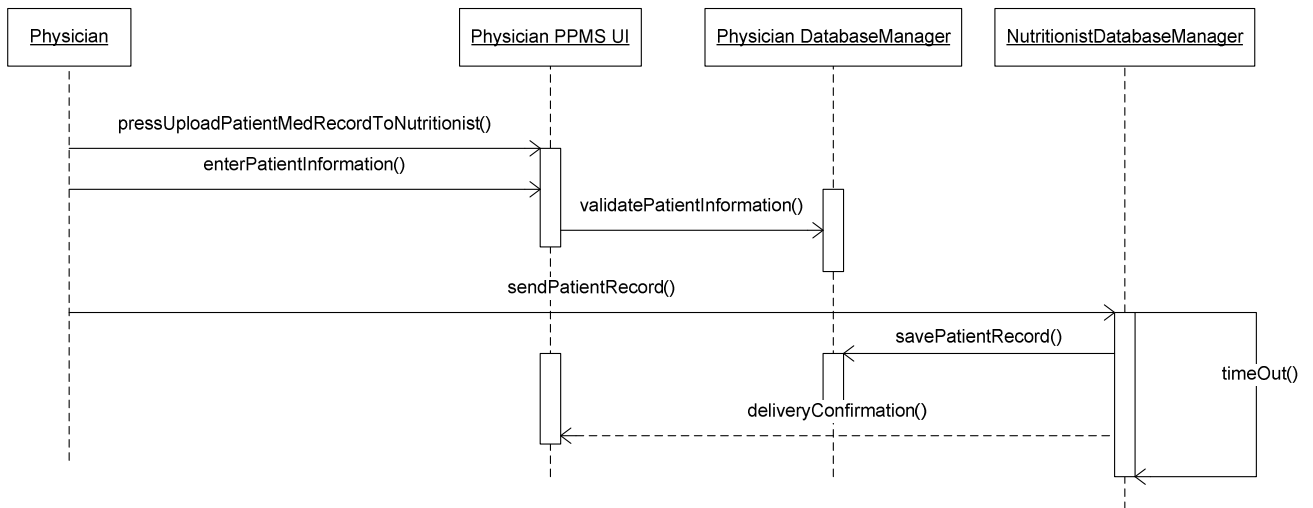


Fig 65: Physician Upload Patient Medical Record To Nutritionist

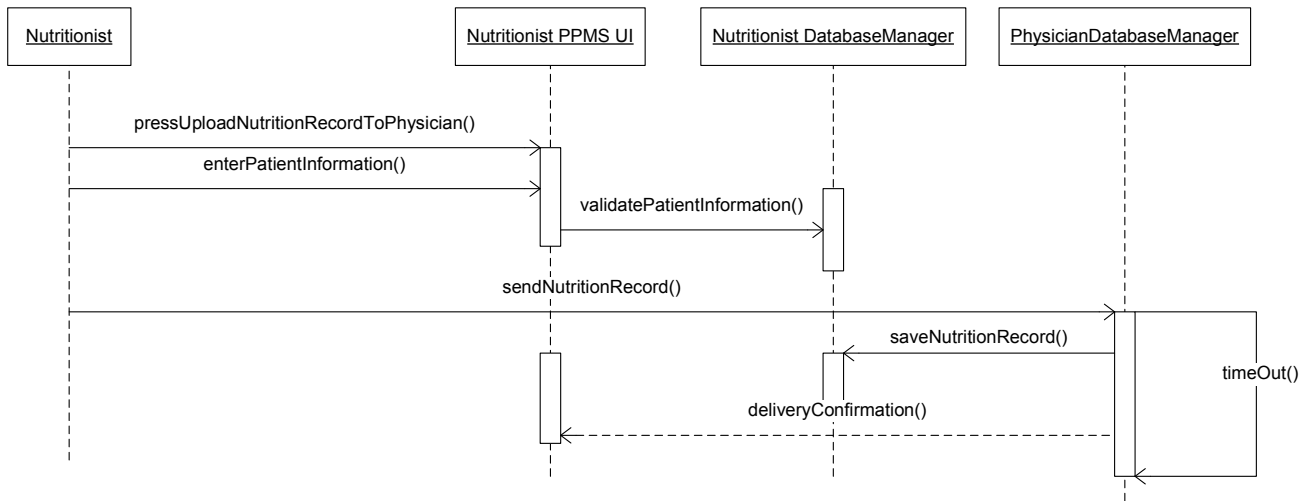


Fig 66: Nutritionist Upload Nutrition Record for Patient to Physician

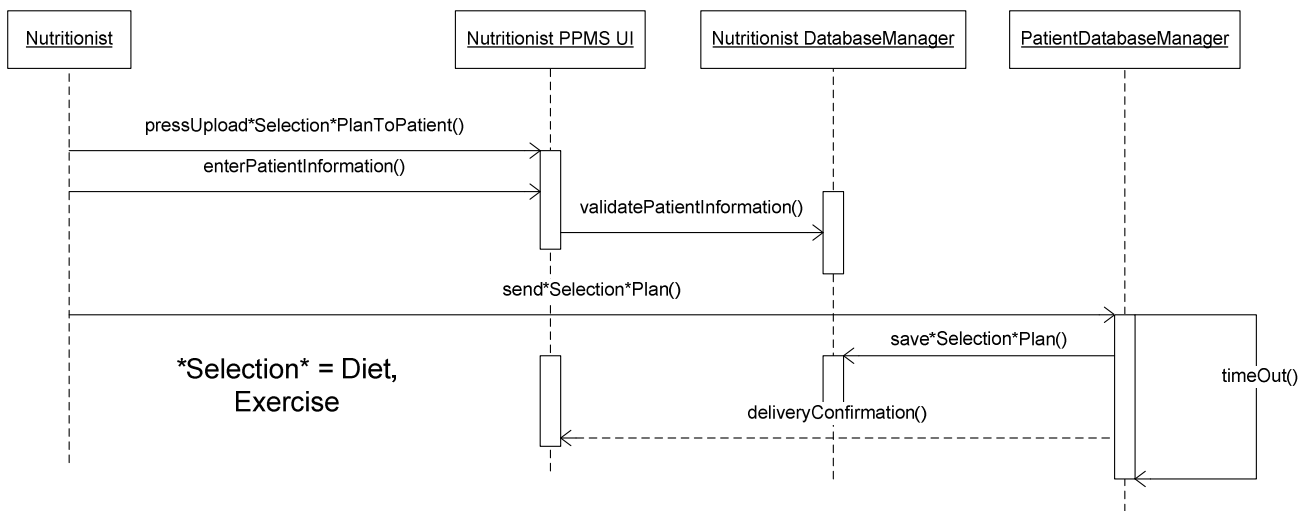


Fig 67: Nutritionist Upload \*Selection\* Plan To Patient



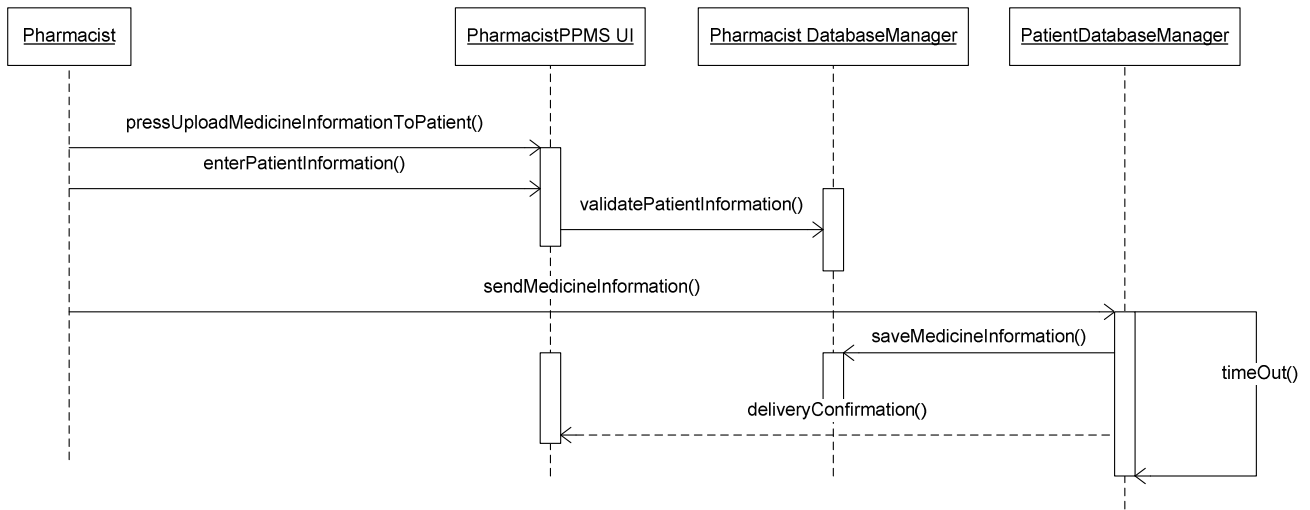


Fig 68: Pharmacist Upload Medicine Information to Patient

### State Diagrams

State diagrams demonstrate the actions performed by the system during system functionality execution. These diagrams provide another view into system implementation, following sequence and case diagrams. A few examples of case diagrams implemented into state diagrams are shown below.

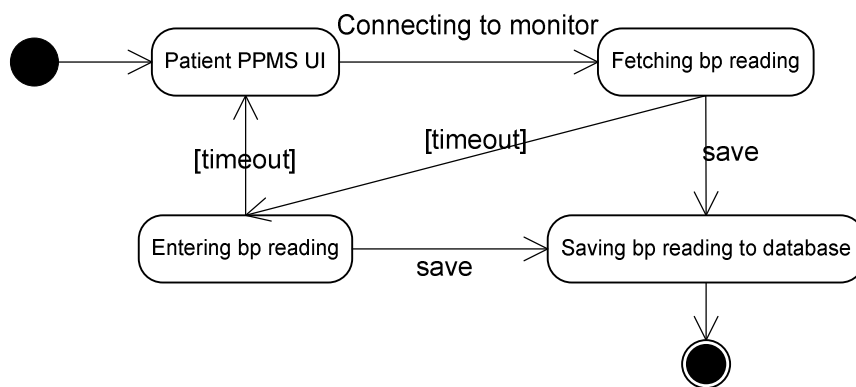


Fig 69: Patient Enters BP Pressure

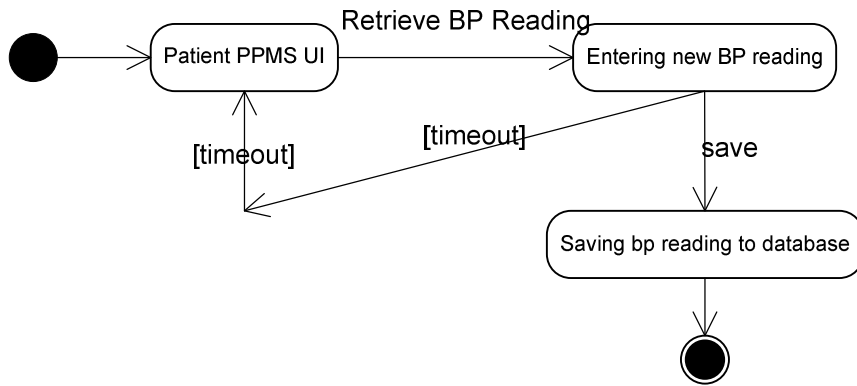


Fig 70: Patient Edit BP Reading

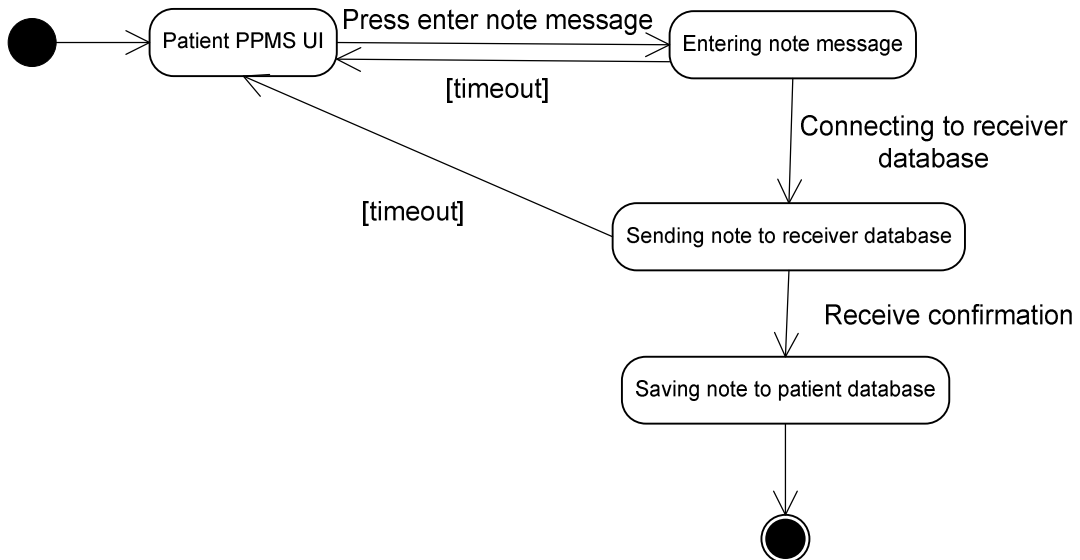


Fig 71: Patient Sends Note To Medical Professional

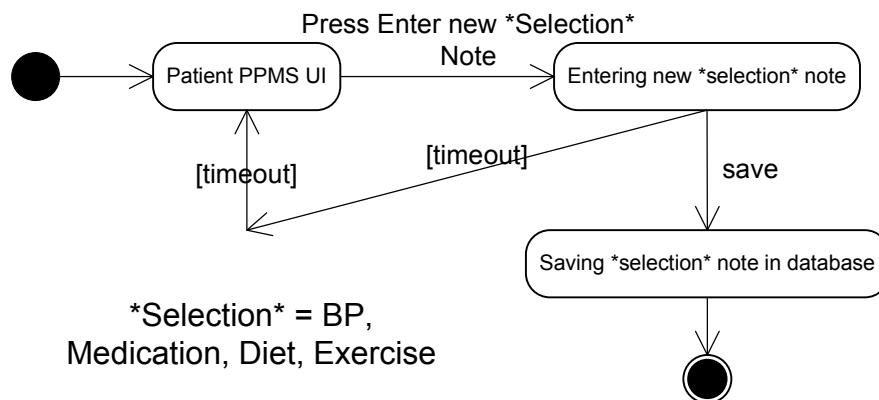


Fig 72: Patient Enters \*Selection\* Note

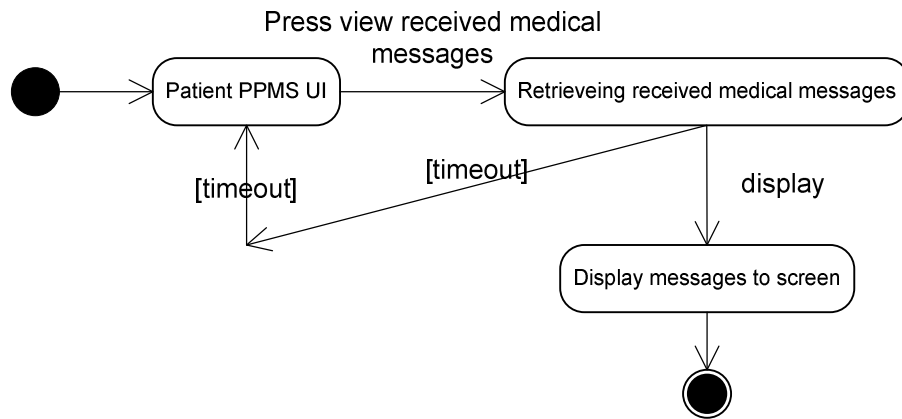


Fig 73: Patient View Received Medical Messages

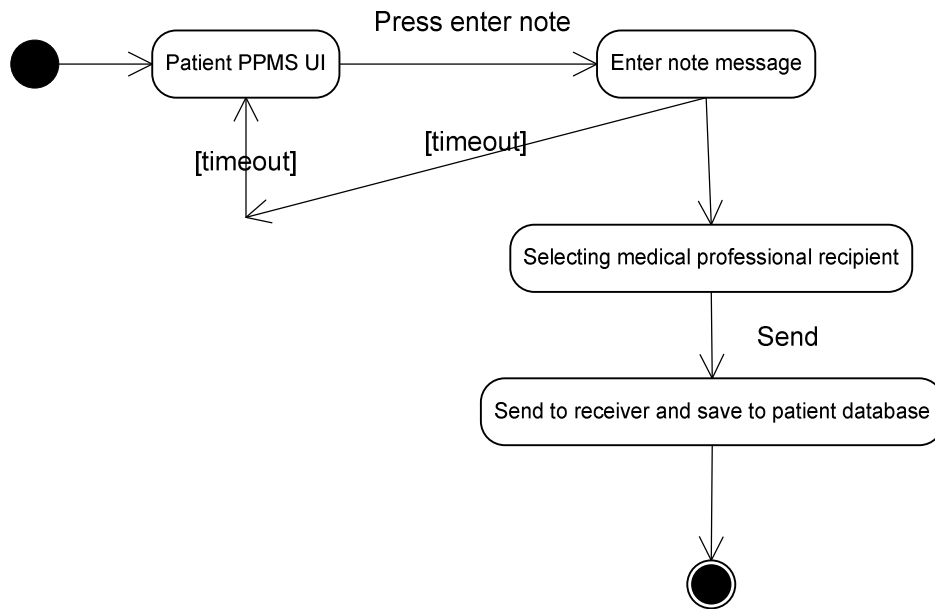


Fig 74: Patient Sends Note To Medical Professional

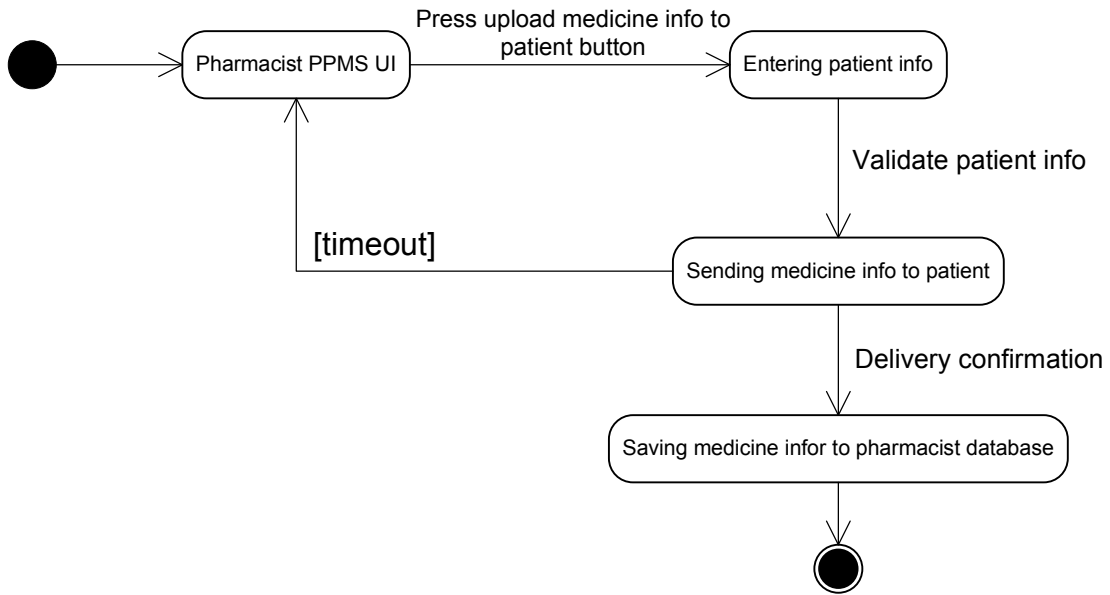


Fig 75: Pharmacist Upload Medicine Information to Patient

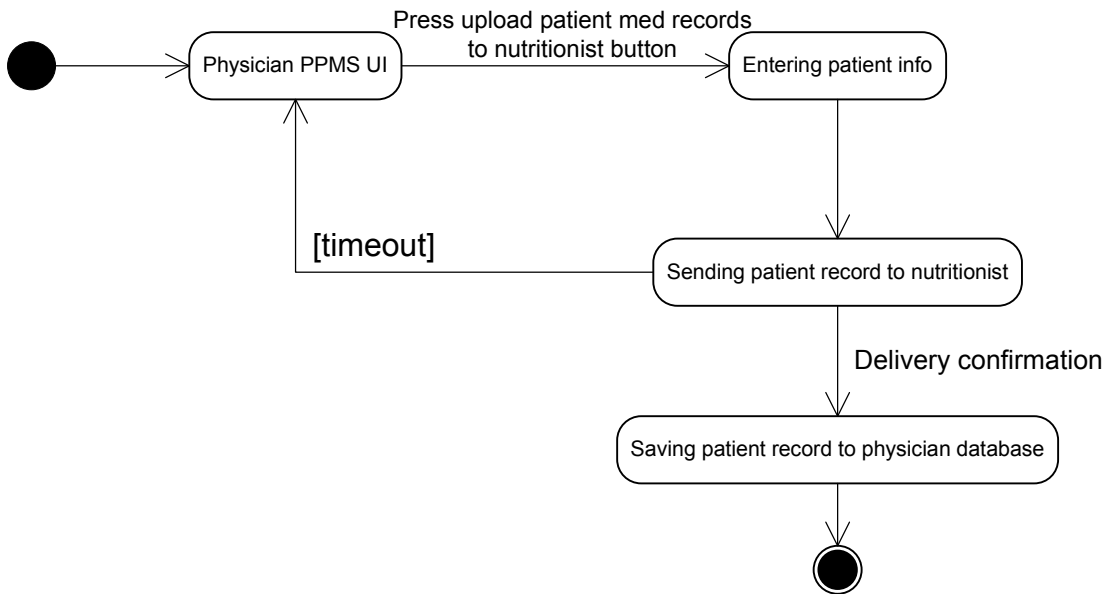


Fig 76: Physician Upload Patient Medical Record to Nutritionist

## Pseudocode Example for PPMS Patient Interface

Below is an example of how the patient user interface should be designed (example demonstrated using pseudocode). Our vision of the patient (and Medical Professional) UI is such that the system will respond to user interaction. The system will idle (or continuously loop-see while loop below) waiting for the user to ask the system to do something. Once the user presses a button, a switch statement will determine what function to call in order to properly execute the user's request. Since the Medical Professional UI is so similar in design (the only difference will be the different functionality of some functions inherent to only the medical professional class), we will only demonstrate the patient UI here.

**// Name of our class will be PPMS**

**// This is the implementation of .cpp file**

```
void main()
```

```
{
    PPMS user;
    UI_object button_pressed = new UI_object;
    UI_object EnterBPReading = new UI_object;
    UI_object EditBPReading = new UI_object;
    UI_object EnterNewBPReadingNote = new UI_object;
    UI_object EditBPReadingNote = new UI_object;
    UI_object ViewBPReadingNote = new UI_object;
    UI_object EnterNewMedicineNote = new UI_object;
    UI_object EditMedicineNote = new UI_object;
    UI_object ViewMedicineNote = new UI_object;
    UI_object EnterNewDietNote = new UI_object;
    UI_object EditDietNote = new UI_object;
    UI_object ViewDietNote = new UI_object;
    UI_object EnterNewExerciseNote = new UI_object;
    UI_object EditExerciseNote = new UI_object;
    UI_object ViewExerciseNote = new UI_object;
    UI_object EnterAlarm = new UI_object;
    UI_object EditAlarm = new UI_object;
    UI_object SendNoteToMedicalProf = new UI_object;
    UI_object ViewReceivedMessages= new UI_object;
```

```
// Our UI is waiting for any button to be pressed, once any button is pressed the //value of that will be
stored in button_pressed.value
```

```
While (button_pressed.value! = null)
```

```
{
    switch(button_pressed.value)
    {
        case EnterBPReading.value:
            user.EnterBPReadingbutton();
            break;
        case EditBPReading.value:
```

```
    user.EditBPReading();
    break;
case EnterBPReadingNote.value:
    user.EnterSelectionNote(bpReading);
    break;
case EditBPReadingNote.value:
    user.EditSelectionNote(bpReading);
    break;
case ViewBPReadingNote.value:
    user.ViewSelectionNote(bpReading);
    break;
case EnterNewMedicineNote.value:
    user.EnterSelectionNote(medicine);
    break;
case EditMedicineNote.value:
    user.EditSelectionNote(medicine);
    break;
case ViewMedicineNote.value:
    user.ViewSelectionNote(medicine);
    break;
case EnterNewDietNote.value:
    user.EnterSelectionNote(diet);
    break;
case EditDietNote.value:
    user.EditSelectionNote(diet);
    break;
case ViewDietNote.value:
    user.ViewSelectionNote(diet);
    break;
case EnterNewExerciseNote.value:
    user.EnterSelectionNote(exercise);
    break;
case EditExerciseNote.value:
    user.EditSelectionNote(exercise);
    break;
case ViewExerciseNote.value:
    user.ViewSelectionNote(exercise);
    break;
case EnterAlarm.value:
    user.EnterAlarm();
    break;
case EditAlarm.value:
    user.EditAlarm();
    break;
case SendNoteToMedicalProf.value:
    user.SendNoteToMedicalProf ();
    break;
case ViewReceivedMessages.value:
    user.ViewReceivedMessages();
```

```

                break;

                default:
                    error_message;
                    exit(0);
            }
        }
    }

void EnterBPReading()
{
    int fetch = fetchBPReading();

    If ( fetch = null)
    {
        enterBPReading();
        connect_database;
        sendBPReading();
        saveBPReading();
        disconnect_database;           // disconnect and return
    }
    else
    {
        connect_database;
        int send_reading = sendBPReading();
        if( send_reading = null)
        {
            exit;                       // return back to UI
        }
        saveBPReading();
        disconnect_database;           //disconnect and return
    }
}

void EditBPReading()
{
    enter_date();

    int fetch = retrieveBPReading();           // connect to database and retrieve

    if( fetch = null)
    {
        int get_reading = enterNewBPReading();
        if(get_reading = null)
        {

```

```

        exit;
    }
    connect_database;
    sendnewBPReading();
    savenewBPReading();
    disconnect_database;
}

```

```

void EnterSelectionNote(PPMS object_type)
//object_type is BP, Medicine, Diet, or Exercise

```

```

{
    int get_reading = enterNewSelectionNote(object_type);

```

```

// We assume that enternewBPReadingNote will return 1 if succeed or return 0 if //failure occurs;

```

```

    if(get_reading = 0)

```

```

    {
        exit;
    }

```

```

    connect_database;
    enterNote();
    sendNewSelectionNote();
    saveNote();
    disconnect_database;

```

```

}

```

```

void EditSelectionNote(PPMS object_type)

```

```

{
    connect_database;
    retrieveSelectionNote(object_type);
    int get_reading = enterNewSelectionNote(); //this fuction will return 1 if
    if(get_reading = 0) //sucedded else return 0
    {
        exit;
    }
    enterNote();
    sendNewSelectionNote();
    saveNote();
    disconnect_database;

```



```

}

void ViewSelectionNote(PPMS object_type)
{
    connect_database;
    retrieveSelectionNote(object_type);
    int get_reading = enterNewSelectionNote();           //this fuction will return 1 if
    if(get_reading = 0)                                 //sucedded else return 0
    {
        exit;
    }
    display();
    disconnect_database;
}

void EnterAlarm()
{
    connect_database;
    int get_reading = enterAlarm();
    if(get_reading = 0)
    {
        exit;
    }

    enterAlarm();
    sendAlarm();
    saveAlarm();
    disconnect_database;           // disconnect and return
}

void EditAlarm()
{
    connect_database;
    retrieveAlarm();
    int get_reading = enterAlarm();           //this fuction will return 1 if
    if(get_reading = 0)                       //sucedded else return 0
    {
        exit;
    }
    editAlarm();
    sendAlarm();
    saveAlarm();
    disconnect_database;
}

void sendNoteToMedicalProf()
{

```

```

connect_database;
int fetch = fetchMedicalProf(name);
if ( fetch = null)
{
    exit;
}
else
{
    int send_reading = sendNoteToMedicalProf();
    if( send_reading = null)
    {
        exit;           // return back to UI
    }
    enterNote();
    saveNote();
    sendNoteToMedicalProf(name);
    disconnect_database; //disconnect and return
}
}

void ViewSelectionNote(PPMS object_type)
{
    connect_database;
    retrieveSelectionNote(object_type);
    int get_reading = enterNewSelectionNote(); //this fuction will return 1 if
    if(get_reading = 0) //sucedded else return 0
    {
        exit;
    }
    display();
    disconnect_database;
}

void ViewReceivedMessages()
{
    connect_database;
    int messages = retrieveReceivedMessages();
    if(messages = 0)
    {
        display("no messages in inbox");
        exit;
    }
    display();
    disconnect_database;
}

```

## **Conclusion**

With PPMS, patients and their healthcare professionals will be able to easily share information and communicate efficiently with each other. This will alleviate stress for the patient as they venture into this new lifestyle common to those with hypertension. PPMS is designed to make this transition as stress-free and painless as possible for the patient, while providing them with a means to monitor their own progress and have all their important information in one area. PPMS will become the new at-home nurse, connecting patients with their medical professionals without leaving the comfort of their homes.

## **References**

Schmuller, Joseph. SAMS Teach Yourself UML in 24 Hours. Indianapolis: Sam's Publishing, 2004.