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Medical Informatics Program

Dosemate

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جامعة حلوان
كلية الحاسبات والذكاء الإصطناعي
برنامج المعلوماتية الطبية

Dosemate

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تحت إشراف:

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Overview:

Dosemate is a mobile medical application that aims to enhance the health care process through providing faster access to professional medical attention, A thorough drug inventory & detailed accurate pocket guide on how to deal with medical emergencies.

This software also offers alternate medical protocols to specific cases, patient monitoring & improve both medication adherence & medication reconciliation accuracy.

Objectives:

The software stores the input from user and actively cross reference any output to the user with the stored information first.

The software collects the symptoms from the user and run them through the AI algorithm to develop a diagnosis & then provide alternate medication protocols from the database associated with the diagnosis.

The software cross references medication searched by or prescribed to the user with his current medication intake stored in the database and check for any contradictions in their active substances.

The software then highlight such contradiction along side the severity or the consequences of it.

The software can remind the user with his drug intake's schedule and doses in the form of an alarm or notification when triggered by the user.

The software shows the user several dietary options that help with certain conditions or increase certain element in the body depending on the user's choice.

Purpose:

The purpose of the software is to actively monitor the user's health condition, Supervise the user's drug intake & provide access to professional medical help in common medical situations.

The scope

Purpose: Dose mate is a mobile application designed to help users manage their medications and track their medical conditions.

Features: The application includes features such as medication reminders, a database of drugs and diseases built using SQLite, and secure user authentication and medical data storage using Firebase.

Target audience: The application is intended for use by individuals who require medication management and monitoring, such as those with chronic medical conditions.

Technical specifications: Dose mate is built using Flutter, a mobile app development framework. The drug and disease database are built using SQLite, and user authentication and medical data storage are provided by Firebase.

Limitations: Dose mate is not a substitute for professional medical advice or treatment. Users should always consult with a healthcare provider regarding their medical conditions and treatments.

Future enhancements: Planned enhancements for Dose mate include additional features for medication tracking and management, integration with wearable health monitoring devices, and expanded drug and disease information resources.

General Constraints

Regulatory compliance

There is a range of medical regulations for Healthcare applications,
especially for those that are deeply connected with third-party medical devices.
Requirements of software usually depend on the class it is related to Mobile devices categorization
is based on different factors and can vary by region and country.
Healthcare applications should be carefully prepared for technical and security audits
In compliance with HL7 FHIR, MedMij, DICOM or other required healthcare standards.
Usually, the audit process is divided into several stages and takes time to pass.

Care mobility and scalability

People that use Healthcare applications expect them to be flexible and accessible.
That is why compatibility with different mobile devices is extremely important.
Healthcare apps should provide multi-platform access to app information and its features
on smartphones, smart watches, fitness bracelets and other mobile devices.

Insufficient focus on patients

The primary characteristic of any Healthcare platform should be "helpful".
It is important to put due attention to UI and UX design making it responsive, easy
and understandable for users.
The target audience of medical and wellness applications is very diverse.
As it can include people with disabilities, aged people and other specific audiences.

Private data vulnerability

The privacy of medical data is one of the most challenging tasks in Healthcare
software development.
A platform should provide security on all access levels – from the app interface to
separate spaces.

Feasibility Study

Introduction:

Dosemate is a mobile medical application designed to provide patients with a convenient and accessible way to manage their medications. The app is aimed at improving patient compliance, reducing medication errors, and promoting overall health and wellness. The purpose of this feasibility study is to assess the viability of the Dosemate application in the Egyptian market and to determine whether it is worth pursuing its development.

Market Analysis:

The Egyptian healthcare market has seen significant growth in recent years, with a growing demand for mobile medical solutions. There is a large number of mobile medical applications available in the market, but very few cater to the specific needs of patients in managing their medications. Dosemate aims to fill this gap in the market by providing a user-friendly, efficient, and effective solution to manage medication.

Technical Feasibility:

The development of Dosemate will require a robust technical infrastructure, including a secure server for storing patient data, a user-friendly interface, and integration with existing healthcare systems. The develop ent team will need to ensure that the application meets the necessary security and privacy standards, as well as ensuring its compatibility with a range of mobile devices.

Financial Feasibility:

The development and implementation of Dosemate will require significant financial investment. The costs will include development, marketing, and ongoing maintenance and support. The revenue potential for Dosemate is substantial, with a large target market of patients and healthcare providers. A detailed financial analysis will be conducted to determine the potential return on investment and to determine whether th project is financially feasible.

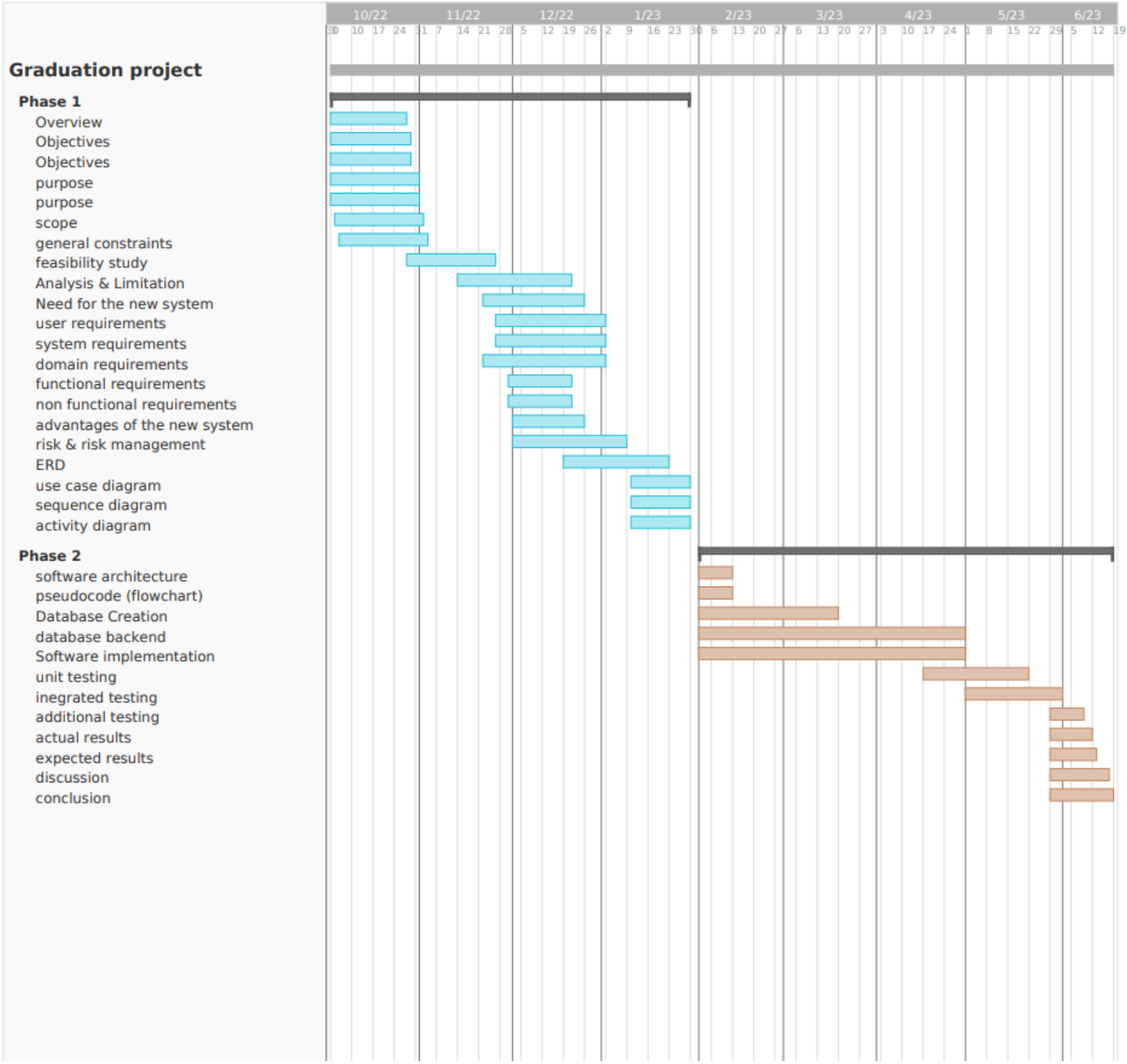
Legal Feasibility:

The development of Dosemate will require compliance with the relevant laws and regulations, including data protection and privacy laws, as well as any applicable healthcare regulations. The legal team will need to ensure that the application is compliant with all relevant laws and regulations before its release to the market.

Conclusion:

The development of Dosemate presents a significant opportunity for the Egyptian healthcare market. The application has the potential to improve patient compliance, reduce medication errors, and promote overall health and wellness. This feasibility study has determined that the project is technically, financially, and legally feasible, and that it is worth pursuing its development. Further research and analysis will be conducted to determine the best approach to bringing the Dosemate application to market.

Gantt Chart


10/22
11/22
12/22
1/23
2/23
3/23
4/23
5/23
6/23
Graduation project
Phase 1
Overview
Objectives
Objectives
purpose
purpose
scope
general constraints
feasibility study
Analysis & Limitation
Need for the new system
user requirements
system requirements
domain requirements
functional requirements
non functional requirements
advantages of the new system
risk & risk management
ERD
use case diagram
sequence diagram
activity diagram
Phase 2
software architecture
pseudocode (flowchart)
Database Creation
database backend
Software implementation
unit testing
inegrated testing
additional testing
actual results
expected results
discussion
conclusion

Analysis & limitations of the existing systems.

Limited integration with electronic medical records (EMR) systems: Many mobile medical apps do not have the ability to seamlessly integrate with EMR systems, which can limit their usefulness for healthcare providers.

Security and privacy concerns: Mobile medical apps can store sensitive medical data, and there is a risk of this data being accessed by unauthorized parties.

Inability to access EMR systems: Some mobile medical apps do not have the ability to access a patient's EMR, which can make it difficult for healthcare providers to view a complete and accurate picture of a patient's medical history.

Security vulnerabilities: Mobile medical apps can potentially be hacked, which could result in the unauthorized access or disclosure of sensitive medical data.

Limited evidence of effectiveness: Many mobile medical apps have not undergone rigorous testing to demonstrate their effectiveness in improving patient outcomes. For example, an app that claims to help patients manage their diabetes may not have been validated through clinical trials.

Lack of regulation: There are currently few regulatory standards for mobile medical apps, which means that there is no guarantee that an app is safe or effective.

Limited scalability: Some mobile medical apps are designed for use by a small number of patients and may not have the capability to support a larger patient population. For example, an app that helps patients track their medication

adherence may not be able to handle the workload if it is used by thousands of patients.

Limited interoperability: Different mobile medical apps may not be able to communicate or exchange data with each other, which can limit their usefulness and effectiveness. For example, an app that helps patients track their physical activity may not be able to share data with an app that helps patients manage their diet.

Limited personalization: Many mobile medical apps are not able to provide personalized recommendations or treatment plans based on an individual patient's unique characteristics and needs.

Lack of coordination with healthcare providers: Some mobile medical apps do not have the ability to communicate with healthcare providers, which can limit their usefulness in a clinical setting.

Inaccurate or unreliable data: Some mobile medical apps may not accurately capture or transmit data, which can lead to incorrect or misleading information being used in the healthcare process.

User error: Mobile medical apps rely on users to input accurate data and follow instructions correctly. If users make errors, the app may not be able to provide accurate or useful information.

Limited offline functionality: Some mobile medical apps require an internet connection to function, which can be a limitation in areas with poor or no internet coverage.

Compatibility issues: Mobile medical apps may not be compatible with all devices or operating systems, which can limit their accessibility for some users.

Internet connectivity: Medical consulting apps typically require an internet connection to function properly. This can be a limitation in areas with poor or unreliable internet coverage.

Device compatibility: Some medical consulting apps may only be compatible with certain types of devices, such as smartphones or tablets. This can limit the number of people who can use the app.

User interface: The user interface of a medical consulting app can impact its usability and effectiveness. If the app is difficult to use or navigate, it may discourage people from using it.

Data storage and processing: Medical consulting apps often need to store and process large amounts of data, such as patient records and test results. This can be a technological challenge, particularly if the app needs to support large numbers of users.

Integration with other systems: Medical consulting apps may need to integrate with other systems, such as electronic health record systems or laboratory test systems. This can be a complex technical challenge.

Security: Medical consulting apps handle sensitive personal and medical information, so it is important to make sure that the app has appropriate security measures in place to protect this data. This can be a technological challenge, as hackers and malicious actors may try to access the data.

Performance and scalability: Medical consulting apps need to be able to perform well and handle high levels of usage, particularly during times of high demand. This can be a technological challenge, as the app may need to scale up its resources to meet the demand.

Need for the new system.

Integration with EMR systems: The new system should be able to seamlessly integrate with EMR systems to provide healthcare providers with a complete and accurate picture of a patient's medical history.

Security and privacy: The new system should prioritize the security and privacy of patient data, with measures in place to prevent unauthorized access or disclosure.

Evidence of effectiveness: The new system should be thoroughly tested and validated to demonstrate its effectiveness in improving patient outcomes.

Regulation: The new system should be developed and marketed in compliance with relevant regulatory standards.

Scalability: The new system should be able to support a large number of users and handle a high volume of data.

Interoperability: The new system should be able to communicate and exchange data with other medical apps and systems.

Personalization: The new system should be able to provide personalized recommendations and treatment plans based on individual patient characteristics and needs.

Coordination with healthcare providers: The new system should be able to communicate with healthcare providers and integrate with clinical workflows.

Reliable and accurate data: The new system should be able to accurately capture and transmit data.

User-friendly design: The new system should be easy for users to navigate and use correctly.

Offline functionality: The new system should be able to function without an internet connection, at least for certain features.

Compatibility: The new system should be compatible with a wide range of devices and operating systems.

There are several reasons why a new mobile medical application system may be necessary:

Integration with EMR systems: Current systems may not have the ability to seamlessly integrate with EMR systems, which can limit their usefulness for healthcare providers. A new system that is able to integrate with EMR systems would provide healthcare providers with a completer and more accurate picture of a patient's medical history, leading to better patient care.

Security and privacy: Current systems may have security vulnerabilities that could result in the unauthorized access or disclosure of sensitive medical data. A new system that prioritizes security and privacy would help to protect patient data and maintain trust in the healthcare system.

Evidence of effectiveness: Many current systems have not been thoroughly tested or validated, and there is limited evidence of their effectiveness in improving patient outcomes. A new system that has been thoroughly tested and validated would provide healthcare providers with confidence in its ability to improve patient outcomes.

Regulation: There is currently limited regulation of mobile medical apps, which can make it difficult for healthcare providers to determine which apps are safe and effective. A new system that is developed and marketed in compliance with relevant regulatory standards would help to ensure that it is safe and effective.

Scalability: Some current systems may not be able to support many users or handle a high volume of data. A new system that is designed with scalability in mind would be able to support a larger patient population and handle a higher volume of data.

Interoperability: Current systems may not be able to communicate or exchange data with each other, which can limit their usefulness and effectiveness. A new

system that can interoperate with other medical apps and systems would be able to provide a more comprehensive and cohesive healthcare experience for patients.

Personalization: Many current systems are not able to provide personalized recommendations or treatment plans based on individual patient characteristics and needs. A new system that can personalize care would be able to better meet the unique needs of each patient.

Coordination with healthcare providers: Some current systems do not have the ability to communicate with healthcare providers, which can limit their usefulness in a clinical setting. A new system that can coordinate with healthcare providers would be able to better integrate with clinical workflows and support patient care.

Reliable and accurate data: Some current systems may not accurately capture or transmit data, which can lead to incorrect or misleading information being used in the healthcare process. A new system that is able to reliably and accurately capture and transmit data would help to ensure that healthcare providers have accurate and up-to-date information about their patients.

User-friendly design: Some current systems may be difficult for users to navigate or use correctly. A new system with a user-friendly design would be easier for users to use and would be more likely to be adopted and used consistently.

Offline functionality: Some current systems may require an internet connection to function, which can be a limitation in areas with poor or no internet coverage. A new system with offline functionality would be able to function in these situations, improving access to care.

Compatibility: Some current systems may not be compatible with all devices or operating systems, which can limit their accessibility for some users. A new system

that is compatible with a wide range of devices and operating systems would be more accessible to a larger number of users.

Limited integration with EMR systems: Many current systems do not have the ability to seamlessly integrate with EMR systems, which can limit their usefulness for healthcare providers. A new system that is able to integrate with EMR systems would provide healthcare providers with a completer and more accurate picture of a patient's medical history, leading to better patient care.

Security and privacy concerns: Current systems may have security vulnerabilities that could result in the unauthorized access or disclosure of sensitive medical data. A new system that prioritizes security and privacy would help to protect patient data and maintain trust in the healthcare system.

Limited evidence of effectiveness: Many current systems have not been thoroughly tested or validated, and there is limited evidence of their effectiveness in improving patient outcomes. A new system that has been thoroughly tested and validated would provide healthcare providers with confidence in its ability to improve patient outcomes.

Lack of regulation: There is currently limited regulation of mobile medical apps, which can make it difficult for healthcare providers to determine which apps are safe and effective. A new system that is developed and marketed in compliance with relevant regulatory standards would help to ensure that it is safe and effective.

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Inaccurate or unreliable data: Some current systems may not accurately capture or transmit data, which can lead to incorrect or misleading information being used in the healthcare process. A new system that can reliably and accurately capture and transmit data would help to ensure that healthcare providers have accurate and up-to-date information about their patients.

User error: Current systems may be difficult for users to navigate or use correctly, which can lead to errors and incorrect use. A new system with a user-friendly design would be easier for users to use and would be more likely to be adopted and used consistently.

Limited offline functionality: Some current systems may require an internet connection to function, which can be a limitation in areas with poor or no internet coverage. A new system with offline functionality would be able to function in these situations, improving access to care.

Compatibility issues: Some current systems may not be compatible with all devices or operating systems, which can limit their accessibility for some users. A new system that is compatible with a wide range of devices and operating systems would be more accessible to a larger number of users.

User Requirements:

- The user shall find a menu where he can create a profile and provide information regarding his health condition.
- The user should be able to type in his symptoms and the software would provide a diagnosis and suggest alternate medication protocols corresponding to user's current medication intake.
- The user can check any drug's alternatives according to price V availability, The user can also select a drug and discover which ones it interacts negatively with.
- The user can set a reminder for his medication plan.
- The user can access a menu that suggests dietary options corresponding to certain conditions.

System requirements:

- *The system will prompt a Profile menu and store input personal & health information (name, age, weight, height, family history, chronic conditions, & current medication intake).*

- *The system will provide diagnosis to the patient according to his symptoms.*

- *The system shall suggest medication protocol corresponding the user current symptoms and his medication intake.*

- *The system shall provide drug's alternatives according to price and/or availability.*

- *The system can show the contradicted medications to the patient's medication protocol which must be avoided.*

- *The system can also send notifications to the patient to remind him with his medication plan.*

- *The system will show the patient a menu that suggests dietary options & meals corresponding to the patient's condition.*

Domain Requirements

The application must be user-friendly and intuitive to navigate.

The application must be able to securely store and retrieve patient medical information, including personal information, medical history, and current medications.

The application must be able to connect to a secure server to transmit and receive data, such as lab results or prescription refills.

The application must be able to display relevant medical information in a clear and easy-to-understand format.

The application must be able to provide alerts and notifications for important events, such as upcoming appointments or medication reminders.

The application must be able to support a variety of mobile devices and operating systems.

Functional Requirements

The app must allow users to enter and store their personal medical information, including allergies, medications, and medical conditions.

The app must allow users to set reminders for taking medications and scheduling appointments.

The app must allow users to track their symptoms and vital signs, such as blood pressure and heart rate.

The app must allow users to access and view their medical records and test results.

The app must allow users to communicate with their healthcare providers through secure messaging.

The app must have a user-friendly interface that is easy to navigate and use.

The app must be secure and protect the privacy of users' medical information.

The app must be compatible with iOS and Android devices.

The app must be regularly updated to ensure compatibility with the latest versions of the operating systems.

Nonfunctional Requirements

The app must be reliable and consistently available to users.

The app must be scalable and able to handle an increase in users and data without degradation in performance.

The app must be usable and accessible to users with different levels of technical proficiency and physical abilities.

The app must be compliant with relevant laws and regulations.

The app must have a user-friendly interface that is easy to navigate and use.

The app must be able to integrate with other medical systems and devices, such as electronic medical record systems and wearable fitness trackers.

The app must be able to operate on a variety of mobile devices and network conditions.

The app must be maintainable and support regular updates and improvements.

Advantages of the new system.

Improved integration with EMR systems: A new system that can seamlessly integrate with EMR systems would provide healthcare providers with a completer and more accurate picture of a patient's medical history, leading to better patient care.

Enhanced security and privacy: A new system that prioritizes security and privacy would help to protect patient data and maintain trust in the healthcare system.

Demonstrated effectiveness: A new system that has been thoroughly tested and validated would provide healthcare providers with confidence in its ability to improve patient outcomes.

Compliance with regulatory standards: A new system that is developed and marketed in compliance with relevant regulatory standards would help to ensure that it is safe and effective.

Improved scalability: A new system that is designed with scalability in mind would be able to support a larger patient population and handle a higher volume of data.

Improved interoperability: A new system that can interoperate with other medical apps and systems would be able to provide a more comprehensive and cohesive healthcare experience for patients.

Enhanced personalization: A new system that can provide personalized recommendations and treatment plans based on individual patient characteristics and needs would be able to better meet the unique needs of each patient.

Improved coordination with healthcare providers: A new system that can communicate with healthcare providers and integrate with clinical workflows would be able to better support patient care.

Reliable and accurate data: A new system that can accurately capture and transmit data would help to ensure that healthcare providers have accurate and up-to-date information about their patients.

User-friendly design: A new system with a user-friendly design would be easier for users to use and would be more likely to be adopted and used consistently.

Improved offline functionality: A new system with offline functionality would be able to function in areas with poor or no internet coverage, improving access to care.

Enhanced compatibility: A new system that is compatible with a wide range of devices and operating systems would be more accessible to a larger number of users.

Risks & Risk Management

***Technical failures**: There is a risk that the new system may experience technical failures or glitches, which could compromise its functionality and reliability. To manage this risk, it would be important to thoroughly test the new system during the development phase and put measures in place to address any issues that arise.*

***Data breaches:** There is a risk that patient data stored in the new system could be accessed by unauthorized parties, potentially leading to a data breach. To manage this risk, it would be important to implement robust security measures to protect patient data and to have a plan in place to respond to any data breaches that may occur.*

***User adoption:** There is a risk that users may not adopt the new system, either due to a lack of awareness or because they prefer the old system. To manage this risk, it would be important to engage with users and stakeholders during the development process to ensure that the new system meets their needs and to effectively communicate the benefits of the new system.*

***Regulatory compliance:** There is a risk that the new system may not meet relevant regulatory standards, which could result in regulatory fines or other consequences. To manage this risk, it would be important to consult with regulatory agencies during the development process and ensure that the new system is*

developed and marketed in compliance with relevant regulations.

Interoperability issues: *There is a risk that the new system may not be able to communicate or exchange data with other medical apps and systems, which could limit its usefulness and effectiveness. To manage this risk, it would be important to ensure that the new system is designed with interoperability in mind and to test its interoperability with other systems during the development phase.*

Unforeseen consequences: *There is a risk that the new system may have unintended consequences that are not anticipated during the development process. To manage this risk, it would be important to conduct thorough testing and analysis to identify any potential unintended consequences and to have contingency plans in place to address them.*

User error: *There is a risk that users may make errors when using the new system, which could lead to incorrect or misleading data being captured or transmitted. To manage this risk, it would be important to design the new system with user-friendly features to minimize the potential for errors and to provide users with training and support as needed.*

Resource constraints: *There is a risk that the development and implementation of the new system may exceed available resources, which could impact the timeline and budget for the project. To manage this risk, it would be important to carefully*

plan the development and implementation process and to allocate resources appropriately.

Legal liabilities: There is a risk that the new system may be the subject of legal action, either due to a data breach or other issue. To manage this risk, it would be important to consult with legal counsel and to have appropriate legal protections in place.

Performance risks: *The app could crash or freeze, leading to a poor user experience.*

Risk management: *Test the app thoroughly to identify and fix any performance issues. Monitor the app's performance in production and implement strategies to optimize performance, such as caching or load balancing.*

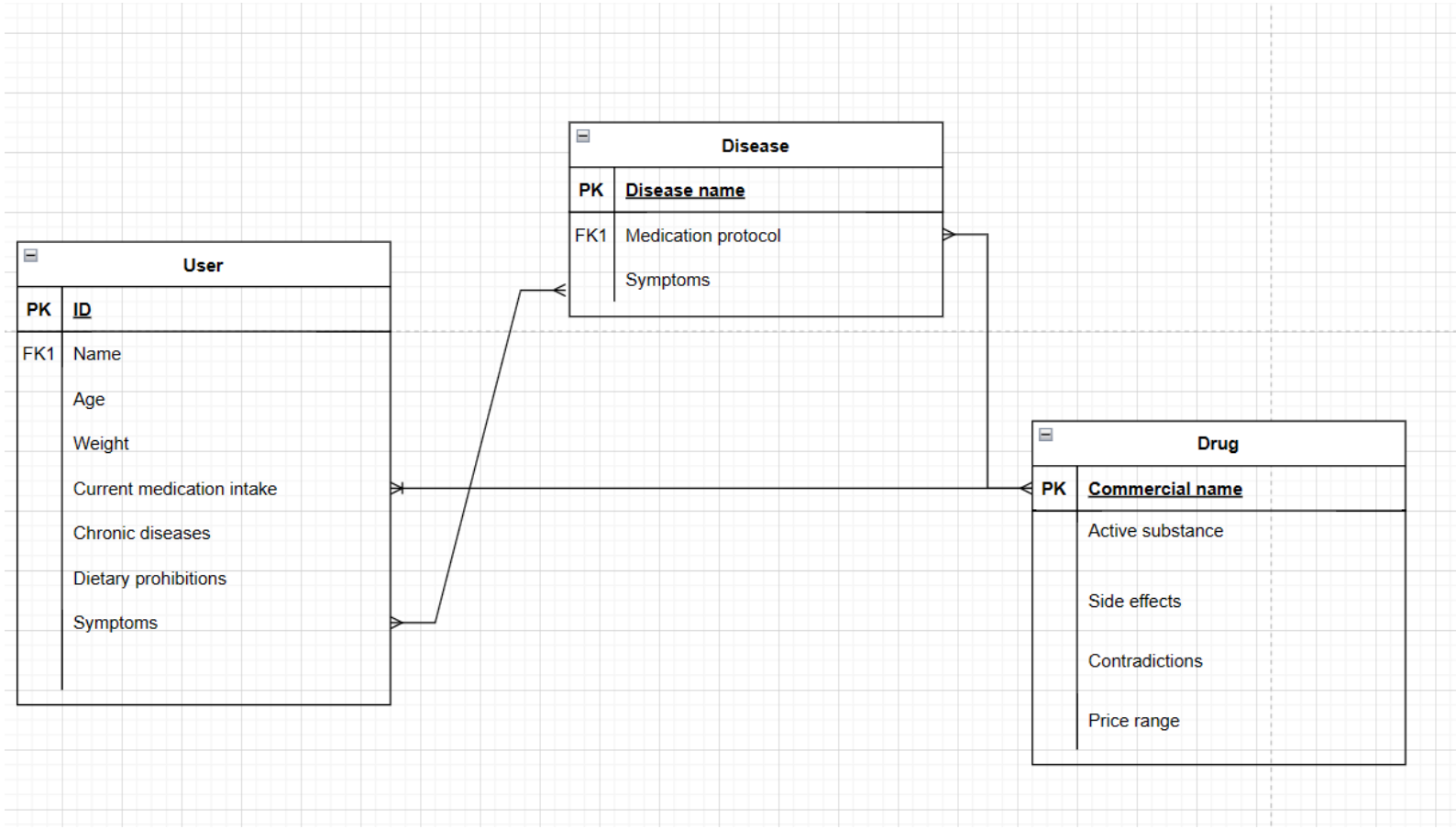
Usability risks:

The app could be difficult to use, leading to user frustration and abandonment.

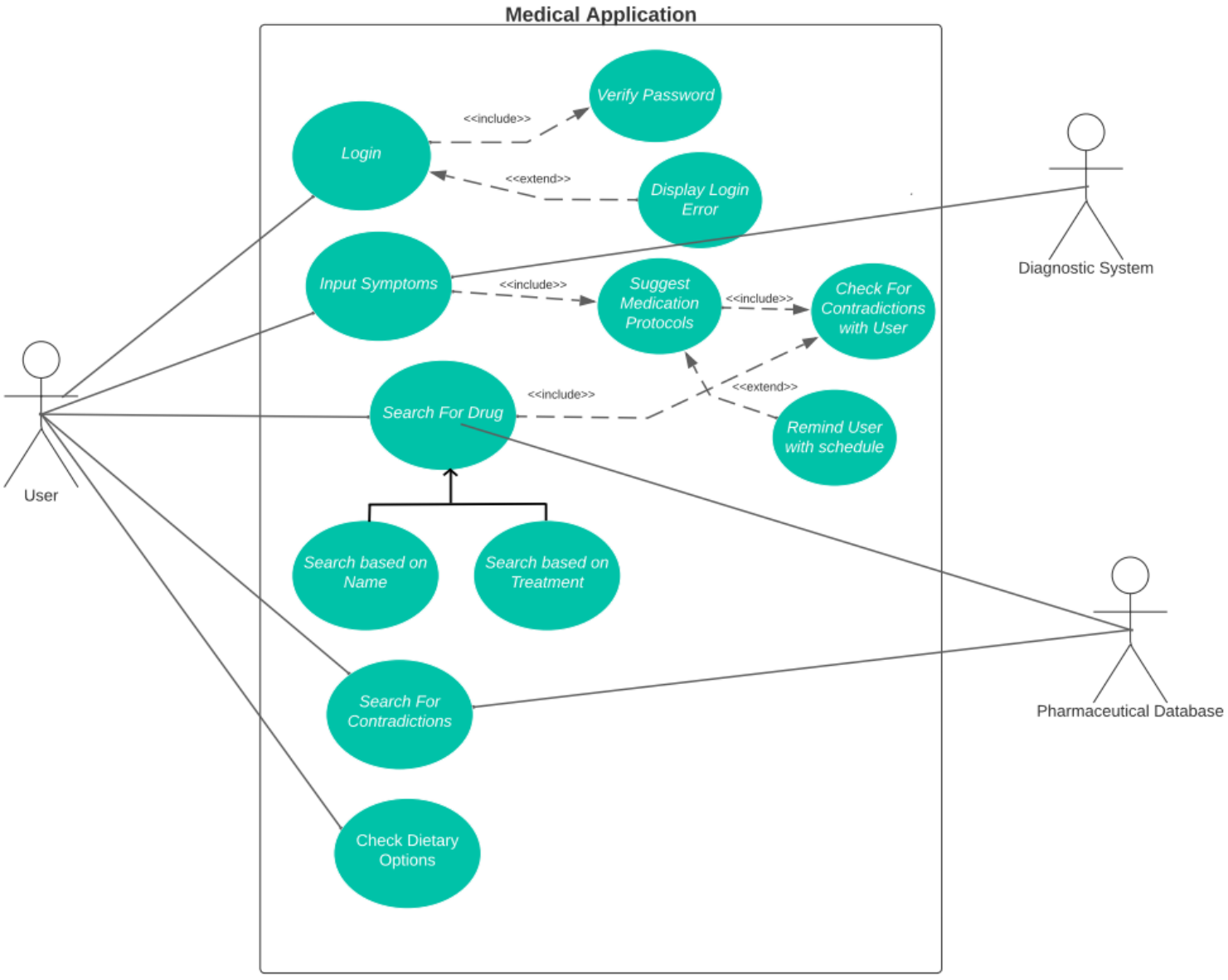
Risk management: *Conduct user testing to identify usability issues and make improvements based on user feedback. Use clear and intuitive design principles to guide the app's user interface.*

Legal & Regulatory Risk management*: Conduct thorough legal and regulatory research to ensure the app is compliant. Consider consulting with legal counsel to address any potential risks.*

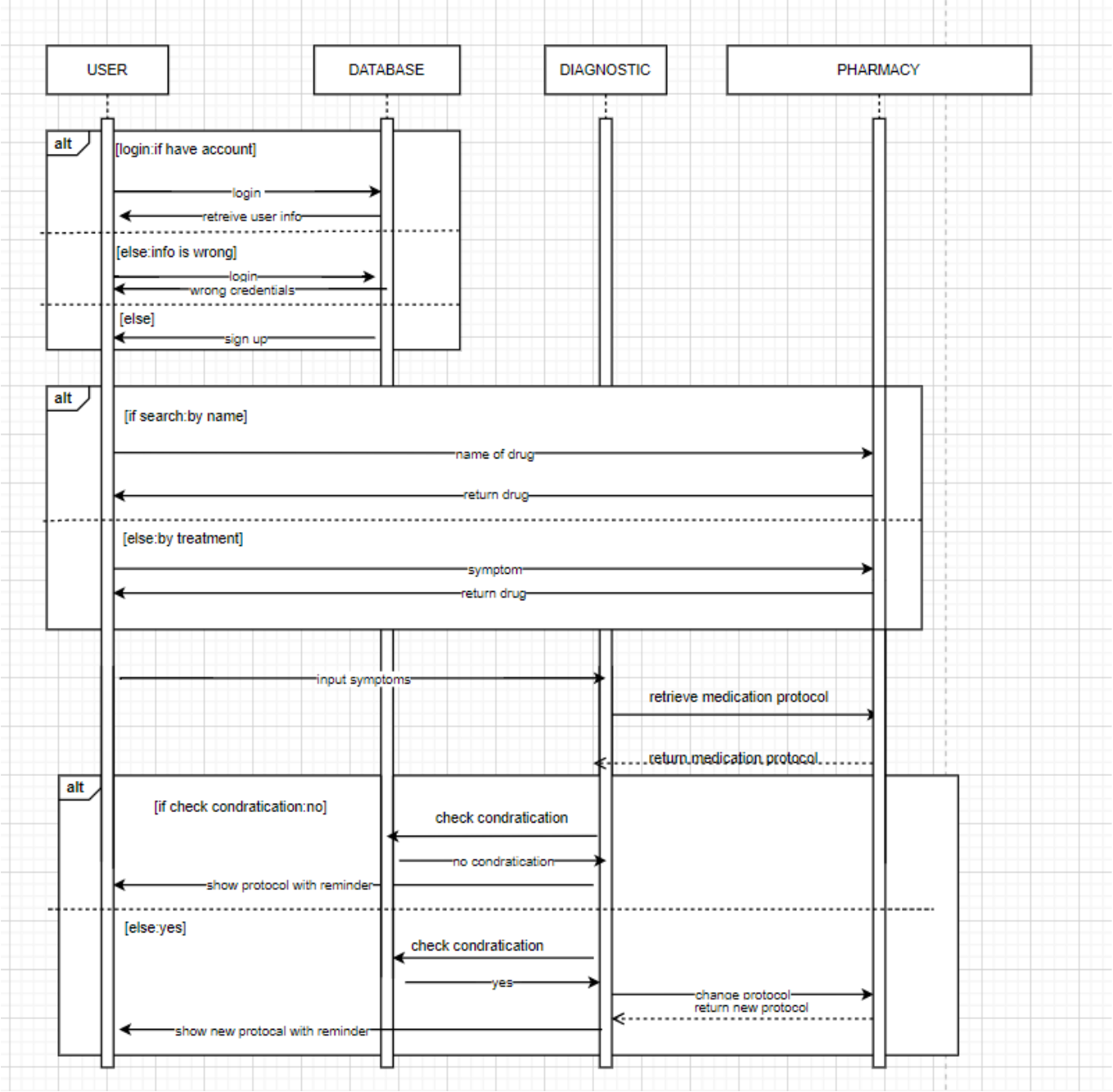
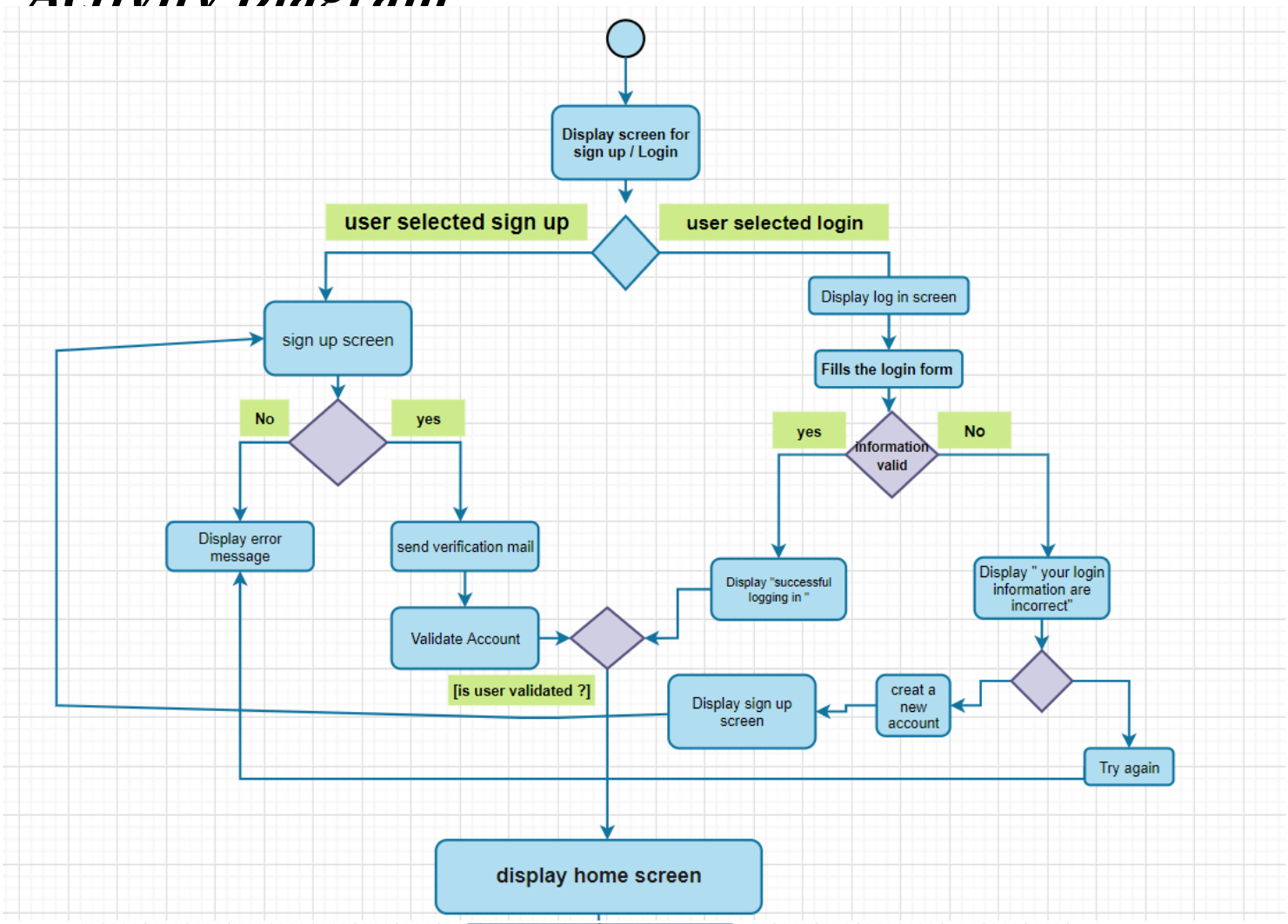
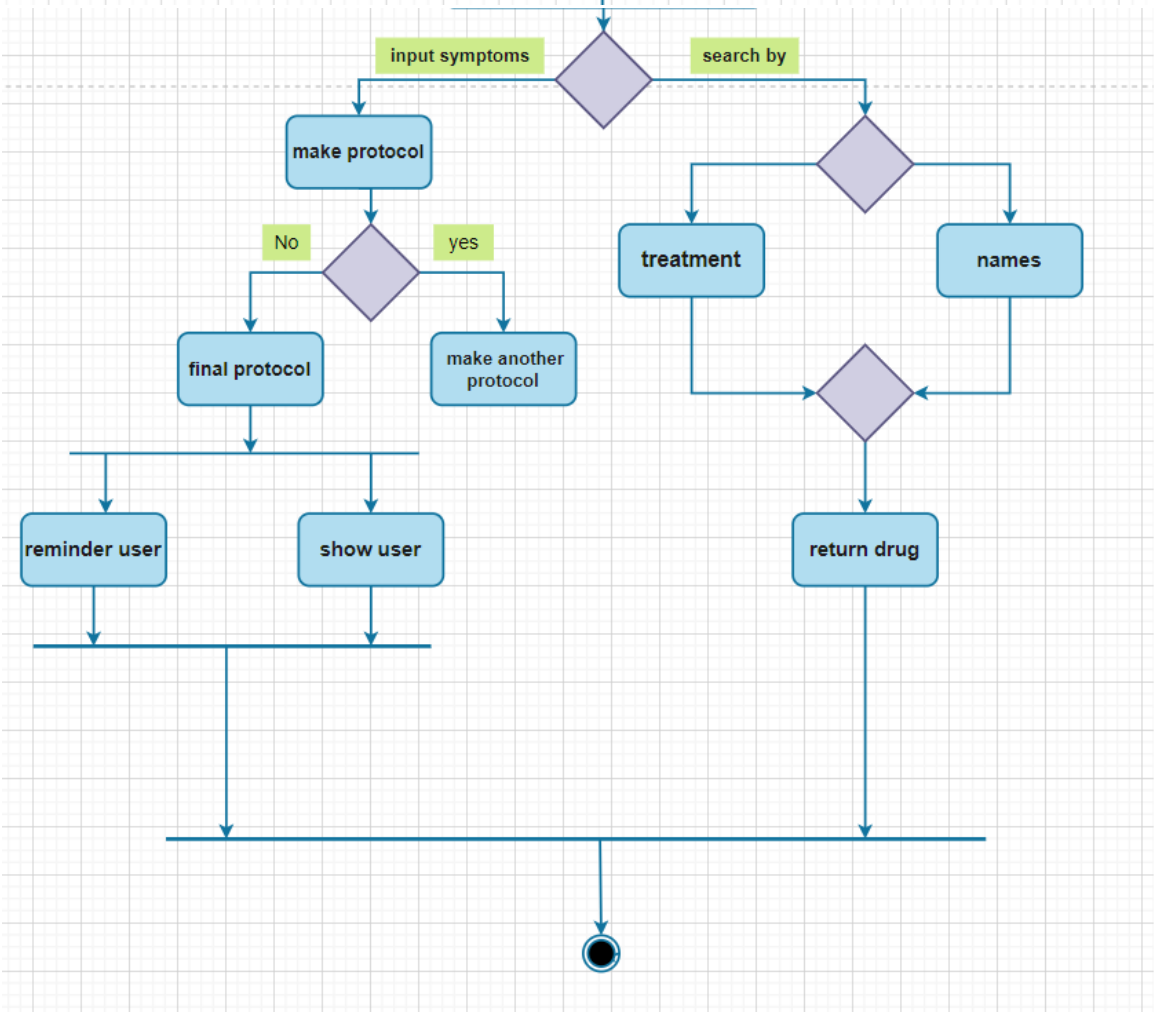
Entity Relaionship Diagram



Use case Diagram



Sequence Diagram



Activity Diagram