Cetalink: One Stop Health-care Platform.

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Abstract: This paper discusses "Cetalink: One Stop Health-care platform", an AI-powered platform developed to improve the access to healthcare services and to enhance the patience experience. With the requirement of linked healthcare management, this paper discuss the symptom analysis using AI-powered tools and geo-location-based recommendations to solve the problems occurred due to disintegrated healthcare services. It uses Open AI api for symptom analysis with a dynamic questionnaire for greater accuracy and disease prediction along with the Google Maps api for nearby medical services recommendations. It assists the patients from providing hassle-free integrated healthcare services right from symptom analysis to accessing hospitals, pharmacy and other pathology centers from a single interface itself. This platform and its study highlight the significance of ground-breaking platforms to improve healthcare access by actually reducing the delays and to enhance the patient satisfaction with the integrated healthcare solutions with location-based results.

Index Terms - AI-powered healthcare platform, symptom analysis, geo-location recommendations, AI tools, disease prediction, dynamic questionnaire, Google Maps API, integrated healthcare services, patient experience, healthcare access, healthcare service integration, location-based healthcare, healthcare management, patient satisfaction, centers, pharmacy recommendations, AI in healthcare, health-tech solutions.

I. INTRODUCTION

Healthcare systems are the structures developed to support the medical services are their seamless interactions with the patients as well as the medical professionals. Earlier these systems used to be in physical or paper-work format but with the advent to digital era, these systems are available at digital interfaces too. Efficient systems are significant for healthcare upliftment, determining and solving the medical issues, and thereby actually improving the overall quality of life and its expectancy. But due to disintegrated healthcare services, it makes difficult as well as delays for initialing the diagnosis process along with reducing the overall experience of patient.

This project tackles all these issues with:

a) **AI powered disease prediction:** Determining most probable diseases with the help of most probable diseases with the help of primary and secondary symptoms.

b) **Generation of Dynamic Questionnaire:** Generating dynamic follow-up questions with the help of AI-powered Open AI application platform interface.

c) **Integrating with real-time location mapping:** Recommendation of nearby hospitals, pharmacy stores and pathology with the help of real-time geo-location services.

d) **Improved Accessibility:** Ensuring healthcare through a user-friendly interface.

Objectives and deliverables:

a) Provides the one stop health-care solution for patients for medical services access, including the hospitals, pharmacy and pathology.

b) System that predicts the probable diseases with the help of dynamic questionnaire and primary and secondary symptoms.

c) Google maps application program interface to recommend the nearby hospitals, clinics, medicals and pathology labs as per requirement.

d) Interactive and user-friendly interface for smother experience of patients.

II. LITERATURE SURVEY:

This review consolidates the key values from the existing literature reviews related to symptoms analysis, health care recommendation system and online platform for people engagement.

1.Symptom Analysis and Diagnosis using AI: Studies have shown effectiveness of AI in diagnosis and analysis of disease suffered by patient but they fail in accuracy due to less data about the symptoms suffering by the patient. Here our platform standout by generating a dynamic questionnaire based on primary and secondary symptoms which would provide enough data for AI to predicate accurate disease patient is suffering.

2.Geolocation services Like Hospital, Pharmacy store, pathology lab Near By user: There are such services provided by the different platforms but they lack in the real time specialized filtering of Hospital and patient review which play critical role to show to performance of particular hospital.

3.Technological Advancement in the Platform: There exist some platform have chatbots using AI for Improving the user experience but there is a loop that the integrate of multiple services like symptom analysis and geolocation heath care recommendation in single platform which reduce user time of navigating through multiple different platform and disease can be cured in its pre-stage.

4.Integration of service like insurance and medicine delivery: There are platform which provide the services but in fragments but out platform provide them together make it one stop health care platform. The blood test service at home which also enhance our platform and make it standout with other platforms providing few similar features of our platform.

II. PROPOSED METHODOLOGY:

1. USER REQUIREMENT GATHERING:

A. Identification of Stake-holders:
The key stake-holder are:
a. Patient: Individual who seek the medical or health-care services.
b. Health-care service providers: Hospitals, pharmacy or pathology labs which are recommended by the web-application.

B. Method for collection of data:
a. **Surveys and questionnaire:** Conducted surveys from various patients regarding their problems, symptoms faced by them and the expectations they have from an ai powered application or platform.
b. **Interviews with focus groups:** Interviewed patients and their family members for the difficulties they may face or have faced with accessing the current healthcare systems.

C. Functional Requirements:
a. **User Login and authentication:** The new user should be able to get himself registered as well as whenever patient may login there should by authentication in the form of password should be provided.
b. **Personalized and dynamic questionnaire based on symptoms:** A questionnaire based upon the primary and secondary symptoms can be generated.
c. **Disease prediction based on AI:** The application should determine the most probable disease with a good accuracy.
d. **Hospital Recommendation:** The system should be able to determine the hospitals or clinics according to the patient's proximity as well as depending upon the probable diseases.
e. **Pathology and pharmacy recommendation:** Similar to hospitals it should be able to recommend the respective entities based upon the said parameters as above.

D. Non-functional Requirements:
a. **Scalability:** The webapp should be able to handle large amounts of patient traffic each time.
b. **Security:** Usage of SSL certificate for a proper and secure connection between the user and the server.
c. **Accessibility:** It should be able to work across all the browsers and made with low weighed animations.
d. **Performance:** The web application should be able to respond quickly to all the input traffic.

2. APPLICATION AND IMPLEMENTATION:

For the development of Cetalink, the principles of user centered design are utmost taken into consideration's an iterative process. It will integrate key technological solutions and frameworks like express.js developed to correspond to the challenges identified in the literature review and develop an efficient and a feasible solution which will be a web application. This web application uses MERN stack as technology stack as a MVC for development and integration with AI powered api and maps api. The platform enables disease prediction, symptom-based questionnaires, and location-based healthcare recommendations, ensuring a smooth and user-friendly experience. The workflow diagram and system architecture diagram is shown in figure 1.
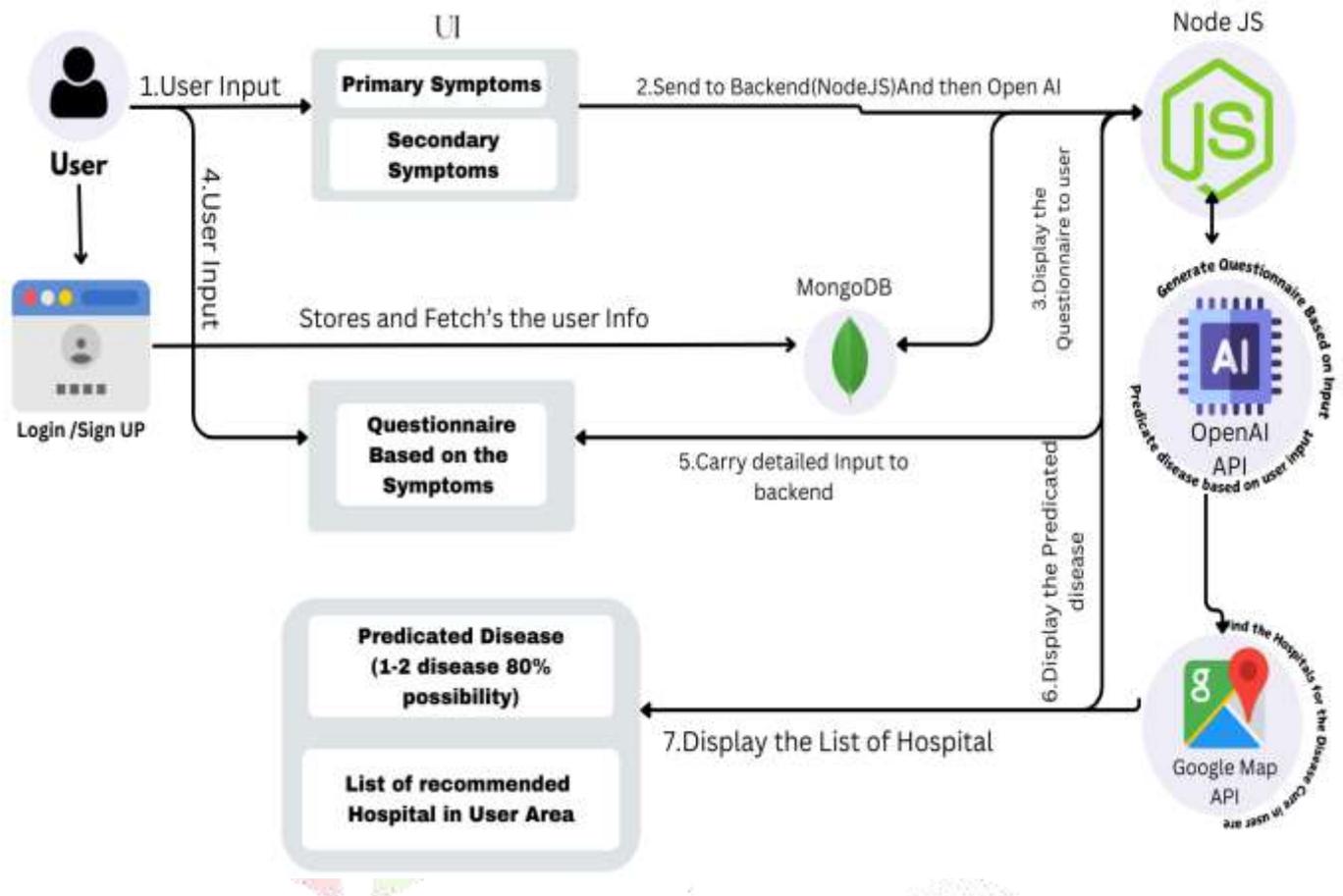

Figure 1

a) User Input and Symptom collection: The user has to either login or sign in on the homepage, thus a new account gets created and details are then stored to the MongoDB database in backend through Node js. The primary and secondary symptoms are then input from the symptoms page itself.

b) Data Processing at Backend: The inputs send by users are then sent to backend using RESTful API with POST request, which is developed using Node.js to process the data. It then integrates with the Open AI using its application program interface to generate the dynamic and symptom-oriented questionnaire for variable symptoms for further determination of most probable disease.

c) Generation of Questionnaire and its Feedback: A dynamic questionnaire is then displayed to the user, there are the follow-up question which help to get more accurate results as the greater the information or symptoms provided the probability of getting greater accuracy is more. It also ensures the accurate data collection.

d) Database Management: These responses are then stored and retrieved using the MongoDB which ensures the efficient handling of records.

e) AI powered Disease Predication: These detailed inputs are then used to predict the most probable diseases using Open AI LLM like chat-gpt. The prediction module uses OpenAI's robust natural language processing capabilities for precise and reliable results.

f) Hospital Recommendation: With respect to the proximity and probable diseases the google maps api determines the nearest clinics and hospitals for further accurate diagnosis.

f) Pharmacy and pathology recommendation: Similar to hospital recommendation, it also uses Google Maps API to determine the nearby pharmacy stores and pathology centers around the patients.

g) Results Display and Recommendations: Thus, the webapp displays the hospitals alongside the most-probable disease within the patient's area or location.

3. ALGORITHM/ WORKFLOW:

Step 1: Start.

Step 2: User Registration and Input Symptoms:
- Start with a guiding message asking the user to login or join an account on the platform.
- If it's a new user, create the user's profile and save the details in the database using Node.js into MongoDB.
- Upon successful authentication, the user should be forwarded to the Symptoms Page.
- Gather both primary and secondary symptoms from the user to get generate the questionnaire.

Step 3: Processing the Input Data:
- The collected symptom data shall be sent to the backend with a secure RESTful API call.
- Use Node.js on the backend to manage this information and send it to Open AI with its api, ensuring input is processed smoother.
- Use the OpenAI API for generation of follow-up questions for getting more accuracy.

Step 4: Questionnaire and Feedback:
- Introduce the participant to the questionnaire.
- Pose subsequent inquiries aimed at gathering more specific data regarding symptoms, thereby enhancing the probability of obtaining accurate outcomes.
- Check and validate the results to ensure that data is collected reliably.

Step 5: Maintaining Database:
- Save the user responses and feedback into the MongoDB database for organized and secure storage.

Step 6: AI powered Disease Prediction
- Provide the complete information of the symptom for OpenAI.
- Most probable diseases of that sample can be predicted using advanced natural language processing to provide better results.

Step 7: Recommendations to Hospitals and Clinics
Based on the disease predictions, use the Google Maps API to:
- Find nearby hospitals and clinics.
- Rank recommendations based on their relevance and proximity to the predicted diseases.

Step 8: Pharmacy and Pathology Centre Recommendations
Extend the feature of recommendation to include:

- Drugs dealing community pharmacies.
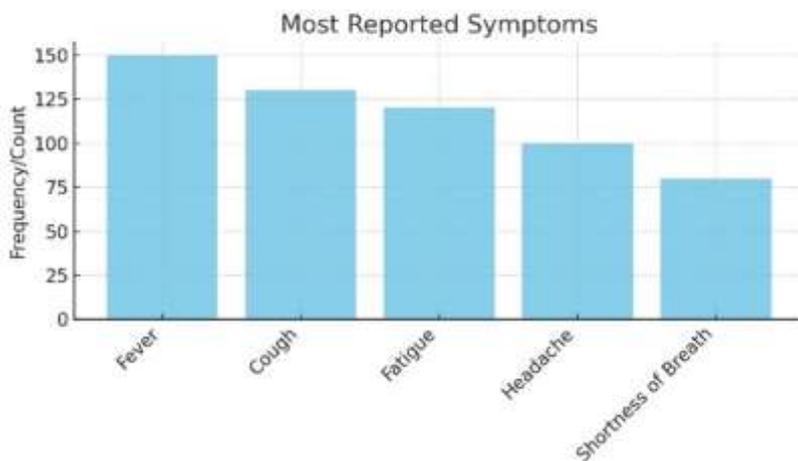- Other pathology centers for diagnostic tests nearby.

Step 9: Presenting the Results to the User

Present the user with:

- Determines the two most probable diseases.
- Suggestions for hospitals, pharmacies, and diagnostic centers, all contingent upon their geographical positioning.

Step 10: Stop.

## III. Results And Discussions:

The graph gives information about the most common symptoms and the frequency of that symptom. This data is useful to understand the count of most common symptom. There are some symptoms like fever and cough which are most common with the count of the 150 and 130 respectively. These are most reported symptoms then there are some moderate reported symptoms like fatigue and headache with the count of approximately 120 and 100 respectively. The symptom like shortness of breath which is less frequent but important It is a critical symptom related to the asthma and cardiac issues. The graph addresses the most frequently reported symptom more efficiently.

This graph explains the frequency of predicted diseases based on the symptoms which are analyzed by our platform which is Cetalink. There are some diseases which has high occurrence like flue. This is the most frequently predicted disease with the frequency of flue is 120. Next is the COVID-19 which second most predicted disease with the frequency count of 100 times, as we know this disease as a global health concern. Next bar of the graph gives information about the

malaria which is moderately predicted disease with the frequency count of more than 80 but less than 100. There are some less frequently occurring diseases like Diabetes and Hypertension which has count of 70 and 60 respectively. These diseases are predicted less frequently by our platform by using symptoms-based diagnosis.
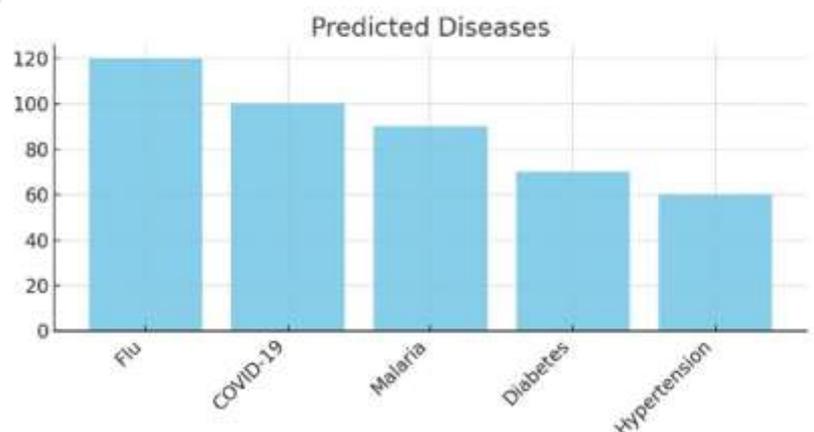
User Demographics (Age Groups)
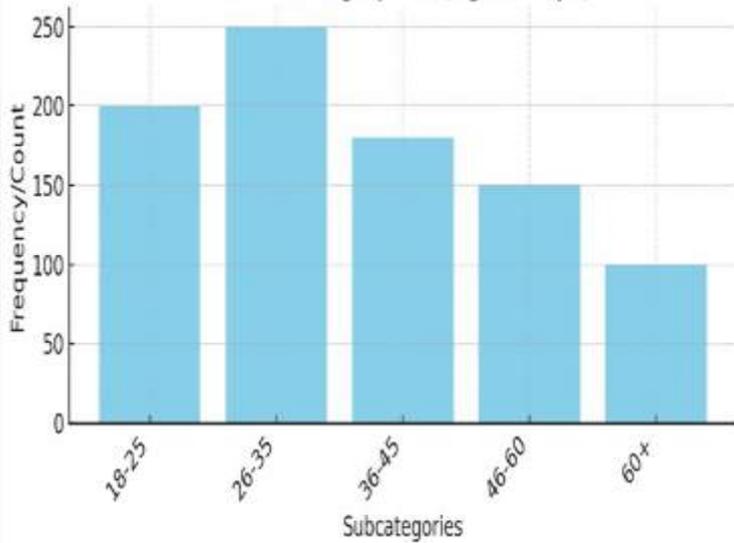
The graph states the distribution of users of different age group with respect to count. The age group of 26-35 has the highest number of users. This shows that the young adults age group is most active on the platform also this indicates that they are aware about their health issues the most. The age group like 18-25 are the second largest user group which falls within this range, this shows that youngers are also aware about their health care and their interest is growing in in preventive care about their health. Then the age groups like 36-45 and 46-60 are middle age groups which has moderate engagement on the platform because they are less aware or rely on the technology for health care. And the age group of senior citizens of age more than 60 are less active on the platform. While older have more health concerns compare to other age groups but they are less active might because of they are not much familiar about the technology in healthcare or because of they rely on traditional healthcare.

This bar graph shows the distribution of hospital recommendation based on their distances from users' location or as per the user's input location. The majority of hospitals are close to the user located within range of <5 km with the approx. 200 count. That shows that most of the users prefer those healthcare systems which are easily accessible within the short distance. The second most frequent category which corresponds to hospitals located within 5-10 kms away. This shows less recommendation compared to the closest range. There is declining in recommendation for longer distance within 10-20 kms, as the distance increases the recommendation in numbers decreases hospitals which are more than 20 kms away have the least recommendation. This data shows that the system shows the nearby healthcare facilities for users' convenience for reducing delays in accessing medical care.

Hospital Recommendations Distance
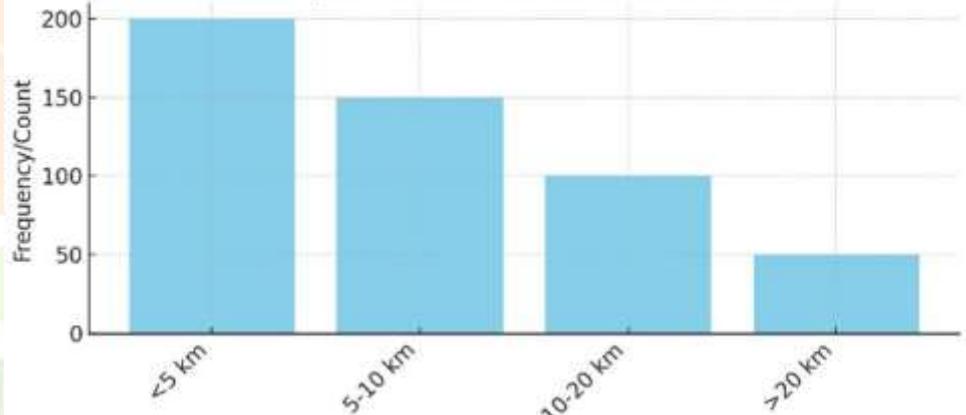
User Satisfaction
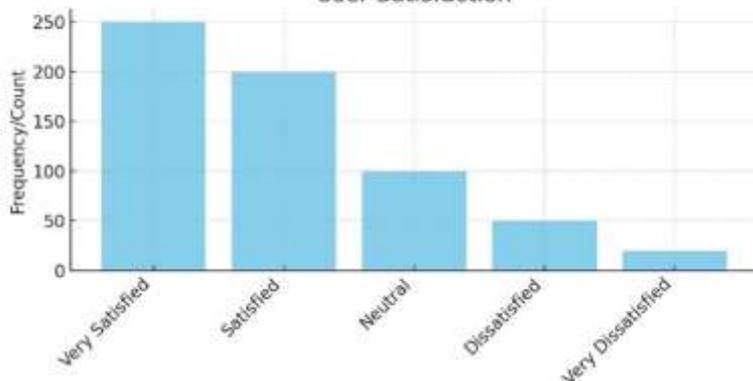
The chart shows the feedback from users on their experience with the platform [Cetalink] as this is measured by the how much user is satisfied. There is high frequency of user which are very satisfied with the frequency of 250. Around 200 users fell into the category of satisfied. And approximately 100 users were neutral, indicating for improvement to move them into higher satisfaction categories. Less than 50 users are falls under the category of dissatisfied shows that there are issues for small subset of users, they are minimal.

IV. Future Scope:

Healthcare Our vision is to expand the services of our platform to provide a comprehensive healthcare ecosystem, looking after critical user needs beyond diagnosis and recommendation. we are going to enhance the platform by adding following services:

1. Insurance Integration:

It will enable the user to manage their health insurance policies directly within the platform. User can track the insurance coverage, process to claim it online through platform and also get detailed information about the policies. The feature will improve simplified financial processes for the patient, it ensures the transparency in medical expenses and reduce the delay in claim approval.

2. Medicine delivery Services:

The feature will help the user to order the medicine at home with providing the prescribed medication. Instead wasting time through physical pharmacy store user may order the medicine at door step. This service ensures timely access to medication, beneficially for the patient with chronic illness and in remote areas and eliminates unnecessary visits at the pharmacy stores.

3. At-Home Blood test services:

The platform will tie-up with the local startups to provide the blood diagnosis at user door step with providing the report within few hours in digital format. The user can book appointment through platform then the trained professional will visit the user to take the blood samples. The feature will be helpful for the elderly patient or patient with mobility issues or during the health crises like pandemics.

4. Prescription Management and Automation:

The platform can directly add the prescription details including the pathology tests and medicines into the database and then can undergo the at home test and home delivery services.

V. ACKNOWLEDGEMENT:

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VI. CONCLUSION:

Cetalink aims to bridge the gap between the patients and the healthcare services by facilitating AI-driven disease predictions as well as hospital, clinics, pharmacy and pathology labs. The results and outcomes of the web applications, has potential to enhance the accessibility and make the patients journey smooth and increases the patient satisfaction with respect to the healthcare services. With the use of MERN stack and application program interfaces of Open AI and Google Maps for determination of the most probable diseases and geo-location-based mapping, Cetalink has effectively resolved the patient's vital pinpoints with respect to the current system including fragmented or disintegrated services and confusion for diagnosis initialization.

Key Outcomes:

1. **Symptom Analysis and Disease Prediction:** The platform efficiently predicts the common diseases based on the symptoms input by the user. This provides the patient with a potential health concern and then support the early medical consultation.

2. **Hospital Recommendations:** The webapp provides the dynamic locations-based hospital recommendations, also it is seen that majority of patients prefer the hospitals within the 5 km radius. This feature enhances the patient experience to ensure the personalized and rapid access to the health-care services.

3. **User Satisfaction:** The platform has a simpler user interface and all integrated with medical services.

Future Directions:

1. **Insurance Integration:** To integrate with the insurance policy providers and then with pre-existing data the user can get personalized policies with respect to the user conditions. Also, the policy makers can utilize it to make more efficient policies for the users.

2. **Medicine Delivery:** This will assist the individual in acquiring their medication from home by supplying the prescribed medicines. Instead of spending time at a physical pharmacy, the user can have their medicine delivered right to their doorstep.

3. **At home blood tests**: Through the platform, users can schedule an appointment, after which a qualified professional will come to collect the blood samples. This functionality will be beneficial for older patients, individuals with mobility challenges, or during health emergencies such as pandemics.

4. **Prescription Management and Automation:** The system has the capability to seamlessly incorporate prescription information, encompassing laboratory tests and pharmaceuticals, into the database, facilitating at home testing and medications delivery services.

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