Functional Design Document

***Copilot-Mazik Care Plan App***

Project

**Project Nova**

Prepared for

**Mazik Global**

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Document History

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# Introduction

## Background

HealthLink is an innovative startup that has developed a healthcare application aimed at transforming patient care and optimizing medical processes. The traditional healthcare system often suffer from fragmented patient data, inefficient treatment plans and lack of personalized care. Healthlink aims to address these challenges by providing a comprehensive platform that combines patient data, diagnosis and vital signs to create personalized treatment pathways for each patient.

## Purpose

Health Link is like a digital health assistant. It not only keeps track of your medical journey but also has a chatbot named CoPilot to help answer your questions. Simply put, Health Link makes healthcare easier, more personal, and ensures you're well-guided every step of the way. Copilot not only interact seamlessly with the patient to comprehend their queries but also intelligently suggests tailored treatment pathways.

The application facilitates seamless communication between healthcare providers and patients, offering personalized treatment pathway for improved patient outcomes. The purpose of this Functional Design Document (FDD) is to outline the detailed functionality and features of application. It serves as a reference guide for development, testing and deployment teams, ensuring a clear understanding of the system’s requirements and behaviors.

## Audience Stakeholders

|  |  |
| --- | --- |
| No. | Audience Stake Holder |
| 1 | Healthcare providers |
| 2 | Mazik Development Team |
| 3 | Patients |
| 4 | **Administrators and Management** |

Table 1: Audience Stakeholders

**Justification**

## Impacted Business Requirements

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ID | Area Path | Business Process Group | Title | Priority |
| 1 | Healthcare | Patient Management | Personalized Treatment Plans | High |
| 2 | Healthcare | Patient care | Vital Signs and Allergies Recording | High |

Table 2: Impacted Requirements

## Design Related Assumptions

The following table describes the design assumption(s) for this customization:

|  |  |
| --- | --- |
| No. | Design Assumptions |
| 1 | The application’s user interface will feature a clean and intuitive design, ensuring easy navigation and accessibility for both healthcare providers and patients. |
| 2 | User profiles will be securely managed, allowing patients to access only their personal health data and healthcare providers to access relevant patient information for effective care coordination |
| 3 | The intelligent algorithms used for diagnosing conditions and recommending treatment pathways will rely on a combination of patient data, medical expertise, and evidence-based guidelines. |

Table 3: Design Assumptions

## Integration Requirements

|  |  |  |
| --- | --- | --- |
| No. | Integration Requirements | Affected Area |
| TFSID |  |  |
|  |  |  |
|  |  |  |

Table 4: Integration Requirements

|  |  |
| --- | --- |
| Question | Response |
| **Business entities**  *What business entities are involved?*  *E.g. Customers, Vendors, Transactions* |  |
| **Data flow direction**  *Outbound, inbound, request and response?*  *E.g. Data export, import, incoming/outgoing request and response* |  |
| **Trigger**  *What triggers the integration?*  *E.g. On demand, CRUD operations within the system, upon successful posting, upon approval, an event in external system, schedule based etc.* |  |
| **Data volume**  *Estimated number of records in one integration?*  *E.g. ~500 order lines in an import file* |  |
| **Data format**  *What data format would be used for integration?*  *E.g. OData, JSON, XML, Text file, CSV file, EDI Standard* |  |
| **Action**  *Is any action required on data post integration?*  *E.g. Journal posting after import, insert / update a record upon successful integration, email* |  |

Table 6: Integration Description

# Functional Design Details

Detailed Functional Requirements

|  |  |  |
| --- | --- | --- |
| Req. # | Requirement Details | Req. Devops ID |
| 1 | **Electronic Health Records (EHR)**   * **Data Storage:** Securely store patient medical history, visit notes, diagnoses, and treatments. * **Data Retrieval**: Quick and efficient retrieval of a patient's records by authorized healthcare providers. * **Data Editing**: Authorized personnel can update the EHR with new medical data after each visit. |  |
| 2 | **CoPilot Chatbot**   * **Natural Language Processing:** Understand and process user queries in natural language. * **Treatment Pathway Suggestions**: Recommend treatment options based on user queries and medical history. * **Interactive Feedback**: Respond to user questions and provide clarifications as needed. |  |
|  | **FOR EXAMPLE:**  **Scenario: 1 Creating a patient** |  |
|  | **Scenario: 2 Fetching patients Data** |  |
|  | **Scenario: 3 Suggesting a treatment pathway for patient** |  |
| 3 | **Treatment Pathway Management**   * **Pathway Generation:** Use algorithms to suggest potential treatment pathways based on EHR and current patient inputs. * **Pathway Display:** Showcase the recommended treatment pathways in a user-friendly manner. * **Pathway Modification:** Allow healthcare providers to modify the suggested pathways based on their expert judgment. |  |
| 4 | **Pictorial representation of the process:** |  |

# Functional Design Consideration

## Data Entity Impact Table

| Req Ref No. | Entity | action (new/change/deletion) | Display Name | Attribute Type | Comments | Mandatory Type (System/Business/CDS) |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

Error Condition Table

| Req. # | Error | Message | Status  (Draft, Reviewed, Localized) |
| --- | --- | --- | --- |
|  |  |  |  |
|  |  |  |  |

Table 8: Error Condition Table

Localization Considerations

|  |  |
| --- | --- |
| No | Localization Consideration |
|  |  |

Table 9: Localization Considerations

Data Conversion Considerations; formatting changes for ISVs

|  |  |
| --- | --- |
| No | Data Conversion Consideration |
|  |  |

Table 10: Data Conversion Considerations

## Test Scenarios

|  |  |  |  |
| --- | --- | --- | --- |
| ID | Area Path | Title | Description |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

# ResPONSIBLE ai

**General aspect:**

Implementing responsible AI in the “healthcare application” involves making sure that the AI system is transparent, fair, robust, secure, and respects privacy. Here are some ways to embed responsible AI principles into this application:

1. **Transparency and Explain-ability:**

It is essential to make the AI's decision-making process clear to users. This can be achieved by clearly explaining how the AI makes decisions, what data it uses, and how it impacts the patient's healthcare journey. When your AI system suggests a diagnosis or treatment, it should provide a clear explanation of how it arrived at that conclusion.

1. **Fairness:**

Ensure that the AI does not exhibit any bias based on factors like race, gender, age, or socioeconomic status. Use diverse and representative data for training to prevent any unintentional biases.

1. **Ethical data handling and Privacy:**

Responsible AI can ensure that patient data is handled with the utmost care and respect for privacy. Health Link can implement strong data encryption, access controls, and anonymization techniques to protect sensitive patient information. This helps in building trust among patients and ensures that their personal data is not misused.

1. **Robustness:**

The system should be reliable and accurate. Implement regular audits and quality checks to make sure the AI system is performing as expected. Also, have a plan in place to handle any errors or mistakes made by the AI system.

1. **Security:**

Given the sensitive nature of healthcare data, it's critical to have robust security measures in place to protect against data breaches.

1. **Human Oversight and Intervention:**

While AI can assist in diagnosing and suggesting treatment pathways, responsible AI involves having healthcare professionals in the loop. AI suggestions should be considered alongside the expertise and judgment of medical professionals to avoid over-reliance on AI and ensure patient safety.

1. **User Training:**

It's critical to train all users, including doctors, nurses, and other healthcare staff, on how to use the AI system correctly and understand its limitations. This includes understanding when to rely on AI and when to seek human input.

1. **Feedback Mechanism:**

A feedback system allows users to report issues or potential improvements, ensuring the system's continuous refinement.

1. **Accountability and Regulation:**

Health Link can adopt industry standards and best practices for responsible AI. This includes adhering to relevant regulations, seeking input from healthcare professionals, and having mechanisms in place to rectify errors or unintended consequences.

**HOW TO IMPLEMENT RESPONISBLE AI?**

Using Azure, OpenAI, Semantic Kernel, and Cognitive Search provides a robust platform for an application.

1**. Transparency**: Use OpenAI's features to make your AI's decision-making process as clear as possible. For example, when using GPT-3 (a model by OpenAI), you can experiment with different parameters to control the model's output, allowing you to understand and demonstrate how changes in the inputs affect the outputs.

2. **Fairness**: Use diverse and representative training data to minimize bias in your AI models. Azure provides tools like Fairlearn that can help you assess and mitigate unfairness in your AI models.

3. **Privacy**: Azure provides robust privacy and security controls. Make sure to use features like encryption for data at rest and in transit, and anonymize sensitive data where necessary. Azure's privacy controls comply with global standards, which should help in meeting regulatory compliance.

4. **Robustness and Security**: Ensure your AI models are robust and reliable. Azure provides tools to monitor model performance over time and update them as necessary. For security, use Azure's built-in security controls like Azure Security Center and Azure Key Vault.

5. **Human-in-the-loop**: While your AI can automate many tasks, keep healthcare professionals in the loop for critical decisions. For instance, any diagnoses or treatment plans suggested by the AI should be reviewed by a healthcare professional.

# Use cases based on ai and copilot

**1. AI-Assisted Diagnoses:**

Utilize AI to analyze a patient's vital signs, symptoms, and medical history, aiding healthcare providers in making accurate diagnoses. Copilot assists in suggesting potential diagnoses based on the data provided by the healthcare provider.

The data can be obtained from various sources:

1.**Electronic Health Records (EHRs):** The application maintains comprehensive electronic health records for each patient. This database contains historical data about patients' medical visits, diagnoses, treatments, and vital signs. AI algorithms can analyze this data to identify patterns and correlations that might not be immediately apparent to human healthcare providers.

2. **Real-Time Data:** During hospital visits, healthcare providers record vital signs, symptoms, and other relevant information through the application. This real-time data can be fed into the AI system to provide immediate insights and suggestions for potential diagnoses.

3.**Medical Literature and Research:** The AI system can also be trained on a vast amount of medical literature, research papers, and clinical guidelines. This knowledge base can help the AI system make informed suggestions based on the latest medical information.

**2. Automated Medical Billing and Coding:**

Extract pertinent information from patient records to generate accurate bills and assign appropriate medical codes, streamlining the billing process and reducing errors.

**1.Medical Coding:** Medical coding involves assigning standardized codes to various medical services and procedures. These codes are used for billing and insurance purposes. The AI system can automatically assign appropriate medical codes to the extracted data based on established coding standards (such as ICD-10 for diagnoses and CPT for procedures).

**2.Billing Statement Generation**: With the coded data, the application can generate accurate billing statements that itemize the services provided, medications prescribed, and associated costs.

**3. Structured Clinical Notes:**

Use NLP to convert unstructured clinical notes into structured data, improving efficiency of healthcare operations.

**4. AI-Driven Medical Image Analysis:**

Assist in analyzing medical images to detect abnormalities, aiding in early detection and treatment planning.

**5. Continuous Pathway Refinement:**

Refine treatment pathways based on real-world data and patient outcomes, identifying areas for improvement.

**6. Personalized Treatment Plans with Copilot:**

Tailor treatment plans considering individual medical history and lifestyle factors. Copilot provides patients with personalized treatment pathways in response to their queries.

**7. Predictive Pathway Optimization:**

Predict the most effective treatment pathways based on large datasets, leading to better patient outcomes.

**8. Early Warning System:**

Monitor patient health in real-time, identifying patterns that may indicate patient's deterioration or potential complications.

**9. AI-Powered Patient Engagement:**

Develop a chatbot for patient queries and education about medical conditions. Copilot2 interacts with the chatbot system to provide informative responses based on patient queries.

**10. Predictive Analytics:**

Identify patterns and trends in patient data for early detection of potential health issues.