

Software Design Document (SDD)

For DementiaInsight

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CEN4010 - Principles of Software Engineering

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1 INTRODUCTION

1.1 Purpose

The Software Design Document (SDD) outlines the architecture and system design for DementiaInsight, an application aimed at enhancing dementia care. Designed to assist caregivers, DementiaInsight utilizes the Dementia Rating Scale to evaluate individuals with dementia and offers evidence-based recommendations tailored to their specific care needs. This document is intended for Project Managers, Software Engineers, and other stakeholders involved in the development and deployment of the application.

1.2 Scope

The dementiaInsight Application is structured around eight primary components, which are essential for its functionality and user experience:

1. Authentication System: Securely manages user access and protects patient data to ensure that only authorized users can login and perform operations within the application.

2. Assessment Tool: Utilizes the Dementia Rating Scale to evaluate the cognitive and functional status of individuals with dementia. This tool aids in accurately assessing both severity and progression of dementia.

3. Database of Care Practices: Contains evidence-based dementia care practices and recommendations. This database is regularly updated to reflect current research and best practices in dementia care.

4. User Interface: Designed for ease of use, the interface allows care providers to input patient data, navigate a variety of functionalities intuitively, and access dementia care recommendations based on the assessment results.

5. User Accounts: Utilized by users for saving patient-specific history including assessment outcomes and personalized care recommendations.

6. Reporting Tools: Generate comprehensive reports of patient assessments and care recommendations. These tools provide detailed reports that can be used by caregivers and exported into PDF format.

7. Support System: Includes a help desk, frequently asked questions section, and information for receiving additional support.

8. Notification System: Sends alerts and reminders to users regarding pending tasks, upcoming re-assessment(s), and general account alerts. The system supports

various channels including SMS, email, and in-app notifications to ensure timely and reliable communication.

1.3 Overview

A detailed architectural design and implementation specifications for DementiaInsight are provided in the Software Design Description (SDD). The purpose, scope, notable characteristics and components of the system are outlined in this document. The document also includes supporting technical documentation and references to standards to support the design and implementation specifications. This document intends to promote effective communication and collaboration among the project team and participants by providing a comprehensive understanding of the architecture and functionality of DementiaInsight through use of definitions, detailed descriptions, and diagrams.

1.4 References Material

Android Open Source Project. (n.d.). AIDL Overview. [Android Open Source Project](#)

Apple Inc. (n.d.). User Interface. [Apple Developer Documentation](#)

IEEE. IEEE Std 1012-2016 IEEE Standard for System, Software, and Hardware Verification and Validation. IEEE Computer Society, 2016.

IEEE. IEEE Std 1633-2016. IEEE Recommended Practice on Software Reliability. IEEE Computer Society, 2016.

*Also refer to Appendices for an expanded list of citations

1.5 Definitions, acronyms, and abbreviations

- Allen's Cognitive Disability Model: a model which places emphasis on the integration of the cognitive functional ability and the level of activities that clients are able and willing to perform. Each cognitive level consists of modes of performance, and the overall performance ranges from 0 (generalized reflexive actions) to 6 (normal functioning).
- Allen Cognitive Levels (ACL): Each Allen Cognitive Level (ACL) provides a description of the patient's level of occupational functioning and his/her ability to perform familiar activities, as well as to learn new ones. Each proceeding cognitive level in Allen's model is cumulative. For example, a patient with the cognitive ability to perform at Level 3 would also be assumed to have the abilities required for Levels 1 and 2.

- Application Program Interface (API): A set of protocols, routines, and tools for building software applications, which allows different software entities to communicate.
- Boolean: data type, a form of data with only two possible values (usually "true" and "false")
- Cognitive Assessment Tool Guide: A tool designed to help identify a person's cognitive status through focused, skilled observations.
- Dementia Capable Care (DCC): is an evidence-based dementia and behavior program designed for health care workers that makes a sustainable impact.
- Health Insurance and Portability Act (HIPAA): A U.S. law enacted in 1996 that provides data privacy and security provisions for safeguarding medical information.
- Interface: A shared boundary across which two or more separate components of a computer system exchange information.
- Operating System (OS): System software that manages computer hardware, software resources, and provides common services for computer programs.
- Outcome: Result or determination of an individual's cognitive functioning based on the structured assessment using Allen's Cognitive Disability Model.
- Relational Database Management System (RDBMS): The software used to store, manage, query, and retrieve data stored in a relational database.
- Unskilled: not having or requiring special skill or training pertaining to dementia capable care.
- User Interface (UI): The part of the system with which users directly interact, including screens, forms, and other graphical elements.

2.0 SYSTEM OVERVIEW

DementialInsight is a software application designed to ease the burden of dementia-specific care and improve the quality of life of individuals with dementia. The system's primary objective is to provide individualized recommendations for the enhancement of dementia capable care (DCC) through caregiver-led assessment of patients' cognitive and physical functioning levels. The safe maintenance of user data through integration with cloud storage and APIs guarantees data privacy and security and adherence to HIPAA guidelines, is essential to the operation of DementialInsight.

The SDD is organized into the following sections:

- System Overview: Describes the functionality, context, and design philosophy of DementialInsight.
- System Architecture: Provides a conceptual model that describes the structure, behavior, and subsystem interactions of the application.

- Data Design: Details how data is managed and organized within the application including details of the database structures.
- Component Design: Details the modular parts of the system architecture, including the specific functionality and responsibilities of each component.
- Human Interface Design: Details how users interact with the system including the design of user interactions, accessibility, and user experience considerations.
- Requirements Matrix: Provides a table that maps user requirements to specific elements of the system design to ensure all requirements are managed in the development process.

This structured approach ensures a complete understanding of the design and implementation strategies of the DementiaInsight Application.

3.0 SYSTEM ARCHITECTURE

3.1 Architectural Design

The DementiaInsight system architecture is designed to ensure efficient, secure, and scalable operations. It consists of six primary layers: User Interface (UI), Business Logic, Data Access, Data Storage, Integration, and Infrastructure. Each component has distinct responsibilities and components to provide a seamless experience for caregivers and healthcare professionals.

3.1.1 High Level System Design

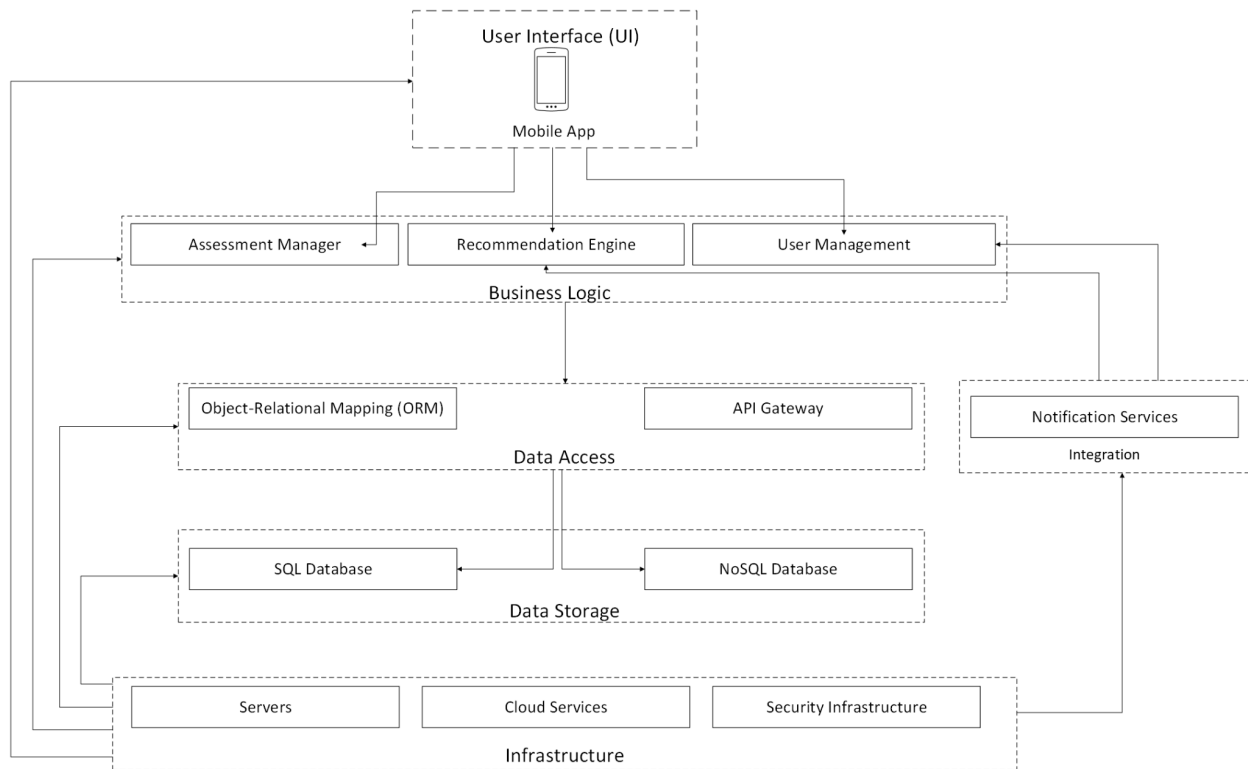


Diagram:

1. User Interface (UI):

a. Responsibilities:

- Responsible for user interactions and complies with accessibility standards to ensure ease of access for individuals with disabilities.
- Accepts user inputs, such as assessment prompts based on Allen's cognitive levels.
- Displays Allen Levels 1-6 and recommendations upon completing the assessment.
- Shares data with other systems, ensuring data exchange and privacy.

b. Components:

- Mobile App:** Uses native mobile applications for iOS and Android for on-the-go access.

2. Business Logic Layer:

a. Responsibilities:

- Processes data and applies business rules, while managing user requests and interactions.
- Provides personalized care recommendations based on assessment results and patient history.

- iii. Ensures secure user authorization and session management.
- b. **Components:**
 - i. Assessment Manager: Manages the logic for administering assessments and calculating scores.
 - ii. Recommendation Engine: Generates personalized care recommendations based on results and history.
 - iii. User Management: Handles the authentication, user session management, and control.

3. Data Access Layer:

- a. **Responsibilities:**
 - i. Serves as an abstraction layer between the business logic and data storage layers.
 - ii. Ensures data is correctly stored, retrieved, and manipulated.
 - iii. Directs client requests to appropriate services.
- b. **Components:**
 - i. ORM (Object-Relational Mapping): Maps application objects to database entries to simplify data manipulation.
 - ii. API Gateway: Functions as a single entry point for all client requests and directs them to appropriate services.

4. Data Storage Layer:

- a. **Responsibilities:**
 - i. Stores and manages all application data securely.
 - ii. Ensures data integrity and availability.
 - iii. Manages both structured and unstructured data.
- b. **Components:**
 - i. SQL Database: Stores structured data such as user profiles, assessment results, and care recommendations.
 - ii. NoSQL Database: Directs unstructured or semi-structured data such as logs and possibly large binary data like medical images or extensive notes.

5. Integration Layer:

- a. **Responsibilities:**
 - i. Oversees integration with external systems and data sources.
 - ii. Facilitates data exchange between the application and external Electronic Health Records (EHR) systems.
 - iii. Handles notifications and alerts to users.
- b. **Components:**
 - i. EHR Integration: Connects with Electronic Health Records systems for importing/exporting patient data.

- ii. Notification Services: Controls sending alerts and reminders to users via email, SMS, or push notifications.

6. Infrastructure Layer:

a. Responsibilities:

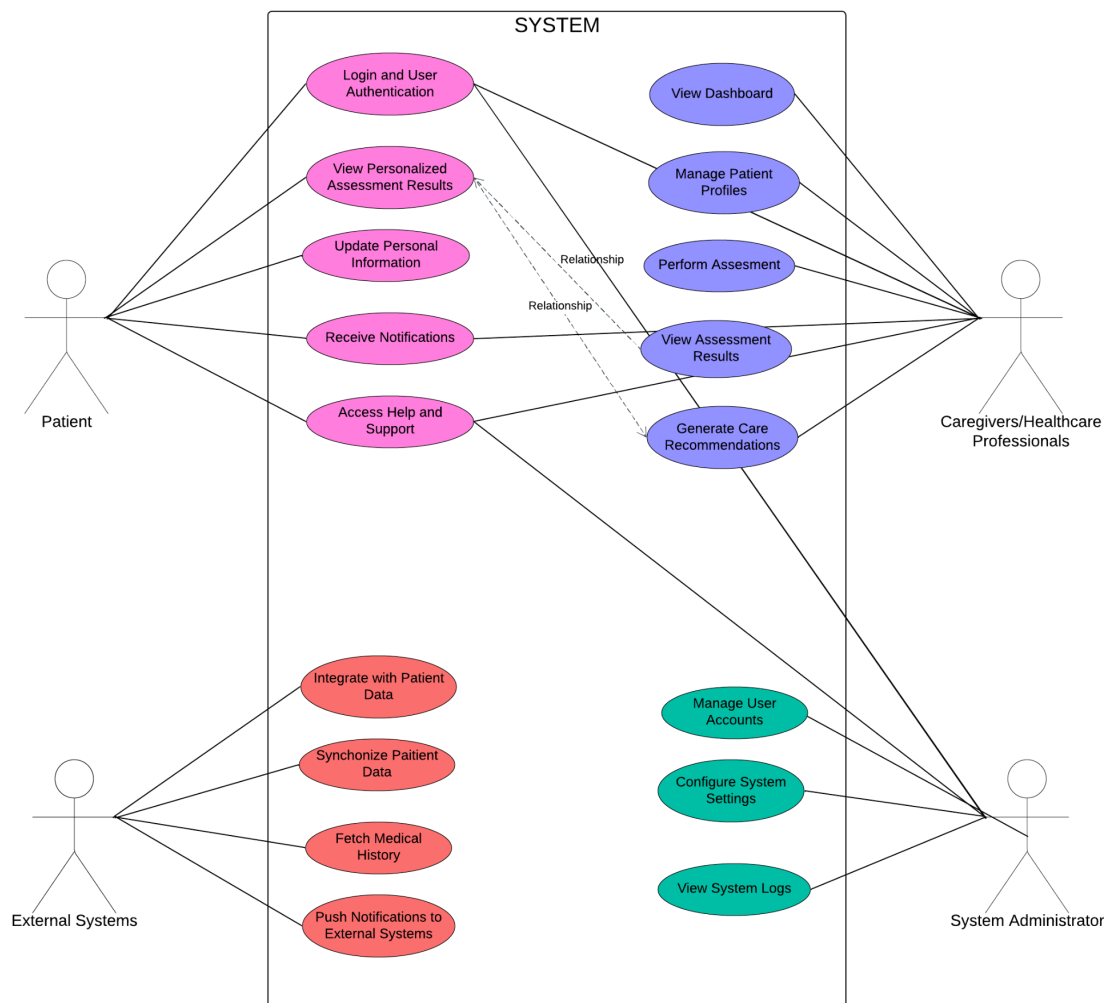
- i. Provides the necessary hardware and network resources to support the application.
- ii. Confirms high availability, scalability, and redundancy of the system.
- iii. Protects sensitive data through robust encryption and security measures.

b. Components:

- i. Servers: Hosts the application, databases, and verifies data redundancy and high availability.
- ii. Cloud Services: Utilizes cloud platforms like AWS, Azure, or Google Cloud for scalable storage, computing resources, and additional services like load balancing and auto-scaling.
- iii. Security Infrastructure: Incorporates firewalls, encryption services, and data protection mechanisms to safeguard sensitive data.

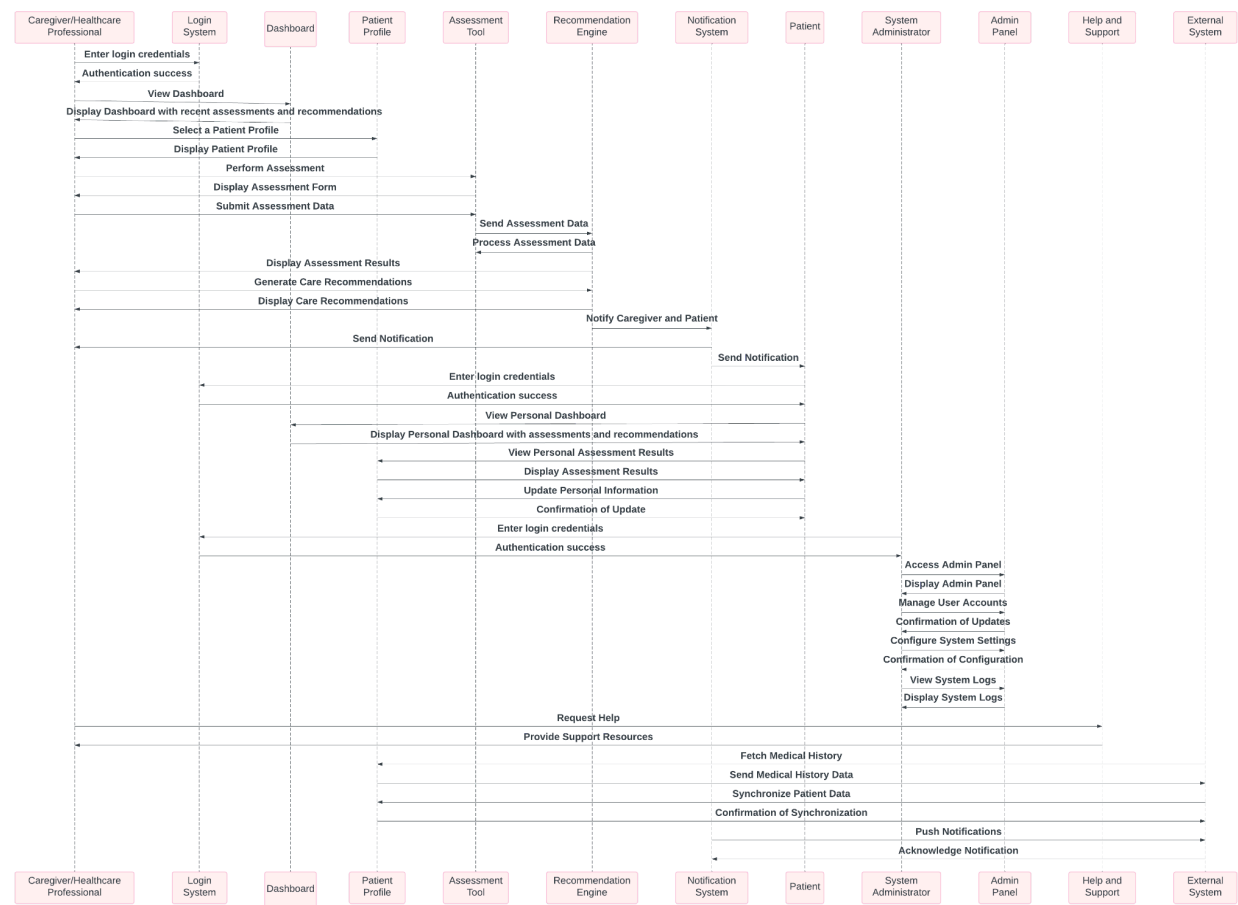
3.2 Decomposition Description

3.2.1 Use Case Diagram:



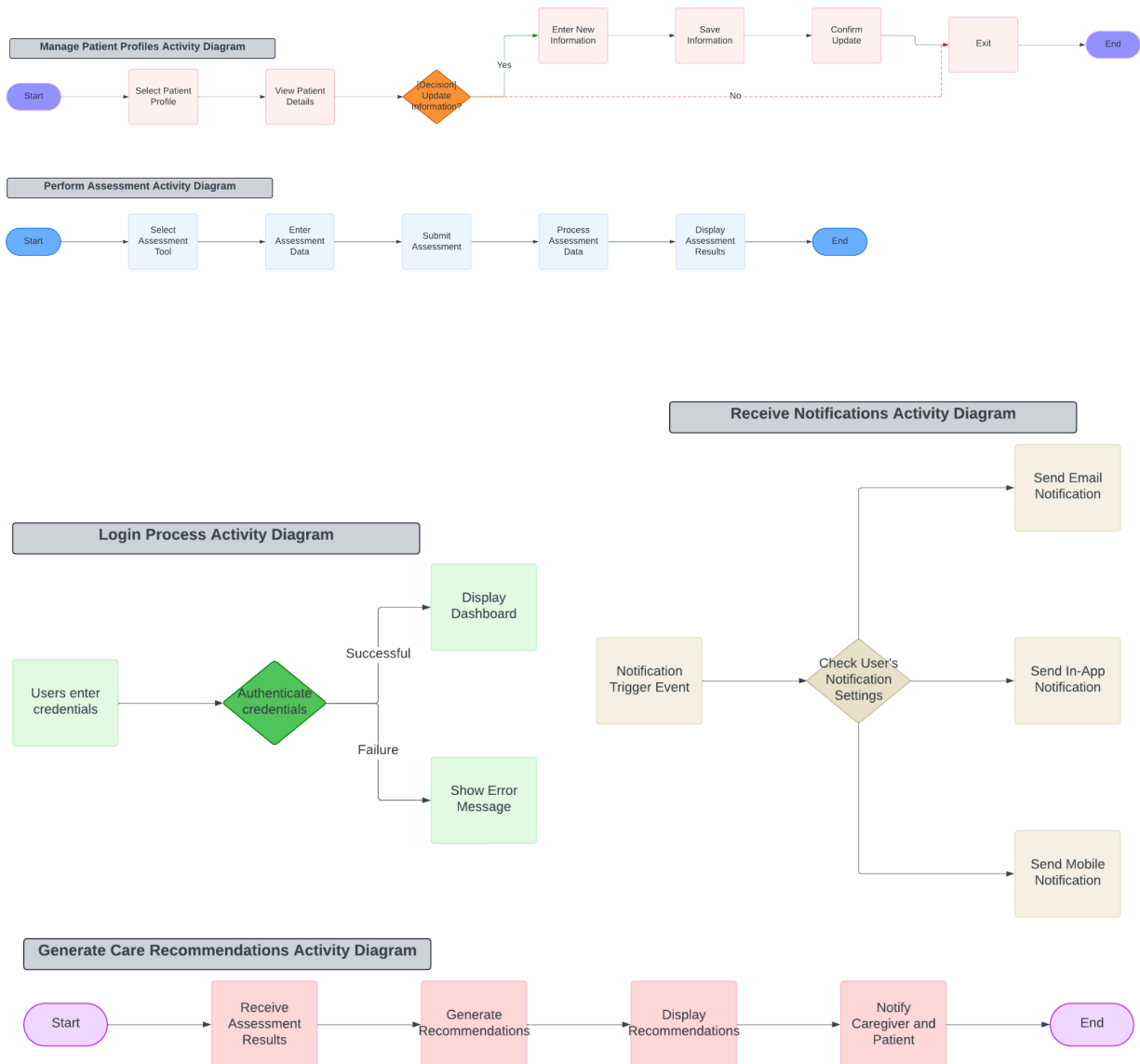
The Use Case Diagram for DementiaInsight Application illustrates how all the systems integrate with the applications core functionalities. 'Caregivers/Healthcare Professionals' use the system to log in, manage patient profiles, perform and view assessments, generate care recommendations, receive notifications, and access help and support. 'System Administrators' have additional capabilities to manage user accounts, configure system settings, and view system logs, ensuring smooth operation and security. 'Patients' can log in to view their personal assessment results, update personal information, receive notifications, and access help and support, which is interconnected with the 'Caregivers/Healthcare Professionals'. In addition, 'External Systems' will integrate with EHR, synchronize patient data, gather medical history, and push notifications to the external systems, which will ensure the patient's data is accurately and securely shared and managed.

3.2.2 Sequence Diagram:



The Sequence Diagram for DementiaInsight highlights key interactions between caregivers, patients, system administrators, and external systems. Caregivers perform assessments using the Assessment Tool and view results through the Recommendation Engine, which also generates personalized care recommendations. These recommendations and assessment results are communicated to patients, who can log in to view and update their personal information on the app. System administrators manage user accounts and system configurations via the Admin Panel, making sure there is smooth integration and security. External Systems interact by fetching medical histories and synchronizing patient data, with notifications being pushed to both the caregivers and patients to keep them informed of updates. The flow of interactions demonstrates a cohesive system designed to enhance dementia care through comprehensive data management and seamless communication.

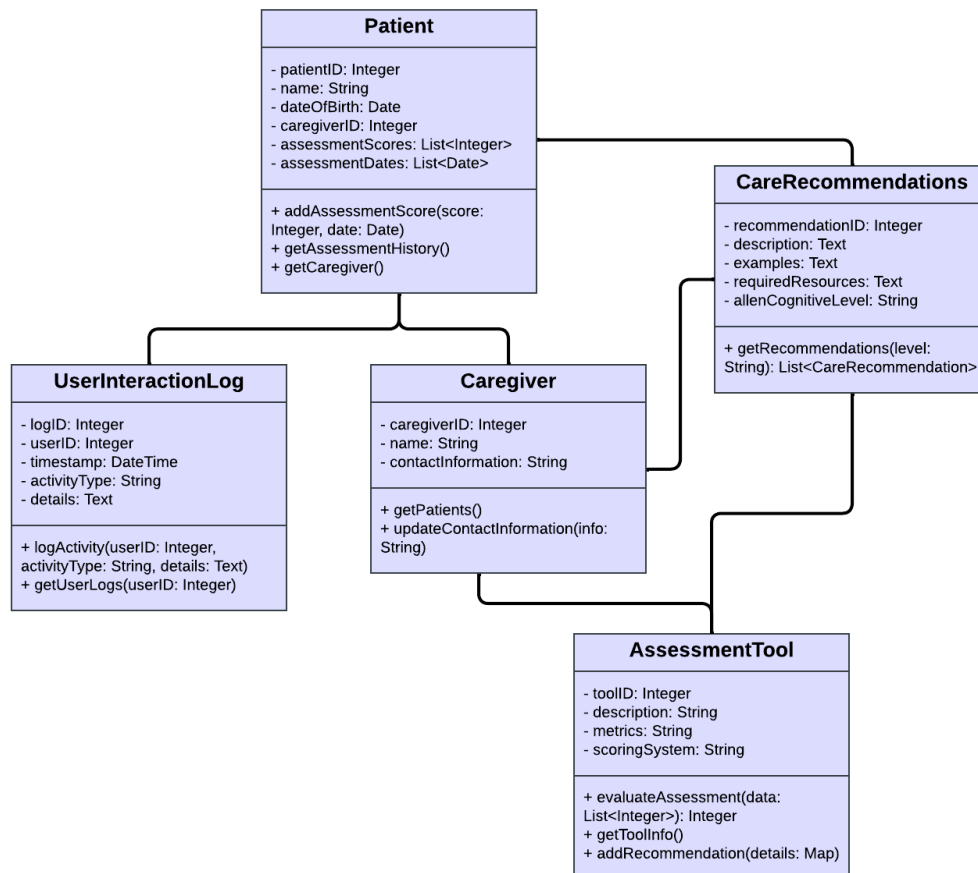
3.2.3 Activity Diagrams:



These Activity Diagrams provide a clear and concise overview of the main processes within the DementiaInsight application. The Login Process Activity Diagram is where users will enter their credentials and are authenticated. If successful, the dashboard is displayed; otherwise, an error message is shown. For the Manage Patient Profiles Activity Diagram, caregivers select a patient profile, view details, and can update the patient's information if needed. Updates are saved and confirmed if there are any changes. For the Perform Assessment Activity Diagram, caregivers can select an assessment tool, enter the data, and submit for processing, so that the results can be viewed. Generate Care Recommendations Activity Diagram follows the assessment results, and the care recommendations are then generated and displayed. This is where notifications are sent to both the caregivers and the patients. Lastly, the Receive Notifications Activity Diagram is when a notification event is triggered, so the system

checks the user's notifications settings and sends notifications via email, mobile, and in-app as configured.

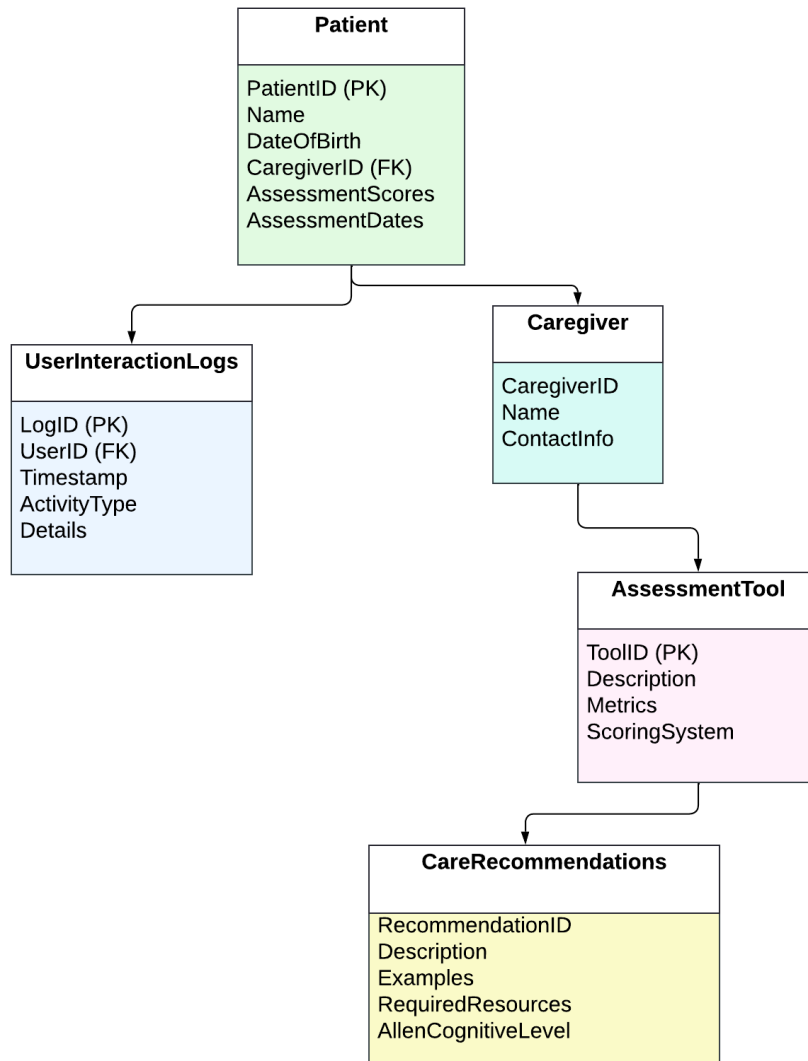
3.2.4 Object Class Design Diagram:



This system is architecturally divided into modular subsystems, each with distinct and critical responsibilities. There is a one-to-many relationship where a single patient can have multiple interaction logs. This is represented by the 'userID' attribute in 'UserInteractionLog' referencing 'patientID' in 'Patient'. There is a many-to-one relationship where multiple patients can be associated with one caregiver. This is represented by the 'caregiverID' attribute in 'Patient'. In addition, each log entry references a patient via the 'userID' attribute. The 'AssessmentTool' and 'CareRecommendations' classes interact with the other classes such that

recommendations can be retrieved based on assessment outcomes and the caregivers will use the assessments to recommend the patients a certain care.

3.2.5 Entity Relationship Diagram:



The Entity Relationship Diagram for DementiaInsight application demonstrates the interconnectedness of the components that are necessary to operate. Patients enter their personal and assessment information, which is represented by the 'Patient' entity. These are associated with the 'Caregiver' entity, which gathers data, including contact details, on the caregivers in charge of the patients. The descriptions, measurements, and scoring systems of the tools used for cognitive evaluations are contained in the 'AssessmentTool' entities. The 'CareRecommendations' entity will be able to manage the care recommendations, making sure that individualized care plans are made for each patient according to their cognitive abilities. The 'UserInteractionLogs' entity is

utilized to track user interactions, including the evaluations and suggestions. By leveraging these connections, the system will improve dementia treatment by offering precise evaluations, tailored suggestions, and thorough patient interaction tracking.

3.3 Design Rationale

Architectural Considerations:

The architectural design for the DementiaInsight Mobile Application was determined by several key considerations.

1. User-Friendly Experience (Accessibility and Usability):

- **Goal:** The primary purpose is to create an application that is intuitive and easy for caregivers and healthcare professionals to use.
- **Implementation:** The chosen architecture ensures a straightforward user interface (UI) that simplifies cognitive assessments and care recommendations. It is designed to be accessible, complying with standards to aid individuals with disabilities.

2. Accuracy and Reliability:

- **Goal:** Accurate cognitive assessment and care recommendations are crucial for improving the quality of care for individuals with dementia.
- **Implementation:** The Calculation Engine, utilizing well-defined algorithms based on Allen's Cognitive Disability Model, will provide reliable and clear results.

3. Data Management and Security:

- **Goal:** Guarantees secure storage and management of user profiles and assessment data.
- **Implementation:** Profiles are organized by unique user identifiers using a Cloud SQL relational database management system (RDBMS). A SQL join table is used within the Data Management Subsystem to manage relationships between different data entities, enhancing data integrity and query performance. Using cloud storage and APIs to ensure data integrity and confidentiality, complying with industry standards such as HIPAA for handling sensitive information.

4. Real-Time Updates:

- **Goal:** Issue real-time updates to ensure that caregivers and healthcare professionals have the most current information.
- **Implementation:** The system uses cloud services and APIs to verify real-time data synchronization and updates, enhancing the user experience and data reliability.

Trade-Offs and Alternatives:

1) Monolithic vs. Modular Architecture:

- **Consideration:** We considered a monolithic architecture in which a single application will house all functionalities.
- **Decision:** In order to improve maintainability and scalability, we opted for a more modular architecture, which results in each module upgrading separately.
- **Trade-offs:** Modularization may result in increased overhead in terms of system complex and resource use. However, the benefits in terms of flexibility, maintainability, and scalability outweigh the disadvantages

2) Local vs. Cloud-Based Data Storage:

- **Consideration:** We discussed whether data should be stored locally or on Cloud storage.
- **Decision:** In order to guarantee data availability and real-time changes, we used cloud-based data storage. Scalability and device synchronization are supported by cloud storage.
- **Trade-offs:** While local storage offers faster access, it lacks synchronization across devices. Cloud storage secures data integrity, availability, and real-time updates but may introduce latency and dependency on internet connectivity.

3) Security vs. Performance:

- **Consideration:** Balancing security measures with system performance.
- **Decision:** We prioritized robust security measures, including encryption and compliance with HIPAA standards, to protect sensitive data. The system is designed to handle the additional processing load of security layers without compromising performance.
- **Trade-offs:** Enhanced security can introduce some performance overhead. However, the critical nature of protecting sensitive health data makes this trade-off necessary and justified.

4) User Accessibility vs. Feature Richness:

- **Consideration:** Checking if the application remains user-friendly while incorporating advanced features/
- **Decision:** We focused on creating an intuitive and accessible UI, making sure it is easier to use. Advanced features are implemented in a way that does not compromise the simplicity and usability of the application.
- **Trade-offs:** Adding too many features can complicate the user interface, but careful design and user testing to help maintain a balance between the functionality and usability.

4.0 DATA DESIGN

4.1 Data Description

1. **User Profiles: Patient Data:**

- **Storage:** Patient profiles are stored in an encrypted MySQL database using Cloud SQL. There will be regular backups to ensure data safety and availability.
- **Data:** Each profile includes user-specific information of patient ID, date of birth, assessment scores, most recent Allen Cognitive Level, and assessment dates.
- **Processing:** Data is processed during entry through validation checks to ensure accuracy and during retrieval to generate personalized care recommendations and assessment reports.
- **Organization:** Profiles are organized by unique user identifiers using a Cloud SQL relational database management system (RDBMS) with tables linking to assessments, recommendations, and caregiver data.

2. **User Profiles: Caregiver Data:**

- **Storage:** Caregiver profiles are stored alongside patient data in the same encrypted MySQL database using Cloud SQL. There will be regular backups to ensure data safety and availability.
- **Data Attributes:** Each profile includes user-specific information of caregiver ID, name, and contact information.
- **Processing:** Data is processed for authentication and authorization purposes.
- **Organization:** Data is linked directly to the patient(s) they care for, with a SQL join table to ensure database integrity while allowing for many-to-many relationships where one caregiver may care for multiple patients within the system.

3. **Assessment Tool:**

- **Storage:** The data for the assessment tool will be stored in a master table within the MySQL database.
- **Data:** Information includes the tool ID, description, metrics, and scoring system.
- **Processing:** Data is processed during the assessment phase where inputs from users are mapped against the scoring criteria to generate results including Allen Cognitive Level.
- **Organization:** The assessment tool data is organized in a structured format to allow developers to easily update and modify the assessment criteria without affecting the integrity of historical data.

4. **Care Recommendations:**

- **Storage:** The data for care recommendations is stored in a dynamic database segment of the MySQL database which supports versioning if

the assessment criteria are updated. This will ensure prior assessments remain valid and are comparably separate from newer versions.

- **Data:** Information includes Allen Cognitive Level information, recommendation ID, descriptions, examples, and required resources.
- **Processing:** Recommendations are processed based on the outcome metrics from the Dementia Rating Scale assessment and retrieved by the data management subsystem.
- **Organization:** Recommendations are organized by Allen Cognitive Level through relational keys to enable targeted and efficient data retrieval.

5. User Interaction Logs:

- **Storage:** Logged data is stored in a separate database with encryption designed for logs and audit trails. There will be regular backups to ensure data safety and availability.
- **Data:** Each record includes log ID, User ID (of both patient and caregiver), timestamp, and details (assessment answers, outcome (Allen Cognitive Level), and recommendations).
- **Processing:** The system appends new log records to the history.
- **Organization:** Log records are organized chronologically with indexing of timestamp and user ID for quick access and review.

Databases and Data Storage:

1. MySQL on Cloud SQL:

- **Purpose:** Houses all primary data entities including patient profiles, caregiver profiles, assessment tools, and care recommendations
- **Tables:** Patients, Caregivers, Assessment Tools, Care Recommendations
- **Features:** Features of the Cloud SQL database include storage encryption, regular backups, version control for care recommendations, and relational structure for efficient querying.

2. Logging Database:

- **Purpose:** Records user interactions for security and auditing needs.
- **Table:** Interaction Logs
- **Features:** Features of the Logging Database include separate storage to prevent performance impact on the main application database, encryption, indexing with timestamps, and user IDs for fast retrieval and regular backups.

4.2 Data Dictionary

Below is the data dictionary for DementiaInsight, which outlines the major data entities, their attributes, and descriptions. This dictionary provides a detailed and comprehensive

overview of the system's data structure, enabling a clear understanding of how information is organized and managed within the application. This resource is essential for ensuring all stakeholders are aligned and can efficiently interact with the system's data components.

1. **Patient:**

- **Patient ID** (*integer*): A unique numerical identifier for each patient.
- **Name** (*string*): Full name of the patient.
- **Date of Birth** (*date*): Patient's birth date in YYYY-MM-DD format.
- **Assessment Scores** (*integer*): Numerical scores from the Dementia Rating Scale assessment and the resulting Allen Cognitive Level.
- **Assessment Dates** (*date*): Dates on which each assessment was conducted, in YYYY-MM-DD format.
- **Caregiver ID** (*integer*): Numerical identifier linking to the primary caregiver.

2. **Caregiver:**

- **Caregiver ID** (*integer*): A unique numerical identifier for each caregiver.
- **Name** (*string*): Full name of the caregiver.
- **Contact Information** (*string*): Data including phone number and email.

3. **Assessment Tool:**

- **Tool ID** (*integer*): A unique numerical identifier for each assessment tool version.
- **Description** (*string*): A brief description of the tool.
- **Metrics** (*string*): Specific criteria used in the assessment.
- **Scoring System** (*string*): Details of the scoring system used by the tool to generate the outcome of the Allen Cognitive Level.

4. **Care Recommendations:**

- **Recommendation ID** (*integer*): A unique numerical identifier for each recommendation.
- **Description** (*text*): Detailed description of the care recommendation.
- **Examples** (*text*): Detailed description of examples for implementation.
- **Required Resources** (*text*): Resources necessary to support the care recommendations.
- **Allen Cognitive Level** (*string*): Specific cognitive level associated with the recommendations, used for matching patient assessment outcomes.

5. **User Interaction Logs:**

- **Log ID** (*integer*): A unique numerical identifier for each log entry.
- **User ID** (*integer*): Identifier of the user who the assessment was performed for (Patient ID).
- **Timestamp** (*datetime*): The exact date and time when the activity occurred, stored in Coordinated Universal Time (UTC).

- **Activity Type** (*string*): Type of activity performed (login, data entry, report generation).
- **Details** (*text*): Specific details about the activity including inputs provided and/or outcomes as a result of the activity.

5.0 COMPONENT DESIGN

1. Patient Assessment Processing

- **Objective:** To calculate and record the assessment scores for a patient using the Dementia Rating Scale.
- **Input:** Responses to assessment questions.
- **Output:** Total assessment score and corresponding cognitive level are stored in the patient's profile.
- **Process/Algorithm:**
 - Each response is assigned a score based on predetermined criteria.
 - Scores are summed to create a total assessment score.
 - Allen Cognitive Level is determined based on the total score using a mapping table.

- **Pseudocode:**

FUNCTION CalcAssessmentScore(responses):

 total_score = 0

 FOR each response IN responses:

 total_score += score_of(response)

 END FOR

 RETURN total_score

FUNCTION GetCognitiveLevel(total_score):

 IF total_score >= level_high:

 RETURN "High Allen Cognitive Level"

 ELSE IF total_score >= level_medium:

 RETURN "Medium Allen Cognitive Level"

ELSE:

RETURN "Low Allen Cognitive Level"

FUNCTION ProcessAssessment(responses):

total_score = CalcAssessmentScore(responses)

cognitive_level = GetCognitiveLevel(total_score)

StoreAssessmentResult(total_score, cognitive_level)

RETURN (total_score, cognitive_level)

END FUNCTION

2. Care Recommendation Generation

- **Objective:** To generate personalized care recommendations based on the patients' more recent assessment results.
- **Input:** Patient's most recent assessment score and cognitive level.
- **Output:** A list of tailored care recommendations provided to the caregiver through the application interface.
- **Process/Algorithm:**
 - i. Query the 'Care Recommendations' database for entries matching the patients' cognitive level.
 - ii. Select recommendations based on relevance.
- **PSEUDOCODE:**

FUNCTION GenerateRecommendations(cognitive_level):

recommendations = []

database_recommendations = QueryDatabase(cognitive_level)

FOR each recommendation IN database_recommendations:

recommendations.append(recommendation)

END FOR

DisplayRecommendations(recommendations)

END FUNCTION

3. User Authentication

- **Objective:** To authenticate users to ensure secure access to the system.
- **Input:** User credentials (username and password).
- **Output:** Authentication status (success or failure) as session token for logged-in users.
- **Process/Algorithm:**
 - i. Encrypt the entered password using a hash function
 - ii. Compare the hashed password with the stored password hash in the database.
 - iii. Generate an access token if the credentials match.
- **PSEUDOCODE:**

FUNCTION AuthenticateUser(username, password):

stored_hash = GetStoredPasswordHash(username)

Input_hash = HashPassword(password)

IF input_hash == stored.hash:

access_token = GenerateAccessToken()

RETURN (True, access_token)

ELSE:

RETURN (False, None)

END IF

END FUNCTION

4. Data Synchronization

- **Objective:** To synchronize data between the application and the cloud database to maintain data consistency across devices.
- **Input:** Local changes made to data while offline.
- **Output:** Updated data on both local device and cloud storage.
- **Process/Algorithm:**
 - i. Upon reconnection to the internet, check the timestamp of the last sync.
 - ii. Push local changes to the cloud if the cloud timestamp is newer.
 - iii. Pull updates from the cloud if the cloud timestamp is newer.
- **PSEUDOCODE:**

```

FUNCTION SynchronizeData(local_changes, last_local_sync, ...
... last_cloud_sync):
    IF last_loca_sync > last_cloud_sync:
        UpdateCloud(local_changes)
    ELSE:
        Local_data = RetrieveUpdatesFromCloud()
        UpdateLocalDatabase(local_data)
    END IF
    UpdateSyncTimestamps()
END FUNCTION

```

5. Interactive Logging

- **Objective:** To log user interactions to provide support system audits.
- **Input:** Details of user activities (login, assessment entry, view recommendations).
- **Output:** A record in the user interaction logs database.
- **Process/Algorithm:**
 - i. Capture the activity type, user ID, timestamp, and activity details.
 - ii. Store the log entry in a separate logging database.
- **PSEUDOCODE:**

```

FUNCTION LogUserActivity(user_id, activity_type, details):
    log_entry = CreateLogEntry(user_id, action_type, details, ...
... GetCurrentTimestamp())
    SaveLogEntryToDatabase(log_entry)
END FUNCTION

```

6.0 HUMAN INTERFACE DESIGN

The user interface (UI) should be user-friendly, effective, and straightforward, given its role in assisting caregivers provide dementia capable care. Below is an overview of the

key components and design principles that should guide the development of the UI for this application.

6.1 Overview of User Interface

General Design Principles

- **Clarity and simplicity:** The UI should be uncluttered and straightforward without unnecessary elements. Clear labels, logical navigation, and consistent element placement are vital.
- **Accessibility:** The UI should be designed with attention to accessibility to accommodate users with varying abilities. This includes color contrast ratios, text size options, keyboard navigation, and touch screen navigation.
- **Responsiveness:** The interface should be fully responsive to ensure usability across different devices and screen sizes, particularly for use with mobile and tablet devices.
- **User-Centric:** The design should be based on user needs and activity with ongoing user testing implemented to refine the interface.

Key Components of the User Interface

1. **Login and User Authentication Page**
 - A secure login page with options for password recovery and multi-factor authentication to protect sensitive data.
2. **Dashboard**
 - This is the main landing page after login is complete. It provides a summary view of the key information which may include recent patient assessments, access to most recent care recommendations, and alerts.
 - Widgets can be used to display this information in a concise manner.
3. **Patient Profile Pages**
 - This provides detailed views for each patient including personal information, assessment results, and care recommendations.
 - This section can be collapsed to organize large amounts of information efficiently.
4. **Assessment Tool Interface**
 - An interface for entering assessment information and viewing results from assessments.
 - This should allow ease of response inputs through an interactive form.
5. **Care Recommendations Module**
 - A section that dynamically displays care recommendations based on the latest assessment scores.

- This will provide options for caregivers to highlight specific recommendations for later reference and mark specific recommendations as viewed.

6. Notification System

- A system to alert users to new updates and reminders for activities to complete.
- This should be integrated into the dashboard. It will also support email and mobile notifications.

7. Administration Panel

- This panel is for use only by system administrators.
- A panel which includes tools for managing user accounts, system settings, and viewing system logs.
- This should include a high level of data protection and security setting options.

8. Help and Support Section

- A section with easily accessible help resources, frequently asked questions, and contact information for additional support.
- Provides a ticketing system for unresolved issues.

6.2 Screen Images and 6.3 Screen Objects and Actions

6.2.1 Login and User Authentication Page



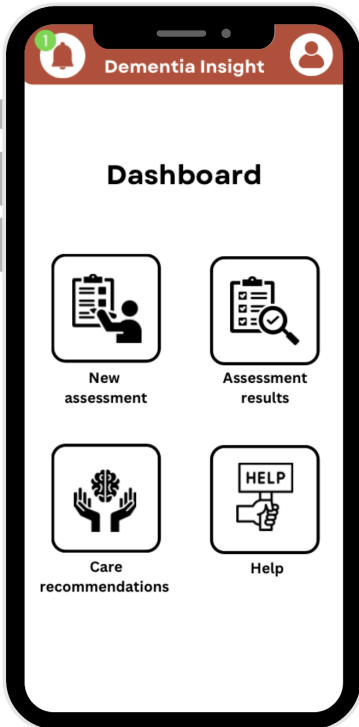
Objects:

- Input fields for username, password, and verification code
- Buttons for login, password recovery, and multi-factor authentication

Actions:

- Enter credentials
- Submit credentials
- Recover password
- Complete multi-factor authentication

6.2.2 Dashboard



Objects:

- Widgets for alerts, user profile, new assessments, assessment results, care recommendations, and support/help

Actions

- View alerts
- Open user profile
- Access new assessments, assessment results, and care recommendations, and support/help section

6.2.3 Patient Profile Page and Notification System



Patient profile Page

Objects:

- Expandable sections for patient information, assessment results, and care recommendations

Actions:

- View patient information
- Edit patient information
- View assessment details
- View care recommendations

Notification System

Objects:

- Notification icon

Actions:

- View notifications
- Mark notifications as read
- Adjust notification settings

6.2.4 Assessment Tool Interface



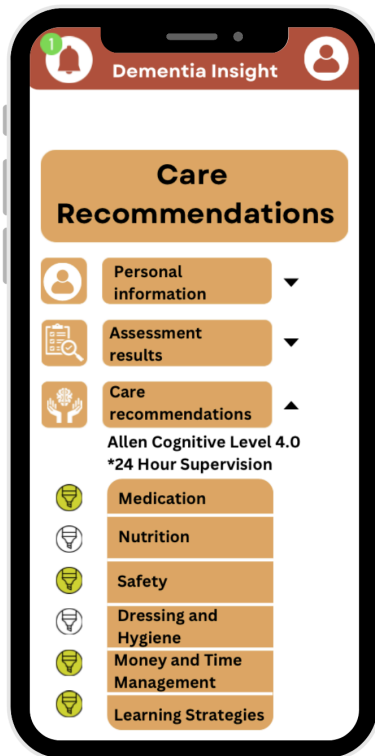
Objects:

- Buttons for simple yes and no prompts in response to each question

Actions:

- Enter answers for assessment questions

6.2.5 Care Recommendations Module



Objects:

- Expandable recommendations section displays a list of actionable care recommendations
- Expandable recommendations subsections including medication, nutrition, safety, dressing and hygiene, money and time management and learning strategies
- Button next to each recommendation to allow user to highlight chosen recommendations

Actions:

- Click the highlight button next to chosen recommendations to highlight recommendations of choice

6.2.6 Administration Panel



Objects:

- Widgets to access management of user accounts, system settings, system logs, and help tickets

Actions:

- Add and remove users
- Adjust user access
- Change system settings to adjust application behavior
- Perform data backup or restore

6.2.7 Help and Support Section



Objects:

- Widgets for resources, frequently asked questions, contact information, and initiating a help ticket

Actions

- Access resources including tutorials and guides
- Browse frequently asked questions
- Retrieve phone number and email address for customer support
- Submit a support request ticket

7.0 REQUIREMENTS MATRIX

Requirement ID	Description	Design Component(s) / Data Structure(s)	Verification Method
REQ-001	Secure user authentication	User Authentication Module, Secure Session Management	Manual testing, security audit
REQ-002	Patient assessment using Dementia Rating Scale	Assessment Engine, Database Tables for Assessments	Unit testing, functional testing
REQ-003	Generation of care recommendations based on assessment	Recommendation Algorithm, Recommendations Table	Functional testing, user acceptance testing
REQ-004	Ability to view and manage user profiles	Patient Management Module, Patients Database Table	Manual testing, user feedback
REQ-005	Accessibility on mobile devices	Responsive UI Components, Mobile App Modules	Cross-platform testing, user feedback
REQ-006	Data synchronization across devices	Sync Controller, Data Replication Logic	Integration testing, performance testing
REQ-007	Compliance with HIPAA	Encryption Services, Audit Trails, Compliance Logs	Security audit, compliance review
REQ-008	Real-time notifications for caregivers	Notification Dispatcher, Notifications Table	Functional testing, performance testing
REQ-009	Comprehensive help and support resources	Help Content Management, Help Resources Table	Manual testing, user feedback
REQ-010	System administrative capabilities	Administrative Tools, Administrator Settings Table	Functional testing, security audit

REQ-011	Report generation for patient assessments and care recommendations	Reporting Engine, Reports Table	Unit testing, user acceptance testing
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8.0 APPENDICES

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