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Software Development Project Year 4

Functional Specification

Elderly Care Management System(ECMS)

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# **Introduction**

The purpose of this document is to outline the functionality of the Elderly Care Management System (ECMS). The aim of this project is to create a secure application by implementing cryptography to safe guard and manage the patient data used by Care Centres. This system will be designed to cater for two primary users the administrator and carers. Administrators will be handling patients details, registrations, as well as creating and managing care plans and rosters. The Carer is tasked with managing daily care activities, administering medication, and reporting any incidents. The secure application ensures both users can perform there roles efficiently while maintaining confidentiality and integrity of there data.

These are a few key features that will be implemented in this project:

* Security: Implementing data encryption and decryption to ensure the security of patients sensitive information and to comply with the Health Level 7 standard.
* Patient Profile: Maintaining the patients personal and medical information.
* Care Planner: To create and manage a custom care plan for individual elderly patients.
* Medical Dashboard: Keeping track of patients medical histories, current medications, and the dosages of medicine to be administered.
* Roster: Schedule daily carer to patients.
* Incident Reporting: Report any incidents that occurred during the carer’s visit to the patient.
* Alerts: To keep up to date on any incidents that have been reported by the carer among other notifications.

This document will highlight the target audience for the application and will also discuss the systems architecture. It will outline a context diagram, use case diagram that will show interactions between different users and will also explain FURPS+ metrics (Functionality, Usability, Reliability, Performance, Supportability+).

# **Project Overview**

The Elderly Care Management System (ECMS) aim is to enhance management of the patients information in care centres. Ensuring all patient data adheres to the Health Level 7 standards of security by implementing encryption and decryption using Shared key or Public key. The data is easily accessible and easily updatable. There are two main users in this application: The Administrator and the Carer.

## **Core Functionality**

The core functionalities of this project are:

**Security:** The aim is to implement cryptography for data encryption/decryption to keep the patients data secured. There are two sorts of encryption and decryption Shared Key and Public Key both of which are discussed below.

**Shared Key:** Which is also known as symmetric encryption. This is a method of encrypting and decrypting using the same key. This key must remain a secret to ensure the confidentiality of the data. Shared key is faster than Public key encryption. Shared key uses cryptographic algorithms such as block ciphers which breaks the data into blocks before encryption has occurred. There are two algorithms commonly used in shared key Triple data encryption standard(3DES) and Advanced Encryption standard(AES).

A diagram of a key encrypted key encryption

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Fig 1: Shared Key. Source: [Shared Key encryption](https://www.sciencedirect.com/topics/computer-science/shared-key-encryption)

**Public Key:** Which is also known as asymmetric encryption. It is a method of encrypting and decrypting data. This involves a pair of two keys: a public key and a private key. The private key is strictly kept private and the public key is freely distributed. Anyone can encrypt data using the public key but only the holder of the private key corresponding with the public key can decrypt the data. This ensures that although the public key is available only the holder of the private key can access the original data.

A diagram of a computer network

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Fig 2: Public Key. Source: [Public key encryption](https://www.sciencedirect.com/topics/computer-science/shared-key-encryption)

**Health Level 7:** The Health Level 7 also known as HL7 provides a framework for the exchange, integration, sharing and retrieval of health information. HL7 is the most commonly used standard globally. The primary standard of HL7 is considered to be very popular for system integration, inter-operability and compliance.

**Patient Profile:**  The ECMS keeps a secure record of the patient personal and medical information. They profile every patient according to their needs and goals they want to achieve.

**Care Planner:** To create and manage a custom care plan for individual patients who have been registered into the care system. The administrator creates tasks which will be completed by the carers for the patient. For example tasks such as cleaning the patient rooms, giving them their medication on time, assisting them with their activities. Multiple visit for the patients will be organised for Morning, Lunch, Afternoon, Evening and Bedtime.

**Medical Dashboard:** This is a crucial component of a care system. It contains the patients medical history, current medication and there dosages. This gives real time updates when the carer administers the medicine to the patients. The patients medical information will be encrypted and securely stored.

**Roster:** This will be used by the administrator to schedule patients a carer for the day. The administrator can make changes to the roster depending on the schedule and the teams availability ensuring only authorized personnel such as carer can view it.

**Incident Reporting:** This will be used by the carer to report incidents that occurred during their visits. For example: If the patient had a fall and injured themselves, the carer will create a report and upload it. They will be able to explain in detail how the incident occurred and what was done. This will send an alert to the administrator.

**Alerts:** The administrator will receive alerts on patients that are created by the carer. An example of this would be if an incident occurred during a carers visit to a patient, the administrator will be able to access that through the alert notification and will be able to sign off the incident.

# **Target Audience/Platform**

There are two users for the Elderly Care Management System:

* Administrator
* Carer

The Administrator will be handling all the patients personal details such as their Name, Date of birth, Phone number, Home address, Email Address, Medical history, Dietary requirements, Medication, there GP and the Next of Kin name, Next of Kin Number and Next of Kin email. The administrator will also be handling Carer details and securely saving all this data by having it encrypted.

The Carer will be assigned to patients for their shifts depending on their roster. The carer assigned to the patient will tend to tasks such as looking after the personal care needs of patients like giving them a shower or bath, assisting with feeding, and toileting. The carer will give the patients medication on time and will document everything. They will also follow the patients interests and support them and assist them in their daily activities. If an incident occurs during the day, the carer must report the incident to the administrator.

This will be a web application that will be accessible on both mobile devices and desktop. Users will be able to access this easily. The user interface will be designed so it is simple to navigate. Administrators and Carers will be able to easily access the application.

# **Context Diagrams**

# **Use Case Diagram**

**A diagram of a medical care system

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# **Brief Use Case**

# **Detailed Use Case**

# **FURPS+ Metrics**

## **Functionality**

* The Management of the patient and carer data, scheduling tasks, incident reporting and security of this application.
* Incorporating real time updates for the patients medication administered.
* Implementing cryptography to protect the data and to comply with the Health level 7 standard.
* The app must allow administrator to make changes to patient and carer data

## **Usability**

* The text will have high contrast to the background to ensure readability and visibility for all users.
* The application must be easy to navigate and use.
* Configure the application to ensure users see only data relevant to their responsibilities.
* The application must save any changes made by administrator or carer within 10-20 seconds.

## **Reliability**

* The application must have a 99% uptime.
* The only downtime should be for maintenance
* Implementing error handling to maintain the application.

## **Performance**

* Ensure quick loading and processing on the application.
* Conduct load testing on the application using different scenarios.

## **Supportability**

* Provide clear user manual and system documentation to assist users to easily navigate the application.
* Ensure the application is scalable for a large amount of users.
* The application should work with any web browser.
* The application should be flexible enough to incorporate additional features in the future.

## **Security(+)**

* Implementing encryption and decryption using either shared key or public key to safely store the patient and staff data.
* All logins must be securely saved in the database.
* Ensuring the system meets security demands as a Care System application.

# **Similar Applications**

These are some of the Applications I came across during my research for this document.

## **Pass App created by Every Life**

This applications features include:

* Care Planning which allows for the creation of custom care plans for the patient, this feature facilitates care tasks to be completed by the carer.
* This app includes a roster for managers to plan visits in detail and allocate the most suitable carer.
* It includes an incident reporting tool to create reports of incidents that have occurred during the carer visits.
* GP connect allows for seamless viewing of patients medical history, access to up-to-date patient information enables care providers to administer medication safely and ensures that all actions are recorded in real time.
* An Emar system to minimise medication errors by ensuring accurate tracking and administration of medication and to view when, where, and who administered the medication.
* Open Pass which allows family members to stay up to date with there loved ones well being.
* Finance system for automated billing and invoicing for more streamlined workflows. Creating and customizing employee profile.
* Document builder to create templates for care docs.

## **Log my care**

This has two separate apps: Care Office and Carer App.

**Care Office:**

* This application allows the office workers to manage and view activities
* It gives a simple overview of tasks, incidents and documents on its dashboard.
* The app can create, assign and track tasks for the carer with details such as signature requirements for when a task has been completed.
* App creates reports to see the overall pattern such as indent reports in the month.
* Create and organise documents such as care plans, risk assessments and goals to reach.
* Manage all carers and residents within the work force.
* Fly through Inspections.

**Carer App:**

* A to do list for the carer for there patient.
* Carer can add photos and videos and a speech to text
* Using eMAR that notifies the carer to administer the medicine and sign it off
* Carer can view all information on there patient includes different care plans and GP information.

## **Nourish**

The application features include:

* Personalized Care Plans according to patients needs
* Emergency admission pack for when a patient is being transferred to a different care centre or hospital.
* Seamless handover: The whole team will be able to see the latest changes to the patients they support.
* Speech to text: to make notes efficiently.
* Quick close tag which signify a task has been completed.
* Record activities of the patient through out there day
* Offline access even without connection: the carer’s are able to access all they key information they require.
* Upload pictures document information with pictures.
* Direct messaging a secure communication between the team.
* Incident care management.
* Care reports
* Control and security on all patient data and follows including ISO 27001 and Cyber Essentials Plus.
* Invoicing and payroll

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