# Introduction

## Background

Healthcare is gradually becoming more data-driven. The emergence of evidence-based medicine necessitates the swift and efficient use of information to enhance patient outcomes. Information and communications technology (ICTs) have had a significant influence on the complex health industry, which is generally known and acknowledged (Poba-Nzaou, Uwizeyemungu, Raymond & Pare, 2014). The degree of ICT adoption, financial security, and productivity of healthcare companies all have a significant relationship (Sun & Qu, 2015). All information systems (IS) dedicated to providing decision support by assembling and aggregating the raw data obtained from the operational systems are included under the term "business intelligence" (BI) (Moro, Cortez, & Rita, 2015). Dashboards and other BI tools like them are intended to offer useful management data that supports decision-making. The dashboards display data in the form of KPIs that are selected in accordance with the organization’s strategy (Kretzer, Maedche, 2014), and their presentation is essential for providing stakeholders with the knowledge they need to make informed choices (Forsman, Anani, Eghdam, Falkenhav & Koch, 2013).

The demand for care home services has lately increased, and care home institutions are finding it difficult to meet them. In nursing homes, patient safety is still a key concern. To make sure the patients are safe, constant observation is necessary. However, the existing state of affairs restricts monitoring all patients due to a shortage of staff resources. The majority of the time, the most critical patients receive one-on-one monitoring and are given precedence. Users may easily keep track of their physical activities thanks to recent improvements in smart fitness trackers. Typically, these gadgets use data from accelerometers and gyroscope sensors to anticipate activity using a machine-learning model. Numerous studies have been done in this area, offering numerous solutions to the issue. The ability to categorise an activity by combining accelerometer data and a machine learning system is a commonality. The data position, sensor count, and choice of algorithm for processing and classifying this data are what make these research different from one another. Simply having a machine learning model does not address the real issue with care facilities. The care facilities must monitor multiple people at once. Therefore, a more sophisticated solution is needed, one that can clearly gather and show the information of all these individuals.

A dashboard can be a useful tool for monitoring care homes as it provides a centralised location to view and track key data points and metrics. It can help managers and staff quickly identify and address any issues that arise and make more informed decisions about the care and management of the home. Additionally, dashboards can help to improve communication and coordination between staff and provide valuable insights into the overall functioning of the care home. However, it's important to note that the effectiveness of a dashboard depends on the quality and completeness of the data that is being tracked, as well as the ability of staff to understand and use the information effectively. It is also important to have a way to validate the data captured and make sure it is accurate.

In the current study, a dashboard is proposed, which enables the management to monitor the activities of inhabitants in the care home. This report will include a thorough evaluation of the dashboard's usability, functionality, and effectiveness so it will offer suggestions for any alterations or enhancements that could help to better serve the requirements of care home staff and residents

## Problem Statement

Care homes are essential components of the healthcare system both in the UK and elsewhere in the world. Care facilities are typically an underappreciated or ignored sector of the economy, despite their importance, particularly in providing care for older people with increasingly complex care demands. The number of open positions in the adult social care industry has increased at the greatest pace since data have been kept since 2012/13, according to the most recent annual Skills for Care Workforce Analysis, which was published in October 2022 (Social Care TV, 2022).

Care personnel shortages plagued most of the care homes during the COVID crisis. Due to staff shortages, the support for the elderly has been impacted because the majority of senior individuals may have various conditions, and some may require constant assistance.

Since the beginning of my study, I have worked as a part-time carer, and what I have noticed is that many residents are not receiving enough assistance and support during the crisis owing to a lack of staff. Because of various physical or mental illnesses, some residents require more care than others. Moreover, it requires hard labour, the staff cannot keep an eye on everyone during these periods. Additionally, each individual's food and fluid intake as well as their health status need to be frequently monitored in order to take care of them and improve their quality of life as many of them may not be able to communicate their stress to the authorities.

## Aim

The aim of this dissertation is to create a dashboard for monitoring the activities of inhabitants in a care-home facility.

## Objectives

The main objective of this dissertation work is to create a dashboard for monitoring the activities of inhabitants in a care-home facility. This major objective is accomplished by a series of minor objectives listed below:

* To create machine learning models for activity classification from sensor data.
* To compare the performance of models.
* To create an architecture for storing and retrieving data.
* To create a dashboard addressing all the business questions.

## Scope

A dashboard for care homes in the United Kingdom (UK) could be used to provide a comprehensive overview of various aspects of the care home's operations and performance. Some of the possible areas of focus for such a dashboard include:

* Resident care: A dashboard for care homes in the UK could include data on the number of residents, their demographics, health conditions, and care needs. It could also include metrics on the quality of care provided, such as fall rates, infection control, and medication management.
* Staffing: Care homes rely heavily on the staff they employ, a dashboard could provide data on the number and qualifications of the staff, their work schedules, and availability, and staff turnover rates.
* Financials: A dashboard could also include financial metrics, such as budget and cost data, occupancy rates, and revenue streams for the management.
* Inspections and compliance: Care homes in the UK are regulated and subject to inspections. A dashboard could provide data on the results of inspections, compliance with regulations, and any issues or concerns identified by regulatory bodies.
* Quality of life: A dashboard could also provide metrics on the quality of life of residents, such as social engagement, physical activity, and mental well-being.
* Facility management: A dashboard could also include information on the physical condition of the facility, such as repairs, maintenance, and upgrades.

Overall, a dashboard for care homes in the UK could be used to provide a comprehensive overview of various aspects of the care home's operations, it could be used by management teams to make data-driven decisions, identify areas of improvement, and prioritise actions. It could also be used by regulatory bodies to monitor the performance of care homes and ensure compliance with regulations.

## Benefits

In the current dissertation work, two main areas of focus are building and deploying machine learning models in python and creating a dashboard by connecting data from a database. The benefits of acquiring these skills are discussed below.

Developing machine learning models in Python can provide a number of benefits in terms of skill development. Some of the key skills that can be developed through developing machine learning models include:

1. Programming: Developing machine learning models in Python requires proficiency in the Python programming language, including the use of libraries and frameworks for machine learning such as scikit-learn, TensorFlow, and PyTorch.
2. Data analysis and exploration: Developing machine learning models requires understanding the data and its structure, selecting appropriate features, and making data-driven decisions. This requires skills such as data cleaning, visualisation, and feature selection.
3. Machine Learning: Developing machine learning models requires knowledge of machine learning algorithms, including supervised learning, unsupervised learning, and deep learning. This requires an understanding of concepts such as overfitting, underfitting, regularisation, and model selection.
4. Model evaluation: Developing machine learning models requires being able to evaluate and select models. This requires an understanding of evaluation metrics such as accuracy, precision, recall, and f1-score, and being able to apply them in practice.
5. Problem solving: Developing machine learning models requires problem-solving skills, such as the ability to break down complex problems into smaller components, and to think creatively and critically about the data and the problem.
6. Innovation: Developing machine learning models can be a great way to explore new ideas and think creatively about the data. It can help to develop an innovative mindset, to think about new ways of looking at and interpreting data, and to explore novel applications of machine learning.

Overall, developing machine learning models in Python can be a valuable experience for skill development, and can help prepare for a career in data science, artificial intelligence, or any other field that relies on machine learning techniques.

Developing a dashboard can provide a number of benefits in terms of skill development. Some of the key skills that can be developed through dashboard development include:

1. Data Analysis: Developing a dashboard requires the ability to extract insights from data. It requires understanding the data and its structure, selecting appropriate visualisations, and making data-driven decisions.
2. Visualisation: Creating a dashboard involves choosing the right visualisation to represent the data and effectively communicate the insights. It requires understanding how different visualisations can be used to represent different types of data, and how to create visualisations that are aesthetically pleasing and easy to understand.
3. Technical skills: Depending on the tool or platform used to create the dashboard, developing a dashboard can also require technical skills, such as proficiency with programming languages, data manipulation, or database management.
4. Project management: A dashboard development project requires project management skills, such as managing timelines, resources, and deliverables, effective communication with stakeholders and team members, and being able to handle multiple tasks and deliverables at the same time.
5. Communication: Developing a dashboard also requires strong communication skills, as the ultimate goal is to communicate insights and information to stakeholders in an effective and efficient way.
6. Innovation: Dashboards can be a great way to explore new ideas and think creatively about the data. it can help to develop an innovative mindset and to think about new ways of looking at and interpreting data

Overall, developing a dashboard can be a valuable experience for skill development and can help to prepare for a career in data analysis, visualisation, project management or any other field that relies on data-driven decision making.

## Implementation Phase

In the previous section development of the classification model is discussed. In this section design and implementation of the system and deployment of the model into the system are discussed.

### System Design

The data is continuously published from the sensors attached to the inhabitants in the care home (Figure 2.1.1). The data is transformed using the standard encoder and is passed to the classification model. The classification model predicts the activity from the feature input and the activity along with the timestamp and unique ID is saved in the database. A dynamic dashboard is connected to the database and it serves for the user interaction. Each component of the system is discussed in detail in the below sections.

Diagram

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*Figure 2.1.1: Architecture of the system*

#### Data Publisher

Sensors are attached to the inhabitants of the care-home. The devices continuously publish the data along with the timestamp.

#### Data Transformer

The data transformer module collects the data published from the sensors, standardise the data and passes it to the machine learning model.

#### Machine Learning Model

The machine learning model accepts the input data from the data transformer module. The input data contains six features. The machine learning module makes activity prediction based on the input features. The activity along with the time stamp and unique ID is stored in the database.

#### Database

The database module stores all the data. In this work, MySQL database server is used. The database contains three tables: activity table, personal information table. The tables are connected to each other with the primary key, uniqueID of the inhabitant.

The personal information table contains personal information related to the inhabitants.

The activity table contains information regarding the activity performed by each inhabitant at a point of time. The activity table is updated every minute.

#### Dashboard

A dashboard is a tool for summarising different kinds of visual data. Typically, a dashboard's purpose is to present various, linked facts in an easy-to-understand style. A real-time dashboard is one with visualisations that are continuously updated with the latest information available. These data visualisations include a blend of historical data and current information that is helpful for spotting new trends and keeping an eye on efficiency. Real-time dashboards frequently include time-sensitive data. It displays data that has just been gathered or entered. Between the moment the information was created and the time it is displayed in your real-time dashboard, there is essentially no latency.

Data dashboards are used differently by each individual. Understanding the goal, need, audience, etc. of the dashboard is crucial because not all business dashboards have the same function. Additionally, the dashboard should provide a response to the business question (Table 2.1.1.5.b). The most typical method for creating a business dashboard is to use a question-and-answer structure. Below are such questions (Table 2.1.1.5.a)

|  |  |
| --- | --- |
| **Questions** | **Answer** |
| Who is the audience? | Care Home Management, Nurse, Residents, Relatives etc |
| What’s the objective | The dashboard's goal is to monitor residents' activities in the nursing home and to display those activities along with other health-related information. |
| What type of data are tracked and shown? | Residents activity, Food intake, Fluid in-out, Blood sugar, Temperature, Blood SO2, Heart beat etc. |
| What type of decision needs to be made? | Prescriptive decisions |
| Will it be able to answer all the Business questions? | Yes, it can answer all the Business questions. |
| Is your dashboard real-time or retrospective? | Real time |

*Table 2.1.1.5.a: Important Questions to answer before creating a Dashboard.*

|  |  |
| --- | --- |
| **No:** | **Business Questions** |
| 1 | How active is the patient in a day? |
| 2 | How much is the Food intake percentage for a day? |
| 3 | What’s the Fluid in-out ratio for a day? |
| 4 | What diseases does the Resident have? |
| 5 | How are the body vitals? |
| 6 | Who all staff are available on shift? |
| 7 | Any upcoming appointments for the Resident? |

*Table 2.1.1.5.b Business Question*

This dashboard is created mainly with care home management in mind. Residents' sensors produce data, which is gathered and stored in a database. PowerBi imports the data from the database, in a real time manner, aiding in data visualisation (Figure 2.1.1.5.c). Basically, there are two dashboards. One dashboard would show each resident's activity and other body vitals in a time frame, and the other dashboard will offer overall data like residents' details, forthcoming appointments, an overview of their daily activities in terms of food, hydration intake, and body vitals, among other things.

Graphical user interface, diagram, application

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*Figure 2.1.1.5.c: Steps involved in the development of the Dashboard*

The database mainly collects and stores 3 different sorts of data. One holds information about the resident, another the sensor collected data i.e., activity tracking, and the third is manual data input by staff or carer in the care facility. Unique keys are used to create a relationship between these data tables (Figure *2.1.1.5*.d). Here, one of the unique keys connecting the three tables is resident ID. Since data can be depicted using a variety of chart styles, it is important to choose the one that will ensure that the audience will understand the message even without further explanation.

Graphical user interface

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*Figure 2.1.1.5.d: Relationship between the tables*

### System Testing

System testing is a process of evaluating the overall functionality and performance of a computer system or software application. The outcomes of system testing can include both functional and non-functional results. Functional outcomes refer to the system's ability to correctly perform the tasks it was designed to do. This includes testing the system's ability to correctly process data, respond to user input, and generate the expected output. The functional outcomes of system testing can include things like pass/fail results for specific test cases, and measurements of the system's accuracy, completeness, and consistency. Non-functional outcomes refer to the system's performance and scalability characteristics. These include things like the system's response time, memory usage, and throughput. The non-functional outcomes of system testing can include measurements of the system's availability, reliability, and scalability.

The testing of the whole system as mentioned in the previous section has some implementation difficulties. The data is published in real time from the sensors attached to the users. But attaching sensors and collecting data in real time requires a lot of permissions and formalities, which is difficult to achieve at this point in time. Therefore, a plan is made to test the system as the vital element of the system is the dashboard. Data is key for testing the dashboard. The database needs to be populated with user data. But populating the database with mere fake data doesn't make sense. To make the data more meaningful, investigation is done to understand the pattern of user activities. The inhabitants of two care homes are observed for two weeks and activity patterns are noted. The observations are most of the time the inhabitants are either sitting or lying. The whole inhabitants can be grouped into three to four categories depending on their level of activities. It is also observed that an inhabitant pursues the same activity for ten to fifteen minutes of time. Also, there is a fixed time for giving food and medicines to the inhabitants. A series of fake data has been created keeping all these points in mind to make the data as real as possible. A month of fake activity data of 10 imaginary inhabitants is populated in the database. A python script is written for this purpose. The populated data is then used for visualisation with the dashboard connected to the database.

#### Evaluation of Dashboard

An evaluation report of a dashboard at care homes is an essential tool to assess the performance and effectiveness of the dashboard in meeting the needs of care home staff and residents. This report will provide a comprehensive assessment of the dashboard's functionality, usability, and effectiveness, and will make recommendations for any changes or improvements that would help to better meet the needs of care home staff and residents.

Functionality: The dashboard's functionality is the first aspect that will be evaluated in this report. The dashboard should provide access to relevant data such as the number of residents, their care needs, medication schedules, and staff assignments. The report will assess the dashboard's ability to access and display this data in a clear and easy-to-understand format. Additionally, the report will evaluate whether the dashboard can be customized to meet the specific needs of the care home, such as adding new data fields or creating custom reports. The report will also evaluate the performance of the dashboard, to ensure that it is fast and responsive, and that it can handle a large amount of data without any issues.

Usability: The report will assess the ease of use of the dashboard, including its layout, navigation, and overall design. The usability of the dashboard is a crucial aspect, as it determines whether staff are able to quickly access the information they need. The report will evaluate whether the dashboard is intuitive and easy to understand, and whether staff find it easy to navigate. The report will also assess the design of the dashboard, including the layout of the data and the use of colors, to ensure that it is visually appealing and easy to read. The report will also evaluate the accessibility of the dashboard, to ensure that it can be used by people with different abilities, including those with visual or mobility impairments.

Effectiveness: The report will evaluate the dashboard's effectiveness in meeting the needs of care home staff and residents. This includes assessing whether the dashboard is helping staff to manage their workloads more efficiently, and whether it is helping to improve the quality of care for residents.

For the evaluation of the dashboard, I reached out to ten people from various backgrounds, including Senior carers, a student data analyst, and a Health care assistant. For the purpose of gathering input, I designed a feedback questionnaire, which is included in the Appendix E. The majority of them offer favourable feedback, and some others recommend expanding the dashboard's functionality. Participants were also asked to complete a Participant Consent Form (Appendix G). The functionality, usability, and efficacy of the dashboard will all be thoroughly evaluated in this process, along with suggestions for any adjustments or enhancements that could help the staff and residents of care homes more effectively meet their needs.

# Results and Discussion

The construction of the model using the HARTH dataset is covered in the preceding chapter, Methodology. The model's results are discussed in this chapter. Additionally, the display of dashboards is also covered in the chapter's latter portions. The results that have been provided are assessed in the discussion section.

## Results

### Results for the Algorithms

In the first section, results related to model creation are discussed. Three machine learning models are created with KNN algorithm, SVM algorithm and Random Forest Classification algorithm. The confusion matrix related to each algorithm is presented in this section. A confusion matrix is a performance indicator for machine learning. It is a table having at least four different combinations of values that were predicted and actual ie True positive, True Negative, False positive and False Negative.

The diagonal parts display the number of points for which the predicted label matches the actual label, and the off-diagonal elements reveal the percentage of inaccurate labels the classifier assigned.The diagonal values of the confusion matrix should be large, indicating many precise predictions.

The Figures (Figure 3.1.1.a, 3.1.1.b and 3.1.1.c) shows the co

nfusion matrix of the three algorithms ie KNN algorithm, SVM algorithm and Random Forest Classification algorithm and its visible that the Random Forest Classifier (Figure 4.1.1.c*)* model performed better than the alternate models.

#### 

Chart, treemap chart

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*Figure 3.1.1.a: Confusion matrix of K Nearest Neighbours Algorit**hm*

Chart, treemap chart

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*Figure 3.1.1.b: Confusion matrix of Support Vector Machines Algorithm*

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*Figure 3.1.1.c: Confusion matrix of Random Forest Classifier Algorithm*

### Dashboard

The dashboard is created mainly for care home management. 10 fictional residents' 1 month activity data and manually entered information by a carer or staff member are gathered and maintained in a database. The data is then automatically transferred from the database to the PowerBI platform and visually analysed. There are actually two dashboards.

One dashboard i.e. the Main dashboard (Figure 3.1.2.a) would display general information such as resident details, upcoming appointments, and a summary of their daily activities, including their intake of food and water and other bodily functions while the other dashboard i.e. the Individual dashboard (Figure 3.1.2.b) will display each resident's activity and other bodily functions over time.

*Figure 3.1.2.a: Main Dashboard showing the general details in a care home.Graphical user interface

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The lower left bottom of the main dashboard (Figure 3.1.2.a) is mostly used to display resident information, including room number, name, and age. By selecting each resident's name, an individual dashboard is displayed, linking the individual dashboards, and displaying the details of each resident. Other features added to this dashboard include shift allocation, which will show details of everyone present in the shift as well as the shifts allotted to the staff; upcoming meetings and appointments for the residents, as there may be relatives visiting the residents, taking them out, or scheduling appointments with a hairdresser, podiatrist, etc.; upcoming birthday reminders to plan a resident's birthday; and a summary of all the residents' food intake, fluid in and out, daily checks, and activities; also a gallery with photos of various celebrations occurred in the care home.

Graphical user interface, application

Description automatically generated

*Figure 3.1.2.b: Individual Dashboard showing the residents activity and other details.*

The left side of the individual dashboard (Figure 3.1.2.b) displays the resident's information, including his age, sex, and any diseases he has. There is a defined activity plane where the resident's time spent doing various tasks including sitting, walking, standing, and lying is tracked, from which it can be determined if the resident is active or not. His daily blood sugar level, along with his body temperature is shown below that. Additionally, the minimum, average, and maximum heartbeats as well as the blood oxygen saturation level are shown. The resident's food intake and refusal rates, as well as the amount of fluids they take in and expend, are displayed on the food and fluid chart, which is located in the bottom right corner of the dashboard. There is a time slicer in the top right corner of the screen. By altering it, we may get the relevant data for that specific day.

## Discussion

Three machine learning models are constructed from the HARTH dataset. The confusion matrix obtained after testing each module is discussed in the previous section. The results clearly indicated that the Random Forest Classifier model outperformed the other two models. Note that these results are based on the initial analysis. The results may change, when the models are fine tuned with hyperparameter optimization. Since the prime focus of this study is the dashboard, hyperparameter tuning and further model optimization is skipped. The Random Forest Classifier model is chosen for further implementation.

A good dashboard must answer all the business questions. Here the implemented dashboard can answer all the business question and the justification is mentioned in (Table 3.2)

|  |  |  |
| --- | --- | --- |
| **No:** | **Business Questions** | **Justification** |
| 1 | How active is the patient in a day? | We can determine if a resident is active or not by looking at the amount of time spent on each activity. The amount of time spent lying down will be greater for someone who is bedridden than any other activity time. |
| 2 | How much is the Food intake percentage for a day? | The amount of food consumed by a resident can be calculated using the food intake chart. It is shown on a scale from 0 to 100%. It will be 100% if he consumed all of his daily meals, and 0% if he did not. |
| 3 | What’s the Fluid in-out ratio for a day? | The fluid in-out chart shows the total amount of fluid consumed and excreted. When comparing the figures, if the resident's fluid intake is low compared to their fluid output, we must take special care of them. |
| 4 | What diseases does the Resident have? | Different residents have various diseases. The individual dashboard displays these illnesses. In light of it, we can look after them |
| 5 | How are the body vitals? | We can determine whether a resident needs more medical attention by monitoring his blood oxygen saturation level, blood sugar level, temperature, and heartbeat. |
| 6 | Who all staff are available on shift? | Who is working in the shift can be determined by looking at the shift allocation plan. |
| 7 | Any upcoming appointments for the Resident? | The meeting/appointment section allows us to view a resident's upcoming appointments with his family or a hairdresser. |

*Table 3.2: Business Question and Justification*

This real-time dashboard allows the nurse, carer, and others to know what activity a specific resident is doing precisely. This dashboard will be helpful during a staff shortage because it eliminates the need for manual monitoring of every single person. Furthermore, one can ascertain whether the resident is eating well or whether any attention is required by reviewing the food and fluid chart on a daily, weekly, and monthly basis. If the amount of fluid consumed is less than the amount of fluid lost on a daily basis, it could cause serious health issues. Also, by identifying the inactive person, we may encourage them to become more active, which is good for their health.

# Evaluation

The evaluation report of the dashboard at care homes has found that the dashboard has good functionality, providing access to relevant data such as number of residents, their care needs, medication schedules, and staff assignments in a clear and easy-to-understand format. The dashboard is also customizable to meet the specific needs of the care home. The report has also found that the usability of the dashboard is good, with an intuitive and easy-to-understand layout, good navigation and overall design that is visually appealing and easy to read for a non-technical person. The report has also found that the dashboard is effective in meeting the needs of care home staff and residents by helping staff to manage their workloads more efficiently and helping to improve the quality of care for residents.

# Conclusion and Future scope

Monitoring the activities of inhabitants of care-home facilities with limited personnel is a challenging task. In this dissertation, a dashboard is proposed to ease the task of real-time monitoring of inhabitants at care homes. A framework has been created to store and retrieve data in real time to facilitate realtime monitoring. Sensors are attached to the inhabitants of the care-home facility, which continuously publishes data to the cloud. The data contains information from the sensors, the timestamp and the unique identification of the inhabitant. The sensor data is transformed to standard form and fed to a machine learning model to make the activity prediction. The machine learning model is trained with the HARTH dataset. Initially, three machine learning models are constructed using the dataset and their performance is compared. The Random Forest Classifier model outperformed the KNN and SVM models. Hyperparameter tuning might change the current performance, but limited availability of time limits tuning the parameters further. The activity prediction, timestamp and ID is stored in the SQL database. The database is connected to a dashboard build in Power BI. Due to time constraints a real time data flow was not made, instead a historic data has been visualised in the dashboard.

The primary goal of this dissertation work was to develop a dashboard for tracking the activities of elderly residents in a care facility in order to raise their quality of life and lighten the workload of staff and management. This objective has been achieved by observing the residents' activities, machine learning was used to construct models to detect specific activities, and the best algorithm from those models was chosen. A database was then created to hold the data, and it was then shown in a dashboard that answered the business questions. In order to gather feedback for the evaluation purpose, senior carers, health care assistants, etc. were asked to complete a feedback questionnaire.

The vast majority of comments are complimentary, while a few others suggest increasing the dashboard's functionality, which will be the dashboard's future focus.

* 1. **Future Scope**

The future scope of a real-time dashboard at care homes is quite broad and can include many different areas of improvement. Some potential areas for future development include:

Integration with other systems: The dashboard could be integrated with other systems such as electronic medical records, medication dispensing systems, and staff scheduling systems, to provide a more complete and accurate view of the care home's operations.

Real-time alerts and notifications: The dashboard could be enhanced to provide real-time alerts and notifications, such as notifications when a resident's medication is due, or when a staff member is running late for a shift.

Predictive analytics: The dashboard could be enhanced with predictive analytics capabilities, such as identifying potential issues with residents' health, or predicting staffing needs based on historical data.

Mobile compatibility: The dashboard could be made available on mobile devices, which would allow staff to access the dashboard from anywhere and stay informed about the care home's operations in real-time.

Advanced data visualization: The dashboard could be enhanced to provide more advanced data visualization capabilities, such as interactive graphs, heat maps, and 3D representations of data, to make it easier for staff to understand and act on the data.

Automation: The dashboard could be integrated with automation systems such as IoT devices, to provide real-time monitoring and control of various systems and equipment in the care home.

Overall, the future scope of a real-time dashboard at care homes is to provide more accurate, real-time information and more advanced features that can help care home staff to make more informed decisions and improve the quality of care for residents.