

Research Proposal

Care Planning for Frail and Elderly

April 28, 2022

1 Motivation

The number of people who are falling into the elderly and frail care categories is continuing to increase. In Wales, the Welsh Government expect the overall population to increase by 0.6% by 2028, however, they expect an increase of 29% in the population of over 75 year olds [1]. The British Medical Association believe that there is currently 35% of over 65's living with mild frailty, 12% being classified as moderately frail and 3% living with severe frailty [2]. The 'Single Integrated Framework for Older and Frail Population' is being implemented within ABUHB to streamline care services.

2 Objectives

The objective of this project is to first identify the overarching pathway elderly and frail patients take. This will identify the services that are being used and need to be incorporated into the model.

Routinely collected data will be analysed to determine trends and similarities across different practices and areas in Gwent.

Once data analysis has been conducted on the different areas, it can be incorporated into a tool which will show predictions for each area of ABUHB as well as the whole health board. This will aim to bring in different factors, such as the EFI Scores to determine the levels of frailty in each area. ONS projection figures will be used to determine the population increases. Geo-spatial analysis can be brought in to determine how access to services, deprivation levels etc. effect the likelihood of requiring long term care services.

Validation of the tool can take place analysing the difference between the proposed pathway and the actual pathway, and determine the results from scenario testing.

2.1 Research Questions

For modelling, an appropriate method has to be identified which is able to incorporate different variables. When developing the model, the following have to be taken into consideration:

- What are the most important steps from the pathway to be included within the model?

- What are main outcomes for optimal patient care; reducing cost, improving outcomes, minimising waiting times?
- How will success be measured? - Use typical, easy to measure such as LOS, occupancy. Or less frequent, harder to measure such as patient happiness? Potentially a combination of both
- How can the tool be developed and introduced to the Clinical Futures to support and help make better planning decisions?

2.2 Project Plan

These questions can be used to divide the project into three main sections

1. Analysis and collection of data
2. Developing of a model
3. Implementation of the model and validation

The following subsections will discuss each step in detail.

2.2.1 Analysis and collection of data

The specific patient data required will be gathered through the direct care team / ABUHB records (anonymous), whilst more generic data will be gathered through open access sources i.e. ONS, Welsh Government or through <https://www.wales.nhs.uk/>.

Then we can identify either through literature or materials from Clinical Futures and Frailty consultants the pathways these patients take. Rashwan et al. [3] generated a model of how the frail and non-frail patients move through a hospital system and the location of discharge (Figure 1). This diagram is based on data across the Irish health care system. The thicker lines represent a larger quantity of patients flowing through. The first step will be to generate a similar diagram which fits to ABUHB data - Potentially using clustering methods.

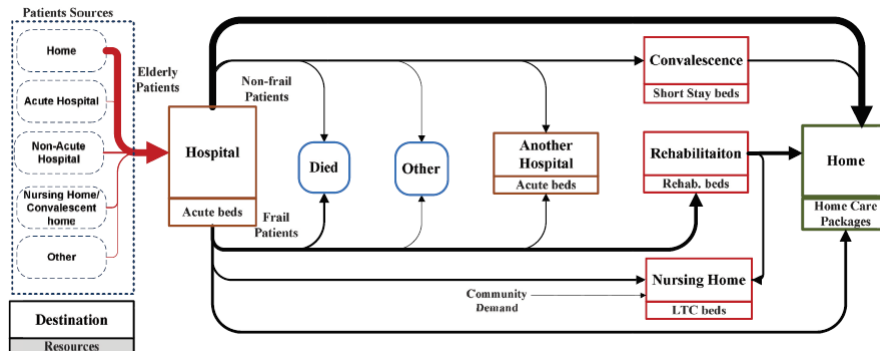


Figure 1: Model of Irish health care system [3]

2.2.2 Development of a model

To develop the model, the appropriate method will first have to be identified. Within the literature it was found that Markov and simulation methods were the most common methods utilised. There are a few approaches that could be taken to generate a useful model:

A decision support system was created by combining GIS (Geographic Information System) and optimisation techniques for air quality management [4] - This method could be adapted and used in the health services, to map the location of potential ‘hotspots’ of elderly population groups and where more services are required in the future.

A process mining tool was used to analyse patients within a specific departmental setting [5]. This type of idea could be expanded using the developed model of Figure 1 to include all aspects of the pathway, for frail and non-frail patients.

The model has to be usable by Clinical Futures and therefore needs a software which can be easily used, or the results can be easily viewed with potentially a linked Excel database.

A simulation model could be generated within VBA which would be able to run multiple simulations and generate an average which could be outputted into an Excel spreadsheet. Then optimisation techniques could be applied to show how improvements could be made.

2.2.3 Implementation of the model and validation

The first measure of success will be how well the model performs against the current data and then how the model performs with the proposed pathway.

In order to measure the success of the model, the outcomes have to be monitored. Studies have shown that for patients who do not need acute care, being in an acute hospital can be harmful with a greater risk of infection and patients who are treated within the community have better clinical outcomes [6]. Therefore one measure of success would be if there is any reduction in length of stay within hospitals and more availability within long term care services. Ricauda et al. [7] conducted a trial on hospital against home treatment for elderly patient where they found there is some evidence of improved clinical outcomes and higher patients satisfaction. Although one measure of outcomes was a questionnaire sent to patients, and may not be the most reliable of methods, they also measured; functional, cognitive, and nutritional status as well as depression levels. This is inline with the Well-being of Future Generations (Wales) act of 2015 where the Welsh Government’s desire is to move patients closer to home [8, 9]. By having a combination of these outcomes, the results from the model will be able to determine the success of implementing the proposed pathway.

3 Data Requirements

The data needed for the project can be split into three streams; patient data, hospital data, and long term care facility data.

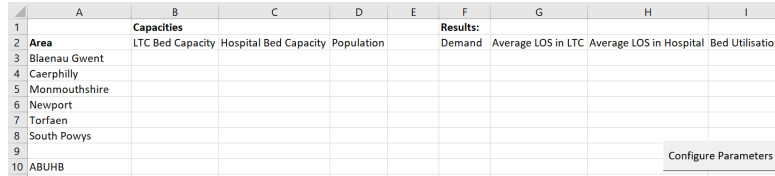
- Patient data - Age, EFI score, location (postcode of registered GP), where they are residing (home, long term care facility etc.), services they have used and frequency of visits

- Hospital data - Length of stay of patients, where they have come from, where they are discharged to, capacity of ward, age and frailty score of patient, reason for admission
- Data from long term care facilities - location, capacity, length of stay

4 Tool

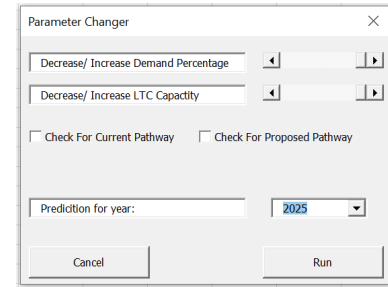
The tool generated will be able to be used by the Clinical Futures Team for future predictions. For this, the interface requires an open source software which is easy to use. Figure 2 shows what a potential tool would look like on Excel. Figure 2a shows what the user would see - with the option to configure the set up with a command button. If selected, this would bring up Figure 2b, where the user would be able to change demands, years etc. through; sliders, check boxes and/or combo-boxes. For example, if more patients were treated at home i.e. through ‘virtual wards’, how would this effect other aspects of the system such as occupancy within hospital/LTC beds.

Further to this, it has been discussed that the use of stochastic integer programming would work well within Excel and the inbuilt solver and VBA. It would have the ability to determine the outflow of hospitals and the demand of community care services, with effects of changing capacities to be visualised.



	A	B	C	D	E	F	G	H	I
1		Capacities				Results:			
2	Area	LTC Bed Capacity	Hospital Bed Capacity	Population		Demand	Average LOS in LTC	Average LOS in Hospital	Bed Utilisation
3	Blaenau Gwent								
4	Caerphilly								
5	Monmouthshire								
6	Newport								
7	Torfaen								
8	South Powys								
9									
10	ABUHB								

(a) Excel Interface



Parameter Changer

Decrease/ Increase Demand Percentage

Decrease/ Increase LTC Capacity

☐ Check For Current Pathway ☐ Check For Proposed Pathway

Prediction for year: 2025

Cancel Run

(b) Configuration Screen

Figure 2: Example of Tool Interface

Additionally, graphical outputs can be produced on separate sheets to show changes over time up until the specified year of the user.

5 Project Schedule

To show a rough timeline of how the project could progress can be seen within Figure 3. The components of the project are split into four: collection and analysis of data, building of the model and then implementation.

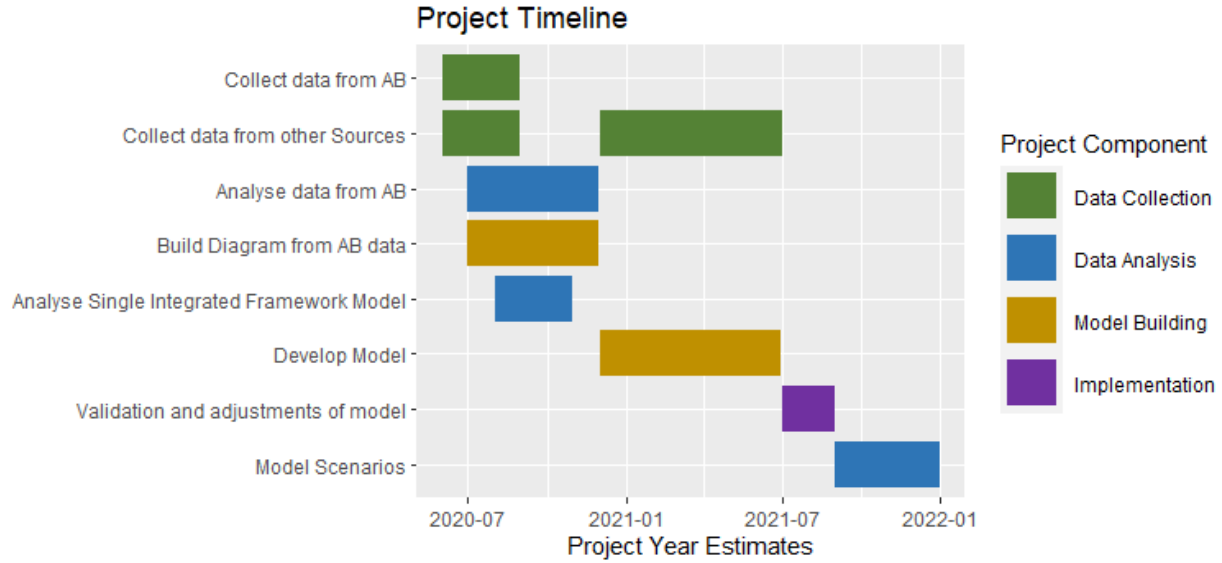


Figure 3: Gantt Chart of the proposed activities

References

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