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| **Implementing improved methods of regional care through the use of IoT, Mobile Devices and Website Applications**  Aaron Stones  BSc Computing with Honours, 2020 |

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# Acknowledgements

# Abstract

300 words

Usually read first by the reader

Write this last

Summarise what you did, results and conclusions

Not an intro so no references

# Abbreviations, Symbols and Notation

If required

# Chapter 1 – Introduction

**750 – 800 words + 133 words per section**

**Set the scene**

**Background to and purpose of the investigation**

**Scope**

**Project aims/research questions**

**Likely to be more focussed than the proposal**

**End with an overview of the remaining chapters**

Within the United Kingdom right now it is estimated that around 410,000 people live inside ‘Care Homes’ (GOV.UK, 2019). Around 10% of these residents have primary health options, this means the patient is no longer able to look after themselves and have been admitted to residential care to protect them. A following 49% of the residents in ‘Care Homes’ are LA-funded, this is a scheme setup by the United Kingdom government to contribute to a quarter of the living costs for these residents (GOV.UK, 2019).

However, it has been reported within the media recently that due to an ever increasing and ageing population, a need for patients to be admitted due to concerns for their health (primary options) out-ways the need for these forms of care. This is in comparison to residents on LA-funded schemes, who could achieve an equally adequate or even better form of care from their own homes through the use of technology. This technology could be used to manage the different conditions patients may have or used to detect these conditions early.

Within these ‘Care Homes’ many patients are living with both; early and advanced neurological brain conditions and require regular assessment from Nurses and Doctors to assess the progression of their disease and any notable changes. This only happens if a patient has been correctly diagnosed. If Parkinson’s is taken as an example according to WebMD – “It has been estimated that, especially in its early stages, nearly 40% of people with Parkinson’s Disease may not be diagnosed, and as many as 25% are misdiagnosed.” (WebMD, 2019) This shows a lack of ability to accurately detect this conditions and so accurate care cannot be provided. The main means for the detection of degrading neurological conditions is the use of CT scans, which are both time consuming and expensive to public bodies like the NHS (National Health Service), with each scan costing around 609.70 pounds according to costevaluation.com (Costevaluation.com, 2019). This is a necessity to accurately detect neurological conditions, but are in high demand. Mobile Phones and IoT devices could be used to run small tests before hand by the suspected sufferers to give an early prognosis of these conditions where then the CT scan is only a formality to confirm what is already known.

# Chapter 2 – Literature Review

This chapter will investigate the work that has been proposed already to help ensure effective care is given to patients who either live in rural areas and struggle to get to see their Doctor. Or are unable to due to their health (elderly, disabled etc).

Care for these patients is usually made up of patients either; being funded to visit their nearest Hospital/General Practitioner, A division of Nurses being used called District Nurses who make house calls or specialised Ambulance crews being sent out to collect the patient and deliver them to their appointment. This can be criticised for taking up too many of the NHS’s resources while causing unnecessary risks for the patients, nurse and ambulance crews, if the problem the patient is suffering with turns out to be of no concern. Within the clinical investigation ‘Residents: Frequency, Causes, and Costs’ it is suggested that the unnecessary hospitalisation of patients is likely to cause their health more issues due to the stress of being transferred to a hospital. The study then goes onto state that 67% of hospitalisations are avoidable and take up a great deal of NHS resources. As previously suggested, each of these methods can be time consuming for the NHS and new ways of implementing this type of care have been suggested.

The first of which is within the book ‘Stop Saving the NHS and Start Reinventing it’ by Colin Jervis, the author first goes onto explain that ‘the price of computer chips continues to fall as their power increases. It will soon be possible to chip everything’ (Jervis, 2013) Within this quote the author is using this to state computer chips can be used to tackle issues like, regional care, as well as many other issues within society and free up other resources, like Ambulance crews. Within the book, the author then goes onto state that ‘Remote devices have a lot of advantages like removing physical dependency’ (Jervis, 2013). The devices the author is referring to hear are called IoT devices or Internet of Things Devices and suggests that these could be used to take basic readings from a patient, things like a patient’s; Heart Rate, Blood Pressure, Blood oxygen etc. Readings that are hard to get wrong and can be taken simply. These readings would be sent to a server to store in a database (previously mentioned in chapter 8). From the database a medical professional can analyse the data and decide if the patient is at a high risk and needs to be seen urgently or is not of a concern.

The NHS has been sceptical with the use of IoT devices within the United Kingdom, because of this they have been going through an intensive phase. This involves “As part of an initiative to set up testbeds to pilot new technologies in the health service, NHS England and the Department of Health has awarded £10m in funding to two 'test bed' projects that it describes as "IoT-led".” (Best, 2020). One of these projects is called, TIHM or Technology Integrated Health Management. This system is used to monitor patients with Dementia, reduce the need for hospital admissions and relieve the stress on carers (Sabp.nhs.uk. (2020)). The devices used are IoT devices, they send a signal to clinicians when they detect an issue with the patient such as; falls, turning on things they shouldn’t and long-term periods of idleness. This system is an effective system; however, long periods of idleness also include; sleep, watching television etc, the devices cannot pick up on these states for a person meaning that clinicians can be mislead due to these facts. Also, if a person is early on in their Dementia and are constantly getting phone calls asking why they are turning the oven on for so long it can irritate them and become an annoyance. This is a problem because the devices cannot track the progressiveness of a patient’s Dementia, meaning there is no way to combat this issue.

To tackle this mobile phones could be used, as they are able to record the same quantity of data and have a vast array of sensors already built into them to track a person’s health. If these were used in tandem with the IoT devices a method to track a person’s vital signs and the progression of their disease could be created, giving a more in-depth view of their state of health as compared to the TIHM system.

The use of tele diagnosis has been used in rural countries in Africa to initially diagnose a disease and then suggest appropriate methods of treating the disease. This usually occurs with a patient sending a photo of the affected area and the medical professional trying to diagnose it.

# Chapter 3 – Methodology

2750-3000 words

Possible for a worker in your field to repeat your method and results

A description of how the project was carried out

Justify the reasons for the step taken

May include:

* Prep work
* Stat analysis
* Experiments
* Design Approach
* Methods used to create/build software/hardware
* Investigation

Ethical considerations

Interviews/Focus Groups/Questionnaires and their design

How data is collected and evaluated

# Chapter 4 – Results

500-800 words

A factual presentation of your results which relate to the project aim

A description of the completed software/hardware and analysis along with test/evaluations/analysis results

Suitably present in:

* Tables/Charts
* Statistics
* Illustrations
* If too many use appendices

Put raw data in appendices

Don’t dwell on discussion of issues. Save to discussion chapter

# Chapter 5 – Discussion

2250-2500 words

Evaluate your findings/results

Comment on their significance in relation to the previous work on the same topic

Refer back to your literature review where appropriate

Use the aims and objectives outlined in your proposal/introduction if appropriate to aid your evaluation, referring back to initial project requirements

# Chapter 6 – Conclusions & Future Work

750-1000 words

What conclusions can you draw from your investigation?

What are the implications of what you have discovered?

How might further work in this area be continued?

# List of References

List all works used and refer using Harvard style – CITE THEM RITE

Write references in text and add to references section while you are writing

# Bibliography

List works that you have considered but do not refer to in text. Use Harvard

# Appendices

Used to stop text being cluttered and broken up:

* Tables of extensive data
* Code
* Legal decisions or laws
* Lengthy quotations
* Copies of sample questionnaires
* Start each appendix on a separate page and label A,B,C etc