**Results and Discussion:**

Throughout the period of Fall 2019 and Winter 2020 of the final two semesters of the Computer Engineering Technology program at Humber college, the team planned and developed a software and hardware-based medium geared towards interaction between a paramedic and a patient during an emergency. The objective behind the development of this project was focused more on significantly improving the receptiveness and efficiency of a paramedic by removing the necessity for a paramedic to retrieve personal information about a patient, which includes a patient’s, current whereabouts, current health situation, and current home of residence. By creating a platform capable of retrieving personal information of a patient, a paramedic’s role has become reduced to simply heading towards the scene of the emergency as soon as possible.

To facilitate the design, the team went about this by:

* Developing a mobile application with video-chat and GPS tracking capability.
* Setting up a database on the network using Firebase database to store patient and paramedic information
* Setting up three sensors, which includes: the MAX30100 Pulse Oximetry Sensor, VMA340 Heart Pulse Rate sensor, and AMG8833 IR Thermal Camera, embedded on a Raspberry Pi microcomputer.

By the end of development, the team was able to ensure these following functionalities for a paramedic->patient interaction:

* Paramedic is able to retrieve a patient’s vital information from the database for display on the mobile application
* Paramedic is able to track a patient’s current location by implementing google map modules on the mobile application. This tracking is done by updating the patient’s and the paramedic’s current longitude and latitude coordinates on the database, which is then retrieved and processed in the mobile application to display the current location.
* Patient is able to initiate a video chat with a paramedic
* Patient is able to view the progress of a paramedic as they are heading to his/her location
* Embedded system has been programmed to activate the sensors to sense and process a patient’s vital information, which includes, blood oxygen levels, heart pulse rate levels, and temperature readings

With regards to the completeness of the project, unfortunately, the team wasn’t able to complete all the functionalities of this projects due o the following reasons:

* Sudden defects or accidents in handling of equipment during the course of development. There were situations where sensors wee malfunctioning due to accidental damage, which resulted in the team having to purchase a replacement.
* Sudden change of environment due to the pandemic. The completion of this project, significantly relied upon exposure to the facilities provided by Humber. Since the team must remain at home during this crisis, it became difficult to complete group tasks. Such as, integrating the system
* Bug fixes. With regards to the mobile application, there were bugs in the program that took months to successfully fix. If these fixes were done much quicker then more time could have been allocated to other tasks throughout the development of the project

The following tasks that have not yet been completed:

* Setting up code for sensor readings to be sent for storage on the database over the network
* Setting up processes on the RPI to run the sensor program automatically upon successful boot
* Some functionalities have not yet been added to the mobile application
* Couldn’t complete the PCB and enclosure due to lack of facilities due to the pandemic

With regard to prospects for mass production, the team believes that, if everything goes well, and sensors could be improved to output readings much quicker, and are much more reliable with regards to accuracy, then this would play a very significant role to paramedics and patients worldwide. Seeing as this product is geared towards removing some of the work that a paramedic has to complete during the course of an emergency, you would expect that a paramedic can now focus more on the well being of the patient and should be better prepared to deal with any situation and make better decisions on what to prescribe for the patient even before arriving at the scene. The biggest hurdle for this prototype is the cost of equipment and additional funds for backup equipment provided that there are any problems during development, but if this prototype should gain sponsorship, the team believes that it will have a positive impact on the world going forward.

**Conclusion:**

Throughout the period of Fall 2019, and Winter 2020, an emergency-oriented platform was successfully developed to sufficiently improve the receptiveness of paramedics during an emergency scenario.

Going forward, the team plans to submit the complete mobile application on Google Play store to allow worldwide access for paramedics. Arrangements will be made to set up a meeting with the collaborator to discuss prospects for the future with regard to the feasibility and usefulness of the prototype, with a goal to decide whether its worthy of sponsorship and mass production

**Pre-screening Checklist:**

1. Has a Proposal for a Technology Report been submitted and accepted and a copy of the approved proposal included in the Technology Report? YES
2. Has the Technology Report been submitted within one year since the proposal was approved? YES
3. Is the Technology Report consistent with the Proposal (as approved and with the comments and suggestions made by the proposal reviewer)? YES
4. Is the Technology Report typed, double-spaced and justified left? YES
5. Has a 12 point Arial, Univers, or similar Sans Serif font been used? YES
6. Is the body of the report a minimum of 3,000 words? YES
7. Are the components included and in the following order: Title Page; Declaration of Authorship; Approved Proposal; Abstract/Executive Summary; Table of Contents; Lists of Illustrations/Diagrams; Body of the TR; Conclusion(s), and if applicable Recommendation(s); Bibliography/Technical References; and Appendices? YES
8. Is there a signed Declaration of Authorship? NO. There is an unsigned Declaration of Authorship
9. Is the report dated? YES
10. Is the Technology Report current? (The Technology Report should be less than 5 years old.) YES
11. Is there a Title Page? YES
12. Is there a Table of Contents? YES
13. Does the Table of Contents correctly reflect the Components: Headings, Illustrations/Diagrams and Appendices? YES
14. Are the pages numbered with appropriate page breaks? YES
15. Is there an Abstract/Executive Summary and Introduction? YES
16. Does the body of the report contain Section Headings? YES
17. Are there Conclusion(s), and if applicable, Recommendation(s)? YES, there is a conclusion, but Recommendations are not applicable
18. Is there a Bibliography with appropriately cited Technical References? YES

**Report Mechanics and Structure Checklist:**

1. Does the Title, in ten words or less, inform readers of the precise subject matter contained in the TR? A title should be concise and include key words for indexing. YES
2. Does the Abstract or Executive Summary provide a brief overview of the report in approximately 75 to 100 words? NO. The Executive Summary is above this range
3. Does the Abstract or Executive Summary summarize the Conclusion(s), and if applicable, the Recommendation(s)? YES
4. Does the Introduction state the reason the work was undertaken? What is the industry, organization or context? What is the problem? YES. Geared towards the Health Care and Automotive Industry. The problem is: How can we go about reducing the number of roles that are required by a paramedic during an emergency event
5. Does the Introduction cover the scope of the report? What is included and /or admitted, and what procedures are used? YES. The following is included: hardware components used, and software components

Procedure:

configure a raspberry Pi by installing an operating system, establishing a stable connection to the internet, enabling required functions such as I2C, SPI and VNC to retrieve data from the I2C and SPI interface, and enable remote access to the RPI via VNC. Additionally, we are required to, design and test PCB sensors, test connections of PCB with Raspberry Pi and sensor, design an enclosure for the Raspberry with integrated embedded system, and finally, test the functionality of the sensors through programming.

User interface should be designed in a simple format to reduce confusion as much as possible for a paramedic and especially for the patient. Paramedic should be able to track patient automatically. Paramedic should be able to view vital information about the patient on the app. Paramedic should be able to search his/her history of completed emergency scenarios. Patient must be able to connect through video chat with a paramedic. Patient should be able to view the progress of a paramedic as they head towards the scene

1. Do the headings and subheadings in the Body adequately and accurately describe the section or subsection content? YES
2. Does the Body include information regarding the methodology? Does it indicate materials, equipment and procedures used and why they were selected over alternatives? Is there sufficient detail so that that the methodology can be duplicated by others? YES to all
3. Does the Body include recent research findings? YES. References to online research were included
4. Does the Body include results/data from the study? YES
5. Are illustrations, tables, diagrams and charts clearly drawn, labelled and numbered? YES
6. Is each Conclusion, and if applicable, each Recommendation, stated in a separate paragraph and in a positive way? Conclusions should not be qualified with “it seems”, “probably”, “it may be”, or other words that dilute the strength of the conclusion. YES
7. Are the References/Bibliography complete? All materials referenced in the TR should be represented in the list of References/Bibliography. YES
8. Do the Appendices support the study? Do the Appendices include substantiating data and calculations? Extraneous material should not be included. YES
9. Is the spelling correct? YES