October 21, 2023

Final Project

Group 3

Halari Shanpru

Karthikeyan Jeyabalasuntharam

Yat Chit Law

Bhumika Pravinkumar Shukla

Himani

Abijith Gopalakrishna Pillai

Sakshi Sareen

Hiu Kwong Lung

Albin Babu Varghese

Index

[1.Problem Statement 3](#_Toc148820821)

[Problem Space: Healthcare 3](#_Toc148820822)

[2.Interview Questions 3](#_Toc148820823)

[3. Insights From Interview 3](#_Toc148820824)

[3.1 Resource Allocation in Pandemic: 3](#_Toc148820825)

[3.2 Tools for Patient Room Allocation: 3](#_Toc148820826)

[3.3 Temporary Locations for Patient Care: 4](#_Toc148820827)

[4. Personas 4](#_Toc148820828)

[4.1 Primary Persona 4](#_Toc148820829)

[5 Empathy Map 5](#_Toc148820830)

[5.1 Pains 5](#_Toc148820831)

[5.2 Gains 5](#_Toc148820832)

[6 Scenario Map 6](#_Toc148820833)

[7 Need Statement 6](#_Toc148820834)

[8 AI Intents 7](#_Toc148820835)

[9 Big Idea Vignettes 8](#_Toc148820836)

[10 AI Data 9](#_Toc148820837)

[11 Prioritization 9](#_Toc148820838)

[12 To-Be-Scenario Map 10](#_Toc148820839)

[13 Hills 11](#_Toc148820840)

[14 Low Flex Prototype 12](#_Toc148820841)

[14.1 Solution 12](#_Toc148820842)

[14.2 Key Task 12](#_Toc148820843)

[14.3 Scenario 12](#_Toc148820844)

[14.3.1 Task 1 12](#_Toc148820845)

[14.3.2 Task 2 13](#_Toc148820846)

[14.3.3 Task 3 13](#_Toc148820847)

[14.3.4 Task 4 14](#_Toc148820848)

[14.3.5 Task 5 15](#_Toc148820849)

[14.4 Testing Feedback 16](#_Toc148820850)

# 1.Problem Statement

# Problem Space: Healthcare

Problem Subspace: Allocation of Hospital Rooms for Patients based on their triage.

Target Audience: Hospital Administrators and Patients.

During the peak of the COVID-19 pandemic, the daily influx of patients overwhelmed hospital resources. The insufficiency of available hospital rooms posed a significant challenge to hospital management. The shortage of patient rooms resulted in a critical dilemma for hospital administrators, as they struggled to provide adequate patient care. Consequently, many patients could not receive timely treatment, leading to a rise in fatalities.

Our forthcoming strategy to address this issue involves the development of an application. This application will empower hospital administrators to maintain up-to-date patient statistics and room availability information, allowing them to extend the reach of their care centers to nearby locations when necessary.

2.Interview Questions

1. How did hospitals prioritize providing critical care beds and ventilators to COVID-19 patients above other patients with medical requirements when there was a shortage of these supplies?
2. What tools or systems are currently in place to assist in patient room allocations, and how effective have they been in handling the surge in COVID-19 cases?
3. Do you use other temporary locations to accommodate the patients and if yes, what are they?

3. Insights From Interview

## 3.1 Resource Allocation in Pandemic:

* Hospitals prioritize critical care resources, like ventilators, based on the severity of COVID-19 symptoms and medical urgency.
* Triage systems were adopted, aiming to save as many lives as possible while considering equitable distribution of resources.
* Ethical frameworks and medical guidelines guided these resource allocation decisions.

## 3.2 Tools for Patient Room Allocation:

* Hospitals implemented various tools and systems to manage patient room allocations effectively during COVID-19 surges.
* These included hospital management software, electronic health records, and real-time occupancy tracking systems.
* Custom applications were developed to streamline patient placement and provide a real-time overview of room availability.
* The effectiveness of these tools depended on existing infrastructure and the level of integration into daily operations.

## 3.3 Temporary Locations for Patient Care:

* Hospitals utilized temporary facilities like field hospitals, convention centers, and repurposed venues (gyms, hotels) during the pandemic.
* These facilities helped expand capacity, particularly for non-critical patients or those with mild to moderate symptoms.
* Temporary locations played a crucial role in isolating COVID-19 patients and reducing the burden on traditional hospital settings

1. Personas
   1. Primary Persona

一張含有 文字, 男人, 西裝, 服裝 的圖片

自動產生的描述

Jones’s perspective and goals are as follows:

* He is a hospital manager who is dedicated and passionate about patient well-being.
* He is responsible for allocating resources, overseeing operations, ensuring compliance with regulations and standards and providing the best care to patients and staff in hospitals.
* He faces challenges such as budget constraints, staff shortages, and increasing demand for healthcare services.

Jones’s pain points are:

* Resource allocation: Jones must optimize patient care and operational efficiency by managing hospital personnel, equipment, and supplies. He must manage unanticipated crises and department and stakeholder requirements.
* Patient safety: Jones oversees hospital service quality and safety. He must verify that the hospital satisfies health care standards and that personnel follow best practices and policies. He must assess hospital performance and resolve patient safety concerns.
* Policy compliance: Jones must follow hospital and healthcare industry regulations. He must monitor policy changes and inform personnel and others. Ensure hospital paperwork and reporting are accurate and full.

1. Empathy Map

一張含有 文字, 螢幕擷取畫面, 設計 的圖片

自動產生的描述

Our target audience is the hospital manager:

## 5.1 Pains

* Hospital managers are tasked with overseeing budget, personnel, and resources to ensure efficient hospital operations aligned with patient and department needs, while optimizing financial performance. They must continuously stay updated on medical advancements, equip the hospital with advanced technology, and implement innovative processes to enhance care quality and efficiency.
* Hospital managers must ensure patient safety and satisfaction. They must enforce health care delivery standards and ensure workers follow best practices and policies. They must also settle staff disagreements and patient or family concerns.
* Hospital managers face stress and strain in a complicated and changing environment. The increased workload and expectations need them to handle many jobs and responsibilities. They must also make rapid, effective choices in unpredictable healthcare circumstances and crises. They must also balance work and leisure and stay healthy.

## 5.2 Gains

* High-quality treatment from a hospital manager may enhance patients' health and well-being. By improving public health and social welfare, they may benefit the community. They may also get thanks from patients, family, colleagues, and stakeholders.
* Leading and managing a healthcare leader hospital allows a hospital manager to give high-quality treatment to the community. They may also demonstrate their talents by adopting new ideas to improve hospital performance and reputation. They may also lead by encouraging and motivating colleagues to flourish.
* A Hospital Manager may take pleasure in their profession by attaining their goals and conquering their problems. Promotions, honors, and certificates may also be given for their accomplishments. Finding meaning and purpose in their job lets them appreciate it.

1. Scenario Map

一張含有 文字, 螢幕擷取畫面, 便利貼, 字型 的圖片

自動產生的描述

First, the healthcare professional checks the contactless triage system to determine the most urgent patients and allocate beds. They consider how to maximize resources and space and worry about patient growth. To coordinate and exchange information, they talk to coworkers and managers.

Healthcare workers monitor vital signs, dispense prescriptions, run tests, and write patient records to manage the patient load. They worry about giving each patient the greatest treatment and feel overwhelmed by the effort and pressure. They also consult other staff members and inform them on the patient's development.

The healthcare worker works with other departments to transfer or discharge stable or recovered patients or refer them to specialists or other institutions. They consider how to make the patients' transition safe and seamless and feel glad and gratified with favorable results. They appreciate the help and collaboration of other departments and treat them professionally.

The healthcare professional evaluates their performance and feedback, identifies their strengths and shortcomings, and learns from their errors and triumphs. They consider ways to improve and feel happy and confident by acknowledging their accomplishments. They thank their teammates and celebrate their successes.

1. Need Statement

一張含有 文字, 螢幕擷取畫面, 設計 的圖片

自動產生的描述

1. **Share Resources:** -A way to collaborate with other healthcare facilities or organizations to share resources or acquire additional space for patient care.
2. **Ensure Patient Safety**: - Establish a systematic patient care approach to guarantee patient safety at such critical times.
3. **Ensure the Staff Well-being**: - Need a way to reduce the workload and ensure the safety and well-being of the staff.
4. **Visualization**: -Examine bed capacity and identify the gap between available rooms and the projected COVID-19 spike to allocate rooms before the surge.
5. **Additional Facilities:** -Hospital administration requires additional resources to serve more patients.
6. AI Intents

一張含有 文字, 螢幕擷取畫面, 正在列印, 圖表 的圖片

自動產生的描述

The AI-Enhanced Operations and Decision support were voted as the best idea:

* Analyze data from sensors, cameras, social media, and reports to find abnormalities that might influence operations. AI warnings and solutions may prevent or fix disturbances.
* Allocate workers, equipment, and supplies according to customer and department requirements to maximize resource usage. AI can also track and regulate operational costs and minimize waste and maximize income.
* Enforce service delivery standards and ensure workers follow best practices and guidelines. The AI may also audit and verify user activities and transactions to ensure compliance with company or industry laws.
* Schedule, route, forecast, inventory, and other planning and decision-making suggestions should be personalized and improved. Weather, traffic, events, and pricing may also influence AI choices.

1. Big Idea Vignettes

一張含有 文字, 螢幕擷取畫面, 字型, 文件 的圖片

自動產生的描述

1. Resource Sharing Platform:

This platform would link hospitals and other healthcare institutions to exchange resources and information. The platform would let facilities share workers, equipment, supplies, and space and coordinate their operations and goals. The platform would deliver real-time data and analytics on resource availability and demand to improve resource allocation and distribution.

1. Patient Flow Efficiency:

An information system to enhance patient flow and bed usage in hospitals is proposed. The system would monitor patients, beds, and staff and notify and propose admission, discharge, transfer, or referral. The system would also estimate patient demand and capacity and arrange patient flow using predictive modelling and simulation.

1. Rapid Response Team:

This concept is to form a healthcare team that can act fast in emergencies. The team would include emergency medicine, critical care, surgery, and infection control professionals. Mobile devices and technologies would provide the team with access to patient records, recommendations, procedures, and telemedicine. The team might also interact with other teams and departments over a secure network.

1. Space Acquisition and Management:

A mechanism to assist hospitals manage and acquire patient care space is proposed. The system would locate and assess hotels, schools, and conference centres that may become temporary or permanent healthcare facilities. The technology would also help with space planning, setup, operation, and maintenance. The system would guarantee that venues meet health care delivery criteria.

1. AI Data

一張含有 文字, 螢幕擷取畫面, 圖表 的圖片

自動產生的描述

Critical database for solution:

Have:

* COVID-19 Hospitalization and Emergency Department Statistics, 2022–2023

Want/Need:

* Travel and Mobility Data
* Hospital Capacity Data

Nice to have:

* Patient triage information
* Patient flow and movement

1. Prioritization

一張含有 文字, 螢幕擷取畫面, 字型, 圖表 的圖片

自動產生的描述

No Brainers:

* Space Acquisition and Management
* Realtime monitoring of bed capacity
* Realtime monitoring of location availability

Big Bets:

* Patient Flow Efficiency
* Automatic allocation of staff at the alternative locations

Utilities:

* Temporary Care Expansion
* Rapid Response Team to handle emergencies
* Alerts if the patient-to-bed ratio increases

1. To-Be-Scenario Map

一張含有 文字, 螢幕擷取畫面, 便利貼, 字型 的圖片

自動產生的描述

* COVID-19 patients are admitted to the hospital and triaged by a contactless system to determine their priority level. A specified location is then used to examine and test the patient. Fearful of their health and safety, the patient worries. Healthcare personnel worry about resource and space optimization and feel overwhelmed by the growing number of patients.
* The patient is isolated in a room with improved technology to monitor and manage their vital signs, medicines, tests, and records throughout enhanced isolation and room allocation. The patient receives a tablet to communicate with family, friends, and healthcare providers. Patients feel lonely and alone while they worry about rehabilitation and well-being. The tremendous workload and demands stress healthcare staff as they consider how to provide each patient the greatest treatment.
* Healthcare personnel are allocated patients based on their abilities, availability, and risk level during staff allocation. Mobile devices provide healthcare staff access to patient information, recommendations, procedures, and telemedicine. A secure network lets healthcare personnel cooperate with other staff and departments. Healthcare personnel consider ways to increase their skills and expertise and feel happy and confident by acknowledging their accomplishments.
* The simplified patient discharge procedure encompasses release from the hospital or transfer or referral to another institution when stable or healed. Patients get a discharge plan with instructions, medicines, follow-ups, and referrals. The patient worries about their future and feels pleased and happy for favorable results. Healthcare staff consider how to provide a safe and easy transition for the patient and feel pleased and delighted by favorable results.

1. Hills

一張含有 文字, 螢幕擷取畫面, 圖表, 字型 的圖片

自動產生的描述

First hill: Hospital management is the who element. The WHAT element is hospital resource optimization. The WOW element prevents resource shortages in full hospitals. The AI initiative intends to assist hospital administration employ workers, equipment, and space more efficiently and effectively to prevent running out while the hospital is full of patients.

Second hill: Nurse is the Who element. Monitoring available resources is the WHAT element. The wow element is making sure patients get care. The AI project intends to assist nurses monitor the availability and status of beds, supplies, and personnel to ensure that each patient receives the right treatment based on their condition and priority.

Third hill: Patient is the who element. The WHAT element is patient accommodation. The WOW element helps patients plan discharge. The AI initiative intends to isolate and treat patients in a pleasant and secure setting and support them with their discharge plan, which includes instructions, medications, follow-ups, and referrals.

1. Low Flex Prototype

## 14.1 Solution

Our technology forecasts patient triage, giving hospital administration real-time access to bed availability, pending discharges, admissions, resource management, and patient mobility. Automatic alerts for patient surges and emergencies enable management to engage the Rapid Response Team (RRT) quickly.

## 14.2 Key Task

一張含有 文字, 螢幕擷取畫面, 字型, 鮮豔 的圖片

自動產生的描述

## 14.3 Scenario

### 14.3.1 Task 1

Task: Login as a patient or hospital manager.

Scenario: Users can log in as a patient or professional account.

A screenshot of a phone

Description automatically generated

### 14.3.2 Task 2

Task: Fill out a questionnaire asking for patient symptoms.

|  |  |
| --- | --- |
| Scenario | |
| Hospital Manager | Patient |
| Users will upload or fill out the questionnaire for patients. | Users need to provide their conditions for evaluating severity. |

A screenshot of a phone

Description automatically generated

### 14.3.3 Task 3

Task: Select a location which directs patients to hospitals based on triage.

|  |  |
| --- | --- |
| Scenario | |
| Hospital Manager | Patient |
| Users want to search the resources available nearby for patients | Users want to search for an available bed to get treatment nearby |

A screenshot of a phone

Description automatically generated

Other resources such as masks or medical supplies (For Staff only);

Users can select how far they want.

### 14.3.4 Task 4

Task: Get beds and resources allocated based on triage.

|  |  |
| --- | --- |
| Scenario | |
| Hospital Manager | Patient |
| Users will get the matching result | |

A screen shot of a phone

Description automatically generatedA screen shot of a phone

Description automatically generated

Users can click the again button to adjust the requirement to match again;

Users also click the wait button to join the waiting list to get a notification if any resources are available.

### 14.3.5 Task 5

Task: Confirmation

|  |  |
| --- | --- |
| Scenario | |
| Hospital Manager | Patient |
| Users will only receive an estimated waiting time when no matching result | Users will receive a valid time for confirm the reservation in a hospital or an estimated waiting time |

A screen shot of a phone

Description automatically generatedA screen shot of a phone

Description automatically generated

Users can set a notification to announce to you if the resources are available.

## 14.4 Testing Feedback

Q: Already hospitalized patients have no beds. How can it obtain timely treatment?

A: After assessing the patient depending on their health, the AI checks the waiting list and suggests alternative hospitals with beds if the wait time is greater than 12 hours. Within 12 hours, it advises hospitalization.

Q: How do you prioritize patients in extremely severe health after completing the questionnaire if only one bed is available?

A: Make every effort to ensure that each patient has a bed.

Q: Another patient is worse off than the one who booked a room on the app. Does it hold the patient's bed or the worst?

A: The patient in the most critical condition should be allocated a bed initially, and subsequently, the AI system will allocate another available bed to patients with reservations following this sequence.