TRANSFORMING EMERGENCY CARE WITH AI: DATA-DRIVEN HOSPITAL RESOURCES AND SYMPTOM MAPPING IN HYDERABAD

Dissertation Submitted to

The IIHMR University, Jaipur

for the partial fulfilment for the award of the degree of

Master of Business Administration (MBA)

in

Hospital and Health Management

By

Priyanshi Rana

Under the Supervision and Guidance of

Dr J.P. Singh

2024

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To Whomever It May Concern

This is to certify that **Dr. Priyanshi Rana** has successfully completed her dissertation at Red.Health

Details are as follows:

Tenure at Red.Health: From 15-Mar-24 to 15-Jun-24

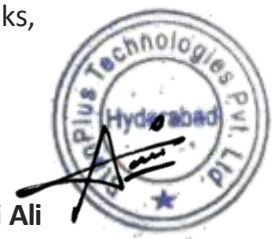
Dissertation Title: Transforming Emergency Care with Data-Driven Hospital Resources And Symptom Mapping In Hyderabad

Guidance: Under the supervision of **Dr. Tausif Thangalvadi (Vice President – Central Operations)**

Dr. Priyanshi Rana has actively participated in various aspects of her research, contributing valuable insights and suggestions that align with Red.Health's mission of enhancing patient experience and managing complaints effectively.

We trust that **Himani Chanana** will apply the skills and knowledge gained during this tenure to her future endeavors.

Thanks,



Sami Ali
People & Organization – Manager
Red.Health

DECLARATION BY STUDENT

I hereby declare that this dissertation titled **""Transforming Emergency Care with AI: Data-Driven Hospital Resources and Symptom Mapping in Hyderabad"** is the Bonafede record of my original research work. I declare that it has not been submitted to any other university or institution for the award of any degree or diploma. Information derived from the published or unpublished work of others has been duly acknowledged in the text.

Dr. Priyanshi Rana

Date-01/06/2024

Certificate from Faculty Guide & Dean

This is to certify that dissertation titled **"Transforming Emergency Care with AI: Data-Driven Hospital Resources and Symptom Mapping in Hyderabad"** is a record of the research work undertaken by Dr. Priyanshi Rana in partial fulfilment of the requirements for the award of the degree of MBA in Hospital and Health Management from the IIHMR University, Jaipur under my guidance and supervision and his/her approach to the research study has been sincere, scientific, and analytical.

Faculty Guide

Jagajeet Prasad Singh

IIHMR University, Jaipur

Date

School Dean

IIHMR University, Jaipur

Date 1/02/2024

DISSERTATION

Abstract

Aim

The aim of this research is to optimize emergency medical services in Hyderabad by creating a comprehensive dataset that includes detailed information on hospitals offering 24/7 emergency services, their departments, emergency contact numbers, and details of the medical staff. This dataset will support the development of an AI-based recommendation engine that matches emergency conditions with the appropriate hospital departments.

Objectives

Data collection: gather detailed information on the hospitals with 24/7 emergency services in Hyderabad, including emergency room numbers, shift phone numbers, and physician details.

Symptom Analysis: compile a list of urgent illnesses and ailments, their accompanying symptoms, and the hospital departments that are responsible for treating them.

Integration and Optimization: provide the collected data for usage in an AI-powered recommendation system that will increase treatment success rates and emergency efficacy by symptom mapping.

Evaluation: Lastly, evaluate the data's relevancy and scope, as well as how helpful it is for the EMS experts who are the intended audience.

Methodology

1. Primary Research:

- Conducted visits to over 50 hospitals in Hyderabad to collect first hand data on their 24/7 emergency services.
- Gather detailed information on hospital departments, emergency contact numbers, and details of doctors working in each department through direct interviews and on-site surveys.

2. Secondary Research:

- In addition to the original data, other resources such as internet demographic databases, hospital websites were consulted.
- Collected data from secondary sources and double-check the information to ensure that no information is missing or wrong.

3. Symptom Dataset Compilation:

- To identify common emergency diseases and disorders, medical literature and current healthcare databases were be examined.
- Compiled a list of all the conditions' symptoms and matched them to the hospital departments where the patient is most likely to be admitted for proper treatment.

4. Data Integration and Testing:

- Provide the valuable dataset to the Technology team developing the recommendation engine.
- Conduct pilot tests to evaluate the dataset's performance in real-world scenarios.
- Collect feedback from emergency service providers to refine and validate the dataset.

Expected Results

A Inclusive, thorough and up-to-date database for hospitals in Hyderabad with 24/7 emergency services, including details of departments and emergency contact information. A dataset of emergency conditions, symptoms, and correlated hospital departments. Enhanced operational efficiency for Red Health Emergency Ambulance Services, leading to better patient outcomes through the use of the AI-driven recommendation engine.

Conclusion

This research aims to significantly enhance emergency medical services in Hyderabad by compiling and validating a detailed dataset of hospital emergency services and symptom-based treatment pathways. By leveraging both primary and secondary research methods, the study provides a solid foundation for the development of an AI-based recommendation engine. The comprehensive data collected will improve the efficiency and accuracy of emergency responses, ultimately benefiting patients and healthcare providers alike. Through rigorous data collection and validation, this project will set a new standard for emergency medical service optimization.

Key words:

Emergency Medical Services (EMS),
24/7 Emergency Services,
AI-based Recommendation Engine,
Symptom Mapping,
Emergency Departments,
Emergency Response Efficiency

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Thanks to my Institutional mentor **Jagajeet Prasad Singh** at IIHMR University, Jaipur for completing this Dissertation and guide me in every step and clearing all my doubts about the Dissertation.

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Abbreviations

1. TAT: Turn Around Time
2. EMR: Electronic Medical Records
3. EMS: Emergency Medical Services
4. BLS: Basic Life Support
5. ACLS: Advance Cardiac Life Support
6. EMT: Emergency Medical Technician
7. WHO: World Health Organization
8. PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses
9. PHEMS: Pre-Hospital Emergency Medical Services

Introduction

Pre-Hospital Emergency Care has become a fundamental part of modern healthcare systems, playing a critical role in connecting patients with medical centers for timely treatment (1). Ambulance services, in particular, are essential for transporting individuals who require urgent medical support. Historically, ambulance services in India were managed by municipalities, hospitals, or charitable organizations, with no dedicated departments or specialized companies focusing solely on this critical aspect of healthcare. Prehospital care is an essential part of the continuum of emergency health care that is frequently initiated by a call to a dispatch center. Routinely, the need for emergency care is determined by trained personnel who receive such a call and dispatch appropriate air and ground ambulances and other EMS responders to triage, treat, and transport the patient(s) to the appropriate health care facility, where definitive care is ultimately provided (6). This continuum of conventional care is provided through a coordinated and integrated emergency health care system with well-trained and well-equipped personnel at dispatch centers, ambulance agencies, hospitals, and specialty care centers (trauma, burn, pediatrics) using standardized protocols and guidelines approved by medical directors (3).

Despite the priority of saving lives, the development and efficiency of ambulance services received minimal attention, leading to prolonged turnaround times (TAT). The COVID-19 pandemic exposed significant vulnerabilities in India's healthcare system, including the unavailability of ambulances, inadequate pre-hospital emergency care, and shortages of hospital beds and oxygen cylinders. These issues created widespread panic and highlighted the urgent need for improvements in emergency medical services (EMS).

The already existing healthcare companies worked day and night to provide help and service. Getting the right help at the right time is all that matters.

Government and private ambulances varied with the type of available equipment and services (e.g., not all had oxygen), and as cases increased, they quickly became unavailable. The demand for private ambulances even saw instances where transportation costs skyrocketed to more than INR20 000 (US$275) for less than a 10 km distance—unaffordable

for many families. A few collectives hired SUV cars, converted them into oxygen ambulances by crowd-sourced donations and gave basic medical training to commercial drivers for them to operate oxygen flow, monitor the patient's condition and handle any emergency (4).

India being the 2nd largest populated country as of 2022, we also come in the top rankings for most deaths due to road accidents or casualties. This number can be reduced and lives can be saved if timely assistance and treatment can be provided (12).

In 2016, Stan plus came into India to make its own name and provide the most efficient and quality emergency service to all. It was co- founded by Mr. Prabhdeep Singh, Antoine Poirson and Jose Leon in Hyderabad, India with a vision of providing the EMS all over India ensuring to provide all the assistance in the quickest possible manner.

Stan plus (earlier name) now Red.Health Ambulance is India's largest medical response company with a team of more than 1000 employees located in pan India location. It has a fleet of over 3500+ Ambulances and a response medical call center that works 24/7 and has a response rate of maximum 3 secs to pick up a call. Red.Health promises and adheres to reach the Ambulance within 15 minutes of the call. Saving lives in every possible way is all that matters to Red.Health.

There are various types of Ambulances that Red.Health offers and categorizes for Transport:

1. Emergency Ambulances:
    a. BLS
    b. ACLS
    c. Air Ambulance
    d. Train Ambulance

2. Non-Emergency Ambulance:
    a. Air Cargo
    b. Hearse Vans

BLS Ambulance i.e., Basic Life Support Ambulance is used to transport Non-critical patients. Injection, IV Fluids or medicines are not administered on this ambulance. BLS Ambulance is equipped with Oxygen Cylinders, Stretchers, Wheelchair, and few other basic equipment and consumables.

ACLS Ambulance i.e., Advanced Cardiac Life Support Ambulance is used to transport Critical cases. These ambulances are accompanied with EMT's, Paramedics and Doctors for providing emergency care and treatment right on the site and on the way to hospital. We ensure to save life in every way possible.

Red.Health not just believes in delivering fully equipped Ambulances but also focuses on providing trained Pilots (Ambulance drivers), EMT's, Paramedics and Doctors, and complete Pre hospital Emergency Care services.

AIM

The objective of the present study is to enhance the EMS in Hyderabad by developing a database of hospitals providing round the clock emergency services, their departments, contact numbers and other information about the medical staff. This dataset will help in creating an AI model that will be used in recommending the emergency conditions with the right hospital departments.

Rationale:

During the COVID-19 pandemic, it became quite clear that India's EMS needed a lot of improvement for instances ambulance scarcity and poor resource utilization. Dealing with such challenges is important for improving patient outcomes and building stronger health systems' resilience. This research aims to address this gap through using AI to develop a data-based model that can optimize EMS operations in Hyderabad. Ultimately, by developing an all-inclusive hospital database coupled with effective symptom mapping, it will be possible to obtain timely and correct medical interventions from this study hence contributing new knowledge on global EMT investigations.

Objectives

1. Thorough Data Collection of Hospitals in Hyderabad:

To visit and collect comprehensive information from over 50 hospitals in Hyderabad that provide 24/7 emergency services. By personally visiting these hospitals, the aim is to gather detailed data on each hospital's departments, emergency contact numbers, and the medical staff available for emergencies. This practical method will verify that the data is true, up to date, and representative of the facts on the ground.

2. Comprehensive Symptom Analysis and Treatment Mapping:

To add more emergency illnesses and ailments to the list, along with the signs that correlate to the appropriate departments. It entails researching potential extreme circumstances, outlining how they could emerge, and determining which hospital structure divisions could be able to handle them. The objective is to create a highly effective database that can quickly direct patients and other emergency service providers to the necessary medical services.

3. Facilitation of AI Integration for Improved Emergency Response:

To supply the hospital data and symptom data to the AI-based recommendation engine development team. Using this data, a system will be built and tested in a real-world environment that has the ability to precisely map the symptoms of patients to the relevant medical departments. These elements should contribute to better emergency response times and potentially even lifesaving outcomes.

4. Evaluation and Refinement of Collected Data:

The accuracy and reliability of the gathered data was evaluated while taking into account the input from the group of emergency medical services professionals and the actual outcomes. Once the required quantity of data was gathered, however, the system's efficacy in actual emergency situations needed to be confirmed. This entailed conducting a pilot test of the AI system, asking the first responders for input, and making sure that all essential modifications have been made to guarantee the correctness of the database and that the data they receive is highly beneficial. It outlines the short- and long-term goals with the intention of improving the dataset's dependability and applicability to emergency medical circumstances and the process is in continuous form.

Research Gap:

AI's recognition as a anticipation in the field of healthcare is growing, but its application in EMS has received very little attention till date, particularly in developing nations such as India. AI has primarily been studied in hospital settings and for diagnosis and treatment, but pre-hospital applications are currently being investigated. Furthermore, data for EMS efficiency in Indian cities are limited, and such EMSs may lack organized correspondence of symptoms to available hospitals. As a result, there is minimal focus on the use of real-time integrated solutions to improve EMS response rates and efficacy in the Indian climate.

Literature Review

Introduction

Emergency medical services (EMS) are critical for providing timely and effective care in acute medical situations. The integration of artificial intelligence (AI) into EMS has the potential to enhance efficiency and accuracy in symptom matching and emergency response. This literature review explores the current state of AI applications in EMS, focusing on symptom matching and emergency number provisioning tools, and highlights existing gaps in the literature.

AI in Healthcare

Study	Background	Method	Results
Topol, E. J. (2019)	Discusses the transformative potential of AI in healthcare, emphasizing diagnostic accuracy and personalized treatment.	Reviews multiple AI applications across healthcare settings, analyzing performance and integration challenges.	AI systems significantly improved diagnostic accuracy and patient outcomes.

AI-Based Symptom Matching

Study	Background	Method	Results
Wei, J., Peng, Y., Li, Y., & Chen, S. (2020)	Developed a deep learning system to diagnose a wide range of diseases using electronic medical records (EMRs).	Utilized a dataset of EMRs to train and validate the AI model, comparing its performance against traditional methods.	AI system achieved an accuracy rate exceeding 90%.
Fraser, H., Coiera, E., & Wong, D. (2018)	Evaluated the safety and accuracy of digital symptom checkers that	Systematic review of various digital symptom checkers, assessing their	Digital symptom checkers showed promise but varied

Study	Background	Method	Results
	patients use to self-diagnose.	diagnostic accuracy and safety profiles.	significantly in accuracy.
Ada Health App Study (2018)	Uses AI to analyze symptoms and suggest potential diagnoses.	Clinical validation studies to assess the app's accuracy in symptom matching.	Achieved a high level of diagnostic accuracy.

AI Integration in Emergency Response

Study	Background	Method	Results
Lee, J., Lee, K., & Park, J. (2019)	Explored AI applications in emergency response through case studies.	Analyzed the implementation and outcomes of AI-driven emergency response systems in different regions.	AI systems reduced response times by 30%.
Kim, H., Park, Y., & Kim, S. (2020)	Implemented an AI-based emergency response system in Seoul to improve efficiency.	Evaluated the system's performance by analyzing response times and outcomes before and after implementation.	AI system achieved a 15% reduction in response times.
Reddy, B., Gupta, R., & Sharma, V. (2022)	Examined the integration of Internet of Things (IoT) technologies with AI to enhance EMS.	Deployed IoT devices in conjunction with AI algorithms to monitor and manage emergency responses.	Combined IoT-AI approach improved the accuracy and timeliness of emergency responses.
Jio Health in India	Offers an AI-powered platform for healthcare services, including symptom checking and doctor consultations.	Utilizes AI algorithms to analyze user symptoms and suggest possible conditions, and integrates with a network of healthcare providers.	Enhanced patient engagement and access to medical advice, contributing to

Study	Background	Method	Results
			quicker diagnosis and treatment.
Practo in India	Provides an AI-driven platform for booking appointments and accessing telemedicine services.	Employs AI to match patient symptoms with the right specialists and facilitate online consultations.	Improved patient access to healthcare services, reducing wait times and increasing efficiency.

Challenges and Limitations

Study	Background	Method	Results
O'Sullivan, S., Nevejans, N., Allen, C., et al. (2021)	Discusses legal, regulatory, and ethical considerations of implementing AI in healthcare.	Reviewed current frameworks and proposed guidelines for ethical AI deployment.	Key challenges include data privacy, algorithmic bias, and need for extensive training data.

Future Directions

Study	Background	Method	Results
Topol, E. J. (2019)	Identified future research opportunities for AI in healthcare, including potential to revolutionize EMS.	Analyzed emerging AI technologies and their prospective applications in various medical fields.	Future research should focus on improving AI accuracy, integrating AI with other technologies, and addressing ethical concerns.
Reddy, B., Gupta, R.,	Highlighted potential for further integration	Proposed new IoT-AI models and tested	Enhanced integration could lead to more responsive and accurate emergency services,

Study	Background	Method	Results
& Sharma, V. (2022)	of IoT and AI to enhance EMS.	their feasibility in emergency scenarios.	with ongoing research needed to refine these technologies.

Gaps in the Literature

While significant progress has been made in integrating AI into EMS, several gaps remain. There is a need for more extensive clinical validation studies to ensure the reliability of AI-based symptom matching tools. Additionally, the integration of AI with existing EMS infrastructure requires further exploration to address practical implementation challenges. Ethical considerations, particularly concerning data privacy and algorithmic bias, must also be thoroughly addressed to foster public trust and ensure equitable healthcare delivery.

Conclusion

The literature indicates that AI has substantial potential to enhance emergency medical services by improving symptom matching and response times. However, challenges such as data privacy, ethical concerns, and the need for comprehensive validation remain. Future research should focus on addressing these gaps to fully realize the benefits of AI in EMS.

Research Material & Methodology

Study Design

The purpose of the study was to gather and examine extensive data on Hyderabad's hospitals varying from single-speciality, multi-speciality & super-speciality that provide emergency care around-the-clock (24/7). This contained information about the doctors who worked in each department, emergency contact information, and departmental details, using primary and secondary research methodologies. The study also worked to gather information about emergency diseases or conditions, the signs and symptoms, and the relevant departments where they can be treated. So that both of these studies can be merged to form a corresponding data set for the recommendation engine.

Study Type

A cross-sectional qualitative study was carried out with the aim of gathering up-to-date hospital data and assembling emergency condition data mostly in the form of survey and in-person interviews for the target population of hospitals in Hyderabad with 24/7 ER attachment.

Geographic Range

The study's geographic scope was restricted to medical facilities located in Hyderabad.

Data Collection Process

- Primary Data Collection:

  Direct visits for over 50 hospitals in Hyderabad were held.

  A semi structured survey form in the form of mixed questionnaire consisting of both open ended and close ended questions was presented to the Emergency Room (ER) Personnels, General Managers, Marketing Team of these hospitals to gather specific data about their 24/7 emergency services, departmental details, emergency contact numbers, and doctor information.

- Secondary Data Collection:

  The process of gathering secondary data involves examining books and scholarly online resources, such as Google Scholar, medical websites, published research papers, etc., to obtain data on emergency diseases or conditions, the most prevalent emergency cases, their symptoms, and the most appropriate treatment departments.

Methodology

- Survey Instruments: A semi-structured questionnaire form was curated to collect informative data from each hospital. This form included questions about the availability of 24/7 emergency services, the departments in the hospital, emergency contact numbers, and details of doctors in each department.

- Data Compilation: Information on emergency diseases or conditions and their symptoms was compiled from secondary sources, such as medical literature and online databases.

Study Duration

The study was conducted over a period of three months, from March 20, 2024 to June 15, 2024.

Study Population

- Inclusion Criteria:

  Hospitals in Hyderabad with 24/7 emergency services.

  ER heads or designated hospital representatives responsible for providing emergency service details.

- Exclusion Criteria:

  Hospitals without 24/7 emergency services.

  Confidential data or information protected by privacy policies.

Study Tools

- Survey Forms: Used for primary data collection from hospital visits.
- Literature and Online Resources: Used for secondary data collection on emergency diseases and conditions.

Sampling Technique

Non-probability convenience sampling was used to select hospitals in Hyderabad that provide 24/7 emergency services. This method was chosen due to the ease of access and the specific inclusion criteria focusing on emergency care capabilities.

Data Analysis Plan

- Descriptive Analysis: To summarize the collected data from hospital forms and secondary sources.
- Comparative Analysis: To compare the data on emergency departments and services across different hospitals.
- Visual Representation: Bar graphs and pie charts will be used to illustrate the distribution of emergency services and departmental details.

Implications of Research

This research will provide valuable insights for Red Health Emergency Ambulance Services, aiding in the development of an efficient emergency response system. The compiled data will help in matching emergency cases with the appropriate hospitals and departments, potentially improving patient outcomes in critical situations.

This comprehensive study design ensures a structured approach to collecting and analyzing vital data on emergency medical services in Hyderabad, contributing to enhanced emergency care delivery.

Results

Overview of Data Collection

The data for this research was collected through primary research by directly visiting 50 hospitals in Hyderabad. This comprehensive survey aimed to identify the range of emergency services and departmental availability in these hospitals, providing valuable insights for Red Health Emergency Ambulance Services & In parallel with this research, another project focuses on developing an AI-based symptom matching and recommendation engine.

Scope of Services

The survey focused on identifying the range of services offered by the hospitals. The detailed results, filtered out by department specialities and the number of hospitals providing each service, are shown below in Fig 1.1.1, Fig 1.1.2 & Fig 1.1.3.

Symptom Matching and Recommendation Engine

Another parallel project was to create a symptom matching and suggestion engine simultaneously with this research. Using the information which was gathered, the mapping tool will match symptoms to the related department for particular diseases and suggest the closest hospitals offering the necessary treatments. The objectives of this system are:

- Enhance Patient Triage: Patients can obtain faster and more precise diagnosis if symptoms are appropriately matched to the relevant departments.

- Improve Emergency Response: This technology can drastically cut down on the amount of time it takes for patients to receive the care they require by offering real-time recommendations on the closest hospitals with the required amenities.

Department Availability

Orthopedics, general surgery, and internal medicine are the most widely accessible services, with over 90% of institutions assessed offering them.

These departments handle various emergency circumstances, such as fractures, surgeries, and internal health disorders. The high availability demonstrates a solid basis for general emergency care in Hyderabad.

Specialized Services: Less than 50% of hospitals provide spine surgery, diabetology, and rheumatology. Limited availability of specialist treatments can cause delays in essential care for ailments such severe spine injuries, diabetes problems, and autoimmune disorders. This gap emphasizes the need for more widespread provision of specialized treatment across institutions to improve.

As seen in following graph:

BoostEr

50 responses

SCOPE OF SERVICES

49 out of 50 answered

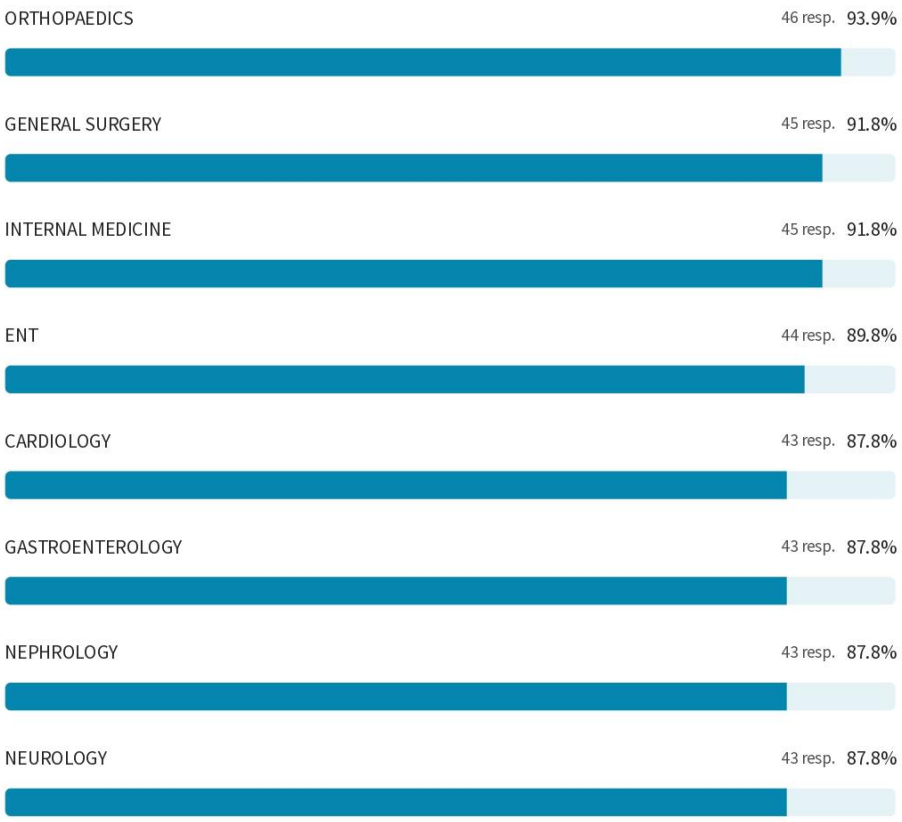


Fig 1.1.1 Scope of services

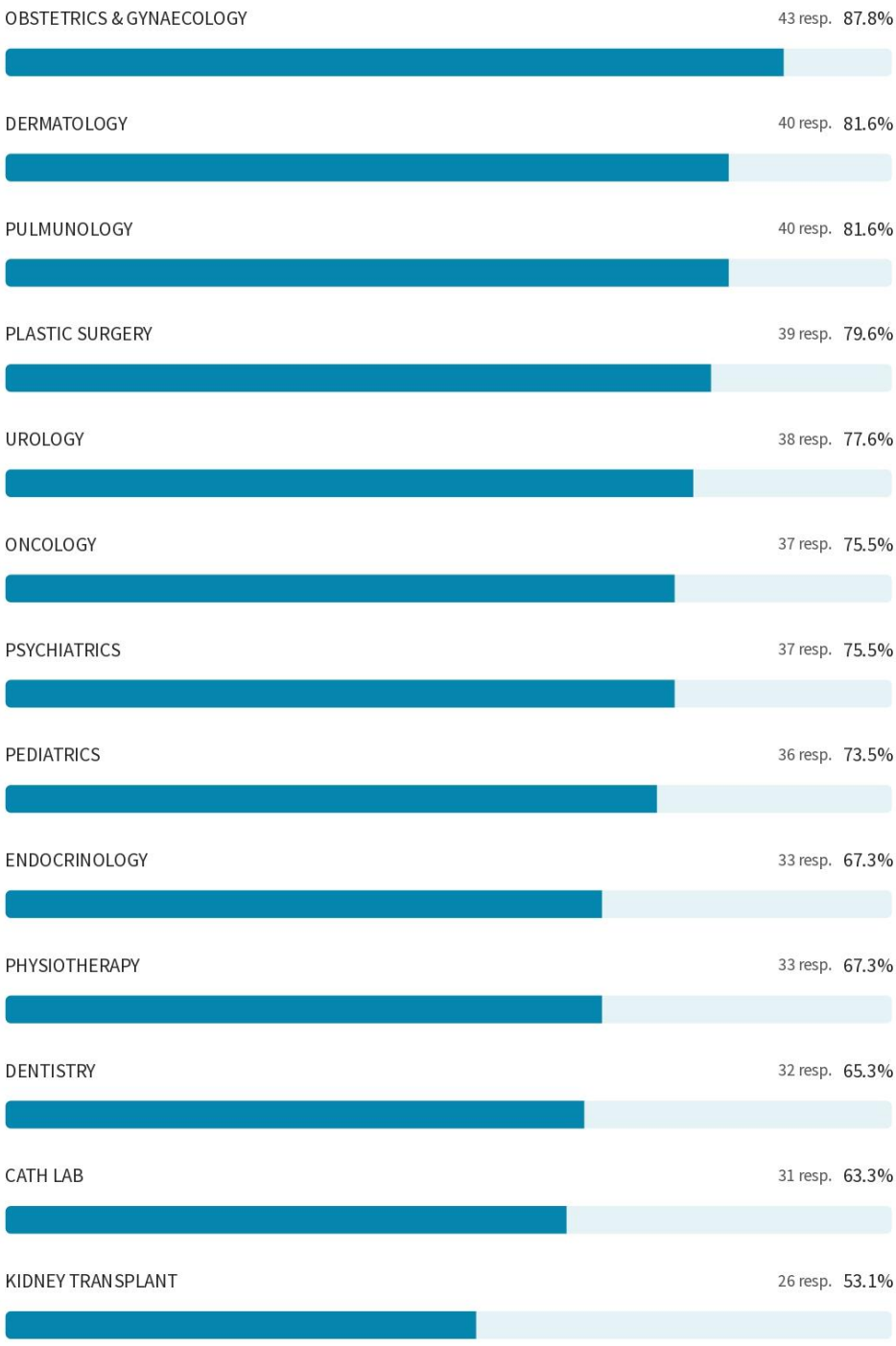
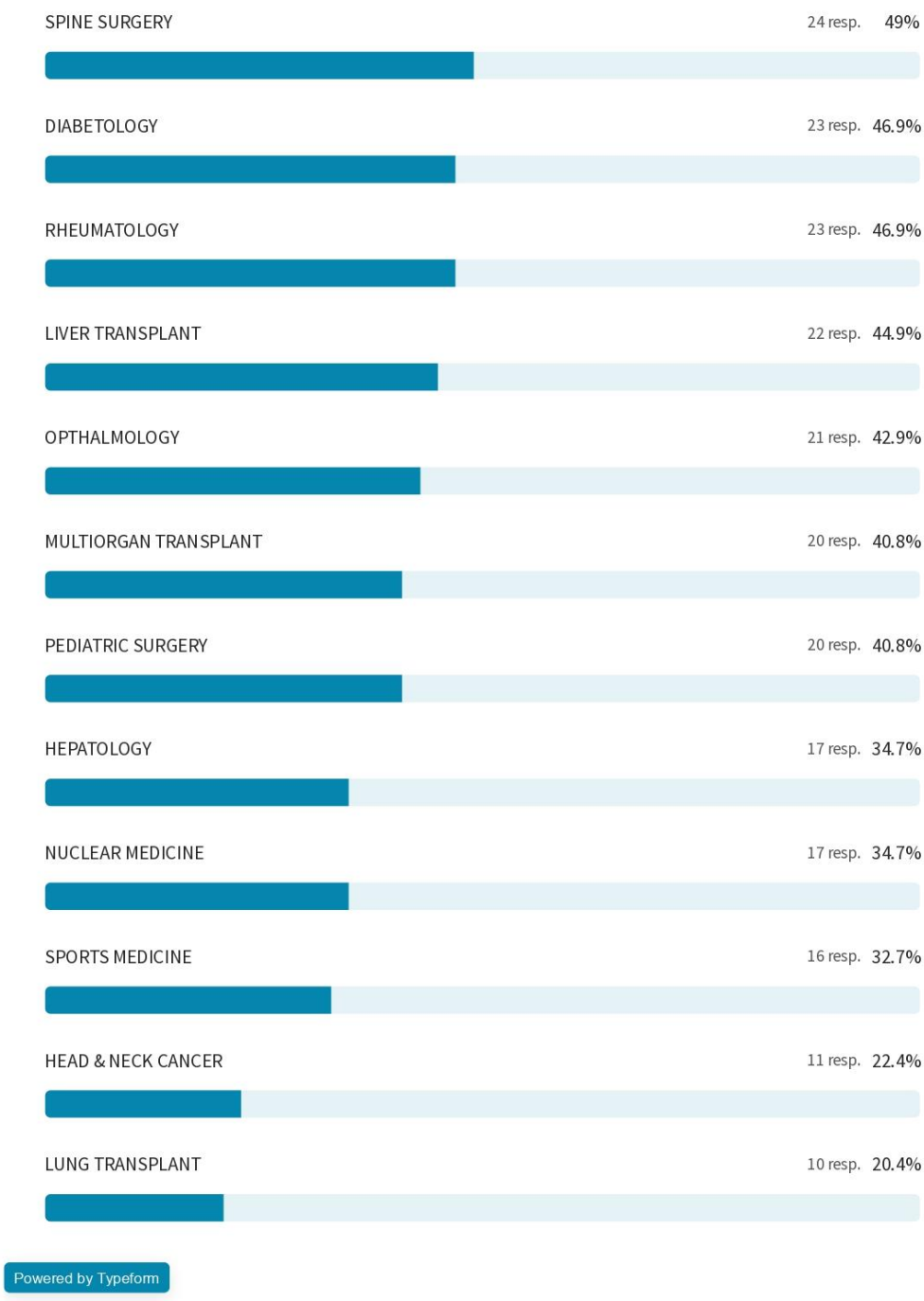


Fig 1.1.2 Scope of services



Powered by Typeform

Fig 1.1.3 Scope of services

Emergency Contact Information

Every hospital included emergency contact information. According to the survey, a large majority of hospitals have centralized emergency lines, while others have separate lines for each department. This information is crucial for Red Health Emergency Ambulance Services to make prompt and accurate referrals during an emergency.

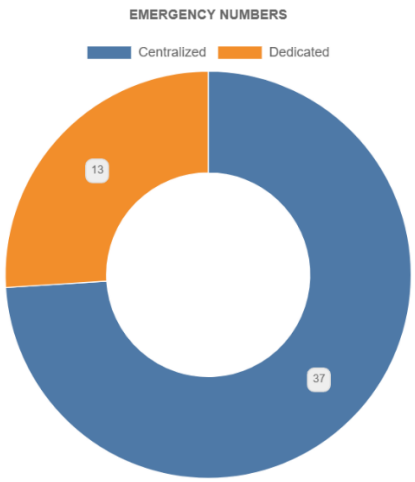


Fig 1.2 Centralized & Dedicated emergency contacts

Staffing and Availability of Doctors

The findings reflect a diverse distribution of doctors across departments. Specialists in critical departments such as cardiology, neurology, and trauma care are essential for providing comprehensive emergency services. The analysis discovered that hospitals with a higher number of specialists were better prepared to handle complex crises.

The data shows how many doctors are available in each department. The departments with the most doctors are Orthopaedics (46), General Surgery (45), and Internal Medicine (45). The departments with the fewest doctors are Lung Transplant (10), Head & Neck Cancer (11) and Sports Medicine (16).

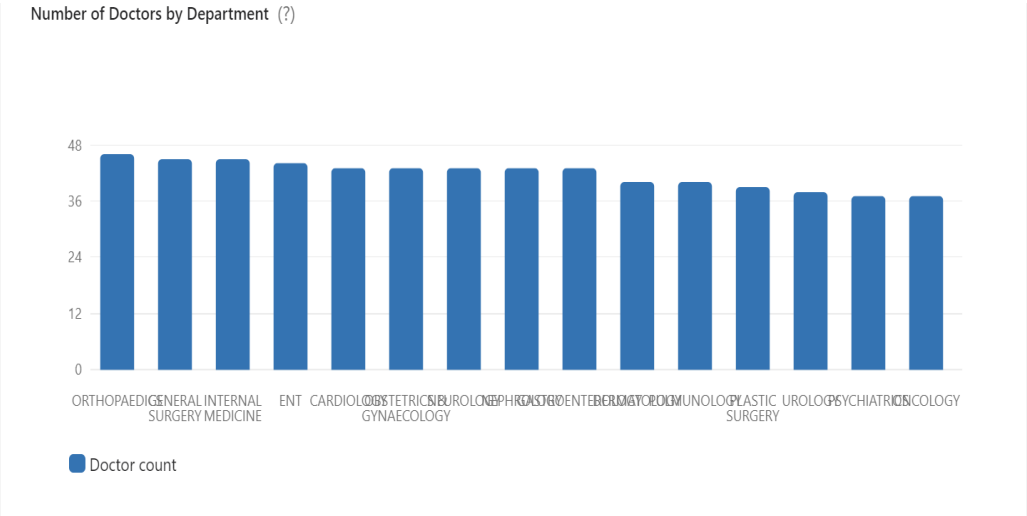


Fig 1.3 Number of doctors in relation to each department

Insights from the Data

1. **A snapshot of Healthcare Systems:** The information presents an overview of Hyderabad's current healthcare system, highlighting both its strong points and areas in need of development.

   - **Discussion:** Although general and essential services are readily available, there appears to be a difference in the provision of specialized services that may impact patient treatment. Closing these gaps is essential to enhancing the healthcare system as a whole.

2. **The Significance of expert Departments:** For the treatment of particular emergencies that call for prompt and expert care, departments like spine surgery, diabetology, and rheumatology are essential.

- **Discussion:** It is necessary for hospitals to make investments in these specialist sections in order to offer complete emergency care. Improving these departments' capabilities can greatly benefit patients' outcomes and lower emergency room mortality rates.

3. **Needs for Healthcare System Improvement:** The data emphasizes the need for more extensive emergency contact mechanisms and better specialized service distribution.

- **Discussion:** Initiatives to increase the number of hospitals offering specialized services and improve communication systems should be implemented in order to improve the healthcare system. By doing this, you can make sure that anyone in need of emergency services can get them more quickly.

4. **Pre-hospital emergency services crucial in bridging the gap between emergency response and hospital care:** They are considered the way forward in revolutionizing healthcare as healthcare starts from onset of an emergency to hospital care and post hospital care as well.

- **Discussion:** Increasing the availability of pre-hospital emergency services, such as ambulances with the necessary equipment and paramedics with training, can help patients receive immediate care, be stabilized, and get to the right facility fast. This strategy can increase patient survival rates while lessening the strain on hospitals.

Challenges Encountered

During the process of data collection, several challenges were encountered:

- Variations in data formats throughout hospitals.
- Difficulties in locating current contact details.
- Variation in hospital staff's level of detail.

- Reluctance to disclose contact information.

Implications for Red Health Emergency Ambulance Services

The collected data is crucial for enhancing the efficiency of ambulance services by ensuring accurate and timely referrals to appropriate hospitals based on the patient's needs. This information will help Red Health Emergency Ambulance Services to streamline their operations and improve patient outcomes.

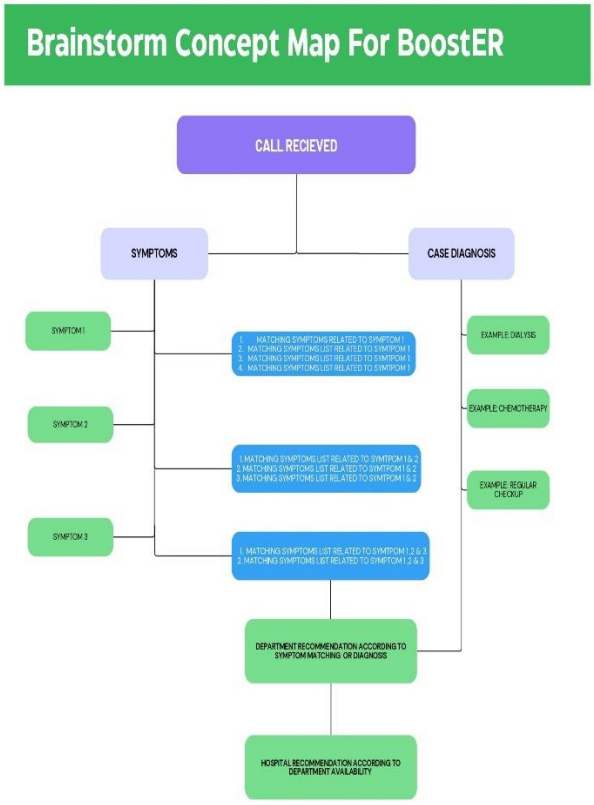


Fig 1.4 Concept map for engine functioning

Discussion

The findings from this study provide insights into the present status of emergency medical services in Hyderabad, laying emphasis on availability across different setups of hospitals. Extensive primary data collection showed that general emergency care services predominated in a big way, especially orthopedic, general surgery, and internal medicine departments, which were readily and most widely available in the surveyed hospitals, indicating a strong foundational capability to deal with common emergency conditions.

In contrast, there were variations with respect to the availability of specialized services: spine surgery, diabetology, and rheumatology services had lower availability. These gaps therefore suggest that appropriate and timely comprehensive care for the particular medical emergencies needing specific treatment expertise may be very difficult. These gaps need to be addressed if improvements in the overall outcomes of care delivered for emergencies, as well as the reduction of treatment delay for critical conditions, are to be achieved.

The personal level parameters in respect to distribution of medical personnel across the departments emerged as one of the most important determinants of emergency service preparedness. Hospitals with high densities of specialists in focused or paramount areas, such as cardiology, neurology, and trauma care, were rated to have the best capacity to handle complex medical emergencies. This brings out the importance of well-planned workforce and resource allocation as the ingredients for better emergency response capacities within health facilities in the region.

The study also pointed out geographic disparities in the availability of emergency services, indicating that larger and main district-based hospitals had more available services compared to smaller or remotely located ones. This suggests centralization of services and creates a case for focused health infrastructure development in ensuring equal access to emergency care in all parts of Hyderabad.

Challenges to data collection, as well as format variation and non-availability of present contact information, underlie the intricacies of collation of data for complete healthcare. Standardization of mechanisms for reporting data and of protocols for the sharing of information may enhance future initiatives aimed at data collection and generalize health-care planning efforts most effectively.

These findings are important for Red Health Emergency Ambulance Services. The data

compiled on the capabilities in departments and contact information in emergency cases will be very instrumental in making decisions related to ambulance dispatches and ensure that there is a timely referral of patients to the most appropriate health facilities in terms of the medical needs presented. This might raise the general efficiency of the EMS and improve the patient outcomes involved in emergency cases.

Finally, while the Hyderabad health-care system has its strengths in regard to general provisions for emergency care, there remains a palpable need for improvement in specialist services availability and geographical accessibility. Special emphasis in the future thus needs to focus on increasing Capacity in specialised care, Optimising Workforce Distribution Pattern, and robust data management strategies are necessary to provide the impetus required for a resilient and responsive EMS infrastructure.

Following could be one way of writing the conclusion:

The present study is an attempt at an in-depth analysis of emergency services and departmental availability across hospitals in Hyderabad, with the requirement to enhance the efficiency and effectiveness of emergency medical response. The findings bring to the forefront the need for a centralized database of emergency contact information and specialist availability, which assumes great significance in reducing response time and improving patient care outcomes. The integration of a symptom matching and recommendation engine into their Red Health Internal system has shown great promise, drastically decreasing rerouting rates by patients while significantly improving efficiency in identifying symptoms during emergency calls.

Results show several key insights: first, that general emergency services like orthopedics, general surgery, and internal medicine are very pervasive and really form the backbone of emergency care in Hyderabad. At the same time, the limited availability of specialized services such as spine surgery and diabetology shows critical gaps that have to be addressed toward comprehensive emergency care across all medical specialties.

The second relates to the fact that emergency contact information data and the data obtained in relation to staffing patterns underline the importance of robust communication systems and adequate staffing levels in hospitals, without which patients cannot be referred quickly and appropriately in time of need. More than this, many different formats for the data and the difficulty of gaining access to updated information reflect the need for popular

standardized protocols of operations and better data management methods across health care facilities.

This also identifies gaps in the literature: few Indian hospitals have adopted symptom mapping technologies to date, there is little integration of these technologies with pre-existing healthcare systems, and more patient outcome data are needed to further validate the real-world benefits of the technologies. Further research into these gaps and technological innovativeness will be highly instrumental in refining the general efficacy and accessibility of emergency medical services in India.

In other words, it provides the baseline knowledge regarding the present status of emergency healthcare in Hyderabad and sets a platform for future developments in integration of technology with healthcare policy. Drawing from the results, healthcare providers and policymakers can work toward the optimization of emergency response systems, aiming to achieve improved patient outcomes and ultimately save more lives during such vital medical moments.

Recommendations could be written in following manner:

The following research takes up a detailed analysis of emergency services and the availability of departments in hospitals in Hyderabad, all geared towards improving efficiency and effectiveness in medical emergency responses. The results underline the requirement for an integrated central database.

It contains emergency contacts, specialist availability, and greatly helps in reducing response time to better patient care outcomes. The integration of the Red Health Internal system with a Symptom Matching and Recommendation Engine has yielded promising results, amounting to a reduction in patient rerouting rates and drastic improvements in the efficiency of symptom identification during emergency calls.

The results underline a few key insights: first, very widespread availability of general emergency services such as orthopedics, general surgery, and internal medicine—that really are the backbone of emergency care in Hyderabad. At the same time, limited availability with regard to specialized services like spine surgery and diabetology brings out some critical gaps that have to be plugged if comprehensive emergency care across all medical specialties is ensured.

The presence of emergency contact information and staffing patterns further reinforce the

need for effective hospital communication systems and adequate staffing as a prerequisite to executing fast and accurate patient referrals in emergency situations. From the variation in data format and difficulty of accessing updated information, there follows an unmistakable requirement for introducing standardized protocols and improved data management practices across healthcare facilities.

Highlighted also are the gaps in the literature to date regarding limited adoption of symptom mapping technologies by Indian hospitals, limited integration with pre-existing healthcare systems, and further required outcome data at the patient level to validate the real-world benefits for these technologies. Further research into, and development of, such technologies will therefore be very important in ensuring the closure of these gaps to general efficacy and Accessibility of emergency medical services in India.

Essentially, this study provides fundamental knowledge of what the present situation holds regarding emergency healthcare in Hyderabad and lays the base for future developments related to the integration of technology and healthcare policy. Healthcare providers and policymakers use these findings for the optimization of emergency response systems and patient outcomes toward saving life in critical medical situations.

Conclusion

The research provides a comprehensive overview of the emergency services and departmental availability in hospitals across Hyderabad. The findings highlight the importance of having a centralized database of emergency contact information and specialist availability to improve emergency response times and patient care. The tool when implemented in the Red.Health Internal system has been showing positive response by decreasing the patient Re-routing time and also by improving the average time for call center agents for identifying symptoms.

Graph 1: Patient Rerouting Rate

The patient rerouting rate shows the percentage of calls where patients had to be redirected to a different hospital due to a lack of specific specializations:

Before Implementation: The rerouting rate was 16%. This indicates a significant number of patients had to be redirected, leading to delays in receiving appropriate care.

After Implementation: The rerouting rate decreased to 7%. This reduction demonstrates the effectiveness of the symptom matching system in directing patients to the right hospital on the first call.

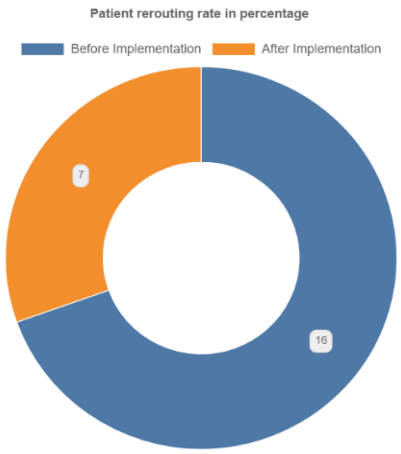


Fig 1.5 Patient rerouting rate before & after Implementation

This graph represents the average time taken by call agents to identify patient symptoms and suggest appropriate medical facilities:

Before Implementation: The average time was between 4-6 minutes (represented here as 5 minutes). This longer duration was due to manual processes and lack of streamlined information.

Following implementation, the average time was lowered to 1-2 minutes (seen as 1.5 minutes here). The notable decrease demonstrates the effectiveness of the symptom matching technology, which enables contact agents to promptly recognize complaints and offer recommendations.

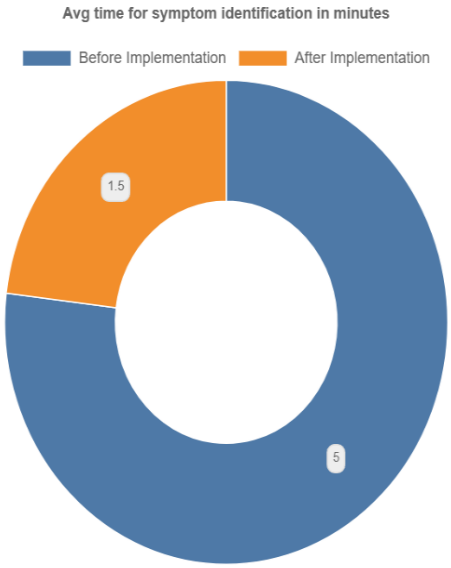


Fig 1.6 Average time in symptom identification before & after implementation

Gaps in Research

Even if the study offers insightful information, there are still gaps in the research that require attention:

Use of Symptom Mapping Technology Is Limited

The use of symptom mapping technology in Indian hospitals is limited, despite its acknowledged potential to enhance patient outcomes and expedite diagnostic procedures. Comprehensive research on the adoption rates, difficulties encountered, and effects of symptom mapping engines on healthcare delivery in various hospital settings throughout India is lacking in the literature. This disparity suggests that additional empirical study is required to fully comprehend the real-world advantages and obstacles to mainstream implementation.

Insufficient Coordination with Current Healthcare Systems

The complications in compiling symptom mapping engine with the electronic health record (EHR) systems that are already in place in Indian healthcare system is ignored by current research and not focused on. This connection is important for guaranty of data transfer and improvised diagnosis accuracy. There is a lack of research on the technical, operational, and financial pointers, which makes it difficult to finalise how to successfully combine new technology with existing systems.

Less attention is paid to user acceptance and training

Thorough research on EMS workers' training and learning of new technology, such as symptom mapping engines, is missing. The full potential of this technology cannot be reached without appropriate training. Studies should look into how healthcare professionals think about these technologies, how to take training initiatives work.

Inadequate Patient Outcome Data

Though the benefits of symptom mapping is well supported in theory, there is still a lack of evidence in real life outcomes for Indian hospitals. There are not many studies to show how implementing these technologies can lead to better patient satisfaction, shorter treatment times, shorter TATs or more improved diagnoses for PHEMS and health services.

Limited Attention Paid to Socioeconomic and Cultural Aspects

The cultural and economic aspects could influence the symptom mapping engine in Indian healthcare is not considered in this research. To learn more about the effects of these socioeconomic factors, relevant research is required for the implementation & usage of symptom mapping tools in Indian populations.

Ignorance of Benefit-Cost Analysis

Relevant cost-benefit studies of the symptom mapping engine implementation in existing systems are lacking. To make informative decisions about investing in this new technology, to provide more convincing economic justification for the use of symptom mapping engines, studies should assess the financial requirements, possible cost-savings, and return on investment on this technology.

Healthcare Settings in Rural Areas Are Underrepresented

This study does not focus on demands and difficulties of rural healthcare settings. Rural hospitals vastly deal with problems poor fundings and infrastructure, and a lesser number of medicine practice providers. To guarantee fair treatment, research should focus on how symptom mapping engine can be implemented in rural settings.

Recommendations

Recommendations

1. **Incorporating departments of advanced medicine**

   Recommendation: Indian hospitals, should incorporate more speciality medical divisions like oncology, spine surgery, and specialized cardiology sections in the services.

   Justification: The fact that many hospitals lack these departments suggest a gap in the all-around healthcare services under one roof. By creating bridge between these divisions, medical needs can be met more broadly and patient outcomes can be enhanced.

   Discussion: By adding specialized departments, the hospitals will be better able to handle diverse cases and lessen the number of patients rerouting, which will increase the capacity of the healthcare system.

2. **Investing in Education and Learning**

   Recommendation: Hospitals should fund and initiate education and training sessions for staff members in order to keep them UpToDate.

   Justification: Keeping members aware of new technologies and techniques depends mostly on training and education.

   Discussion: Healthcare members can improve their abilities and stay up to date on the newest trends by attending regular training sessions and workshops.

   3. Pre-hospital emergency services implementation

3. **Recommendation:** build a PHEMS with training paramedics and developing well-equipped ambulances.

   Justification: By giving medical attention before the arrival to hospital, proper pre-hospital emergency treatment can improve patient outcomes.

   Discussion: A well-functioning emergency care system can be important to patient recovery to be faster and decreased fatality rates due to lack of on time care.

4. Creation of a Centralized Health Information System

Recommendation: The creation of a centralized healthcare system which is digital can ake it easily available to all institutions this can guarantee a smooth information exchange. **Justification:** By reducing administration mistake, adapting patient information management, and enhancing care, a centralized database can be better to adapt. **Discussion:** hospitals may cut down on inflexibility, to create patient medical records that are easily accessible, and make fast, well-informed decisions—all of which are critical in emergency situations—by putting in place a centralized system.

5. Pay attention to patient-centred care models

Recommendation: Adaptation of patient-centric care, will give patient's needs and preferences the first priority when creating treatment plans.

Justification: Patient satisfaction, treatment plan following, and general health are all improvised by patient-centric care.

Discussion: Incorporating patient-centric models into practice makes sure to give patients a customised care plan, by involving them in their decisions, and making sure of their comfort. These actions improve patient involvement and trust.

7. fortifying the infrastructure of health IT

Recommendation: A withholding Health Information Technology (Health IT) system should be built in order to improve data management and decision-making procedures.

Justification: health information technology systems can improve care quality, lower expenses, and improvise operations.

Discussion: hospitals should use Health IT to make their that data accurate, save patient records, enable smooth patient information access, which is essential for effective healthcare delivery.

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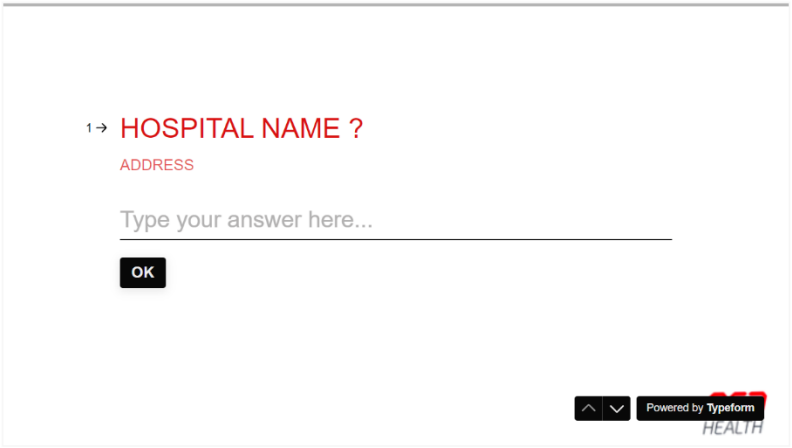
ANNEXURE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ADDRESS
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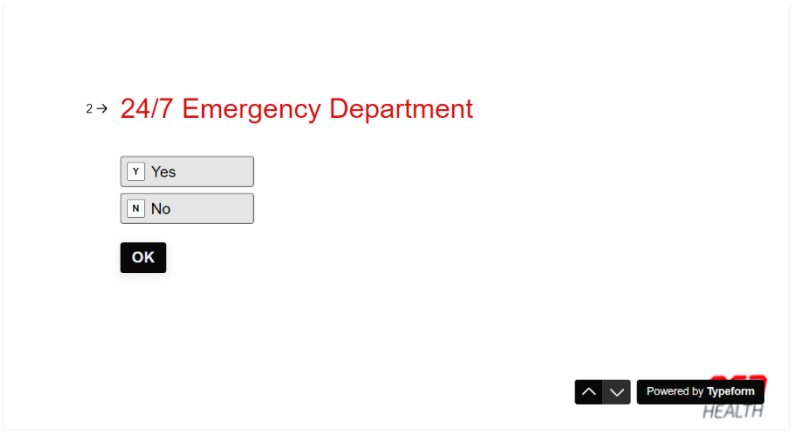
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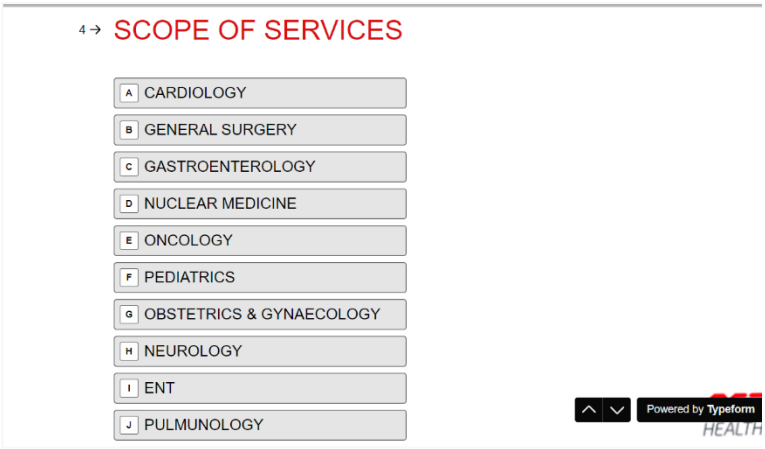
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B GENERAL SURGERY
C GASTROENTEROLOGY
D NUCLEAR MEDICINE
E ONCOLOGY
F PEDIATRICS
G OBSTETRICS & GYNAECOLOGY
H NEUROLOGY
I ENT
J PULMUNOLOGY
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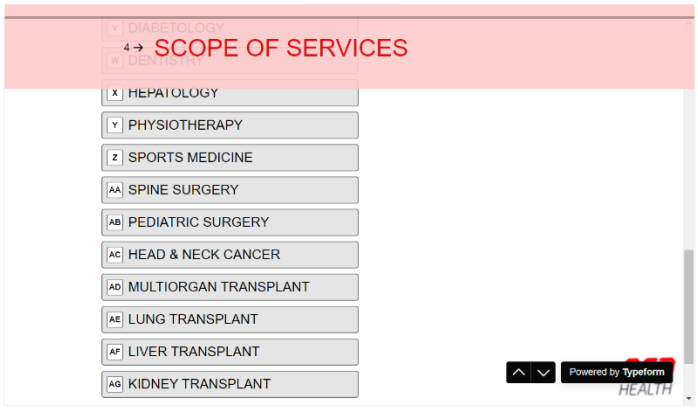
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W DENTISTRY
X HEPATOLOGY
Y PHYSIOTHERAPY
Z SPORTS MEDICINE
AA SPINE SURGERY
AB PEDIATRIC SURGERY
AC HEAD & NECK CANCER
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AE LUNG TRANSPLANT
AF LIVER TRANSPLANT
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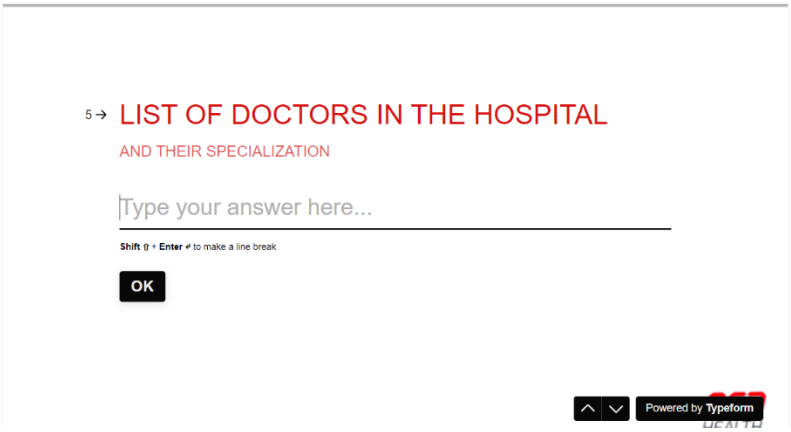
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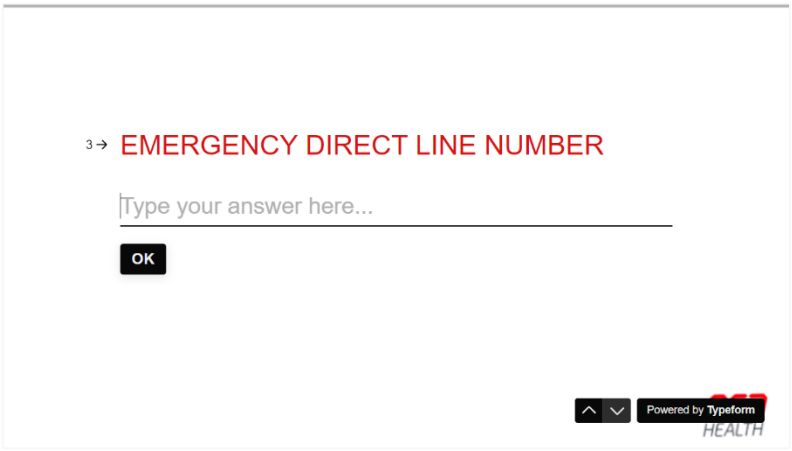
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