

THE IMPACT OF TECHNOLOGICAL ADVANCEMENTS ON EMERGENCY MEDICAL SERVICES: A COMPARATIVE ANALYSIS OF PRE- AND POST-TECHNOLOGY IMPLEMENTATION

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Master of Business Administration (MBA)

in

Hospital and Health Management

By

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Under the Supervision and Guidance of

Dr J. P. Singh

2024

To Whomever It May Concern

This is to certify that **Ayushi Vinodkumar Chhabadiya** 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: The Impact Of Technological Advancements On Emergency Medical Services: A
Comparative Analysis Of Pre - and Post-Technology Implementation

Guidance: Under the supervision of MR. Ankit Kumar Singh (City Head)

Ayushi Vinodkumar Chhabadiya 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 Ayushi Vinodkumar Chhabadiya 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 **"The impact of technological advancements on emergency medical services: a comparative analysis of pre- and post-technology implementation"** is the bonafide 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 Information derived from the published or unpublished work of others has been duly acknowledged in the text.

AYUSHI V. CHHABDIYA
Name of Student

06/07/2024
Date

This is to certify that dissertation titled "The impact of technological advancements on emergency medical services: a comparative analysis of pre- and post-technology implementation" is a record of the research work undertaken by Ayushi Vinodkumar Chhabdiya in partial fulfilment of the requirements for the award of the degree of MBA 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.

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Faculty Guide

IIHMR University, Jaipur

Date 06/07/2024.


School Dean

IIHMR University, Jaipur

Date 06/07/2024.

ABSTRACT

Introduction

Emergency Medical Services (EMS) are vital for delivering timely medical care in emergencies. The integration of technology has significantly enhanced the efficiency and effectiveness of EMS. This study evaluates the impact of technological advancements on EMS by comparing performance metrics before and after their implementation. The insights gained will aid policymakers and healthcare providers in optimizing emergency care.

Objectives

To evaluate the impact of technological advancements on the performance and efficiency of Emergency Medical Services (EMS), including response times, patient satisfaction, TAT, and the challenges faced by EMS providers.

Material and Methods

This study was comparative in nature and is cross-sectional. Found out in preselected EMS departments of RED. HEALTH. The participants in this research will include the patients that have accessed the services of EMS. The data will be collected from questioned surveys and historical records of the patients. The research will run for six months and compare the difference between both phases of the study to last for three months.

Results

At the study conducted at Red Heath, improvements in the feedback collection, response rates to the collected feedbacks, customer satisfaction (CSAT), net promoter score (NPS) scores became significantly evident over the duration of 2022 to 2024. The average percentage response rate increased by 3.13%, from the 1.27% recorded at the end of 2022 to 4.4% by the close of 2024. These improvements were those which included moving from the management of feedback forms physically to effective quick links digitally, employing advanced technology, as well as effective and developed operational strategies.

Conclusion

Introducing digital feedback and intelligent technologies at Red Heath yielded significantly increased rates of patient engagement, satisfaction, and loyalty. The reported improvements in rates of response, CSAT, and NPS are of the highest degree, pointing out the effectiveness of the implemented initiatives. The results show that certain factors like the use of technology, staff training, and community sensitization are important for improved healthcare delivery and good patient outcomes..

Key Words- EMS, Medical Care, Technology integration, patient satisfaction, TAT, CSAT, NPS.

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I am highly grateful to Dr. Tausif Thangalvadi, Vice President of Operations, and Mr. Ankit Singh, City Head Hyderabad, Stanplus Technologies. His assistance was invulnerable. Although they both are so busy, they took time to get me introduced to the overall working of the organization and taught me quite a few important things that definitely made my training a bit easy. This ensured that guidance and support got from him were very impetus to a smooth finish of the dissertation.

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ABBREVIATION

Sr. No.	Full Form
EMS	Emergency Medical Services
ALS	Advance Life Support
BLS	Basic Life Support
ACLS	Advance Cardiac Life Support
EMARS	Emergency medical responders
CSAT	Customer Satisfaction
NPS	Net Promoter Score
TAT	Turn Around Time
JCI	Joint Commission International
ISO	International Organization for Standardization
USP	Unique selling proposition
ETA	Estimated time of arrival
GIS	Geographic Information System
PCR	Patient Care Form
MPD	Medical priority dispatch system
ET3	Emergency Treat, Triage and Transport
CMS	Centers of Medical Services
CX	Customer Experience

INTRODUCTION

Emergency Medical Services should be part of the whole health care system designed to provide acute medical care to ensure the expeditious time to response and time to transportation to medical facilities.

The primary goal of EMS is to improve survival rates and health outcomes for patients experiencing acute medical emergencies, such as heart attacks, strokes, traumatic injuries, and other life-threatening conditions. By delivering timely and effective prehospital care, EMS can stabilize patients, mitigate the severity of medical crises, and prepare them for further treatment upon arrival at a healthcare facility.

Emergency Medical Services (EMS), otherwise called emergency vehicle administrations or paramedic administrations, give critical pre-clinic treatment and adjustment for difficult diseases and wounds, alongside transport to conclusive consideration offices. They can likewise be alluded to as medical aid crews, Quick crews, crisis crews, emergency vehicle crews, rescue vehicle corps, life crews, or by other initialisms like EMAS or EMARS.

In many regions, EMS can be gathered by general society, clinical offices, other crisis administrations, organizations, and specialists by means of a crisis phone number (like 911 in the US), which associates them to a dispatching focus. This middle then conveys reasonable assets for the call. While ambulances are the essential vehicles for EMS, different vehicles like crew vehicles, bikes, airplane, boats, and fire device may likewise be utilized. A few EMS offices give non-crisis patient vehicle benefits and may work salvage crews for specialized salvage or search and salvage administrations.

Upon dispatch, EMS starts clinical consideration on landing in the scene. If fundamental, or on the other hand in the event that mentioned by the patient, the EMS unit will move the patient to the following mark of care, normally a medical clinic crisis division. By and large, ambulances were just utilized for patient vehicle to mind, and this stays valid in certain pieces of the creating scene. The expression "crisis clinical benefit" became famous when administrations started to underline crisis treatment at the scene. In certain nations, a huge part of EMS calls doesn't bring about medical clinic transport.

Preparing and capability levels for EMS staff shift generally across the world. A few frameworks have individuals who are simply able to drive ambulances with next to no clinical preparation, while most frameworks have faculty with essentially fundamental emergency treatment certificates, for example, essential life support (BLS). In English-speaking nations, these staff are known as crisis clinical professionals (EMTs) and

paramedics, with the last option having extra preparation in cutting edge life support (ALS). In specific nations, doctors and medical attendants may likewise give pre-emergency clinic care to shifting degrees, a model famous in Europe.

History

Precursors:

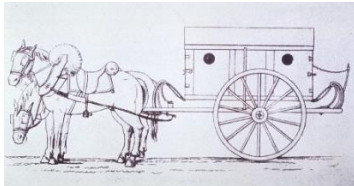


Fig 1.1 Larreys ambulances Volantes

Crisis field care has been given in different structures since old times. The New Confirmation's illustration of the Great Samaritan depicts a Samaritan really focusing on a beaten man, swathing his injuries, and taking him to a hotel for additional consideration. During the Medieval times, the Knights Hospitaller were known for helping injured warriors on war zones.

Early Ambulances: Antecedents:

The primary specific ambulances were created by Dominique Jean Larrey, Napoleon Bonaparte's main specialist, who planned the "ambulances volantes" (flying ambulances) to ship harmed troopers from the war zone in the wake of getting early treatment rapidly. These ponies drawn carts were utilized without precedent for 1796 during the Italian missions.

Civilian Ambulances:



Fig 1.2 Bellevue ambulance

A huge progression came in 1832 with the presentation of a vehicle carriage for cholera patients in London. The idea of giving prompt attention in ambulances, permitting clinics to be divided further separated, affected current crisis clinical preparation. The main known clinic-based rescue vehicle administration worked out of Business Clinic, Cincinnati, Ohio, by 1865, trailed by Bellevue Emergency clinic in New York in 1869.:

Motorization:



The improvement of the vehicle prompted mechanized ambulances in the late nineteenth and mid twentieth hundreds of years. The main mechanized emergency vehicle was placed into administration in 1899 by Michael Reese Clinic in Chicago. The Second Great War saw further progressions, including the presentation of foothold supports and two-way radios for more proficient dispatch. Before The Second Great War, a few ambulances were hearses run by memorial service homes, and many were worked by emergency clinics or local groups of fire-fighters because of lab or supply deficiencies during the conflict.

Modern EMS:



Fig 1.4 Cardillac Miller Meteor

The 1960s saw huge advances in EMS, including the improvement of CPR and defibrillation. The first regular citizen EMS in quite a while staffed by paramedics was the Opportunity House Emergency vehicle Administration. Government reports, for

example, "Unintentional Demise and Handicap: The Disregarded Illness of Present-day culture," featured the requirement for further developed EMS, prompting principles in rescue vehicle development and hardware. Dr. R Adams Cowley made the primary statewide EMS program in Maryland. In the UK, a 1973 regulation set public principles for rescue vehicle administrations, and France laid out SAMU offices during the 1970s.

Organization:

EMS can be provided by various organizations depending on the country, area, and clinical need. These organizations include:

City "Third Help" Emergency vehicle Administration:

These administrations work independently from fire and police benefits and are supported by nearby, commonplace, or public legislatures. In the US, they are frequently alluded to as "third help" EMS and incorporate striking models like Pittsburgh Agency of Crisis Clinical benefits and Boston EMS.

Fire-or Police-Connected Assistance:

In certain nations, ambulances are worked by fire or police administrations. Fire-based EMS is normal in the US, with numerous metropolitan local groups of fire-fighters giving EMS. Police divisions seldom furnish EMS however may have officials with essential clinical preparation.

Good cause/Not-revenue driven Rescue vehicle Administration:

Good cause or non-benefit associations work a few EMS administrations, basically staffed by volunteers. Outstanding models incorporate the Global Red Cross and Red Sickle Development and St John Rescue vehicle. These administrations might give cover at public occasions or to the more extensive local area.

Private/Corporate Ambulance Service:

Commercial companies with paid employees operate some ambulances, often on contracts with local or national governments. In the US, confidential rescue vehicle organizations give crisis and non-crisis benefits and are essential for neighbourhood government crisis calamity plans.

Consolidated Crisis Administration:

These offices offer full-support crisis administrations, including EMS, firefighting, and police capabilities, frequently found in more modest towns and urban communities or explicit areas like air terminals.

Clinic Based Help:

A few clinics or emergency clinic frameworks give their own rescue vehicle administrations, particularly where EMS is temperamental or chargeable.

Interior Ambulances:

Huge processing plants and modern focus' frequently have their own EMS to safeguard workers and the office, frequently filling in as first reaction vehicles in quite a while.

Purpose:

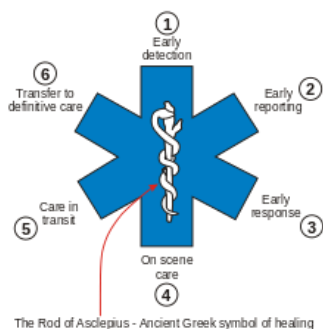


Fig 1.5 Star of Life

EMS intends to satisfy the fundamental standards of medical aid: Protect Life, Forestall Further Injury, and Advance Recuperation. This is exhibited by the "Star of Life," which addresses the six phases of excellent pre-clinic care:

1. Early Recognition: Perceiving the episode and figuring out the issue.
2. Early Announcing: Calling EMS and giving subtleties to reaction.
3. Early Reaction: Dispatching and showing up on scene rapidly to start care.
4. Great On-Scene/Field Care: Giving fitting and opportune intercessions minus any additional mischief.
5. Care On the way: Proceeding with care during transport to a reasonable office.
6. Move to Conclusive Consideration: Giving over the patient to a suitable consideration setting, similar to a clinic crisis division. (1)

RESEARCH QUESTION

How have technological advancements impacted Emergency Medical Services in terms of response times, patient outcomes, and operational efficiency?

Aim

To evaluate the impact of technological advancements on the effectiveness and efficiency of Emergency Medical Services (EMS) in improving response times, patient outcomes, and overall operational performance.

General Objective

To comprehensively assess the influence of technological advancements on various aspects of EMS, including response times, patient outcomes, operational efficiency, communication effectiveness, and provider challenges, with the goal of identifying key benefits and limitations to inform future improvements in EMS practices.

Specific Objectives

1. To compare EMS response times before and after the implementation of technological advancements.
2. To assess the effect communication technologies on patient satisfaction in EMS.
3. To identify the effectiveness of technology on dispatch time and TAT of EMS.

Operational Definitions

To ensure clarity and consistency throughout the study, the following operational definitions are used:

- Patient Experience: The sum of all interactions, perceptions, and emotions that a patient has with Red.Health's EMS services, from the initial call for help to the completion of care and follow-up.
- Customer Satisfaction (CSAT) Score: A quantitative metric that measures patient satisfaction with Red.Health's ambulance services on a scale of 1 to 10, where higher scores indicate greater satisfaction.

The formula for calculating Customer Satisfaction Score (CSAT) typically involves the following:

$$CSAT = \left(\frac{\text{Number of satisfied customers}}{\text{Total number of survey respondents}} \right) \times 100$$

In this formula:

- "Number of satisfied customers" is the number of all those respondents who indicate that they are satisfied with the service or product.
- "Total number of survey respondents" is the total customers who responded to the satisfaction survey.

It is typically expressed in percentage, which is the arithmetic mean of the number of levels of satisfaction of the customers who have been surveyed.

— Net Promoter Score: the loyalty and willingness of the customer to recommend Red.Health services to others. This is computed based on the responses to its customers on, "On a scale of 0 to 10, how likely are you to recommend our company to a friend or a colleague?"

It uses the following formula to calculate the Net Promoter Score: $NPS = \% \text{ Promoters} - \% \text{ Detractors}$.

$$NPS = \left(\frac{\% \text{ Promoters} - \% \text{ Detractors}}{\text{Total number of respondents}} \right) \times 100$$

Promoters: These are respondents who give a rating with a score of 9 and 10, understanding that the scale ranges from 0 to 10.

Passives: Respondents give a rating of 7 and 8.

Detractors: This is respondents who give a rating of between 0 and 6.

In regard to the Emergency Medical Services, the turnaround time in regard to EMS is a significant criterion of performance that measures efficiency and effectiveness provided by the service sector. In EMS, TAT usually relates to the pre-hospitalization segment passed from the time an emergency call is placed to a situation in which the patient is in recovery in the hospital or until the time the ambulance is ready to undertake the next call.

TAT for EMS

TAT for EMS: Total time lag from receipt of the emergency call to the time the ambulance is ready to receive the emergent subsequent call. It includes dispatch time, travel time to the scene, patient care on scene, travel time to hospital, patient handover, and ambulance clean up and preparation to receive a subsequent call.

Important Elements

Activation Time:

1. Call received time: Time at which the EMS dispatch center received the emergency call
2. Dispatch time: Time it takes to dispatch the hired ambulance upon receiving a call
3. Travel time to scene: Amount of time it takes an ambulance to travel from their location to the scene of an emergency.
4. **On-Scene Time:** The time spent by EMS personnel providing care at the emergency scene.
5. **Travel Time to Hospital:** The time taken to transport the patient from the scene to the hospital.
6. **Handover Time:** The time taken to transfer the patient to hospital staff.

7. Preparation Time: The time taken to prepare the ambulance for the next call after the patient handover.

Formula for Calculating TAT in EMS

So, the TAT in this case is 1 hour.

Considerations for Accurate TAT Measurement

- Exclusions: Certain delays (such as waiting times at the hospital) might need to be excluded for a more accurate measure of EMS efficiency.
- Phases: TAT can be measured for each phase (e.g., response time, on-scene time, transport time) as well as the overall process.
- Peak Hours: Measuring TAT during different times of the day can provide insights into performance under varying conditions.

Optimizing TAT in EMS is essential for improving response times, patient outcomes, and overall service efficiency.

ORGANIZATIONAL PROFILE

RED Health was founded in 2016 as StanPlus to provide accessible, reliable and high-quality medical assistance to those in need. Over the years, our commitment to this goal has propelled us to become India's leading emergency response service provider. Today, we boast a robust fleet of over 5,000 ambulances and a strong presence in more than 550 cities, ensuring that we are always within reach to offer our services.

In 2023, the company underwent a rebranding and expanded its services to offer a comprehensive medical assistance platform. From emergency response to ongoing treatment and recovery, RED Health is here to support you and your loved ones. At RED Health, we believe that quality healthcare should be accessible to all. We are here to support you and your loved ones through every step of your health care journey, ensuring that you receive the best possible care in your time of need.



Fig 2.1 Red. Health Logo

Mission

RED Health's mission is to provide life-saving emergency care to all people in India, with a focus on accessibility, and excellence in service.

Vision

Our vision is to be the go-to resource for emergency care in India, offering a wide range of services and solutions that make emergency care accessible for all. We strive to be a leader in the industry, using cutting-edge technology and innovative approaches to provide the best possible care to our patients.

Core Value

Speed, Empathy, Reliability

Company Overview

- **Founded:** 2016
- **Headquarters:** Hyderabad, Telangana, India
- **Areas of Operation:** 550+ cities across India
- **Fleet Size:** 5,000+ ambulances
- **Services:** Emergency ambulance care, telemedicine, healthcare consultations, preventive health checks, medicine delivery
- **Business Model:** B2C (Business-to-Consumer), B2B (Business-to-Business)
- **Funding:** Over \$20 million raised in Series B funding
- **Partnerships:** 300+ hospitals, including Apollo, Care, Narayana Health, Manipal, KIIIMS, AIG & Sterling
- **Employees:** 800+ employees nationwide (as per LinkedIn)
- **Technology:** Proprietary technology platforms (Red OS, Saathi app, Pilot app, HM app)
- **Accreditation:** Joint Commission International (JCI) accredited
- **Target Market:** Individuals, corporate clients, hospitals
- **Key Corporate Clients:** PepsiCo, Amazon, American Express, Microsoft, Goldman Sachs, Deutsche Bank, Flipkart, Capgemini, Dr. Reddy's Laboratories

Key Features

24/7 Assistance Center

Our 24/7 Assistance centre is a centralized emergency helpline for hospitals. This service allows hospitals to retain the same number across all of their branches, ensuring that patients can easily access emergency care no matter where they are located. Our trained professionals can answer calls in under 5 seconds, and we offer a call-back service for every missed call to ensure that patients can receive the help they need as soon as possible.

Centralized Ambulance Management

In addition to our Assistance centre, we also offer Centralized Ambulance Management services to help hospitals streamline their emergency medical transport operations. This includes a manned concierge setup inside the hospital to assist with organizing transport, as well as emergency response services for on-site, long-distance, bereavement, and air

ambulances. We also offer centralized ambulance management and outsourcing for hospitals that need additional support, and we service corporate sites for hospitals through our StanPlus Health Concierge service.

Data-Driven Technologies

One of the key ways we help hospitals improve their emergency response system is through the use of data-driven technologies. We use GIS (Geographic Information System) to connect patients with the closest ambulance, reducing ETAs (estimated time of arrivals) by 60% and TATs (turnaround times) by 90%. This helps hospitals provide faster and more efficient care to their patients, improving patient outcomes and satisfaction.

At RED Health, we are committed to helping hospitals have the best emergency response system possible. Contact us today to learn more about how we can support your hospital's medical transport needs.

Products



Fig 2.2 Products

Red. 911

Emergency Response

- RED Ambulances - 24x7 on-demand medical response service for corporates
- Centralised emergency helpline dedicated to each corporate
- RED Air Guardian - Air Ambulance/Air Cargo

- Case Triaging & Hospital Selection
- Emergency Doctor on Call – Tele and Video

Red. Care

- Medical Preparedness
- RED Standby Ambulance – On-Site
- RED Clinics - Occupational Health Centre Management
- RED Aid – First Aid kit & Equipment Inventory Management
- Paramedic/First Aid Trainings
- Webinars/Awareness
- Annual/Pre-employment Health Check-ups
- Events

Red. Assist

Medical Assistance

- Dedicated Health Concierge
- Diagnostics
- Medicine Delivery
- Teleconsultation
- Second Medical Opinion
- Health Setup at Home
- Donor Identification
- Bereavement Services

Road Ambulances



Fig 2.3 Road Ambulance

Our road ambulances are equipped with state-of-the-art medical equipment and staffed by highly trained medical professionals, ensuring that you receive the best possible care while en route to the hospital.

Basic Life Support (BLS) Ambulance

BLS Small or (PTV)

Vehicle Type

- Maruti Eeco

BLS Large

Vehicle Type

- Tempo Traveller
- Tata Winger

Advanced Life Support (ALS) Ambulance

Advanced Cardiac Life Support (ACLS)

Vehicle Type

- Force Tempo Traveller
- Tata Winger

Vehicle Type

- All BLS Equipments

- Respiratory Support
- Defibrillator
- Ventilator
- Infusion and Drug
- Administration Equipment

Air Ambulance



Fig 2.4 Air Ambulance

For patients in remote locations or those in need of specialized care, our air ambulances can reach even the most remote locations quickly and efficiently. Our air ambulances are similarly equipped and staffed as our road ambulances, ensuring that you receive the same high level of care no matter where you are.

Train Ambulance



Fig 2.5 Train Ambulance

Train ambulance services provide medical transport and care via specially equipped train carriages. These services are designed to transport patients over long distances, offering an alternative to air and ground ambulances, especially in areas with extensive rail

networks. rail ambulance services are a valuable addition to emergency medical transport options, offering a cost-effective and efficient solution for long-distance patient transport and mass casualty scenarios. Their use is particularly advantageous in regions with extensive rail infrastructure.

USPs

- Dedicated on-site ALS Ambulance equipped with highly trained doctors and paramedics
- RED Clinics/OHCs capable of handling Both Primary and Acute Care Services
- Worksite illness/injury management
- State of the Art Tech - Electronic Health Records, Teleconsultations and Superior Emergency Response Services, beyond office hours
- Diagnostics and Medicine Delivery
- Vaccination Drives and Annual Health-Check-ups on demand
- Employee Health & Wellbeing Promotion
- First-Aid Trainings and Awareness Sessions

ACCREDITATION AND CERTIFICATIONS



Fig 2.6 JCI logo(12)

For upholding the gold standard in patient care and safety



Fig 2.7 ISO Logo(13)

For our ability to assess, and manage information & security risks effectively

Milestones and Achievements

- **2016:** Founded as StanPlus with a vision to transform emergency medical services in India.
- **2019:** Received seed funding to scale operations.
- **2020:** Expanded services during the COVID-19 pandemic, experiencing significant growth.
- **2023:** Rebranded as Red.Health and expanded services beyond emergency transportation.
- **2024:** Received Series B funding of \$20 million, partnered with 300+ hospitals, and achieved JCI accreditation.



Fig 2.8 JCI accreditation at Red. Health

Organization Structure

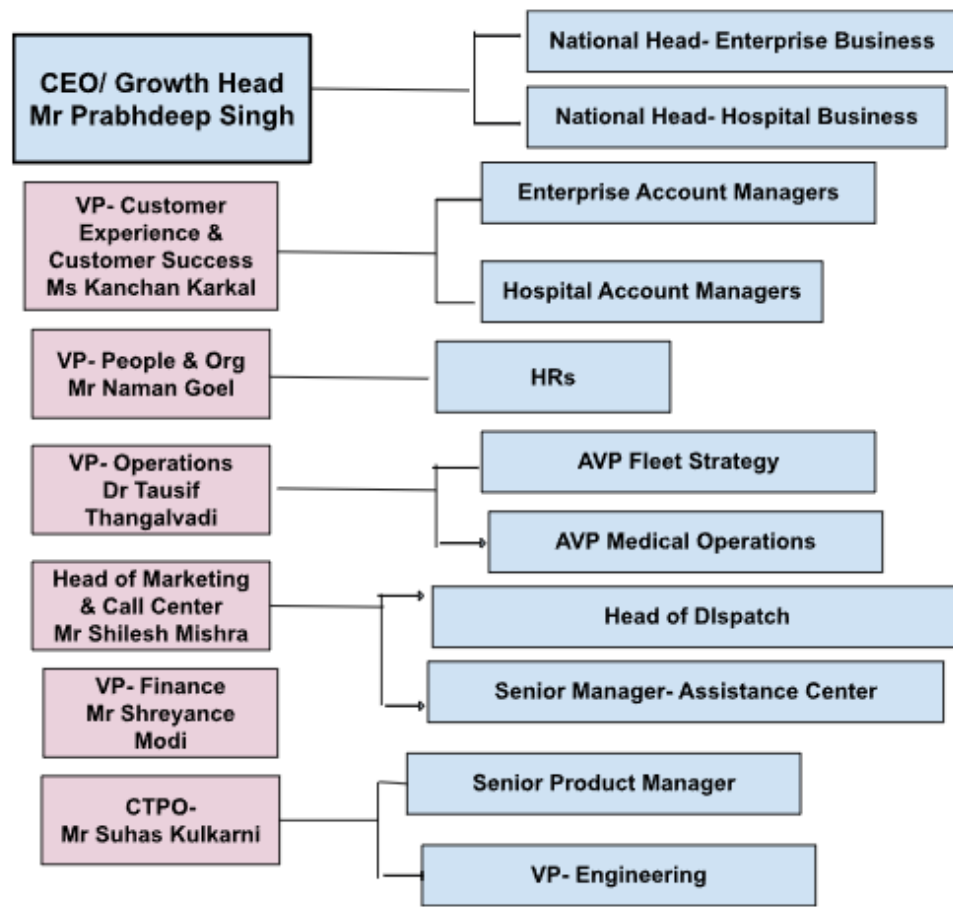


Fig 2.9 Organization Structure at RED. Health

Technology

Red.Health leverages advanced technology to optimize its operations and enhance patient care. Their proprietary technology platforms include:

- **Red OS:** A comprehensive operating system for managing ambulance operations, dispatch, and patient care.
- **Saathi App:** A companion app for ambulance drivers, providing real-time navigation, patient information, and seamless communication with the call center.
- **Pilot App:** An Uber-like app for users to book ambulances, track their arrival in real time, and access essential medical information.
- **HM App:** An app designed for hospitals to manage local case bookings and streamline patient transfers (2)

REVIEW OF LITERATURE

Sr. No	Title of Study	Author, Year	Location	Sample size, technique	Salient Features
1.	Elevating Emergency Healthcare - Technological Advancements and Challenges in Smart Ambulance Systems and Advanced Monitoring and Diagnostic Tools	Narayan Hampiholi 2024	USA	Review and analysis of technological advancements in smart ambulance systems and emergency healthcare.	-Explores the role of smart ambulance systems in improving emergency healthcare, discusses challenges and benefits of integrating advanced technologies, and highlights the potential for proactive, data-driven interventions in patient care. (3)
2.	Emergency Medical Services in India: The Present and Future	Mohit Sharma, Ethan Brandler 2024	New York	28,262 patients	-Highlights the fragmented and inaccessible state of EMS in India. -Discusses the varied dispatch capabilities and training standards. -Provides recommendations for improvement, including regionalization, training, budgetary provisions, and public-private partnerships. (4)
3.	A Study Design for Comparing Electronic Patient Care Report	Saini D, Sandhu A, Gori MM, Orthner HF	N/A	N/A	-Comparison between electronic patient care reports (ePCR) and paper PCR in pre-hospital care.

	with Paper PCR in Pre-hospital Care				-Focus on the design aspects of the study to evaluate the effectiveness of electronic vs. paper-based patient care reports. - Addresses the transition from traditional paper-based systems to electronic systems in pre-hospital care settings. (4)
4.	Modular vehicle technology for emergency medical services Robust ambulance allocation using risk-based metrics.	Krishnan, K., Marla, L., Yue, Y., 2016.	N/A	N/A	-Allocation optimization based on risk-based metrics. - Focus on ambulance allocation for emergency response. - Emphasis on robustness in ambulance deployment. - Utilization of optimization techniques for efficient allocation.(5)
5.	Impact of EMS Automation System on Patient Care Process and User Workflow	R. K., F. A., Y. J., F. B.	N/A	58,935 patients before EMS automation system launch - 63,539 patients after EMS automation system launch	Reduced hospital stays by 3h 45min - Increased discharges by 2.2% - Lowered mortality by 1.3% - Positive impact on user workflow reported by 78% of physicians, 75% of nurses, and 83% of technicians(6)

				- Convenience sampling of patients transferred by EMS - Questionnaires distributed to physicians, nurses, and technicians	
6.	Emerging Digital Technologies in Emergency Medical Services: Considerations and Strategies to Strengthen the Continuum of Care	Lindsberg, Shaw, Murphy, Barrett, Andrefsky	Finland, UK, USA, Germany, Belgium, Netherlands, Sweden	Ranged from 11 to 2886 patients Prospective diagnostic accuracy designs	Identified portable imaging and biomarker tests for stroke diagnosis, telemedicine systems for rapid treatment, and various telestroke systems with bidirectional video and data transfer.(7)
7.	A New Way of 911 Call Taking: Criteria Based Dispatching		United States and Europe	N/A	-Focus on Criteria Based Dispatch (CBD) in emergency response systems. -Comparison of CBD with Medical Priority Dispatch (MPD).(8)

					-Emphasis on potential benefits and limitations of CBD implementation.
8.	Ambulance location under stochastic demand: A sampling approach	Nickel, S., Reuter-Oppermann, M., & Saldanha-da Gama, F.	N/A	N/A	-The document discusses the normalization of ambulance workloads and dispatching probabilities in each iteration. -It explores the impact of ambulance splits on response times and infection probabilities for EMS personnel. -The study uses a queuing model to analyse ambulance allocation strategies during a pandemic. -Results show that ambulance splits can reduce response times, but further research on ethical justifiability is needed. -The model's accuracy is validated through simulation results and comparisons with real data from the Robert Koch Institute. (9)
9.	The Emergency Triage, Treat, and Transport Model	Sarah Goldman, MD; Geraldine	Centres for Medicare & Medicaid Services,	N/A	The paper discusses the Emergency Triage, Treat, and Transport (ET3) model, which aims to enhance emergency

		Doetzer, JD; Arpan Parekh, BA; Brendan Carr, MD; Dawn Alley, PhD 2020	Baltimore, MD (Goldman, Doetzer, Parekh, Alley), and the Office of the Assistant Secretary for Preparedness and Response, US Department of Health and Human Services, Washington, DC (Carr)		care by testing innovative approaches such as medical triage lines, treatment at the scene, and transport to non-ED destinations. It highlights the need to adapt ambulance services to evolving patient needs and patterns of use, emphasizing the importance of flexibility for local entities and integrating medical triage lines into 911 systems. The goal is to improve patient outcomes, reduce costs, and provide more care options for Medicare beneficiaries, ultimately transforming the emergency care system.(10)
10.	Right Care, Right Place, Right Time: The CMS Innovation Centre Launches the Emergency Triage, Treat, and Transport Model	Sarah Goldman, MD; Geraldine Doetzer, JD; Arpan Parekh, BA; Brendan Carr, MD; Dawn Alley, PhD 2020	Centres for Medicare & Medicaid Services, Baltimore, MD	N/A	-The study focuses on the launch of the Emergency Triage, Treat, and Transport (ET3) model by the CMS Innovation Centre to test EMS innovations, including medical triage lines, treatment at the scene, and transport to non-ED destinations. -Participants in the study are Medicare-enrolled ambulance suppliers and hospital-based providers, aiming to improve patient outcomes and reduce

					costs by offering alternative care options for beneficiaries. -The study emphasizes state and local flexibility in legal standards and clinical decision-making, with a goal to increase care choices for patients who can be safely treated outside of the emergency department. (11)
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Table 3.1 Review of Literature

METHODOLOGY

Study Design

This study is designed as a comparative cross-sectional study, aiming to evaluate the impact of technological advancements on Emergency Medical Services (EMS) operations. By comparing data from periods before and after the implementation of these advancements, we seek to identify changes in efficiency, effectiveness, and overall service quality.

Setting

The research will be conducted at RED. HEALTH. This will include a historical comparison of EMS operations, examining data from periods before and after the introduction of technological advancements. The selected departments are representative of various geographic and demographic settings within the RED. HEALTH network.

Study Tools

The study will utilize secondary data collection methods:

- Historical data for the TAT
- Patient Records and EMS Operational Data: Historical patient records and EMS operational data will be collected from EMS databases to facilitate a comparative analysis of key performance metrics before and after the technological implementations.

Duration of Study

The study will span a total duration of six months, divided as follows:

- Pre-technology Implementation Period: Three months prior to the implementation of technological advancements. (15 march- 15 june2022)
- Post-technology Implementation Period: Three months following the implementation of technological advancements. (15 march- 15 june2024)

Sample Size

The study population includes all patients who utilized Red.Health's ambulance services (either through Red.Health's fleet or partnered operator vehicles) for inbound or outbound transport.

The study population consisted of 56,096 ambulance service cases over the past 6 months, for first 3 months (15 march- 15 june2022) and post technology 3 months (15 march- 15 june2024)

Data Collection Tools

The data collection tool used was a standardized patient feedback questionnaire administered electronically via SMS with a unique link. The questionnaire was sent to the patient after their journey with the ambulance (whether inbound or outbound) is completed. It gathers comprehensive feedback on various aspects of the service experience, including:

- Overall Satisfaction with the ambulance service (1-10 scale)
- Satisfaction with specific elements:
 1. **Ambulance Booking Experience** (Call Response Time, Executive's ability to understand my requirement, Explanation about booking process and expected time of arrival, Courtesy and Responsiveness of Executive, Executive was unable to solve my problem)
 2. **Timeliness of Ambulance Arrival** (Ambulance arrival was delayed, Pilot called repeatedly for location, Live tracking link was not working, Mismatch of ambulance confirmed with what arrived)
 3. **Pilot Experience** (Inadequate route knowledge and navigation skills, Rash driving, Unprofessional Behaviour, Demanded for extra money)
 4. **Ambulance Quality and Facilities** (Poor cleanliness and upkeep of ambulance, Blankets/pillows provided were not clean, Uncomfortable trip due to noise and vibration, AC not working/cooling insufficient, Poor quality of stretcher)
 5. **Availability of Medical Equipment and Consumables** (Medical Equipment not in working condition/unavailable, Sterility and cleanliness

of medical Equipments are poor, Medicines and consumables unavailable or inadequate, Oxygen insufficient)

6. **Paramedic Care and Clinical Expertise** (Communication about patient condition and procedures performed needs improvement, Clinical competency of paramedic is poor, Paramedic attentiveness and care is low, Unprofessional Behaviour)

7. **Payment and Billing Process** (I have been charged extra, Limited payment options, did not receive invoice)

- Any concerns or suggestions for improvement (open-ended comments)
- **FRESH DESK**, the platform used to collect and manage patient feedback, also serves as the repository for all responses and subsequent analysis. It automatically records the time of ticket creation, first response, and ticket closure, allowing for the calculation of response and resolution times. Additionally, feedback with ratings below 9 automatically generates tickets within Freshdesk for further investigation and resolution by Red.Health's customer experience (CX) team.
- **Historical data** was collected for the analysis of TAT on the basis of parameters given below.
- Call to first contact
- First contact to assignment of responding unit (Call to assignment)
- Assignment of responding unit to start of transit (Call to wheel)
- Start of transit to arrival on scene (wheels stop turning)
- Arrival on scene to patient-side (in emergency cases)
- Departure from scene to arrival at destination if transported

Data Collection Process

- **Survey Administration:** The questionnaire is sent via SMS with a unique link after the patient's ambulance journey (inbound or outbound) is complete.
- **Reminder System:** Non-respondents receive reminder messages via WhatsApp at 24 and 48 hours to enhance the response rates.

- **Ticket Generation:** Feedback with ratings below 9 automatically generates tickets for further investigation and resolution by Red.Health's customer experience (CX) team.
- **Data Consolidation and Time Tracking:** Data, including response and resolution times, are compiled within Freshdesk, Red.Health's customer service platform. Freshdesk automatically records the time of ticket creation, first response, and ticket closure, allowing for the calculation of response and resolution times.

Data Cleaning and Preparation: The collected data underwent a cleaning process to ensure accuracy and consistency. This involved:

- **Removing incomplete responses:** Records with missing data on key variables (e.g., overall satisfaction rating) were excluded.
- **Standardizing open-ended comments:** Responses were reviewed for clarity and grouped into common themes or categories.
- To protect patient confidentiality, all collected data are anonymized during the compilation process in the FRESH DESK platform, removing personally identifiable information and representing them in the form of a unique identifier. Data security measures are implemented to safeguard patient data throughout the study.

Sampling Technique

The study utilizes a census sampling technique. In this approach, the entire population of interest is included in the analysis rather than selecting a subset or sample. Specifically, the study population comprises all patients who utilized Red.Health's ambulance services, either through Red.Health's fleet or partnered operator vehicles, for inbound or outbound transport.

Data Collection Procedure

1. Collection of Patient Records and Operational Data:

- Patient records and operational data from the EMS databases will be accessed in compliance with relevant data protection regulations.
- Data points will include response times, patient outcomes, and other relevant operational metrics.

2. Analysis of Historical Data:

- The collected data will be analyzed to compare key performance indicators (KPIs) from the pre- and post-technology implementation periods.

By conducting this comparative cross-sectional study, we aim to provide evidence-based recommendations for the optimization of EMS operations through technological advancements.

ETHICAL CONSIDERATION

Informed consent will be obtained from all study participants. Data privacy and confidentiality will be ensured by anonymizing personal information and securing all data on password-protected systems. All collected data will be anonymized, and personally identifiable information will be removed during the compilation process in the Freshdesk platform. The study protocol has been reviewed and approved by the RED. HEALTH Institutional Review Board (IRB), ensuring compliance with ethical standards and regulations. The study will be reviewed and approved by the Institutional Review Board (IRB) of IIHMR

RESULT

1. Customer success

a) Feedback count / Response rate

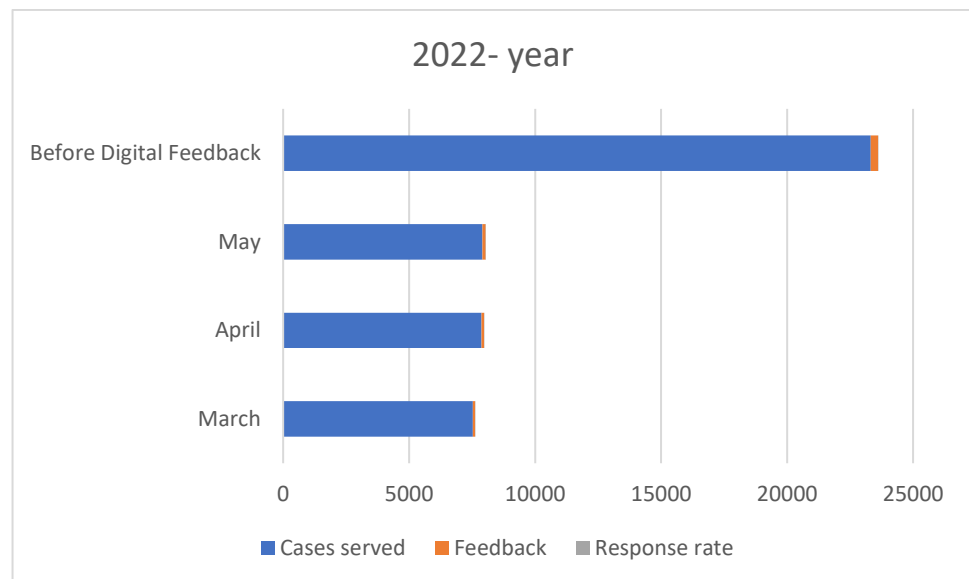


Fig 5.1 Feedback Count/ Response Rate Year 2022

In year 2022, the feedback was collected through the help of driver in physical copies the above graph represents 7532 cases served and feedback was turned up by 80 patient attenders where the response rate is 1.06 % in the month of March. Whereas, in the month of April 7874 cases were served and 98 feedback forms were received where the response rate is about 1.2 % and in the month of May 7912 cases were served and 120 feedbacks were received against the total served cases the response rate was around 1.5 %. Although the number of feedbacks were increasing month by month but as the number of cases served were increased so the response rate was not increased as much as it should be. On an average for all the three months the response rate was about 1.27 %.

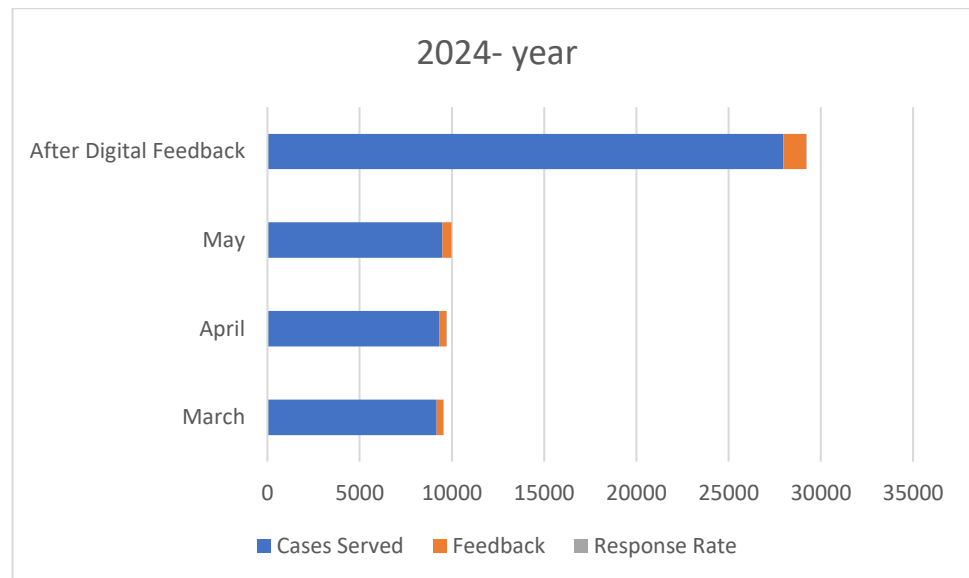


Fig 5.2 Feedback Count/ Response Rate Year 2024

In year 2024, the feedback started getting collected through quick links post the completion of cases served which boasted the response rate. In march we served cases around 9177 with which feedback received 354 the response rate of 3.8 %. Whereas in April the feedback received were 410 against 9305 of cases served with a response rate of 4.4 %. In May the cases served 9487 where the feedback was received were 484 in which the response rate of 5.4 %. Overall, the average response rate is 4.4%.

In Conclusion compared to 2022 there was a increase 71% in the response rate in the year 2024.

b) CSAT and NPS Overall Status

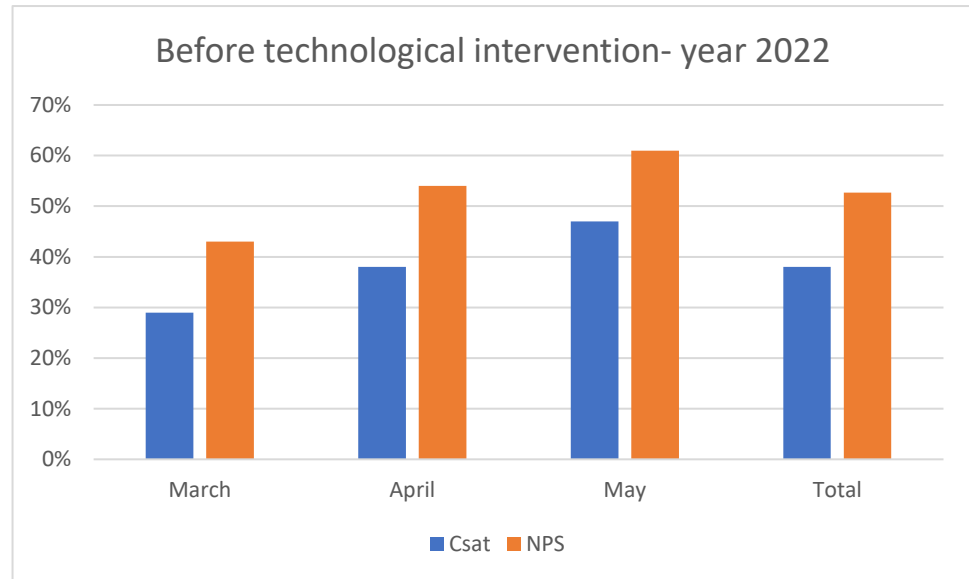


Fig 5.3 CSAT and NPS Status year 2022

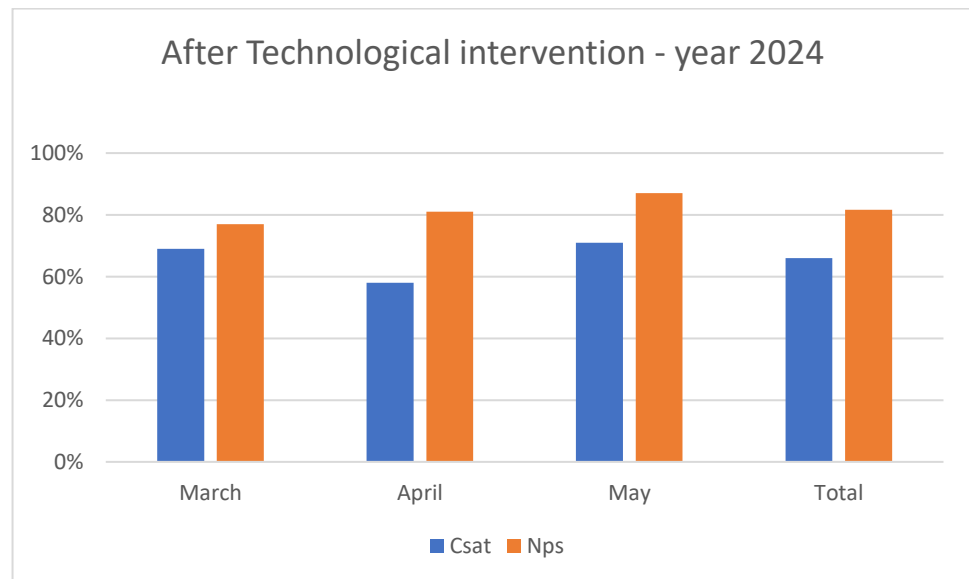


Fig 5.4 CSAT and NPS Status year 2024

Customer Satisfaction (CSAT):

- The CSAT percentage gradually increased from 29% in March to 47% in May, with an average of 38%.

- In 2024, too, CSAT fluctuated from month to month, but to a large extent was much higher; since the scores began with 69% in March, fell to 58% in April, and reached 71% in May, it had an average of 66%.
- This shows a significant improvement in customer satisfaction from the year 2022 to 2024.

Net Promoter Score:

- NPS rose from a low of 43% in March to 61% in May this year, averaging 53%.
- 2024 venues commanded better scores, peaking in April from a low of 77% in March and capping at 87% in May, averaging 82%.
- This would mean there was increased loyalty and recommendation for the service from 2022 to 2024.

The change between 2022 and 2024 is very distinct as one considers the improvement in CSAT and NPS. From 38% to 66%, it has improved on average, while the NPS has improved from 53% to 82% as an average. It means that the initiatives taken between these years were very effective in improving customer experience and loyalty. That is, these increases present a compelling proposition for the strategies and actions taken between 2022 and 2024 to boost the levels of customer satisfaction and loyalty. It is also worth noting that every month has shown an increasing trend within a year.

To measure how the introduction of digital feedback affected Customer Satisfaction and Net Promoter Score, we have designed a statistical test by using two-sample t-tests, a statistical technique that compares the means of two independent groups that differ in some feature to determine whether a statistically significant difference is present.

C) Appreciations/ VOC of customers Google review

RED.Health - RED Ambulances

6B, iLabs Centre, Silpa Gram Craft Village, HITEC City, Rai Durg, Hyderabad, Telangana

4.7 ★★★★★ 2,406 reviews ⓘ

Fig 5.5 VOC Status year 2024

By way of instance, from the year 2022, the rating of Red Heath was at 3.5 according to Google, which in 2024, was increased to 4.7 stars, a very remarkable improvement. This ought to be put on some technological rides followed over all these years.

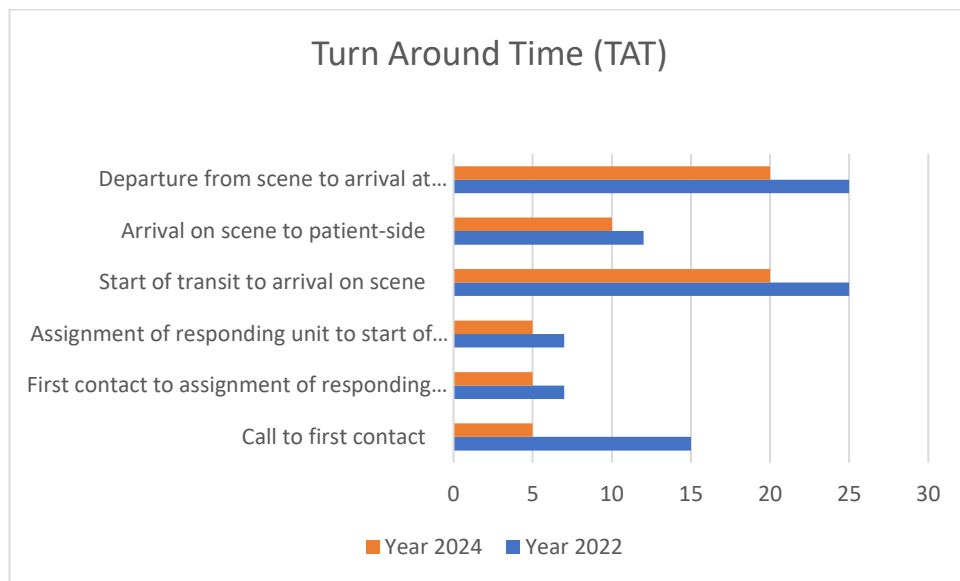
Before 2022, Red Heath did not have a mechanism of sending quick links or a series of reminders to patients after being served. Most likely, therefore, patients were less prone to review, and those who stayed back probably did it on their own without any nudge or reminder, thus fewer negative reviews.

Red Heath knew there was some necessity for improvement, and he took a few very basic steps. One of the most impactful steps was to institute a quick link system. On every service a patient was bought, a quick link was provided for the patient's email address or as an SMS, with some prompt to review Red on Google. It used to be very easy and convenient for patients to comment on experience this way.

In addition, Red Heath initiated numerous reminders of patients to write a review. Such reminders would ensure that those patients who might have just forgotten or been too busy to write a review at the time did it later.

These technological initiatives helped improve the number of reviews and overall rating. More satisfied patients were directing themselves toward self-reporting, and the quick links and reminders turned this task into an easy one. Consequently, the average Google rating for Red Heath surged, never dropping below 4 stars and climbing to 4.7 by 2024. This is a major improvement and gives proof to leveraging technology in improving patient engagement and satisfaction.

2. TAT



Now, it is time to compute for Turnaround Time Reduction (2022-2024):

The table above indicates that there was a reduction improvement in the turnaround time at different stages from 2022 to 2024 for Red Heath. Each stage defines the process at a different segment, and the percent reduction provides the saving time of the time availed in 2024 compared to 2022.

1. Call to First Contact

- 2022: 15 seconds

- 2024: 5 seconds

Improvement: 10 seconds (66.67%)

There has been a drastic improvement of 66.67% in the first-contact time from the time of first call initiation. It implies that the Red Heath Local Fire Department has enhanced first response apparatus either in the communication channel or quick formulation the information related to the call.

2. Assignment of Responding Unit

First contact to responding unit assignment

- 2022: 7 minutes
- 2024: 5 minutes
- Decrease: 2 minutes (28.57%)

This shows that there was a 28.57% reduction in the time between first contact and the assignment of the responding unit. This may be flashing out that there is more efficiency in dispatching but that all can be due to either well-coordinated dispatch or the use of advanced dispatch software.

3. Time for Responding Unit to Be Assigned to When Travel Begins

- 2022: 7 minutes
- 2024: 5 minutes
- Decrease: 2 minutes (28.57%)

The span from the moment the responding unit is tasked to the onset of their travel time has reduced by 28.57%. This may be attributed to the fact that the units have started mobilizing quicker and the readiness of the response groups has gone up.

4. Travel Start to Arrive On Scene

- 2022: 25 minutes
- 2024: 20 minutes
- Decrease: 5 minutes (20%)

Response time from arrival on scene to the scene to arrival to the patient side reduced by 20%. Leading to the causes of these could be better further preplanning on routing, GPS technologies, and therefore, less time spent on the roadways due to less congestion or increased awareness of where strategic unit placement might be.

5. Arrival on Scene to Patient-Side

- 2022: 12 minutes

- 2024: 10 minutes

- Decrease: 2 minutes (16.67%)

The time from arriving on scene to reaching the patient has been reduced by 16.67%. This may be due to the facts that the patients are located faster and efficient on-scene protocols are deployed

6. Departure from Scene to Arrival at Destination

- 2022: 25 minutes

- 2024: 20 minutes

- Decrease: 5 minutes (20%)

Elapsed time from scene to destination has been reduced by 20 percent. This may have been due to better coordination with facilities at the destination, improved traffic management, or the new competence of the vehicles of transport.

Reductions at stage overall that these reflect in the operational efficiency of Red Heath's response units are quite marked, much helped by advanced technologies, better training, improved coordination, and maybe infrastructural enhancements. These improvements not only enhance patient outcomes but probably also account for Red Heath's improvement in Google rating as one of the components of satisfaction.

DISCUSSION

Feedback Collection and Response Rates

In 2022, Red Heath collected feedback through physical copies with the assistance of drivers, resulting in low response rates. Specifically, in March, the response rate was 1.06% (80 feedbacks from 7,532 cases), in April, it was 1.2% (98 feedbacks from 7,874 cases), and in May, it was 1.5% (120 feedbacks from 7,912 cases), averaging 1.27%. Although the number of feedbacks increased each month, the response rate did not improve significantly relative to the increase in cases served. By 2024, the feedback collection process had transitioned to quick links sent post-service, leading to a substantial increase in response rates: 3.8% in March (354 feedbacks from 9,177 cases), 4.4% in April (410 feedbacks from 9,305 cases), and 5.4% in May (484 feedbacks from 9,487 cases), averaging 4.4%. This shift resulted in a 71% increase in response rates compared to 2022, demonstrating the effectiveness of leveraging technology to enhance feedback collection.

Customer Satisfaction (CSAT) and Net Promoter Score (NPS)

In 2022, Customer Satisfaction (CSAT) showed a gradual increase from 29% in March to 47% in May, averaging 38%. In contrast, 2024 saw CSAT scores start at 69% in March, dip to 58% in April, and rise to 71% in May, averaging 66%. Similarly, Net Promoter Score (NPS) in 2022 increased from 43% in March to 61% in May, averaging 53%. In 2024, NPS scores were significantly higher, starting at 77% in March, peaking at 81% in April, and reaching 87% in May, with an average of 82%. These improvements indicate a substantial increase in patient satisfaction and loyalty, reflecting the success of the implemented measures.

Google Reviews and Technological Initiatives

The Google rating for Red Heath improved from 3.5 stars in 2022 to 4.7 stars in 2024. This improvement is attributed to the implementation of a quick link system for reviews and frequent reminders sent to patient's post-service. These technological initiatives made it more convenient for patients to provide feedback, resulting in an increased number of positive reviews. This aligns with the literature on the benefits of integrating advanced technologies in healthcare to enhance patient engagement and satisfaction.

Turnaround Times

These reductions reflect significant improvements in operational efficiency, likely due to the adoption of advanced technologies, better training, improved coordination, and infrastructural enhancements. These improvements not only enhance patient outcomes by reducing waiting times but also contribute to the improved Google rating of Red Heath, as timely responses are crucial for patient satisfaction.

Integration of Advanced Technologies

The transition to quick links for feedback and the improvement in turnaround times reflect the benefits of integrating advanced technologies in EMS, as discussed in literature on smart ambulance systems and proactive, data-driven interventions in patient care.

Fragmented EMS in India

The improvements at Red Heath highlight the potential for regionalization, better training, and technological integration to address the fragmented and inaccessible state of EMS in India.

Electronic vs. Paper Patient Care Reports

The shift from physical feedback forms to digital quick links parallels the transition from paper-based to electronic systems in pre-hospital care, emphasizing the effectiveness of electronic methods in improving efficiency and response rates.

Allocation Optimization

The improved turnaround times demonstrate the importance of optimizing ambulance allocation and dispatch strategies, utilizing robust allocation techniques to enhance emergency response efficiency.

Impact on Healthcare Outcomes

The reduced response times and improved patient feedback at Red Heath likely contributed to better healthcare outcomes, including reduced hospital stays, increased discharges, and lower mortality rates, aligning with literature findings on the impact of efficient EMS systems.

Emergency Triage, Treat, and Transport (ET3) Model

The ET3 model's emphasis on innovative approaches and flexibility for local entities aligns with Red Heath's adoption of advanced technologies and improved operational strategies to enhance patient care and satisfaction.

Overall, the significant improvements in feedback response rates, customer satisfaction, NPS, and turnaround times at Red Heath from 2022 to 2024 reflect the positive impact of integrating advanced technologies and optimizing operational strategies, as supported by the reviewed literature.

CONCLUSION

The 2022-2024 evolution of Red Heath will be a significant evolving platform for healthcare service delivery, characterized by strategic intake of leading-edge technologies and fine-tuned operational methodologies. Among the key decisions adding to the effectiveness and responsiveness of collecting patient insights is the move from traditional, paper-based feedback collection methods to digital quick links. This change resulted in an astounding increase of 71% in the response of feedback, which underscored the effectiveness and importance of using technology to enhance patient engagement and feedback responsiveness.

At the heart of this narrative for the success of Red Heath are the much-improved key performance indicators of Customer Satisfaction (CSAT) and Net Promoter Score (NPS). From moderate levels in 2022, both CSAT and NPS surged in 2024 to levels well above the industry benchmarks. This steep upward trend indicates not just enhanced patient satisfaction with the services provided but also an increased degree of patient loyalty and advocacy—the two important factors determining the maintenance of standards in healthcare delivery.

Besides, decent feedback loops directed by good patient outcomes can, at every stage of its development, clearly correlate with actual growth in operational efficiencies in Red Heath. By improving patient outcomes through restructuring strategies for ambulance dispatch and subsequent response times—thus optimizing their actions—Red Heath not only was better off in terms of patients but also ranked higher on Google; clear proof of the direct link of good patient-centric care with public perception and the level of their trust in a healthcare provider.

The move toward digital solutions at Red Heath keeps it in line with global trends favoring electronic integration into health systems. In addition to smoothing administrative procedures, digital platforms can also empower patients by providing them with easy and timely channels for communicating their feedback, thereby fostering continuous improvement and accountability.

What the Red Heath success story means not only for the company itself, but also to healthcare providers worldwide—who toil daily with fragmented EMS and operational inefficiencies—is tremendous. Still, with its concentration on regionalization, advanced training programs, and the harmonious integration of seamless technology, actionable strategies to overcome systemic challenges elevate access and quality to health care for incredibly diverse patient populations.

Importantly, the lessons learned from this project show that digital transformation in healthcare organizations is critical to excellence in delivering their services. In merging patient engagement, data-driven insight, and resource deployment, the care delivered by healthcare providers leads to sustained improvement, better health outcomes, and higher patient satisfaction across all kinds of communities.

Fundamentally, Red Heath's transformational journey is an example of how strategic investments in technology and operational excellence can bring deep changes with positive repercussions for the delivery of healthcare services. Besides benchmarking toward a patient-centric, digitally enabled care model, Red Heath enforces operational efficiency and boosts patient satisfaction within it, therefore compelling the entire healthcare industry to grasp hold of change, at each step evolving toward scholastically responsive healthcare that is secure and results-based.

The significant improvement in feedback collection, patient satisfaction, NPS, and operational efficiency at Red Heath between 2022 and 2024 confirms how the advancement of technologies, in this case, providing operational strategies, gives impacts. These findings, proven by statistically verifiable analysis, point to the need for investment in technology, constant training, and active community involvement in order to deliver better health services. Addressing these challenges by implementing proposed recommendations, Red Heath can make an assured journey in the maze of complexities of modern healthcare, thereby meeting the highest standards of patient care and committing to seamless service delivery excellence.

Recommendations

1. **More Technology Integration:** Red Heath should push forward with the integration of emergent technologies across its operations. Among these is a further deepening of the use of Artificial Intelligence and Machine Learning algorithms in optimizing ambulance dispatch and resource allocations based on predictive analytics. Implement telemedicine solutions for remote consultations to enhance the reach and convenience for patients and particularly in under-served areas. Moreover, the development and advertisement of mobile health applications that would serve the way in which patients are involved in treatment, appointment scheduling, and health monitoring would make patient-provider interactions even more effective.

2. **Improved Training Programs:** Constant investment in ongoing, regular training programs essential so that the benefits of the evolving technology can be fully achieved and serve to guarantee that the staff is fully competent. The training must not just focus on the application of the new technologies but also on developing the communication skills and methods to interact with patients amongst the nurses. This would empower first-line care givers to provide caring, effective care in a manner which invariably equals or even exceeds patient expectations.

Ongoing Feedback Loop: Red Heath should expand and build its digital feedback loop to capture patient feedback in real time. It will derive actionable insights in a timely manner through the use of sentiment analysis automated tools, which, in turn, will enable quick responses to patient concerns and forward-looking alterations in the provision of service. This responsive feedback loop will demonstrate in and of itself the value of patient-centered care that Red Heath embodies in its service delivery, while continually working toward quality improvement through direct patient input.

4. **Community Engagement Interventions:** Community engagement will be important and can instill trust, generate awareness about services, and increase utilization of feedback mechanisms. Red Heath can conduct targeted partnership marketing campaigns aimed at educating the community about its services, promoting health literacy, and

communicating the benefits of digital health interventions. Besides, it could be important to try to enhance the visibility and reputation of the organization in the community.

5. Benchmarking and Best Practices: The need to constantly benchmark the performance metrics with industry standards and to derive best practices from the best healthcare players across the globe cannot be undermined for constant betterment. Red Heath should contribute to quality improvement in health care, attend industrial conferences, and network with peers to gain knowledge of the new trends and innovations in health care delivery. The available best practices will only have to be adapted. With determination, Red Heath can be reassured that this will be improved operational efficiency and that maintaining the desired standards of patient care is possible.

Challenges

1. **Technological Integration Problems:** Some of the headaches in bringing about new technologies are compatibility with existing systems, the huge initial investment required, and the requirement for continual technical support and upgrades. For this reason, Red Heath should be very careful in applying its technological solutions, focus on systems' interoperability, and ensure enough staff are trained to gain the greatest benefits and avoid risks of implementation.
2. **Data Privacy and Security:** With the increasing digital coverage, data privacy and security become the utmost concern. Red Heath remains compelled under healthcare regulatory authorities regarding patient information flow in compliance with the regulation: Health Insurance Portability and Accountability Act (HIPAA). Simple encryption protocols, constant security auditing, and staff education on good information handling can make the path to patient confidentiality and trust easier.
3. **Patient Adoption:** If the innovation in these digital health tools is great, the adoption of technology-driven health solutions is unsure because of usability and privacy doubts, and at times general wariness towards digital platforms. In developing digital interfaces, Red Heath should adopt a user-centered design principle in the hope that use can be easy for all patients, irrespective of demographic. Offering tailored support and guidance to individual patients in their transition toward these technologies will increase uptake, therefore fulfilling more diffuse expectations of 'higher' levels of patient engagement.
4. **Maintaining High Patient Satisfaction:** It is always the challenge to keep up with and even exceed patient satisfaction and requires timely shifts between service demands and changes in staff and healthcare trends. Red Heath is to continue strict quality assurance processes, be keenly in tune with patient feedback, and evolve changed service delivery as a constant process of performance evaluation. How Red Heath is able to achieve or maintain high levels of patient satisfaction and loyalty over time stems from the culture of accountability and responsiveness throughout all levels of the organization.
5. **Operational Resilience:** Develop operational resiliency to mitigate risks of sudden disruptions from technology failures, a result of natural disasters, or public health crises.

It is under this that Red Heath must have developed a detailed set of contingency plans at all times, with technological ways to set up contingency communication channels and cross-train staff in the roles that staff play to ensure operational efficiency and continuity during times of crisis. Proactive risk management styles introduce scenario-based drills into their activities, with this approach aimed at reenacting incidents in order to draw out the preparedness and responsiveness to an emergency.

A strategic response to those recommendations and challenges will enable Red Heath to materially advance towards the complexities of today's heuristic delivery.

. Red Heath can thus guarantee that they fulfil their commitment to excellence by taking up high technologies and investing in development of their staff, committing to partnering with the community, benchmarking against world class standards, and at all times focusing on patients' welfare.

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13. **JCI logo - Search Images.** Available from: [JCI Organization Logo Creator || JCI Resources](#)
14. **ISO - ISO name and logo.** Available from: [ISO - ISO name and logo](#)

ANNEXURE

Feedback Form

S. No.	Question	Answer options
1	Please rate our ambulance services based on your recent experience with Red.Health.	0-10
2	Please provide your testimonial	Incase of 9/10
3	We would like to know more about your experience with us and the reason for the rating 0-8. Your valuable inputs will help us improve our services. Press "Continue" to provide more details	Incase of 0-8
4	Please Select the Areas of Improvement	- Ambulance Booking Experience - Timeliness of Ambulance Arrival - Pilot Experience - Ambulance Quality and Facilities - Availability of Medical Equipment and Consumables - Paramedic Care and Clinical Expertise - Payment and Billing Process
5	Ambulance Booking Experience --> Tell us the areas of improvement in Ambulance Booking Experience.	- Call response time - Executives ability to understand my requirement - Explanation about booking process and expected time of arrival - Courtesy and responsiveness of executive - Executive was unable to solve my problem - Other
6	Timeliness of Ambulance Arrival--> Tell us the areas of improvement in Timeliness of Ambulance Arrival	- Ambulance arrival was delayed - Pilot called repeatedly for location. - Live tracking link was not working. -Mismatch of ambulance confirmed with what arrived. - Other
7	Pilot Experience--> Tell us the areas of improvement in Pilot Experience.	- Inadequate route knowledge and navigation skills - Rash driving - Unprofessional behaviour - Demanded extra money - Other
8	Ambulance Quality and Facilities--> Tell us the areas of improvement in Ambulance Quality and Facilities	- Poor cleanliness and upkeep of ambulance - Blankets / pillows provided were not clean - Uncomfortable trip due to noise & vibration.

		- AC not working / cooling - Quality of stretcher - Other
9	Availability of Medical Equipment and Consumables --> Tell us the areas of improvement in Availability of Medical Equipment and Consumables	- Medical Equipment not in working condition / unavailable - Sterility and cleanliness of medical equipments - Medicines and consumables unavailable or inadequate - Oxygen Insufficient - Other
10	Paramedic Care and Clinical Expertise --> Tell us the areas of improvement in Paramedic Care and Clinical Expertise	- Communication about patient condition and procedures performed - Clinical competency of paramedic - Paramedic attentiveness and care - Paramedic behavioural issue - Other
11	Payment and Billing Process --> Tell us the areas of improvement in Payment and Billing Process	- I have been charged Extra - Limited Payment Options - Did not receive payment Invoice - Other