

Master of Public Health (MPH)

Johns Hopkins Bloomberg School of Public Health (JHBSPH) & IIHMRU

Practicum Report

By

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Cohort-10

(2022-2024)

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Government of Maharashtra &

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Certificate of Completion

To,

Whomsoever it may concern,

This serves to acknowledge that Dr. Amol Ganesh Sahasrabuddhe, student enrolled in the Master of Public Health Programme at IIHMR University, Jaipur, in collaboration with Johns Hopkins Bloomberg School of Public Health, (JHBSPH), has successfully completed practicum training at Maharashtra Emergency Medical Services (MEMS), Pune, Maharashtra, India from October 25th to November 21st, 2023.

During the practicum training period, Dr. Amol Sahasrabuddhe exhibited commitment to the assigned study, demonstrating a sincere, scientific, and analytical approach. His performance aligns with the rigorous standards set forth by the program, showcasing good understanding of the subject matter.

The practicum training fulfills the prescribed course requirements, attesting to Dr. Amol's practical application of knowledge gained in the academic settings. As his faculty advisor, I commend him on his achievements during this training

period and anticipate continued success in his academic and professional endeavors.

Wishing Dr. Amol Sahasrabuddhe, the very best in all his future pursuits.



Dr. Neetu Purohit

Practicum Advisor

Professor, IIHMR University,

Jaipur, Rajasthan, India

Certificate by Scholar

I, Amol Sahasrabuddhe, bearing enrolment number IIHMR-U/07/2022-2024/0058 and Hopkins ID: 577244, declare that the Practicum Project presented by me for the fulfillment of Master of Public Health degree, conducted under the guidance of Dr. Neetu Purohit (my practicum advisor) and Dr. Biranchi Jena (my preceptor), is an authentic representation of my original work. This project, conducted from October 25th to November 21st, 2023, has not been employed for granting of any other academic credential, such as a degree, diploma, associate degree, fellowship, or any comparable title, either within this institution or any other similar higher educational establishment.

In addition to fulfilling the academic requirements, this Practicum Project symbolizes my dedication to the practical application of knowledge acquired during the Master of Public Health program. The guidance & mentorship provided by Dr. Neetu Purohit and Dr. Biranchi Jena have been instrumental in enhancing my understanding and skills in the field.

I further assure you that the research conducted adheres to ethical standards, with due acknowledgement given to any references or sources utilized. This project contributes to the ongoing discourse in public health, addressing pertinent issues and showcasing the application of theoretical concepts to real-world scenarios.

By signing below, I affirm the accuracy of information provided and the authenticity of the Practicum Project

Amol Sahasrabuddhe

Student, MPH Cohort-10 (2022-2024)

JHU-IIHMR Collaborative Program

Certificate from the Organization

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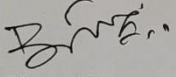
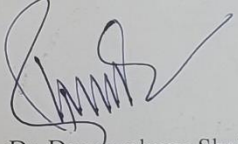
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No. Gov/MEMS/2023-24/950
Date-22/03/2024

To Whomsoever This May Concern

This is to certify that Dr. Amol Sahasrabuddhe, Student of Master of Public Health, IIHMR University was placed in the MEMS Organization for Field Placement from October 25th, 2023, to November 21st, 2023.

During his placement Dr. Amol Sahasrabuddhe has shown keen interest in his assignments including visits to the MEMS control room and exhibited interest in the operational & research activities of the organization. He was found sincere & committed to completing his assignment & obtained appropriate guidance from our Operations Team & Research Consultant.

We wish him success in his future endeavors.

 Dr. Biranchi Jena Research Consultant		 Dr. Dnyaneshwar Shelke C.O.O MEMS, Maharashtra State
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Acknowledgements

I extend my heartfelt appreciation to Dr. Neetu Purohit, a distinguished Professor at IIHMR University, Jaipur, India, & Dr. Biranchi Jena, a Research Consultant at MEMS, which is a Government of Maharashtra - Department of Public Health and BVG India joint venture in Pune, India for their invaluable guidance during the completion of this practicum report.

My sincere gratitude goes to Dr. Neetu Purohit, my mentor & professor, whose unwavering support has been a beacon throughout my MPH journey. Her guidance has been instrumental in shaping my understanding and skills in the field of public health.

I express my thanks to Dr. Dnyaneshwar Shelke, COO at MEMS, and my practicum preceptor, Dr. Biranchi Jena, for providing me with the opportunity to contribute to their organization. Working under their leadership has been a privilege, and I am fortunate to have learned from them their wealth of experience in the realm of emergency medical services.

A special note of appreciation goes to Dr. Seema Mehta, Professor and Faculty In-charge, MPH Programme at IIHMR University, Jaipur, whose encouragement has been a constant source of motivation throughout the course.

Gratitude is also extended to my colleagues at IIHMRU and colleagues from WHO-TDR, MPH batch for their collective efforts, which transformed my MPH journey into a meaningful and unforgettable experience.

In conclusion, I want to extend my heartfelt gratitude to the faculty and personnel at Johns Hopkins University (JHU) and then the Indian Institute of Health Management Research University (IIHMRU), as well as my parents, sister and spouse, whose unwavering support and inspiration have played an important role in my academic endeavors. I am sincerely indebted to them for believing in me and guiding my path forward.

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Abbreviations

Advance life Support	(GPRS)	5
(ACLS).....	Global Positioning System	
2	(GPS).....	5
Alert-Verbal-Pain-Unresponsive	low-and-middle income countries	
(AVPU)	(LMICs)	13
34	Maharashtra Emergency Medical Services	
Automatic Vehicle Location Tracking	(MEMS)	1
System	National Health Mission	
(AVLTS).....	(NHM)	2
5	Road Traffic Accident	
Basic Life Support	(RTA).....	32
(BLS).....	Vikas Group	
2	(BVG)	2
Emergency Medical Services		
(EMS)		
33		
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General Packet Radio Service		

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1. Practicum Details

1. Duration: October 25th,2023, to November 21st,2023
2. Hours: 160 hours
3. Name of the Institute: Maharashtra Emergency Medical Services (MEMS),
Government of Maharashtra and BVG India Pvt. Ltd.
4. Name of the Division of Internship: Research & Operations Department,
MEMS
5. Supervisor: Dr. Biranchi Jena, Research Consultant, MEMS, Government
of Maharashtra & BVG India, Department of Public Health, Pune,
Maharashtra
6. Faculty Advisor: Dr. Neetu Purohit, Professor, IIHMR University, Jaipur.

2. About the Organization

2.1 Background

The Government of Maharashtra, Maharashtra State in collaboration with Bharat Vikas Group (BVG) & UKSAS India Pvt. Ltd under a public-private partnership, has initiated a commendable project known as Maharashtra Emergency Medical Services (MEMS), widely recognized as 108 service¹. The MEMS headquarters are situated at Aundh Chest Hospital in Pune and operated round the clock. The pre-hospital, Basic Life Support (BLS), Advance life Support (ACLS) is provided free of cost under the banner of National Health Mission (NHM). The toll-free helpline 108 is easily accessible from both mobile and landlines throughout the state.

The ambitious initiative has witnessed a deployment of over 5500 dedicated EMS professionals, providing them a significant opportunity to contribute to humanity. Particularly noteworthy is their response to the challenges posed by the Covid-19 pandemic, with BVG MEMS having served 5,73,467 Covid-19 patients between March 2020 to June 2021. From the launch of this service on January 1, 2014 to January 31, 2024, MEMS has successfully assisted over 9.5 million patients. The medical emergency infrastructure is robust, featuring 937 well-equipped and well-maintained ambulances. The emergency response helpline 108 is managed by highly qualified and experienced professionals, ensuring a

swift and effective response for individuals in need of emergency services. MEMS has effectively managed various emergencies, including accidents, mass casualties, medical emergencies, poly-trauma patients, disasters, and instances of self-injury. Notably, the system has managed both medical emergencies, highlighting its versatility and commitment to public welfare.

2.2 Goals & Objectives of MEMS

- To provide 24x7 pre-hospital emergency medical response service across Maharashtra, including disaster situations in the State.
- To provide first aid to preserve life, shifting of patients in EMS vehicle to appropriate hospital, prevent further injury, and promote recovery.
- To mobilize all stakeholders & to provide a wide array of services during emergency health situations.
- To achieve a 20% decrease in mortality and morbidity rates in pre-hospital care emergencies.

2.3 Scope

1. Create & manage an emergency response or ambulance service dedicated to delivering high-quality, dependable, and trustworthy assistance during emergencies.
2. Establish a system that collaborates seamlessly with the police and fire departments, operating efficiently through a unified toll-free number, 108

3. Establish streamlined logistical processes to maintain an average response time of 20 minutes in urban regions and 30 minutes in rural areas after full implementation of the operations.
4. Establish a fleet comprising 937 ambulances equipped for life support, with 233 designated for Advanced Life Support and 704 for Basic Life Support, through a turnkey approach.

2.4 Organogram

Figure 1 & 2 Shows Broad Organogram of State & District Level State Govt- BVG Collaborative Emergency Ambulance Service Organization.

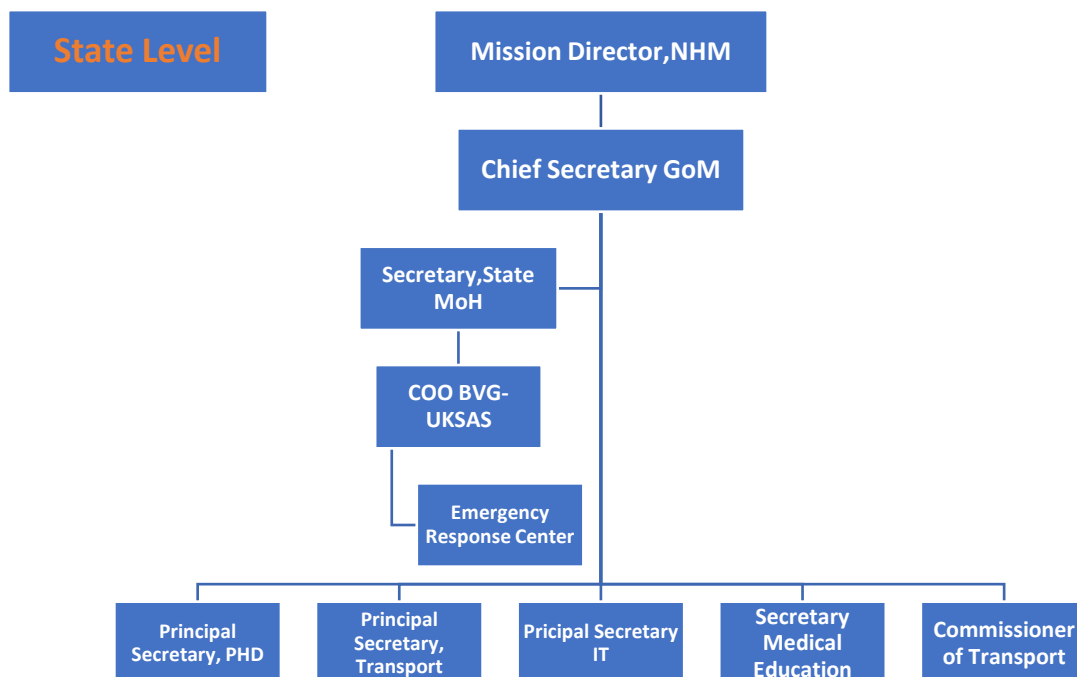


Figure 1: Organogram of MEMS Source: MEMS Office Documents 2024

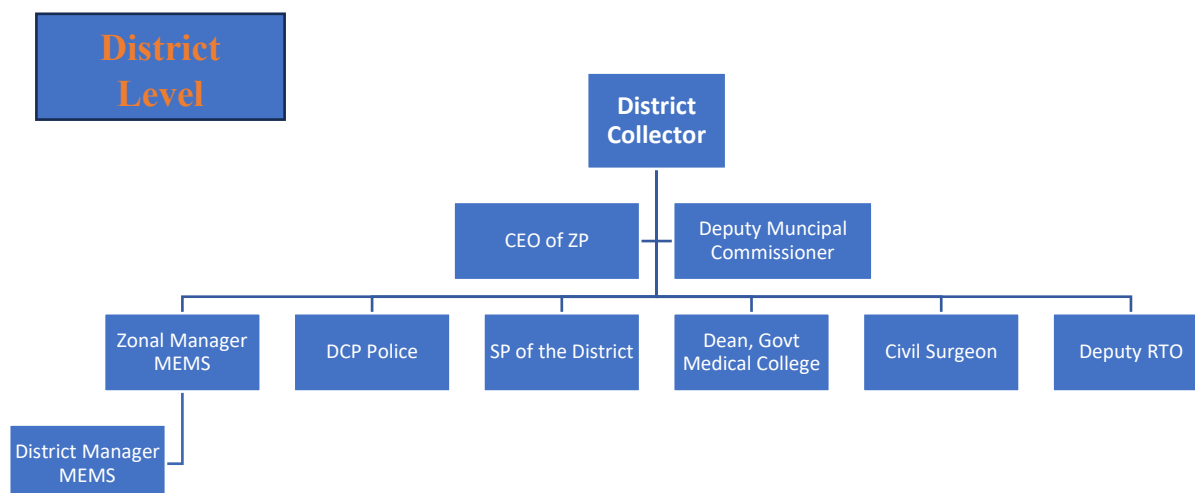


Figure 2: Organogram of MEMS Source: MEMS Office Documents 2024

2.5 Functioning

The MEMS has a Centralized control room, and all pre-hospital emergency management ambulances are monitored from the centralized control room. Ambulances are deployed in rural areas as ONE ambulance for 100,000 population and for urban areas ONE ambulance for 200,000 population. The centralized emergency response centre situated in Aundh, within Pune City, oversees the movement of all ambulances using technology systems like General Packet Radio Service (GPRS), Global Positioning System (GPS), and Automatic Vehicle Location Tracking System (AVLTS)². A toll-free number 108 is provided to the beneficiaries to get the access. There are 10 parallel lines per district to avoid congestion in the calling network. Round the clock trained call-taker and call-dispatchers work for emergency response. Beneficiaries or first responders call from emergency site or accident site via 108 number. The call centre receives

the call and ambulance from the nearest location is identified. Ambulance is informed through mobile phone and dispatched to the location. Patient is stabilized with BLS / ACLS protocol and transportation with treatment is ensured. At the same time the destination hospital is informed. Usually, it is Government Hospital or a network hospital which may be private.

2.6 Roles and responsibilities during Internship

During my internship at Maharashtra Emergency Medical Services (MEMS), spanning a period of about 170 hours, I undertook various roles and responsibilities aimed at gaining practical experience in emergency medical service operations, research and data analysis. This report outlines my activities and contributions during my internship.

Familiarization with MEMS: On joining MEMS, I familiarized myself with the organization structure, departments, and emergency response protocols. This included visits to 24x7 call center, ambulance facilities, and administrative departments located at the Emergency Response Center (ERC) at Aundh, Pune.

Throughout the internship, I observed the operations of Basic Life Support (BLS) and Advanced Cardiac Life Support (ACLS) ambulances, gaining insights into their equipment, functionalities, and response procedure. Additionally, I learned about data collection processes and administrative procedures within MEMS.

In the second week under the guidance of my supervisors, I conducted a literature review on geriatric pre-hospital emergencies. This involved synthesizing existing research to understand the challenges and best practices in providing emergency care to geriatric patients. I observed the data entry for geriatric cases and learned about nuances of data collection specific to these cases. As part of my responsibilities, I analyzed data on geriatric pre-hospital emergencies to identify trends, patterns and insights that could inform organizational decision making.

Toward the end of my internship, I compiled my findings into a report and shared with the MEMS leadership and Research Consultant. This includes summarizing key insights from the data analysis and providing recommendations for improving geriatric emergency care services.

2.7 Challenges Faced

During my internship at MEMS, I encountered a few challenges that provided opportunities for growth and learning. One significant challenge was navigating the complex landscape of emergency medical services operations within MEMS. Understanding the intricacies of emergency response protocols, ambulance operations and data collection procedures required a steep learning curve. Additionally coordinating with various departments and stakeholders to gain access to necessary information and resources posed logistical challenges. Despite these hurdles, I embraced the challenge by actively seeking guidance from supervisors and immersing myself into day-to-day activities of MEMS.

Additionally, ensuring the accuracy and relevance of gathered information from the literature review, amidst the dynamic nature of healthcare research presented its own set of challenges. Overcoming these obstacles involved re-learning, re-visiting academic content provided by the college, and effective time management. Through diligent efforts and guidance from my mentors, I was able to navigate these challenges. Overall, these challenges served as opportunities for personal and professional growth, reinforcing my commitment to learn something new in the field of geriatric medicine.

My learning from the practicum: My practicum experience at Maharashtra Emergency Medical Services (MESM) has been incredibly enriching and educational, providing me with valuable insights into the complexities of emergency medical services operations and the challenges of providing pre-hospital emergency care, particularly for geriatric patients. Through hands-on observation and participation, I gained a deeper understanding of emergency response protocols, ambulance operations and data management procedures. This practical experience has not only broadened my knowledge bases but also has honed my critical thinking and problem-solving skills as I navigated the intricacies of emergency care delivery.

Furthermore, my involvement in conducting a literature review on geriatric pre-hospital emergencies and analyzing related data has deepened my understanding of the unique healthcare needs of elderly patients during emergency situations.

This experience underscored the importance of evidence-based practice in shaping effective emergency care strategies and highlighted the significance of interdisciplinary collaboration in addressing complex healthcare challenges. Overall, my practicum at MEMS has equipped me with valuable skills, knowledge, and insights that will undoubtedly inform my future endeavors in the field of emergency medicine, reinforcing my commitment to delivering high-quality care to individuals in need.

2.8 Competency-based learning

During my practicum at MEMS, I actively engaged in competency-based learning, focusing on mastering specific skills and competencies essential for effective emergency medical services delivery. Rather than passively absorbing information, I took ownership of my learning journey by identifying key competencies relevant to emergency care, such as rapid assessment, triage, and effective communication in high-stress situations. Throughout the practicum, I demonstrated competency-based learning by immersing myself in real-world scenarios, including observing emergency response protocols, ambulance operations and participating in data analysis of geriatric pre-hospital emergencies. By actively participating in these experiences, I honed my skills and developed a deeper understanding of the complexities involved in delivering timely and efficient emergency care.

Moreover, competency-based learning allowed me to tailor my learning experience to my individual needs and interests, enabling me to focus on areas where I needed improvement and leverage my strengths to contribute effectively to the team. Through practical application and hands-on experiences, I gained confidence in my abilities and developed a comprehensive skill set that will serve me well in my future endeavors in tertiary hospital care settings.

3. Project Report

Epidemiology of Pre-Hospital Geriatric Emergencies in Maharashtra State

3.1 Abstract

This report presents an analysis of prehospital geriatric emergencies in the 108-ambulance service within Maharashtra State, utilising secondary data obtained from the emergency response centre (ERC) of Maharashtra Emergency Medical Services. A total of 12,379 patient records for October 2023 were examined. Findings revealed that the mean age of pre-hospital geriatric emergencies was 67.48 years, with median age of 65 years. Gender distribution showed 40.9% females and 59.1% males, while geriatric patients aged 60 and above constituted 11.8% of the total 110691 emergencies handled by EMS in October 2023. Notably, Pune Kolhapur and Ahmednagar districts, particularly in western Maharashtra exhibited higher number of geriatric patients served indicating effective utilisation of EMS services. In contrast some tribal districts like Nandurbar and Hingoli in northern Marathwada demonstrated poorer utilization. Approximately 50.5% of patients required transportation to a hospital with the remainder treated on scene. Predominant presenting symptoms included generalised body weakness (27.09%), abdominal pain and gastrointestinal issues (18.5%), respiratory issues (10%), fever/infections (9.7%), Trauma /injury (7.2%). These findings underscore the importance of understanding the

epidemiology and patterns of pre-hospital geriatric emergencies to inform targeted interventions and improve Emergency Medical Service delivery for elderly populations in Maharashtra.

3.2 Introduction

Pre-hospital emergency care is frequently overlooked in low-and-middle income countries (LMICs), despite its pivotal role in emergency medical services. Its significance lies in its potential to significantly influence health outcomes³.

The global population is experiencing a notable increase in age, with developing countries such as India undergoing aging at a swifter pace compared to developed nations⁴. The swifter pace is due to a combination of factors like declining fertility rates, improvement in healthcare leading to increased life expectancy, rapid urbanization and migration patterns, and shift in social and cultural dynamics are contributing to this trend. A rise of approximately 12 to 24% in the number of emergency visits by geriatric patients is projected in both developed and developing nations⁵. Thus prevalence and consequences of Geriatric Emergencies on a global scale have become increasingly significant. The aging global population is associated with an increased incidence of chronic diseases, functional impairments, and cognitive decline, leading to a higher susceptibility to emergencies. Understanding the global trends is crucial for framing the significance of localized studies and crafting effective healthcare policies, especially in addressing pre-hospital geriatric emergencies in Maharashtra State, India. By integrating insights from global epidemiological data with local research findings and contextual factors, policymakers can develop tailored

interventions that improve emergency care services for older people, aligning with evidence-based practices and public health principles.

3.2.1 Indian Context

India is witnessing a rapid demographic shift with a rising aging population, requiring a nuanced examination of geriatric emergencies at the local level. Distinct cultural, social, and economic factors in India pose a unique challenge in delivering prompt and effective emergency care to the elderly. In India, the number of elderly individuals are increasing rapidly. As of July 1, 2022 India had approximately 149 million individuals aged 60 years and above, constituting roughly 10.5 percent of the total population⁶ and are expected to reach 323 million in by the year 2050⁷. Thus, by 2050, the proportion of older individuals is projected to double, reaching 20.8 percent. Our study in Maharashtra aims to contribute valuable insights within this specific Indian context.

Current literature on Geriatric Emergencies underscores the intricate nature of managing health crises among the elderly. Globally the studies emphasize the prevalence of chronic conditions and the necessity for targeted emergency response system. In the Indian context, limited research has primarily focused on non-communicable diseases prevalent in the elderly. However, the absence of state-specific data emphasizes the importance of localized studies to inform healthcare strategies and emergency response protocols.

3.2.2 Definition of Public Health Problem

Geriatric emergencies in pre-hospital settings encompass a diverse range of acute medical conditions affecting individuals more than 60 years of age. These emergencies often require urgent attention and may include a range of different systemic events including accidents and self-injury⁸.

The demographic transition is influenced notably by the aging global population and the surge in chronic illnesses. According to the World Health Organization (WHO), the global population of individuals aged 60 and above is projected to exceed 2 billion by the year 2050⁹. Therefore, the growing burden of geriatric emergencies poses a significant public health challenge, necessitating a multidimensional approach to address the unique needs of the vulnerable population.

3.2.3 Risks to the community

The escalating prevalence of geriatric emergencies presents several risks to community:

In India, adults and the elderly male patients constitutes most individuals who utilize the Emergency Medical Services (EMS) most frequently.¹⁰ Strain of EMS resources, leading to potential delays in response time and compromised care delivery.

- Increased healthcare expenditures associated with the management of complex geriatric conditions and the provision of emergency services¹¹.

- Adverse health outcomes among elderly individuals, including disability, functional decline, and mortality, without timely access to appropriate pre-hospital care. Most young older adults (aged 60-79) & old older adults (>85 years) with trauma need hospitalization¹².
- Impact on community well-being and social cohesion, as families and caregivers may face heightened stress and financial burdens in caring for elderly individuals experiencing emergencies. Issues in elderly may result from changes in bio physiology, characterized by the gradual narrowing of homeostatic reserves in various organ systems, accompanied by a decline in the ability to cope with physical, psychological & psychosocial stressors¹³.

3.2.4 Importance of Data in shaping public health issues

Data serves as the cornerstone for understanding the epidemiology of pre-hospital geriatric emergencies and informing evidence-based public health policies and interventions.

By analyzing patient demographics, clinical presentations, geographic distribution, and utilization of EMS resources, the policy makers can identify the priority areas for intervention, allocate resources efficiently, and monitor trends over time. Moreover, data driven approaches facilitate collaboration between healthcare providers, policymakers, and community stakeholders, fostering a

coordinated response to address the complex challenges posed by geriatric emergencies¹⁴.

4. Literature Review

India, like many other countries, is experiencing a demographic transition characterized by an increasing proportion of elderly individuals in its population. The elderly population in India has been increasing, with 8.6% of the population aged 60 years and above according to 2011 census. Projections suggest, this percentage will surpass 10% by 2020, indicating a significant demographic shift towards an aging population¹⁵. As per the United Nations Organization (2019), by 2050, it is anticipated that the elderly population in India will reach 340 million. With this demographic shift comes a significant burden on healthcare system, particularly concerning the management of geriatric emergencies in the pre-hospital setting. This literature review aims to delve deeper into the epidemiology of geriatric emergencies, the challenges faced in pre-hospital care and the interventions and innovations needed to address these challenges effectively.

The scholarly article by Kaele et al (2020) provides a framework for understanding geriatric emergencies in Maharashtra State, India. Research revealed that geriatric patients commonly experience multiple co-existing medical conditions and a decline in physiological functional status. Emergency physicians need to adopt a specific and tailored approach due to the intricate interaction of numerous factors involved in managing geriatric patients The

clinical manifestations, mortality rates, and morbidity patterns observed in geriatric patients significantly diverge from those in younger populations, necessitating a customized approach and specialized emergency set-ups⁵. The research underscores the necessity of establishing specialized emergency departments and dedicated facilities tailored for the geriatric populations, addressing the evolving demographic trends, particularly in developing nations such as India. This is particularly relevant for Maharashtra State, which has a higher percentage of elderly population aged 60 and above compared to the national average, according to UNFPA report on status of elderly in India in 2011. Additionally, the study revealed that roughly 75% of the elderly population in India resides in rural areas, with approximately 73% of them being illiterate and engaged in physical labor for their livelihoods. Rural areas often face limited access to healthcare facilities and resources, potentially leading to delays in receiving emergency medical attention. Moreover, the prevalence of illiteracy and physical labor among the elderly may exacerbate health risks and increase the likelihood of accidents or medical emergencies occurring. Tailored solutions are necessary to address these challenges, such as community-based emergency response systems, providing targeted education or preventive measures and recognizing early signs of emergencies, and ensuring that emergency medical services (EMS) are accessible and culturally appropriate for elderly individuals in rural areas. Therefore, the article offers valuable insights into the epidemiology of geriatric emergencies within a teaching hospital setting in northern India.

While the study was conducted in a specific region, it can provide a framework for understanding the epidemiology of geriatric emergencies in Maharashtra State, India. The study underscores the importance of establishing specialized emergency departments and dedicated facilities for geriatric population to address the continuously evolving demographic trends.

The Operational Guidelines for the National Programme for Healthcare of the Elderly (NPHCE) in India provides a comprehensive framework for the implementation of the geriatric care services in India. The document offers valuable insights into the overall status of geriatric care in India and the challenges confronted by elderly population. One significant finding is the necessity for comprehensive, preventive, curative and rehabilitative services across all levels of care encompassing healthcare facilities, long term care institutions community settings, and home care. It stresses the importance of establishing departments of Geriatric Medicine within medical colleges and hospitals to deliver affordable and accessible healthcare of the highest quality. These departments should take on the responsibility of enhancing capacity in geriatric care through regular continuing education program and both short term and long-term training initiatives for medical professionals, nurses' paramedical staff and caregivers¹⁶.

The document also emphasises the necessity for geriatric medicine services to evolve into an independent speciality, seamlessly integrated with other services

and specialities within the institution. Patients should be directed to these services from various departments based on specific criteria, such as age, frailty, and the presence of multiple medical psychological and social issues. The department of geriatric medicine within Medical College hospitals ought to offer acute, intermediate, and long-term care, with a primary focus on enhancing the functional status, independence, and overall quality of life for elderly patients. Regarding the challenges encountered by the elderly population in India, the document acknowledges that a significant majority (80%) resides in rural areas, posing difficulties in delivering services. Furthermore, there has been a rise in the population of individuals aged above 80 years, and a considerable proportion of the elderly (30%) are below the poverty line. These factors underscore the necessity for policy interventions that encompasses social, human, and economic investments to prevent the emergence of unnecessary dependencies in later stages of life for individuals, as well as within aging societies as a whole. Overall, the document provides information into the overall state of geriatric care in India and the challenges faced by the elderly population. These insights can be used to inform a literature review on the epidemiology of geriatric emergencies in Maharashtra State, providing a broader context for understanding the opportunities for improving geriatric care in the region.

Epidemiology of pre-hospital Geriatric Emergencies

Geriatric emergencies encompass a wide range of acute medical conditions commonly encountered in the elderly population. These include cardiovascular

events, stroke, falls, respiratory distress and exacerbation of chronic conditions such as diabetes and hypertension¹⁷. Studies have shown a rising trend in geriatric emergency calls in India, indicating the growing need for specialized pre-hospital care services tailored to the elderly population¹⁸. The prevalence of these emergencies is further exacerbated by the presence of multiple co-morbidities and age-related psychological changes, which necessitate prompt and pre-hospital interventions.

Challenges in Pre-hospital care

Pre-hospital care: This refers to medical attention and interventions provided to patients before they reach the hospital or medical facility. In the geriatric population, timely and appropriate pre-hospital care is crucial due to the unique health challenges like high susceptibility to infection, cognitive decline, morbidity issues, higher risk of falls, age-related metabolic changes, polypharmacy or using several types of therapies at once makes management of medications and treatment more complex. The challenges in pre-hospital care are as follows.

1. **Resource Constraints:** One of the most significant challenges in providing pre-hospital care to the elderly population in India is the limited availability of ambulance services and trained healthcare personnel. This issue is particularly acute in rural areas, where access to emergency medical services is often severely limited¹⁹. Furthermore, the lack of

specialized equipment and medication required for managing geriatric emergencies poses additional obstacles to the delivery of timely & effective care. For example, in resource constrained settings in most remote tribal areas of Maharashtra, the pre-hospital emergency ambulances may not have mobility aids for geriatric patients, or thrombolytic medicines used in stroke or myocardial infarction, or for that matter specialized care facilities like Cardiac Cath-lab or Stroke Unit & ICU.

2. Communication Barriers: Effective communication is crucial in pre-hospital assessment and management of geriatric emergencies. However, language diversity and low health literacy levels among the elderly population in India present significant communication barriers for healthcare providers²⁰. In Maharashtra there are many tribal belts. Tribals often have a variety of languages spoken in different communities. Emergency responders may encounter difficulties in communicating with elderly patients who speak their native language. Lack of interpreters or translation service exacerbates issues. Limited access to technology also creates issues in communication. There is limited availability and accessibility to medical records. Low health literacy results in difficulties in understanding medical instructions or conveying symptoms accurately to emergency responders. I have personally experienced these

communication issues. This can lead to misunderstandings, misdiagnosis, and delay in treatment, ultimately compromising patient outcomes.

3. **Illness Beliefs and practices:** Cultural beliefs and practices surrounding illness and advanced age can influence the health seeking behavior of elderly individuals and their families. In many cases, traditional remedies and home care practices are preferred over seeking professional medical assistance, leading to delays in accessing medical care²¹. For example, some tribes may attribute health problems to supernatural causes or spiritual imbalances, opting for traditional healing methods rather than seeking modern medical care. Barrier like this may influence the decision-making process of elderly patients and their families. Addressing these cultural barriers requires culturally sensitive approaches to healthcare delivery and community engagement strategies.

Interventions & Innovations

1. **Community-Based care models:** Community based care models have shown promise in improving access to pre-hospital care for elderly population in India. Initiatives such as training community volunteers as first responders and establishing mobile health clinics in underserved areas have been successful in reducing response times and improving patient outcomes²². These models emphasize the importance of community

involvement and empowerment in enhancing emergency medical services for geriatric patients.

2. Geriatric-specific training: Training programs for pre-hospital care providers should incorporate geriatric-specific curriculum components to enhance their knowledge and skills in managing age-related emergencies. These programs should focus on comprehensive geriatric assessment, communication techniques tailored to elderly population, and the management of common geriatric syndromes such as falls & delirium²³. By providing healthcare providers with the requisite tools and competencies, these training programs have the potential to enhance the quality of care delivered to geriatric patients in pre-hospital settings²⁴.
3. Integration of technology: The integration of technology into pre-hospital care delivery holds great promise for improving access, efficiency, and coordination of services. Mobile applications for emergency alerts, GPS tracking of ambulances, and telemedicine consultations can facilitate rapid communication and decision-making particularly in remote and underserved areas²⁵. These technological innovations have the potential to bridge gaps in healthcare delivery and overcome barriers to access faced by elderly population in India.

5. Objectives

1. To gain orientation of emergency care, functioning & protocols and procedures involved in pre-hospital emergency care for geriatric patients, including initial assessment, triage, treatment, and transportation done on scene.
2. To analyse pre-hospital emergency care data to understand the prevalence, types, and patterns of illnesses among the elderly population, with the aim of informing strategies for improving emergency medical service utilization and outcomes in geriatric patients.

6. Methodology

This study utilizes secondary data obtained from the Maharashtra Emergency Medical Services ambulance records. A total of 12,379 patient records from October 2023 were included in the analysis. Descriptive statistics were employed to analyze patient demographics, presenting complaints, geographic distribution of emergencies, and utilization of EMS resources. The findings were summarized using tables & graphs to facilitate interpretation and presentation.

Data collection: Data retrieval from emergency medical services records includes comprehensive information on patient demographics, emergency types, response times, and outcomes. Ethical considerations, including data confidentiality and privacy, are paramount throughout the data collection process.

7. Results & Discussion

First objective is summarised at the beginning of this practicum report. Our second objective was to analyse pre-hospital emergency care data to understand the prevalence, types, and patterns of illnesses among the elderly population, with the aim of informing strategies for improving emergency medical service utilization and outcomes in geriatric patients. Following results are presented.

Age Distribution: Table 1 shows age distribution of Pre-Hospital Geriatric Emergencies studied for the month of October 2023. The distribution of age is symmetric, with 25% of the patients aged 62 years or younger (1st quartile), 50% aged 65 or younger (median or 2nd quartile) and 75% aged 70 years or younger (3rd quartile). This suggest that most of the patients fall within a range of 60-70 years. Figure 3 exhibits shows histogram, mean age is = 67.48 years. There were few outliers in the data. Figure 4 shows percentage frequency of age. However, it needs to be checked for ‘ **rounding or heaping bias**’ as age 60,65,70,75,80 shows higher frequency.

Table 1: Age Distribution of Geriatric EMS Cases Source: MEMS Data, Oct 2023

N=	12379
Mean	67.48
Median	65.00
Mode	60.0

Minimum	60.0
Maximum	110
Percentile 25	62.0
Percentile 50	65.0
Percentile 75	70.0

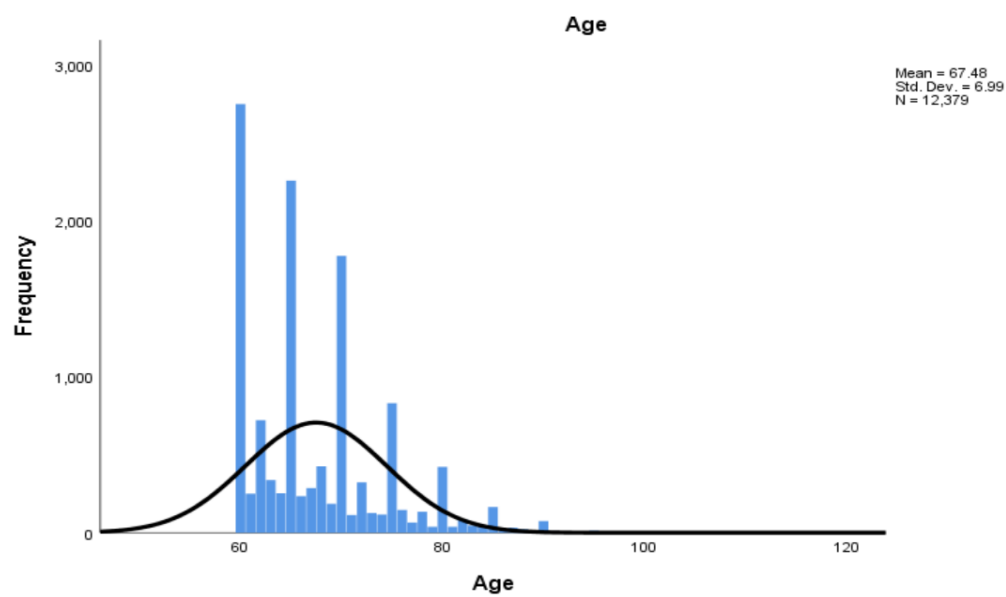


Figure 3: Histogram of Age distribution of geriatric Emergencies, Source: MEMS Data Oct 23

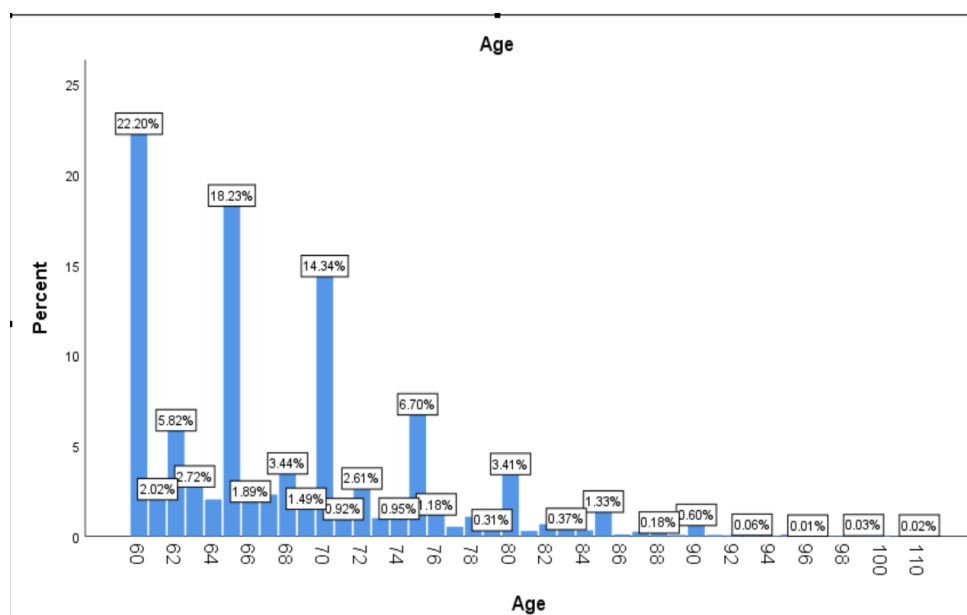


Figure 4: Bar Chart of age-wise percentage distribution of geriatric emergencies, Source: MEMS Data Oct 2023

Gender Distribution: Table 2 & figure 5 shows gender distribution of geriatric pre-hospital emergency cases. The dataset reveals a gender distribution among patients involved in geriatric pre-hospital emergencies, with approximately 40.88% being female & 59.12% being male. This indicates a higher representation of males compared to females in the observed emergencies. These insights are crucial for understanding the demographic composition of the population affected by geriatric-pre-hospital emergencies & may inform tailored healthcare interventions and resource allocation strategies.

Table 2: SPSS Output Gender Distribution of Geriatric Emergencies, Source: MEMS Data Oct 2023

Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	5061	40.9	40.9	40.9
	Male	7318	59.1	59.1	100.0
	Total	12379	100.0	100.0	

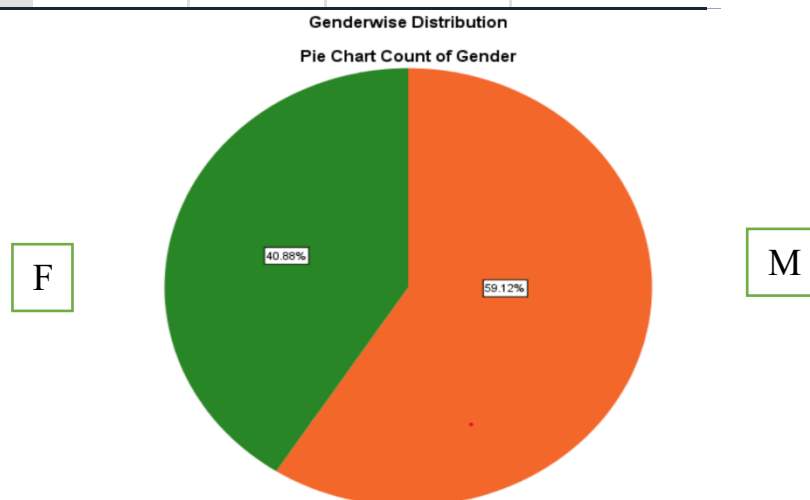


Figure 5: Pie Chart of age-wise distribution of Geriatric Emergencies, Source: MEMS Data Oct 23

Age-wise Total Emergency Patients: For the month of October 2023, age-wise distribution of patients served by MEMS pre-hospital emergency services was as follows. Geriatric emergencies constitute about **11.18 %** of the total emergencies.

Age	Patient Count
<=5	2882
6-18	8842
19-60	86588
>60	12379
Total	110691

District-wise Percentage of Geriatric Emergencies: Figure 6 shows district-wise emergency cases handled. The district-wise geriatric emergencies observed were highest in Pune district (n=987,8%) followed by Kolhapur (n=811,6.6%), further, the largest district in Maharashtra, Ahmednagar (n=791,6.4%) & Satara (n=671, 5.4%). Interestingly Mumbai having the largest population density contributed only n=531 or 4.3%. The distribution clearly shows better utilization or greater demand of services in Western Maharashtra. Hingoli (n=114,0.9%) & Nandurbar district (n=49,0.4%) recorded lowest patients. Table 13 & Table 14 in the annexure shows district-wise availability of ambulances and utilization of geriatric emergency services. In general, the Western Maharashtra shows good EMS infrastructure and utilization. Utilization and availability of EMS services in Mumbai district needs more research

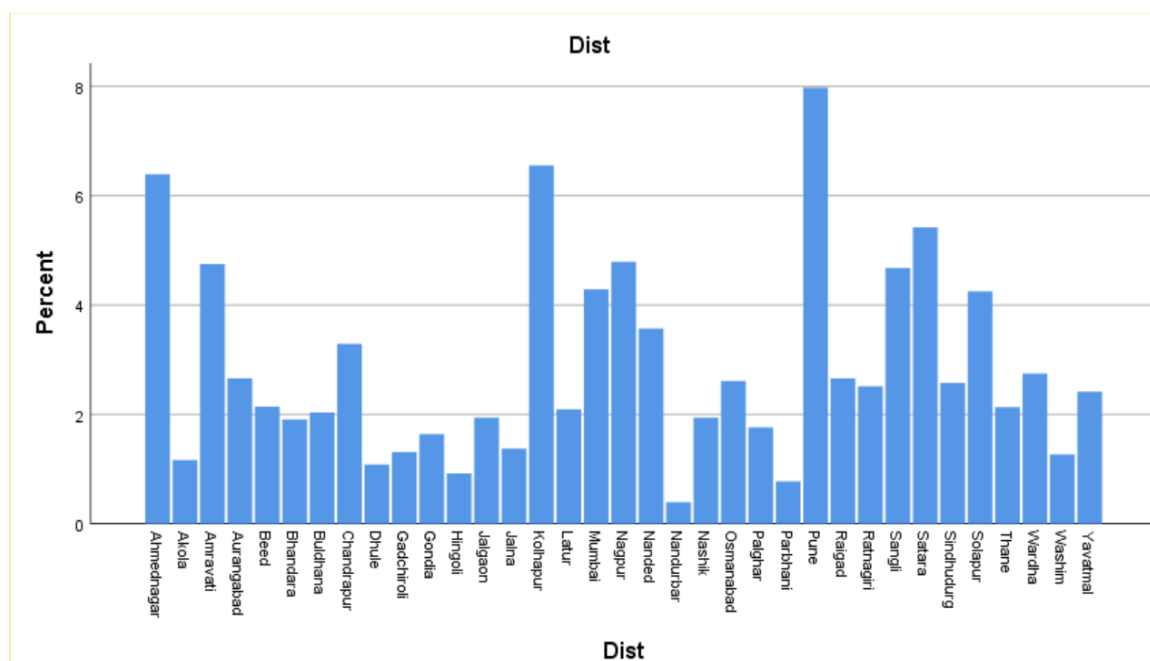


Figure 6: District-wise Geriatric Emergency Cases, Source: MEMS Data October 2023

Type of Case & Nature of Illness: Based on nature of illness MEMS ERC follows the following classification. In the analysed data nearly 50% patients were treated on scene and in remaining 50% the highest number of patients have had medical emergencies (38.3%), 4% had fall or self-injury, 3% patients were Road Traffic Accident (RTA) patients, and close to 2% of the population studied suffered from Intoxication or Poisoning. This percentage is alarming. The Table 3 shows that 49.5% patients did not require transportation and were managed on scene. However, 6257 patients (50.5%) required transportation to Hospital.

Table 3: Types of Geriatric Emergencies, Source: MEMS Data Oct 2023

Type of case/ Nature of illness		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Accident Vehicle (RTA)	374	3.0	3.0	3.0
	Assault	85	.7	.7	3.7
	Burns	13	.1	.1	3.8
	Cardiac	52	.4	.4	4.2
	Corona Positive	1	.0	.0	4.2
	Death on Arrival	137	1.1	1.1	5.3
	Fall	494	4.0	4.0	9.3
	Fire	1	.0	.0	9.3
	Intoxication / Poisoning	239	1.9	1.9	11.3
	Lightening / Electrocutation	2	.0	.0	11.3
	Mass Casualty (MCI)	9	.1	.1	11.4
	Medical	4738	38.3	38.3	49.6
	Others	4	.0	.0	49.7
	Poly Trauma	105	.8	.8	50.5
	Structure Collapse	1	.0	.0	50.5
	Suicide / Self Inflicted Injury	2	.0	.0	50.5
	Treatment on Scene	6122	49.5	49.5	100.0
	Total	12379	100.0	100.0	

Transportation to Hospital: Table 4 shows percentage of geriatric patients who needed transportation to hospital. About 50.5% cases attended by EMS required transportation to an empanelled hospital. 49.5 needed on-scene care.

Table 4: Transportation to Hospital of Geriatric Cases, Source: MEMS Data Oct 2023

Transportation to Hospital	Frequency	Percentage
Yes	6257	50.5
No	6122	49.5
Total	12379	100.0

Emergency Response & Care Plan (ERCP) Advice: Patients requiring active transportation to empaneled hospital requires ERCP advice. Since the Emergency Medical Services (EMS) system is now well established in last one decade, only 1% patients required ERCP advice. Table 5 shows the percentage of cases which required ERCP advice.

Table 5: ERCP advice for geriatric cases. Source: MEMS Data Oct 2023

	Frequency	Percentage
Yes	126	1.0
No	12253	99.0
Total	12379	100.0

Alert-Verbal-Pain-Unresponsive (AVPU) at Scene & Hospital: Nearly 1% patients have had pain as prominent symptom. Unconscious and Unresponsive patients were 191 (1.5%) & 102 (0.8%) respectively. Table 6 & figure 6 depict this data.

Table 6: AVPU Status of Geriatric Emergency Cases, Source: MEMS Data Oct 2023

Type	Frequency	Percentage
On Scene Managed	6122	49.5
Alert	5527	45.5
Pain	122	1.0
Unconscious	191	1.5
Unresponsive	102	0.8
Verbal	214	1.7
Total	12379	100.0

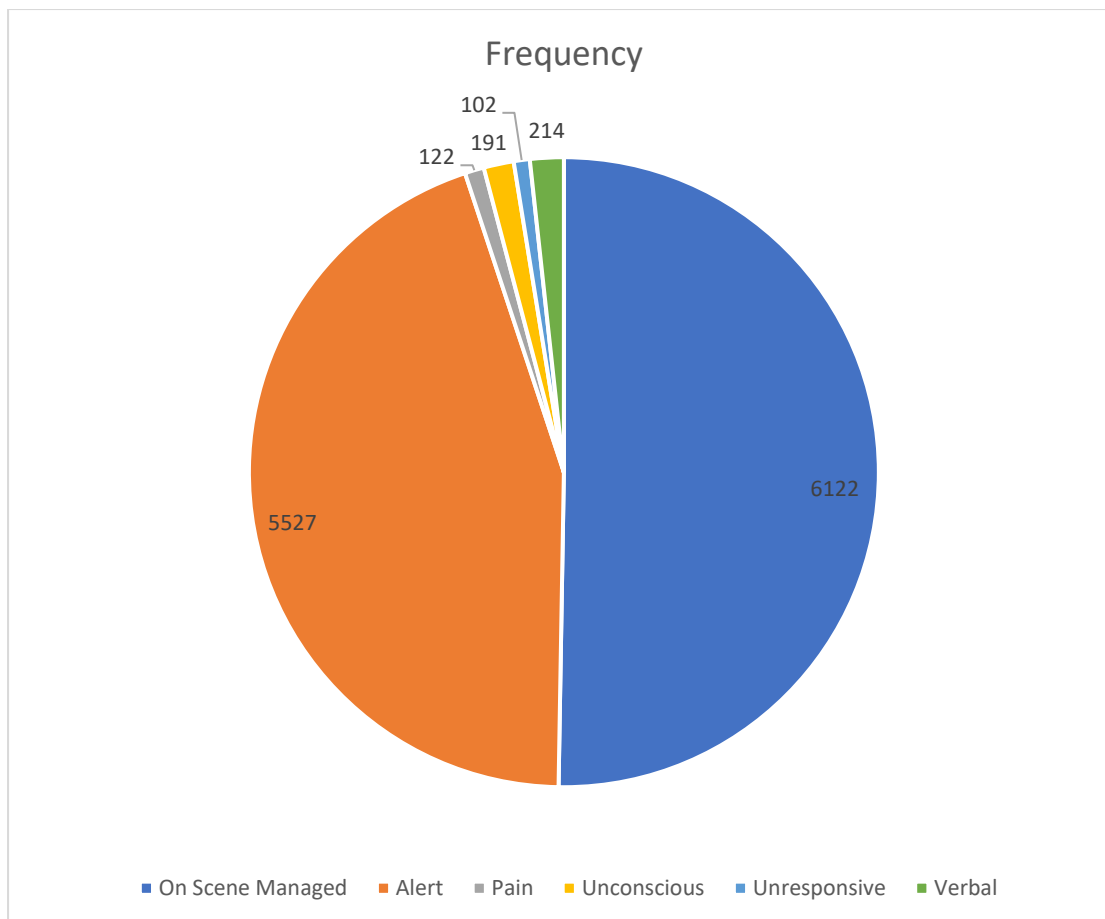


Figure 7: Pie Chart of AVPU Frequency, Source: MEMS Data October 2023

Association between Gender & Transportation to Hospital: To examine the association between gender & whether patients were transported to the hospital or not, a Chi-Square test was applied. Past studies, Malik et.al (2021) have mentioned that gender disparities exist in healthcare access and utilization. With women often facing barriers such as limited decision-making power, socio-economic constraints & cultural norms. We thought the test could help identify whether these disparities extend to pre-hospital emergency care utilization among geriatric patients in Maharashtra. Also, in view of risk assessment & allocation of resources and possibility of implementation of interventions like community

outreach programs, education campaigns or improvement in transportation infrastructure we thought that the test may be helpful. The following results were obtained. Pearson chi-square, continuity correction & likelihood ratio indicated a significant association between the gender & whether patients were transported to hospital. The p-value being .000 for all three tests. This suggests that gender may play a role in determining whether patients receive transportation to medical facilities in geriatric pre-hospital emergency situations. Table 7 shows Chi-square output and p-value.

Table 7: Chi Square Output SPSS, Source : MEMS Data Oct 2023

Chi-Square Tests					
	Value	df	Asymptotic Significance (2- sided)	Exact Sig. (2- sided)	Exact Sig. (1- sided)
Pearson Chi-Square	54.507 ^a	1	.000		
Continuity Correction	54.238	1	.000		
Likelihood Ratio	54.563	1	.000		
Fisher's Exact Test				.000	.000
N of Valid Cases	12379				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 2502.90.

b. Computed only for a 2x2 table

Relationship between transportation at two different places: To examine the relationship between time taken for ambulance to reach on scene and time taken

by ambulance to transport patient to medical center we performed correlation test. The Pearson correlation coefficient is 0.224 and $p < 0.01$ indicating that the correlation between the two variables is significant at .01 level (2-tail). It means that as time taken from the call to the scene increases, it tends to be associated with a longer time taken from the scene to hospital. However, the correlation coefficient of 0.224 indicates a weak positive correlation. While statistically significant, the strength of the relationship is not strong. Table 8 & 9 shows SPSS output.

Table 8: Descriptive Statistics of Correlation Test, Source: MEMS Data Oct 2023

Descriptive Statistics			
	Mean	Std. Deviation	N
Time in Min	15.71	49.936	12379
Scene to HSP in Min	39.19	56.782	12379

Table 9: Correlation output SPSS, Source: MEMS Data Oct 2023

Correlations			
		Time in Min	Scene to HSP in Min
Time in Min	Pearson Correlation	1	.224**
	Sig. (2-tailed)		.000
	N	12379	12379
Scene to HSP in Min	Pearson Correlation	.224**	1
	Sig. (2-tailed)	.000	
	N	12379	12379

** . Correlation is significant at the 0.01 level (2-tailed).

Test of Association between two categorical variables:

Table 10: Association between On-Scene Care & Generalized weakness, Source: MESM Data Oct 2023

	On Scene Care	No On Scene Care	Total
Generalized Weakness	2002	707	2709
No Weakness	4120	5550	9670
Total	6122	6257	12379

Many patients were found to have generalized weakness. So, we conducted the Chi Square test to determine whether there is an association between the presence of body weakness and on scene care. Table 10 shows frequency distribution.

Null Hypothesis (H0): There is no association between weakness and on-scene care.

Alternate Hypothesis: (H1): There is an association between weakness and on-scene care. The Chi Square value is = 829.2. p-value is 0.0000 at alpha= 5

This suggests a highly significant association between generalized weakness and on-scene care.

Odds Ratio: The odds ratio of approximately 3.81 indicates a strong association between generalized weakness and receiving on-scene care. Patients with generalized weakness are significantly more likely to receive on-scene care compared to those with other ailments.

Binary Logistic Regression: We conducted binary logistic regression with the dependent variable being 'On scene care.' The predictor variables taken were age, gender, time to reach on scene.

Interpretation: For the variable 'Age', the coefficient is 0.079. However, the p-value associated with this coefficient is 0.214, indicating that it is not statistically significant at the conventional $\alpha=0.05$. This suggests that the age does not have a significant effect on the odds of receiving on-scene care after controlling for other variables.

For the variable 'Gender', the coefficient is -1.870. The associated p-value is 0.056, which is marginally above the conventional threshold of 0.05. This suggests that there be some evidence of association between gender and the odds of receiving on-scene care. The odds ratio is 0.154 indicating that, all else being equal, being male is associated with approximately 0.154 times lower odds of receiving on-scene care compared to females.

For the variable 'Time to reach on scene from the time of call' the coefficient is -4.671, and the p-value is <0.01 , indicating that it is highly statistically significant. The odds ratio is 0.009 indicating that for each additional minute it takes to reach the scene, the odds of receiving on-scene care decreases by a factor of 0.009. Thus, from the logistic regression analysis, time taken to reach the scene

from the time of call is the only significant predictor of receiving on-scene care in geriatric pre-hospital emergency care. Table 11 shows relevant SPSS output.

Table 11: SPSS Output of Binary Logistic Regression, Data Source: MEMS Data Oct 2023

Variables in the Equation									
		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
Step 1 ^a	Age	.079	.064	1.541	1	.214	1.082	.955	1.226
	Gender(1)	-1.870	.979	3.651	1	.056	.154	.023	1.049
	Time in Min	-4.671	.577	65.503	1	.000	.009	.003	.029
	Constant	8.211	4.015	4.182	1	.041	3681.914		

a. Variable(s) entered on step 1: Age, Gender, Time in Min.

Care provider Impression & Descriptive Statistics: Table 12 shows frequency of various ailments under the heading ‘Care providers impression’ in both males and females. We have calculated gender-wise risk ratios in the examined data.

Table 12: Care Provider Impression-Statistics, Data Source: MEMS Oct 2023 data

Care Provider Impression	Female	Male	Total	Total %
Abdominal pain / GI Issues	882	1414	2296	18.5%
Allergic Reaction	82	145	227	1.8%
Altered consciousness	18	35	53	0.4%
Assault	17	42	59	0.5%
Behavioral disorders / Psychiatric issues	13	9	22	0.2%
Cataract	108	96	204	1.6%

Chest Pain/ Discomfort	277	306	583	4.7%
Burn/ Electrocution	9	11	20	0.2%
Fall	35	33	68	0.5%
Fever/ Infections	483	718	1201	9.7%
Giddiness	195	292	487	3.9%
Head Injury	54	111	165	1.3%
Hematemesis	5	9	14	0.2%
Hyperglycemia	37	45	82	0.7%
Hypertension	248	379	627	5.1%
Hyperthermia	17	19	36	0.3%
Hypoglycemia	25	47	72	0.6%
Hypothermia	2	0	2	0.0%
Joint pain	7	18	25	0.2%
Death	55	82	137	1.1%
Poisoning	20	56	76	0.6%
Respiratory Discomfort	597	645	1242	10%
Seizure Disorder	39	72	111	0.9%
Shock/ Hypotension	12	10	22	0.2%
Snake Bite	32	42	74	0.6%
Stings/ Venomous bites	33	50	83	0.7%
Stroke/ CVA	154	196	350	2.8%

Syncope/ Fainting	7	20	27	0.2%
Trauma/ Injury	367	530	897	7.2%
Weakness of Body Generalized	1069	1640	2709	21.9%

Interpretation: Considering the Male population in the data to be 7318 and Female population 5061, we calculated risks ratios of some major ailments as provided in the data.

1.For Abdominal Pain /GI issues: The risk ratio is approximately 0.900. This suggest that the risk of experiencing abdominal pain or GI issues is slightly lower in females compared to males, with females having about 90% of the risk that males have.

2.Fever/Infections: The risk ratio is approximately 0.969. This indicates that the risk of experiencing fever, or infections is slightly lower in females as compared to males, with females having 97% of the risk that males have.

3.Respiratory Discomfort: The risk ratio is approximately 1. 341.This suggests that the risk of experiencing respiratory discomfort is higher in females compared to males, with females having about 1.341 times the risk that males have.

4.Trauma / Injury: The risk ratio is approximately 1.014, indicating that the risk of experiencing trauma or injury is very similar between females and males, with females having about the same risk as males.

5.Generalized body weakness: The risk ratio is approximately 2.219%, meaning that risk if experiencing body weakness is significantly higher in females than males, with females having about 2.219 times the risk that males have.

Time to reach on scene Statistics: For geriatric pre-hospital emergency care, there are 12,379 observations. The mean time taken for ambulance to reach the scene is 15.71 minutes which is comparable to the objective of the organization. Standard deviation is 49.93 minutes. This suggests greater variability around the mean, indicating that the time taken by the ambulances to reach the scene varies widely across different cases.

The results highlight several key findings regarding the epidemiology of geriatric emergencies in 108 ambulance service in Maharashtra. The distribution of geriatric patients across different age groups and gender reflects the diverse healthcare needs of the elderly population. The district-wise analysis reveals variations in the utilization of EMS resources, indicating potential disparities in access to emergency care. Commonly presenting complaints provides insights into the predominant health issues affecting geriatric patients, emphasizing the importance of targeted interventions and specialized care protocols.

8. Conclusions

Geriatric emergencies represent a significant health challenge in Maharashtra, requiring comprehensive strategies to tackle the unique health needs of the geriatric population. By leveraging the data driven approaches, policymakers can develop evidence-based interventions to enhance pre-hospital care services, improve outcomes, and promote the health & well-being of the geriatric patients across the state.

9. Recommendations

- Strengthen community-based geriatric programs, including health education initiatives and preventive screening campaigns, to promote healthy aging and reduce incidence of emergency events.
- Enhance training programs for EMS personnel to improve their proficiency in managing geriatric emergencies, including communication skills and geriatric-specific care protocols.
- Implement technology-enabled solutions, such as telemedicine platforms and mobile health applications, to enhance access to emergency services and facilitate remote consultations for geriatric patients.
- Foster collaboration between healthcare providers, policymakers, and community stakeholders to develop integrated care pathways and multidisciplinary approaches for managing geriatric emergencies effectively.
- More research is needed to assess the application of use of emergency services for apparently insignificant presenting complaints in geriatric subset.

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Annexure

Table 13: MEMS-District-wise Ambulance availability, Source: MEMS Website Data

Sr. No.	District	ALS	BLS	Grand Total
1	Ahmednagar	9	31	40
2	Akola	4	12	16
3	Amravati	6	23	29
4	Aurangabad	8	23	31
5	Beed	5	14	19
6	Bhandara	3	8	11
7	Buldhana	5	18	23
8	Chandrapur	7	16	23
9	Dhule	4	14	18
10	Gadchiroli	2	8	10
11	Gondia	3	12	15
12	Hingoli	3	9	12
13	Jalgaon	9	26	35

14	Jalna	4	11	15
15	Kolhapur	8	28	36
16	Latur	5	15	20
17	Mumbai	26	67	93
18	Nagpur	9	31	40
19	Nanded	6	19	25
20	Nandurbar	3	11	14
Sr. No.	District	ALS	BLS	Grand Total
21	Nashik	11	35	46
22	Osmanabad	4	11	15
23	Palghar	6	23	29
24	Parbhani	4	9	13
25	Pune	24	58	82
26	Raigad	4	19	23
27	Ratnagiri	4	13	17
28	Sangli	5	19	24

29	Satara	6	26	32
30	Sindhudurg	3	9	12
31	Solapur	10	25	35
32	Thane	12	27	39
33	Wardha	3	8	11
34	Washim	3	8	11
35	Yavatmal	5	18	23
Grand Total		233	704	937

Table 14: District-wise Geriatric Emergencies, Source: MEMS Data Oct 2023

		Frequency	Percent
Valid	Ahmednagar	791	6.4
	Akola	144	1.2
	Amravati	588	4.7
	Aurangabad	329	2.7
	Beed	265	2.1
	Bhandara	236	1.9
	Buldhana	252	2.0
	Chandrapur	407	3.3
	Dhule	134	1.1
	Gadchiroli	162	1.3

Gondia	203	1.6
Hingoli	114	.9
Jalgaon	240	1.9
Jalna	170	1.4
Kolhapur	811	6.6
Latur	259	2.1
Mumbai	531	4.3
Nagpur	593	4.8
Nanded	442	3.6
Nandurbar	49	.4
Nashik	240	1.9
Osmanabad	323	2.6
Palghar	218	1.8
Parbhani	96	.8
Pune	987	8.0
Raigad	329	2.7
Ratnagiri	311	2.5
Sangli	579	4.7
Satara	671	5.4
Sindhudurg	319	2.6
Solapur	526	4.2
Thane	264	2.1
Wardha	340	2.7
Washim	157	1.3
Yavatmal	299	2.4
Total	12379	100.0