Original Article

Maharashtra Emergency Medical Services: an example of A Public-Private-Initiative

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Abstract

Lack of optimal emergency services is one of the crucial contributing factor high mortality rates in India. With this background, Maharashtra Emergency Medical Services (MEMS) project was launched by the Department of Public Health, Government of Maharashtra through the National Rural Health Mission in 2014. The project is being implemented through public-private partnership model. The present short article provides the information of the project as an example of public-private- initiative. The objective of this project was to provide 24x7 pre-hospital emergency medical response services across Maharashtra, including disaster situations in the state. It is a descriptive study compiled from available records. The ambulances are well equipped with Basic Life Support (BLS) and Advanced Life Support (ALS) equipments and medicines. Total 937 ambulances, including 233 ALS and 704 BLS are working in MEMS. Community awareness about the 108 services is created through frequent awareness and training programs. A total of 6.8 million individuals are provided services till Jan 2022. The system offers quality services of transportation freely.

Keywords : Maharashtra Emergency Medical Services, Ambulances, Basic life support, Advanced life support

Introduction

Optimization of emergency services is achieved through an appropriate mix of human resources, material, and infrastructure of health institutions[(1)]. Even in low-income countries, it is not considered a luxury. The mortality depends upon both pre-hospital and hospital care. The emergency care situation before a few decades, even in the capital of India, was dreadful, the mortality of head injuries often. The concept of emergency medical services received impetus after launching the National Rural Health Mission. Through its Department of Public Health, the Government of Maharashtra had launched Maharashtra Emergency Medical Services (MEMS) project on 26th January 2014. Since its inception, Maharashtra state has chosen the public-private partnership model. It is an ambitious initiative to serve the entire population of Maharashtra in "Pre-hospital care," which provides 108 call-based Toll-free emergency medical access from anywhere in Maharashtra. One can dial 108 phone number from any landline or mobile phone to avail these services.

Maharashtra Emergency Medical Services as a project (MEMS) was organized in view to take health services at doorsteps of needy patients. The main pillar of these services is to start the treatment in golden hour at the scene, to be continued en-route and preferably, hand over the patient to nearest Govt. hospital, in case it is needed utmost, then with the consent of relative, may be admitted in a private hospital. The responsibility to execute, operate, and maintain has been entrusted to BVG India Ltd., a company based at Pune. The public-private partnership model still continues.

There is a fleet of 937 'well-equipped world-class ambulances' staffed by doctors and Drivers. The further project includes 60-seater "Emergency Call Centre" 24 X 7 round the clock at Aundh Chest Hospital, Pune. MEMS has served over 68,27,644 emergency patients since launch on 26th January 2014 till January 2022. The performance of the initial years has already been published[(2)].

Objectives

1. To provide 24x7 pre-hospital emergency medical response services across Maharashtra, including disaster situations in the state

Material and methods

It is a descriptive study compiled from available records. The study pertains to the entire Maharashtra State, India. The population of the state is 11.24 Crores as per the last census conducted in 2011, and 54.78% of the population is rural[(3)]. The population density is 365/km^2. There are 36 districts grouped in six revenue divisions. (Figure 1)

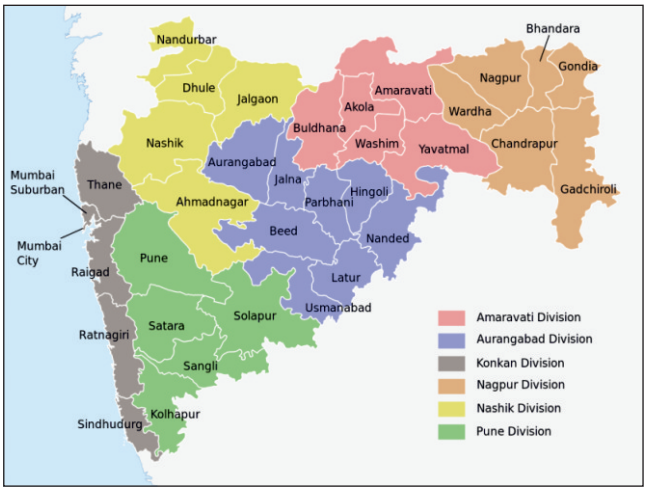

Figure 1: Map of Maharashtra with divisions

Source: The map is used from https : // en.wikipedia.org / wiki / List_of_districts_of_Maharashtra

gives these details in the map. The public health services are catered through a three-tier system of health institutions. There are 1,058 sub-centers, 1,811 primary health centers, 440 sub-district hospitals having 50 to 200 beds, and 23 district hospitals. The rest of the districts have medical college hospitals[4].

The mutually agreed in public-private partnership scope includes;

- Develop and operate emergency response service/ ambulance service which will provide Quality, Reliable, and Trustworthy Emergency Response Service.
- Develop a fleet of advanced ambulances on a turnkey basis.
- Develop mechanism in consonance with police and fire department operated through a single toll-free number 108.
- Effective logistics to maintain average response time of 20 minutes in urban and 30 minutes in rural areas after full-fledged operations.

Observations

The present status from inception to January 2022 of various aspects as per the scope is described below.

A. Infrastructure

1. *Ambulances*

   Total 937 ambulances, including 233 Advanced Life Support (ALS) and 704 Basic Life Support Ambulances (BLS), are working in MEMS. The ambulances have World Class Equipment (Defibrillator and transport ventilator - Germany, medical-grade oxygen delivery System-Spain). The project has the distinction of having the first ambulance in the country to have a medical-grade oxygen delivery system. The homologated ambulances are certified by the Automotive Research Association of India (ARAI). The ambulances are located on strategic points, including some PHCs, many sub-district hospitals, all district hospitals, and almost all government medical colleges. Some are located at private hospitals, including medical college hospitals.

2. The salient features of the Emergency Response Centre (ERC) are given below.

2.1 State-of-the-art control room (uninterrupted power, primary rate interface lines from 2 different telephone exchanges, Precision AC, Fire/ Heat suppressant, server clusters)

2.2 Seamless integration with other Departments.

2.3 Backup of 5 ambulances for each ambulance.

2.4 Dynamic display on the map for incident location identification.

2.5 MEMS dashboard - real-time data access to government officers.

3. *Manpower*

3.1 Well-trained Medical Doctor (EMSO) and trained Driver (Pilot) available 24 X 7 round the clock.

3.2 ERC with EROs, ERC Physicians, Dispatch Closure Officers (DCO), and other supervisory staff.

4. *Training and retraining*

4.1 First Time in India, all the doctors working in ambulances are trained.

4.2 The First state in the country to have an EMS treatment protocol for emergency care.

4.2 Manual of Maharashtra EMS is prepared and followed.

5. *Logistics*

5.1 Ambulances are well equipped with necessary life-saving medicine and consumables.

5.2 List of equipment is given below.

5.3 List of medicines and consumables is also given below.

6. *Medicines and Equipment*

Required medicines and consumables are always available in the MEMS Ambulance. A total of 161 different types of medicines and consumables are available in ALS and BLS Ambulances. Different types of 35 medical equipment required for treating the patients in 704 BLS ambulances are available. In addition, a Defibrillator, Ventilator, Syringe infusion pump made available in advance life support ambulances. Medical grade oxygen is available with two Jumbo oxygen cylinders. All ambulances are as per the National ambulance core.

B. *Awareness programs*

Awareness plus training programs about first response and

activation of 108 services were organized in 33,838 community clusters covering 1,29,93,269 individuals. The awareness plus training about first response programs were also conducted in 6,793 schools attended by 8,21,592 students/teachers duos.

C. *Involvement in Pandemic of COVID-19 in the State*

1. Separate desks were created in ERC Pune for dispatching ambulances for suspected corona cases.
2. Additional desk established at Bombay Municipal Corporation Disaster control room for continued coordination with 1916 BMC Disaster helpline. Desk works 24 X 7 and handles calls from 1916, MOH, Ward Officers, and Corona Helpline (i.e., 47 085 085)
3. Ambulances are designated in respective districts for patient transfer for suspected corona cases. Daily coordination has been established with respective districts Collector for corona suspected patient transfer.
4. Till January 2022, MEMS has served 5,92,649 COVID-19 patients.

D. The number of patients served by 108 MEMS ambulances since launch is given in Table 1.

It also shows the type of emergencies served till January 2022 by ambulances in the Maharashtra State.

Table 1: MEMS emergency patients served since launch till January 2022

S. No.	Type of Emergency	Total
1	Accident(Vehicle)	4,53,000
2	Assault	65,056
3	Burns	23,748
4	Cardiac	15,075
5	Fall	1,43,861
6	Intoxication/Poisoning	1,76,129
7	Labour/ Pregnancy	1,29,5734
8	Lighting/Electrocution	6,152
9	Mass casualty	23,421
10	Medical	38,29,075
11	Others	7,79,297
12	Poly Trauma	11,674
13	Suicide/Self Inflicted Injury	5,422
Grand Total		68,27,644

Additionally, the health care workers have conducted 37,381 emergency deliveries in the ambulances and have managed 3,788 patients on ventilators during transit. The system has recorded 5,39,636 feedbacks. The system takes feedback usually next day. In the last five years, the feedbacks ranged from 46,692 to 100,408. Due to the COVID-19 pandemic, there is some reduction in numbers. Before feedback, the death rate varied from 0.36 to 0.62% in the last five years. About 14% of feedbacks were excellent, 83% good, and only three percent were average. The ERC was on line 99.84% time. The average call Handling Time (AHT) was 3:39 minutes.

Table 2: Major events served by MEMS (108 Service)

Event	No. of patient served	Remark
Maha Kumbh Mela Nashik 2015	107,200	Safest Kumbha mela in history with zero fatality
Pandharpur Wari	238,680	Significant reduction in deaths during last 5 years.
Ganpati Festival	2,175	Significant reduction in deaths during last 5 years

*MEMS takes care of all the major incidents in the state including Main Landslide Roha, Train Accidents, Mumbai Floods, Fire in Mumbai Buildings, Bridge Collapse, all mass casualty incidents on road, etc.

E. *List of Equipment in MEMS Ambulance*

A list of 35 different types of medical equipment required for treating the patients in 704 BLS Ambulances is given in Table 3. Defibrillator, ventilator, syringe infusion pump, and all equipment from BLS are made available in advance life support ambulances. Medical grade oxygen is available with two Jumbo oxygen cylinders. All ambulances as per National ambulance core.

Table 3: List of equipment in MEMS ambulance

Sr. No.	ALS	Sr. No	BLS
1	Ambulance cot	1	Ambulance cot
2	Scoop stretcher	2	Scoop stretcher
3	Spine board	3	Spine board
4	Transfer sheet	4	Transfer sheet
5	Wheel chair	5	Wheel chair
6	Bi-phasic defibrillator cum cardiac monitor with recorder	6	Oxygen flow meter with humidifier
7	Transport ventilator	7	Suction pump (manual and handheld)
8	Oxygen flow meter with humidifier	8	Suction pump electronic
9	Suction pump (manual and handheld)	9	Self-inflatable resuscitation bags
10	Suction pump electronic	10	Mouth to mask ventilation device
11	Self-inflatable resuscitation bags	11	Oxygen cylinder (portable) with oxygen pressure reducer
12	Mouth to mask ventilation device	12	Oxygen administration equipment
13	Oxygen cylinder (portable) with oxygen pressure reducer	13	Laryngoscope with blades with mackintosh blade 1, 2, 3 and 4
14	Oxygen administration equipment	14	Fetal doppler (handheld)
15	Laryngoscope with blades with mackintosh blade 1, 2, 3 and 4	15	Handheld glucometer
16	Volumetric infusion pump	16	Stethoscope paediatric and adult
17	Syringe infusion pump	17	BP apparatus (digital)
18	Foetal doppler (handheld)	18	Pupillary torch
19	Handheld glucometer	19	Needle and syringe destroyer and sharp dispenser
20	Stethoscope paediatric and adult	20	Thermometer (digital)
21	BP apparatus (digital)	21	Pneumatic splints set of 6 (adult size)
22	Pupillary torch	22	Roller splints
23	Needle and syringe destroyer and sharp dispenser	23	Cervical collars
24	Thermometer (digital)	24	EMT shears
25	Pneumatic splints set of 6 (adult size)	25	Toothed Forceps-Dissecting
26	Roller splints	26	Artery forceps 6"
27	Cervical collars	27	Toothed forceps 6"
28	EMT shears	28	Magill's forceps
29	Toothed forceps-dissecting	29	Kidney tray
30	Artery forceps 6"	30	Klik clamp (50 no.)
31	Toothed forceps 6"	31	Tongue Depressor (100 no.)
32	Magill's forceps	32	First aid kit bag
33	Kidney tray	33	Search light (not torch light)
34	Klik clamp (50 no.)	34	Rescue equipment
35	Tongue depressor (100 no.)	35	Pulse oximeter
36	First aid kit bag		
37	Search light (not torch light)		
38	Rescue Equipment		

F. Table 4 gives the list of important medicines and consumables out of 161 different types of medicines and consumable that are available in ALS and BLS Ambulances.

Table 4 : Medicines and consumables in the ambulances

Sr. No.	Name of Medicines /consumables
1	Cotton roll 500 gm
2	Bandage 15 cm x 3 mt.
3	Antiseptic solution 200 ml/100 ml
4	Povidine Iodine solution 100 ml
5	Micropore 1/2 inch to 3 inches
6	Pain spray
7	Face Mask (Disposable)
8	Surgical Gloves (Size 6.5 to 7.5)
9	Classic LMA disposable(2 to 4)
10	Classic LMA disposable (2.5)
11	Endo tracheal tube, disposable uncuffed no-(3- 9.5)
12	Wide bore needles (20 G - 24 G)
13	Disposable L. P. Needles (Spinal needle) size:18-26
14	Syringes ABG 2 -5ml with needle
15	Three-way stop cork
16	Extension I/V lines 100 cm
17	Disposable delivery Kit
18	ECG electrodes
19	Guedel's airway 00-4
20	ABDs, 10"x12" or larger
21	Nasal airways(all sizes) and catheters Size 5-9
22	Binasal Cannula
23	Tracheostomy tube – Disposable uncuffed No-3 - 9
24	Mini Tracheostomy kit
25	Ventimask, facemask with nebulizer Mask
26	Pressure Infusion Bags
27	Right angled swivel connector
28	Bone Marrow Needle
29	I. V. Fluid(RL)
30	I. V. Fluid(NS)
31	I. V. Fluid (DNS 5%)
32	I. V. Fluid(Isolyte-P)
33	I. V. Fluid(5% D)
34	I. V. Fluid(Haemaccel)
35	Micro drip-set (pediatric)
36	Drip Set
37	Nasogastric Tubes- Ryles Tube 8 - 20
38	Elastic bandages Non-sterile (6 cm-15 cm)
39	Occlusive dressing Sterile, 3"x8" or larger
40	Adhesive tape : 1/2 Inch
41	Adhesive tape : 1 Inch - 3 Inch
42	Adhesive tape (hypoallergenic): Transpore 1/2"-3"
43	Burn Pack : Standard package, clean burn sheets (or towels for children)
44	Triangular bandages (Minimum 2 safety pins each)
45	ABDs, 10'x12'or larger
46	Sterile multi trauma dressing (5cmx5cm – 10cmx10cm)
47	4"x4" gauze sponges
48	Tab. Paracetamol 500mg
49	Gauze rolls Sterile (-10cm* 3,15cm * 3 Mtrs)- Gamjee
50	Cold packs
51	Waste bin for sharp needles, etc.
52	Disposable bags for vomiting, etc.
53	Teeth guard (Adult+Pediatric)
54	Inj. Adrenaline
55	Inj. Atropine 0.6 mg
56	Inj. Calcium Gluconate
57	Inj. Dopamine
58	Inj. Dobutamine
59	Inj.Noradrenaline
60	Inj.Nitroglycerine
61	Inj. Sodium Bicarbonate
62	Inj. Hydrocortisone
63	Inhaler Beclomethasone
64	Inhaler Salbutamol
65	Inj. Frusemide
66	Inj. Diazepam
67	Inj. Midazolam
68	Inj. Etofylline 77mg + Theophylline 23mg 2ml
69	Inj. Phenytoin sodium
70	Inj. Pheniramine maleate 22.75 mg/ml 2ml
71	Inj. Dexamethasone
72	Inj. Ondansetrone
73	Inj. KCl
74	Inj. Lignocaine 2%
75	Inj. Amiadarone (50 mg/ml)
76	Inj. Magnesium sulphate 25% 2ml.
77	Inj. Mannitol 20 %
78	Inj. Morphine
79	Inj. Noradrenaline bititrate 4mg (Repeated Item)
80	Activated charcoal
81	Inj. Naloxone HCl
82	Inj. Fentanyl
83	Bacteriostatic Water for Injection
84	Inj. Sodium Valproate
85	Inj. Diclofenac Sodium 3ml
86	Inj. Paracetamol
87	Syp. Paracetamol 125mg/ml 60ml
88	Tab. Isosorbide Dinitrate 5mg
89	Tab. Aspirin 75 mg
90	Tab. Amlodipine 5mg

Discussion

Philosophically a system of pre-hospital care is needed to stabilize the patient having life/limb-threatening injury or illness. The list of illnesses needing time-bound help includes severe infections, convulsions, hypoxia, dehydration, cerebral stroke, acute coronary heart disease, pre/intra/postnatal bleeding[5]. National Medical Council, India accepted Emergency Medicine specialty in 2009. WHO has accepted emergency care services as an essential component of universal health coverage very lately only in 2019[6]. In emergency medical services, the focus has always been on trauma, particularly in Low and Middle-Income Countries[7,8]. The government of Maharashtra has established 68 trauma centers inclusive of all district hospitals and 45 sub-district hospitals of various strengths[4]. Two call numbers have been propagated in India, 102 for maternity services and 108 for other medical emergencies. Presently both services are provided by 108. In the initial phases, NHM provided financial support for the purchase of vehicles. Later, gradually, the proportion of sharing expenditure decreased. Last few years Government of Maharashtra has been spending about Rs. 26 crores annually on MEMS. The model may not be technically a public-private partnership as it was a response to a call for outsourcing EMS which was responded by the firm. It has been continued because of satisfactory performance. In Kerala, since 2011, a non-government agency Active Network Group of Emergency Life Savers (ANGELS), started emergency medical services in one district and now extended to two more districts[9]. The group also has initiated Bike Emergency Rescue Teams. The latest advances demand helicopter services for acute emergencies; helicopter services were utilized in the COVID-19 pandemic in Nepal[10]. Apart from transportation, excellent communication is an equally important component of emergency medical services[1] which is being taken care of MEMS by the emergency response center.

The initiative of MEMS has conducted community training for immediate care, provided state-of-the-art ambulances with trained human resources to offer quality services during transportation without any charges to the patients. The subsequent care is not under the purview of MEMS. Thus, it is functioning satisfactorily in two of the three identified functions of emergency medical care[5]. There is a good scope for nurses to get specialized training in ambulance nurse[11]. The locations of ambulances are a crucial aspect in minimizing response time. There are always arguments about the adequacy and placing of trauma care centers, even in developed countries[12].

The training of community members and health care workers and further research has been aptly recommended universally[1].

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