Chapter-II

Performance Audit

Department of Health and Family Welfare Services

2.1 Arogya Kavacha – 108 Project

Executive Summary

Emergency medical services (EMS) is defined as the system that organises all aspects of care provided to patients in the pre-hospital or out-of-hospital environment. It is a critical component of health systems and is necessary for improving outcomes of injuries and other time-sensitive illnesses. Government of Karnataka aimed to provide a comprehensive Emergency Response Service, from the time of event occurrence to shifting to an appropriate hospital, through a single toll free number '108' for which, it had entered into a Public Private Partnership arrangement (Design, Build, Operate and Maintain model) with GVK Emergency Management Research Institute, Secunderabad through a Memorandum of Understanding (MOU).

The success of EMS is largely dependent on its responsiveness to emergencies and the adequacy of the infrastructure in place. The performance audit conducted for the period 2014-15 to 2018-19 intended to ascertain whether EMS was appropriately responsive and equipped to deliver quality pre-hospital emergency care and the Information and Communication Technology deployed in the project was supporting the overall activities and the objective of delivering quality emergency care adequately. Though the project envisaged catering to police, fire and medical emergencies, 99 *per cent* of the emergencies attended to were medical emergencies.

Audit noticed that EMS fell short of achieving the desired objectives completely. The project aimed to reach the patients/sites within 20 minutes on an average in urban areas and 30 minutes on an average in rural areas. However, rural-urban classification of data was not available. Hence, maximum 30 minutes' response time was considered for audit analysis and we noticed that this was achieved in only 72 *per cent* of the cases. The response time comprised triage time, chute time and travel time. The triage time was more than the stipulated three minutes in 47 *per cent* of the cases. In 85 *per cent* cases, the chute time was more than the stipulated one minute and was up to 100 minutes and beyond in few cases. Studies indicate that the response time for cardiac, respiratory and stroke cases was to be less than 10 minutes. However, the ambulances reached the patients after the stipulated 10 minutes in 62, 66 and 63 *per cent* cases respectively. In 50 *per cent* of the trauma cases, the patients were admitted to the hospital after the crucial one-hour time. In the absence of adequate follow-up data, the impact on the final outcome of the patients could not be ascertained.

The total calls received comprised 64 *per cent* ineffective calls, out of which no response and disconnected calls were 42 and 34 *per cent* respectively. The callers were called back only in three *per cent* of the disconnected cases indicating absence of call monitoring mechanism.

Pre-arrival instruction is a critical component in EMS. There was no mechanism in place for alerting the hospitals in advance about arrival of ambulances. In 18 *per cent* of the cases, there was a delay in handing over the patients beyond 15 minutes because of which 1.75 lakh ambulance hours were lost. This was compounded by the delay in reporting closure of cases by the crew even after reaching the base station leading to loss of 31.87 lakh ambulance hours. Ambulances were despatched only in 3.74 lakh cases out of the 8.87 lakh requests transferred to vehicle busy desk. The allocation of ambulances was not based on criticality of emergencies as ambulances with Basic Life Support system were allocated in 75 *per cent* of the cases to critical emergencies such as cardiac, respiratory and trauma that required allocation of Advanced Life Support systems.

The project adopted population as the criteria for deployment of ambulances. In the absence of policy regarding positioning/location of the ambulances, we observed that ambulances were stationed mainly within the Government hospital premises and not within the vicinity of black spots. The round trips undertaken by the ambulances impacts the responsiveness of EMS.

There were 20 and 21 *per cent* vacancies in the post of ambulance drivers and emergency management technicians respectively. The shortage of ambulance staff led to ambulances remaining off the road for 41,342 days during the audit period. Emergency Response Centre Physicians (ERCPs) were required to provide virtual medical directions to EMTs who were in the field. There were only three ERCPs available at the emergency response centre. The percentage of unanswered calls by ERCPs was 58.20 and 65.52 during 2017-18 and 2018-19.

There was no strategic management plan to ensure the availability of EMS to disadvantaged sections such as people living in remote/tribal areas, marine fishermen *etc*. In addition, assessment of effective response time for different categories of emergencies, pre-alerting mechanism, monitoring of patient outcomes, upgradation of ICT infrastructure and research of effectiveness of pre-hospital care remained out of the purview of the top management at Government level.

Validation procedures were absent which resulted in incomplete data, back-end insertion of data and incorrect reporting. Back up plans, incident management and business continuity plans that were necessary for taking remedial measures in cases of disruption were not prepared. There were no reporting arrangements between the Government and the Partner. There were 6,411 complaints received from emergency service users during the audit period. However, the Government was not informed of the public grievances by the Partner in the absence of any such mechanism. The State Government did not have access to project databases, which impaired monitoring of the project and the use of data to undertake research and development activities for improving patient care. The State and District level committees, which were supposed to monitor the project were not constituted.

The Government decided to discontinue the association with the Partner before the scheduled 10-year period citing deficiencies in services. However, the

existing service provider is continuing as identifying a replacement partner was delayed. The MOU did not provide for an exit strategy plan for fulfilment of the contractual obligations as regards transfer of assets and intellectual property rights. The consequent risk of disruption in implementation of the project could not be ruled out. The project was also not evaluated despite being in operation for over a decade.

2.1.1 Introduction

The Government of Karnataka accorded (August 2008) sanction for implementation of the 'Emergency Medical Service -108 Project (Project)' under a Public Private Partnership (PPP) arrangement (Design, Build, Operate and Maintain model) with GVK[5] Emergency Management Research Institute (EMRI), Secunderabad in order to provide a comprehensive 'Emergency Response Service' to those in Medical, Police or Fire emergencies, through a single toll free number - 108. The service provides complete pre-hospital emergency care from event occurrence to evacuation to an appropriate hospital[6]. The aim is to reach the patients/sites within 20 minutes on an average in urban areas and 30 minutes on an average in rural areas. The emergency transportation is conducted in a state-of-the-art ambulance, which is provided free. The transportation is coordinated by an emergency call response centre, which is operational 24-hours a day, 7-days a week.

The Department appointed the Private Partner (Partner) without any competitive bidding, after obtaining exemption under the Karnataka Transparency in Public Procurement Act. A Memorandum of Understanding (MOU) was entered (August 2008) between the Government and the Partner, which laid down the terms and conditions, responsibilities and deliverables. There was no separate Service Level Agreements and guidelines specific to the information and communication technology used in the Project.

This PPP model was unique to the Project in the sense that the Government would provide funds in advance to meet (i) the cost of capital expenditure for deployment of ambulances, setting up Emergency Response Centre and IT infrastructure and (ii) 100 *per cent* of the operational expenditure (on quarterly basis) while the Partner designed, built and maintained the infrastructure and operated the services. The Partner would, however, meet the cost of senior management. The PPP arrangement was for a period of ten years ending August 2018. All the assets (movable, immovable and software) created under the project would be the property of the State Government. The MOU with the Partner was extended as identification of a replacement partner for continuing the project through a competitive tendering process was getting delayed.

In accordance with the MOU, 517 ambulances were to be initially deployed for the entire State in a phased manner. Each ambulance thus catered approximately to a population of 1.0 lakh to 1.10 lakh. Deployment of 517 ambulances translated to a per trip distance of approximately 25 km which

[5] GVK represents the name of the founder Gunupati Venkata Krishnareddy.
[6] Appropriate hospital refers to hospital appropriate to the emergency at hand.

would ensure the transportation of the victim within the Golden Hour[7]. Subsequently, the State Government procured (August 2014) another 194 ambulances taking the total fleet to 711 ambulances. There were 746 active ambulances (including 35 back-up ambulances) as at the end of October 2019, of which 181 were ambulances with Advanced Life Support System[8] (ALS) and 565 were ambulances with Basic Life Support System[9] (BLS). In addition, the State provided (April 2015) 30 bike ambulances[10].

2.1.2 Organisational setup

The Principal Secretary to Government, Health and Family Welfare Services (H&FW) Department is the administrative head of the department. The Commissioner, H&FW Department assisted by Deputy Director (EMS) monitored the implementation of the project at the State Level. At the District Level, District Medical Officers were the nodal officers for monitoring project implementation. The Partner had set up State, Regional and District Level administrative infrastructure for implementing the project.

2.1.3 Audit objectives

The Performance Audit (PA) seeks to examine whether:

- The Emergency Medical Service was appropriately responsive and adequately equipped to deliver quality pre-hospital emergency care; and
- The Information and Communication Technology deployed in the project was adequately supporting the overall activities and the objective of delivering quality emergency care.

2.1.4 Audit criteria

The criteria for the PA were derived mainly from:

- The Memorandum of Understanding (MOU) between the State Government and the Partner;
- The General Principles of Information Systems Governance, Development and Maintenance;
- The Karnataka Integrated Public Health Policy, 2017; and

[7] The time period lasting one hour following a traumatic injury during which there is highest likelihood of preventing death by providing prompt medical care.

[8] A vehicle ergonomically designed, suitably equipped and appropriately staffed for the transport and treatment of emergency patients requiring invasive airway management / intensive monitoring.

[9] A vehicle ergonomically designed, suitably equipped and appropriately staffed for the transport and treatment of patients requiring non-invasive airway management / basic monitoring.

[10] Bike Ambulances act as first responder service and is dispatched along with a regular ambulance.

- Guidelines on Post- Award Contract Management for PPP Concessions issued by Department of Economic Affairs, Ministry of Finance, Government of India.

2.1.5 Audit scope and methodology

The project was supposed to cover police, fire and medical emergencies. However, in practice it focused predominantly on medical emergencies, which constituted about 99 *per cent* of the total emergencies. Hence, the PA was largely restricted to Emergency Medical Services. The PA was conducted between April and October 2019 covering the period 2014-15 to 2018-19 through a test-check of records in the offices of the Commissioner for H&FW and the Partner at State level. Eight[11] out of 30 districts were selected through probability proportionate to size without replacement with size measure being the number of ambulances. Joint inspection of 25 *per cent* of the ambulances in each district was conducted with the district personnel.

The audit objectives, criteria and scope of audit were discussed in an entry conference (March 2019) with the Principal Secretary, H&FW Department. The audit methodology involved document analysis relating to project implementation and analysis of databases maintained by the 108-Project Office. The application and databases examined included the Call Management System, the GPS based Ambulance Tracking System, Fleet Management System and the Human Resource Management System.

Apart from the joint inspection of ambulances, structured interviews were held with emergency management technicians (119), pilots (120) and emergency department staff in district hospitals of the selected districts (115). A survey of beneficiaries (371) admitted in the district hospitals was also conducted to assess the quality of service delivery. The findings of the interview/survey are incorporated at relevant places.

An exit conference was held on 6 May 2020 with the Additional Chief Secretary to Government of Karnataka, H&FW Department, wherein the audit findings were discussed. The report takes into account the replies furnished (March 2020) and the response of the Government during the exit conference.

2.1.6 Acknowledgement

We acknowledge the cooperation and assistance extended by officers and staff of the State Government and the Partner in conducting the performance audit.

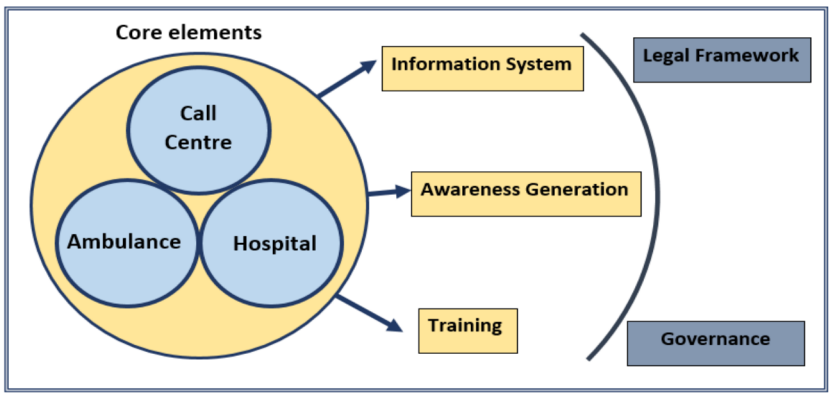
2.1.7 Components and process of Emergency Medical Service

Good medical emergency performance requires resources such as paramedics, vehicles and a robust information and communication environment capable of supporting the efforts of the paramedics and the transport services.

[11] Belagavi, Bengaluru Urban, Bidar, Dakshina Kannada, Davanagere, Dharwad, Hassan and Kalaburagi.

Components of an EMS can be visualised as depicted in **Figure 2.1**.

Figure 2.1: Components of EMS



As depicted in the figure, the core elements of the system would include the ambulances, the call centre and the hospitals. The functioning of these elements would be critically dependent on robust information system, trained healthcare providers, and widespread awareness among members of the public on the appropriate use of EMS. For overall transparency in operations and high level of citizen satisfaction, an overarching legal and governance framework was necessary.

2.1.8 Information and Communications Technology Infrastructure

Effective use of information and communication technology (ICT) is central to the quality and safety of any emergency service. A number of interrelated pieces of technology were used towards provision of timely emergency response service. The main components of the ICT infrastructure are:

- Emergency Management Centre Application System
- Automated Vehicle Location Tracking System
- Fleet Management Application
- Hospital Information System Application

Audit findings

The findings noticed during the performance audit are discussed in the succeeding paragraphs.

2.1.9 Emergency Management Centre Application System

In order to provide quick and timely intervention in an emergency, a communication network to facilitate access to people in distress from anywhere and at any time is essential. An Emergency Response System (ERS) should be robust, well-staffed, always active and ready for immediate action.

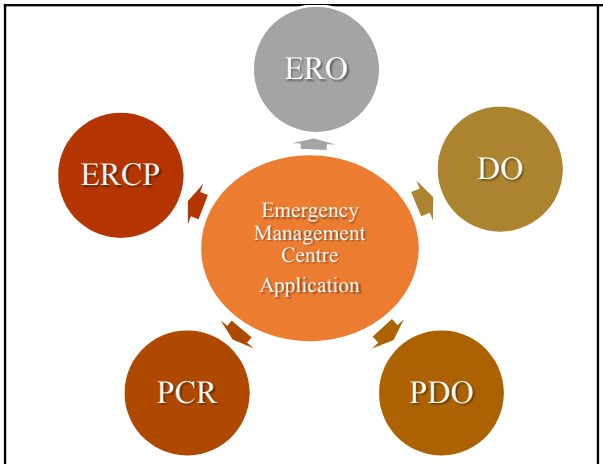
An Emergency Management Centre consisting of a Call Centre was set up in the year 2008 at Bengaluru, which provided round the clock services through

an integrated solution including Voice Logger System, Geographic Information System, Global Positioning System (GPS), Automatic Vehicle Tracking and mobile communication system[12]. The system was designed to ensure that the control room could mobilise the nearest available ambulance to pick up the distressed person and transport them to the nearest hospital immediately on receipt of a distress call.

The project consisted of a Computer Aided Despatch System with 62 incoming lines for police, fire and emergency medical assistance. The Call Centre has 53 call taker stations. Each station is equipped with a phone, a computer interface to enter call information and a playback recorder to review incoming calls.

The Emergency Management Centre Application (EMCA) consisted of the following modules as depicted in **Figure 2.2**.

Figure 2.2: Modules of the Emergency Management Centre Application



Emergency Responsive Officer (ERO) module operated by the call centre personnel collects information about the caller, incident, type of emergency *etc.*, and based on an initial triage[13] allocates an appropriate ambulance. The Despatch Officer (DO) module captures incident information from the ERO Module and collects additional details of the victim, the destination hospital, ambulance travel *etc*. The Police Dispatch Officer (PDO) module handles the fire and police emergency cases transferred to it by the ERO Module. Patient Care Record (PCR) module captures the pre-hospital emergency care provided by the emergency personnel. The Emergency Response Centre Physician (ERCP) module captures the interaction of the physicians in the call centre with the Emergency Medical Technicians (EMTs) in the field in providing pre-hospital care.

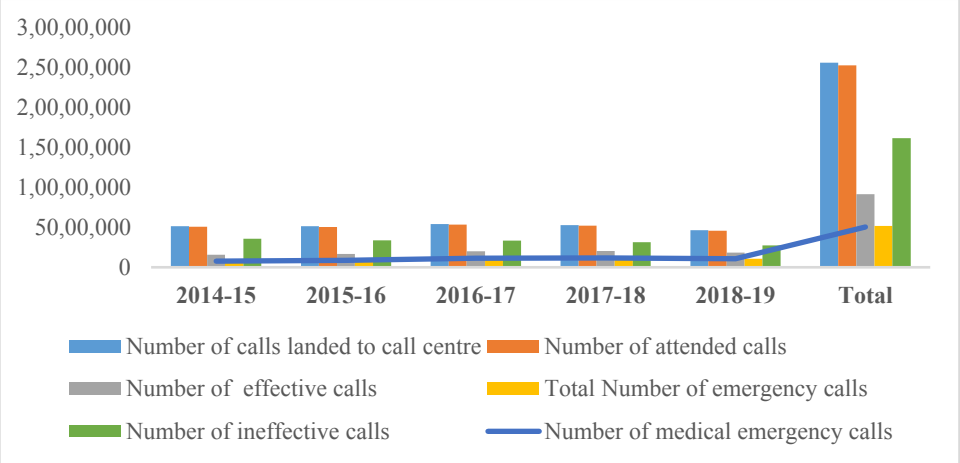
2.1.9.1 Classification of calls and their status

Calls received were mainly classified into effective[14] and ineffective[15]calls. Effective calls were further classified into emergency and non-emergency calls. Majority of the emergency calls were medical emergencies. Medical emergency calls constituted 99 *per cent* of the emergency calls with the police and fire emergencies contributing the remaining one *per cent*.

The status of calls received during the period 2014-15 to 2018-19 is indicated in **Chart 2.1**.

[12] Automated Vehicle Tracking System (AVTS) is a software platform hired by the Partner from a third party, M/s iTriangle Infotech Private Limited. The AVTS is integrated with the ERO Module of the Emergency Management Centre Application.
[13] Triage is the process of determining the severity of cases and assigning the ambulances.
[14] Effective calls comprise of emergency calls and non-emergency calls such as follow-up calls, enquiry calls, appreciation calls *etc*.
[15] Ineffective calls comprise of no response calls, wrong calls, nuisance calls, missed calls *etc*.

Chart 2.1: Status of calls received during the period 2014-15 to 2018-19



Source: Extraction and analysis of data provided by the Partner

During the period 2014-15 to 2018-19, the call centre attended to 253.30 lakh calls out of 256.45 lakh calls landed[16] at the call centre. Of the attended calls, 91.62 lakh calls (36 *per cent*) were triaged as effective calls. In the effective calls, there were 51.65 lakh emergency calls (56 *per cent*) out of which 51.05 lakh were medical emergencies. Ambulances were despatched in 41.94 lakh cases (82 *per cent*) as detailed in Paragraph 2.1.10.4.

2.1.9.2 Call Management

The first step towards achieving an effective ERS involves efficient management of the call centre.

❖ ***Effective but non-emergency calls***

The call centre had received around 44 *per cent* non-emergency calls during the period 2014-15 to 2018-19. These were mainly enquiry calls, follow-up calls, caller concerns and appreciations, calls from field staff to DOs and ERCPs. Routing such calls through 108 would burden the emergency helpline and delay the response to other callers requiring emergency assistance. Best practices require providing information to the public and officials on the usage of 108 emergency number. We observed that

- the project did not provide for sharing the ambulance despatch details and crew numbers with the emergency callers thereby necessitating the use of 108 for follow-up actions.
- the project did not offer a non-emergency call number for public to make enquiries.
- though EMTs were given a separate access number to reach out to the ERCPs and DOs, large number of such calls were routed through 108.

[16] Calls landed refer to the incoming telephone calls received through the dedicated number 108 at the Electronic Private Automatic Branch Exchange (EPABX) of the Emergency Management Centre located at Bengaluru.

The Partner, thus, failed to monitor the huge number of non-emergency calls, which could have facilitated taking suitable remedial measures.

Need for providing ambulance crew mobile details and ambulance arrival status to callers

On 2 December 2017 at 4.29 am, the call centre received an emergency call related to cardiac ailment from Chitradurga District. An ambulance (KA07G402) was assigned to the case immediately. The ambulance took 56 minutes to reach the patient. We observed that the caller made five additional calls to 108 number prior to the arrival of the ambulance. Thus one emergency call was followed by five non-emergency calls in this instance.

On 4 May 2018 at 1.33 am, the call centre received an emergency call related to medical assault from Raichur District. An ambulance (KA07G459) was assigned to the case at 1.39 am. The ambulance took 80 minutes to reach the scene. We observed that the caller made 18 follow-up calls to the 108 number prior to the arrival of the ambulance. Thus one emergency call was followed by 18 follow-up calls.

Hence, providing a monitored direct telephonic access between callers and the ambulance crew can reduce the number of follow-up calls to 108.

❖ ***Ineffective calls***

These calls comprise of no response call, wrong call, missed call, disconnect call, nuisance call *etc.*, and constituted about 64 *per cent* (161.68 lakh calls) of the total calls attended at the call centre during the period 2014-15 to 2018-19. Larger number of ineffective calls can adversely impact the project's ability to respond to effective calls. This issue has to be approached through multiple means as there can be no single solution. There is a need for a widespread public awareness program that emphasises the important role 'dial 108' plays in saving lives. We observed that

- No response calls and disconnect calls constituted 42 *per cent* and 34 *per cent* of the ineffective calls respectively during the above period. Best practices require that the disconnected calls and no response calls are followed up further to make sure that no emergency cases are left unattended. Out of 55.31 lakh disconnected calls, the callers were called back only in 1.49 lakh cases (3 *per cent*). Similarly, call back was resorted to in only 0.20 lakh cases (0.3 *per cent*) out of 68.27 lakh no response calls.

Disconnected Calls - Need for effective call-back mechanism

An emergency call was received (27 March 2018) requesting to shift a pregnant lady to a hospital (Case id: 20180001175821). The call was triaged as emergency. However, the call got disconnected and no ambulance was allotted. After 45 minutes, the caller complained that the patient died due to non-receipt of timely ambulance service. An internal enquiry was conducted and the call taker was terminated from service. However, no mechanism was instituted to ensure that the call was returned in the event of disconnection. The State Government, during the exit conference, accepted that call back facility was not available at present.

- though 18 *per cent* of the ineffective calls were nuisance calls, no procedure was specified to deal with frequent nuisance callers. We noticed that in 460 instances, nuisance calls were received from the same numbers in excess of 300 times in each instance. The issue of nuisance calls was not escalated to law enforcement authorities in any of these cases.

Need for protocol on handling calls – An illustration

A request was made for an ambulance by an attendant of an unconscious patient (March 2018). The caller had called six times within 78 minutes as he did not get a proper reply from the ERO. We observed that during the triage, one of the calls was classified as a Nuisance call and another call which got disconnected was not returned. No ambulance was assigned as the three nearest ambulances were busy. This information was not conveyed to the caller for a long time. Finally, when an ambulance became free and was allotted, EMT of that ambulance refused to take the patient and the patient died. The quality team confirmed the details and closed the case by transferring the EMT to another location. Detailed investigation was not conducted on the lapses that occurred during the triage process.

The State Government, while accepting the observation during the exit conference, stated that the MOU did not make the Partner responsible for reporting the grievances raised by public to the Government and monitoring committees at the districts were not functional. It further stated that these issues were being addressed in the proposed tender.

❖ ***Unattended calls***

These calls constituted around one *per cent* of the total calls landed at the call centre. Such calls were to be monitored through a call back mechanism to cater to the required emergency service. However, we noticed that no such mechanism existed.

The State Government, in its reply, did not offer specific remarks on the issues raised in the above paragraphs. However, in the exit conference, it stated that the necessary details would be collected from the Partner and remarks offered thereafter.

It is recommended that as there is a likelihood that many of the unattended calls could be emergency calls from distressed callers, such unattended calls be monitored through a call back mechanism to ensure that the emergency is attended to.

2.1.9.3 Call centre metrics not specified and monitored

The performance of a call centre is monitored through a set of generally accepted metrics such as numbers of callers receiving busy tone, time spent in queue, number of calls abandoned *etc*. Inbound callers may receive busy tone, which could be a missed opportunity to connect with a distress caller and thus, requires close monitoring by tracking calls receiving busy tone for possible call back. Analysing the volume of calls receiving busy tones can provide valuable

information about the performance of the call centre including sufficiency of the lines, staffing levels *etc*.

A call queue refers to the situation where callers are put on hold, in a queue, while they wait to speak with a call centre agent. Waiting in a queue for a long period of time impacts the emergency service delivery and can lead to either termination of the call by the system or abandoning the call by the caller. It is therefore, important to monitor the average time spent by the callers in the queue. Abandon rate is an important metric. It provides the information regarding the service delivery and can be a predictor of call centre infrastructure facilities. Higher abandon rate indicates under-allocation of resources to the call centre and results in lost opportunities in attending to emergencies besides leading to public dissatisfaction with the service. The percentage of terminated calls and abandoned calls during the period 2017-18 to 2018-19 as per the Contact Centre Management System (CCMS)[17] was 2.87 and 2.94 *per cent* respectively.

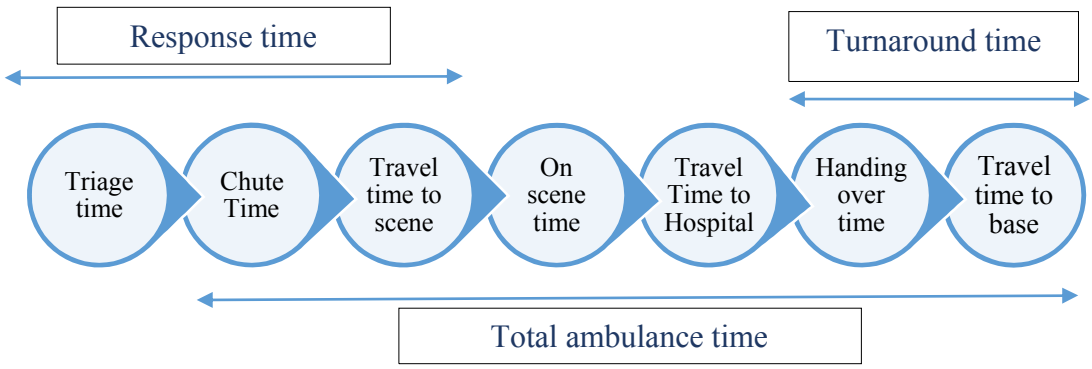
We, however, observed that no mechanism existed to monitor the instances of callers receiving busy tone, terminated and abandoned calls. The State Government, during the exit conference, accepted that call back facility was not available at present.

2.1.9.4 Response to emergency calls

The EMS process is highly dependent on time, a critical and significant indicator in the delivery of emergency services. The speed with which a patient is shifted to a hospital and the quality and timeliness of pre-hospital care can affect a patient's chances of recovery. Accordingly, EMS performance is measured by response time and the resultant outcome for patients.

The performance measurement of the 'time' window and its evaluation is, therefore, important to ensure that the EMS is performing at an optimum level. The time from the onset of an incident to appropriate emergency response has the components depicted in **figure 2.3**:

Figure 2.3: Components of time involved in EMS



[17] Contact Centre Management System is a bunch of application programming interfaces provided and supported by a third party vendor for routing of calls to appropriate agents based on skill sets, adding and managing agents *etc*.

Triage time[18]: It is the time taken for assigning the ambulance after receiving the call and should be less than three minutes. Analysis of the data for the period 2014-15 to 2018-19 showed that in 19.77 lakh (47 *per cen*t) out of 41.94 lakh instances, the triage time was more than three minutes. Out of this, in respect of 17.67 lakh calls the triage time went up to 10 minutes and in respect of 2.11 lakh calls (11 *per cent*) triage time was beyond 10 minutes.

It is recommended that since Triaging is a very critical component of the Emergency Medical Service, automated location identification should be provided in all ambulances to ensure proper and timely assignment of ambulances. Further, the running status of the ambulances should be available at the call centre to enable it to provide this information to any follow up calls from the distressed persons.

Chute time: It is the time between the assignment of an ambulance and the moment it starts moving towards the scene. We observed that a uniform chute time of one minute was recorded by the call centre application software programmatically without actually capturing the actual time taken by the ambulance to start moving towards the incident location. Even the EMTs were recording uniformly one minute from the time of assignment of case to starting of ambulance from the base.

Analysis of the GIS data showed

- that ambulances were moved within one minute in 5,703 out of 38,737 cases (15 *per cent*) analysed for the period January 2019 to June 2019[19].

- The time taken was 2-10 minutes in 9,761 cases, 11-50 minutes in 23,219 cases, 51-100 minutes in 26 cases and more than 100 minutes in 28 cases. The reasons attributed for delay in starting the ambulance journey were non-availability of the EMT/Pilot in the ambulances, parking of vehicles in front of the ambulance, incorrect allocation of ambulances *etc*.

In view of the chute time exceeding the stipulated one minute in 85 per cent of the cases leading to delays in response time, it is recommended that a penal clause be introduced in the MOU for safeguarding any breach in the timeline agreed between the private partner and the Government. In this regard, an assessment mechanism of the efficacy of the private partner be also put in place, which would periodically review and assess the performance of the private partner.

Travel time: The travel time is the largest component of the response time and is the main factor in influencing overall system quality. "Travel time" is measured from the time when an ambulance is despatched, until the time when it arrives at the scene.

[18] When a call arrives at the dispatch centre, it takes some time for the dispatcher to assess the urgency of the call and assign an ambulance. This process is called triage.

[19] Data available from January 2019 only.

2.1.9.5 Response time

Response time is the combination of triage time, chute time and travel time. The Project specified a response time of 20 minutes for the urban areas and 30 minutes for the rural areas. The emergency type wise response time in respect of 41.94 lakh ambulance despatches during the period 2014-15 to 2018-19 is shown in the **Appendix 2.1**. We observed that in these 41.94 lakh despatches, the time limit of 30 minutes was adhered to in 72 *per cent* of the cases. Since the urban and rural classification was not recorded in the database, disaggregated analysis of the extent to which this benchmark was achieved was not possible in audit.

❖ ***Response time for various emergencies***

Each type of emergency requires a different approach and a different response time. An effective emergency response needs to be planned on the basis of an analysis of the type of emergencies that may occur to the population and identifying the effective response time for each category of emergency. Studies indicate that the road accident cases, cardiac cases and respiratory issues in general demand shorter response time. Cardiac cases require a response time of less than 10 minutes and trauma victims have the best survival chance if they are in hospital within one hour after the accident. The Project, however, specified a uniform response time. The response time for cardiac, respiratory, stroke and accident cases that demand shorter response time and earliest possible hospitalisation were as indicated in **Table 2.1**. The total time taken by the ambulance to reach the destination hospital for various emergencies is shown in **Appendix 2.2**.

Table 2.1: Statement showing the response time taken for various emergencies

Type of emergency	Number of Ambulance despatches	Ambulance reaching the scene after 10 minutes		Ambulance reaching the destination hospital after one hour	
		Number of instances	Percentage	Number of instances	Percentage
Cardiac	2,71,251	1,68,828	62	1,70,307	63
Respiratory	2,37,882	1,58,189	66	1,52,952	64
Stroke	53,639	33,681	63	36,254	68
Trauma	6,37,437	4,17,010	65	3,16,627	50

Source: Extraction and analysis of data provided by the Partner

Thus, patients received care after 10 minutes in 62, 66 and 63 *per cent* of the cardiac, respiratory and stroke cases respectively. In 50 *per cent* of the trauma cases, the patients were admitted to the hospital after the 'golden hour'. The impact of these delays on the final outcome of the patients could not be ascertained as the follow-up data was not captured by the Project in all the cases.

We noticed that response time data was not analysed and utilised for exploring the possibility of strengthening the emergency response chain through interventions like improving the handling of emergency calls at the Emergency call centre, monitoring the immediate movement of the ambulances upon receipt of despatch instructions, optimising the deployment of the ambulances by

identifying the black spots[20], and improving the ambulance uptime *etc*. The response time analysis would also highlight the need for improving the first responder access by enhancing the participation of general public, training a pool of emergency first responders, training police and fire personnel in medical emergencies and the need for strengthening the accident and emergency infrastructure in the State.

2.1.9.6 Absence of procedure for providing pre-arrival instructions and continued call support

(i) Emergency despatchers giving Pre-arrival medical instructions (including cardiopulmonary resuscitation) by telephone is well recognised as a critical component of an EMS. "Pre-arrival instructions" refers to specific instructions or guidance provided by despatchers or call-takers to the individuals making the emergency call before help arrives at the scene. These instructions are beneficial and potentially life-saving in many specific circumstances, including sudden cardiac arrest, respiratory arrest, choking, childbirth, or major haemorrhage. They can also guide bystanders in scene safety considerations (such as electrocution), skin chemical exposures, or properly protecting a seizing patient. When specific life-threatening medical emergencies are identified, the subsequent actions, by both the caller and recipient, can make the difference between survival or death.

We, however, observed that the EROs and DOs were not trained to provide pre-arrival instructions to the callers or bystanders. The application did not provide any standardised instructions for use by call centre personnel in respect of specific call complaints. While it is difficult to estimate the exact number of lives that could be saved by offering pre-arrival instructions, its potential to save additional lives each year is well recognised.

(ii) As already stated in paragraph 2.1.9.2, the telephone numbers of the ambulance crew were not shared with the callers resulting in frequent follow-up calls. The application also did not provide the running status of ambulances, which could have assisted the call takers to attend the follow-up calls. Details of the callers were shared with the ambulance crew to enable them to provide continued support to the callers. The EROs/DOs were also to be in communication with the ambulance crew to ensure continued support. Considering the gravity of the situation, it would have been preferable to provide the citizen the option of contacting the ambulance.

A case study

In October 2018, a call was made requesting an ambulance for a patient suffering from breathing problem. A Basic Life Support ambulance was assigned for this case. The ambulance did not reach the scene even after 1 hour 20 minutes. The caller had made four follow-up calls in between to enquire about the status of the ambulance. As the ambulance did not reach the scene, the patient was transported to the hospital in a private vehicle. The patient died after reaching the hospital. An internal enquiry based on the complaint,

[20] An accident blackspot is a place where there is frequent occurrence of road traffic accidents due to a variety of reasons, such as sharp drop or corner in a straight road, a hidden junction on a fast road, absence of traffic lights, poor or concealed warning signs at cross-roads, *etc*.

concluded that the ambulance crew took a break for dinner on the way to the scene. There was, however, no detailed investigation on the failure of ERO to communicate with the EMT and the pilot even after receiving four follow-up calls.

The State Government, during the exit conference, stated that the MOU did not make the Partner responsible for reporting the grievances raised by public to the Government and monitoring committees at the districts were not functional. It further stated that these issues were being addressed in the proposed tender.

2.1.9.7 Turnaround time

Turnaround time refers to the time taken to handover the patient after reaching the hospital and the ambulance returning back to its base location.

❖ ***Delay in transfer of patients leading to loss of ambulance hours***

Transferring a patient from an ambulance to an emergency department in the destination hospital should happen as soon as possible after the ambulance arrives at the hospital. Each failure to meet this time expectation would result in (i) delay for the patient waiting to be received and (ii) delay in an ambulance crew being available for a new emergency call. This means patients, including those with a life-threatening condition have to wait longer without any face-to-face medical support, thereby posing a potential safety risk and causing emotional distress.

It was noticed that in 82 *per cent* of the cases, the patients were handed over to the hospital within 15 minutes of reaching the hospital during the period 2014-15 to 2018-19. In respect of the balance 18 *per cent* of the cases, 1.75 lakh ambulance hours (equalling 14,620 ambulance shifts) were lost because the ambulances took more than the expected 15 minutes to transfer the patient and make their vehicle ready for the next call. The delay in transfer of patients was high in Victoria hospital, National Institute of Mental Health and Neuro Sciences, Vani Vilas Hospital and Sri Jayadeva Institute of Cardiovascular Sciences and Research of Bengaluru Urban district, Karnataka Institute of Medical Sciences, Hubballi and district hospitals of Dharwad, Kalaburagi, Koppal, Tumakuru and Vijayapura.

The delay was mainly on account of the fact that there was no facility for pre-alerting[21] the emergency department of the destination hospital about the ambulance arrival by the ambulance crew.

During audit survey,

- *95 per cent of the EMTs stated that they did not have any facility to inform the destination hospitals in advance about the ambulance arrival,*

[21] Pre-alerting refers to transmission of information about the victim's condition to the receiving health-care facility in advance so that the resources required to meet the patient's needs can be mobilised prior to the patient's arrival. Concise and accurate information transfer between the crew, control and the receiving hospital reduces the need for unnecessary communications, thereby reducing the handing over time at hospitals.

- *83 per cent of emergency staff at destination hospitals stated that they did not have any communication system for receiving information about a patient being transported to the hospitals.*
- *84 per cent of the EMTs also stated that there was no pre-alerting system to the hospitals about the critical emergencies such as trauma, cardiac arrest etc.*
- *86 per cent of the pilots stated that they faced delay in handing over patients in the hospitals and 25 per cent stated that the delay occurs very often.*

The State Government replied that the MOU did not provide for such pre-alerting/communication facility. It accepted the absence of linkage between ambulance and hospitals, and lack of facility for the ambulance crew to be informed about the hospital facilities during the exit conference and stated that this was being addressed in the proposed tender.

❖ ***Ambulance hours lost due to closure of cases after reaching the base location/delayed closure of cases***

The ambulance would be available for the next assignment only after the case on hand is closed. The existing practice was that the ambulance crew closed the case only on reaching the base location. Since this might result in denial of ambulance facility to others, a time limit needs to be specified to make the ambulance available for a new assignment as early as possible. We observed the following:

* A time limit for cleaning and disinfecting the ambulance after the patient had been transferred to the hospital was not prescribed. In the absence of a prescribed time, we worked out the number of ambulance hours[22] lost, considering a standard of 15 minutes, at 29.80 lakh hours equivalent to 12 hour shift of 2.48 lakh ambulances.

* Analysis of the timelines recorded in the ERO and DO modules showed that in 37.35 lakh out of 41.94 lakh instances, the ambulance crew did not report closure of cases immediately after reaching the base location. Consequently, 31.87 lakh ambulance hours, which was equivalent to 12 hour shift of 2.66 lakh ambulances was lost.

Importance of immediate closure of cases after handing over the patients

(*Reference: 20180003425773/20180003425873*)

A request for ambulance service was received on 19 September 2018 at 00.45 hrs relating to a road accident in Chitradurga district. The call centre took 15 minutes to allot an ambulance. As the three nearest ambulances were not available for allotment, a fourth nearest ambulance (KA42G916) which was 21.5 km away from incident location was allotted. The allotted ambulance also did not reach the scene because of tyre puncture. The patient was shifted in another vehicle and later expired.

[22] A time period of 15 minutes commencing from the time the patient was handed over till the time of closure including cleaning and disinfecting the ambulance was considered.

We observed that at the time of emergency call (19/09/2018, 00:45), the first nearest ambulance (KA42G828) was at its base location (District hospital, Chitradurga) but was not available as it had not given closure for a previous case. The second nearest ambulance (KA07G403), though available after handing over the previous case patient to a hospital, was not available for the call centre as it had not given closure and the third nearest ambulance (KA16G594) which was recorded as busy was actually free and stationed at District hospital, Chitradurga.

This instance highlights the importance of closure of cases immediately after handing over the patients to the hospital and the need for providing real time information on the nearest ambulance by integrating the ERO Module with AVLT.

The State Government replied that it was introducing e-PCR system under the proposed tender which ensures online closure of cases and also stated that GPS systems would be strengthened to prevent such cases.

2.1.9.8 Absence of interface between ERO and ERCP modules

The despatch officers were to assess the criticality of the emergencies and decide the despatch of ambulances to the emergency site and co-ordinate with the ambulance staff / first Responder and ERCP for virtual handholding. ERCPs are medical doctors with specialisation in emergency care who are to be present in the call centre round the clock to provide medical direction to the EMTs working in the field.

Such a handholding required an interface between ERO and ERCP modules wherein the initial data captured by the ERO could be automatically presented to the ERCP for additional inputs for triaging, allocation of appropriate class of ambulances and providing pre-hospital care support to the EMTs. It was, however, noticed that there was no provision in the ERO Module to transfer the data to the ERCP module.

We observed that the application did not provide for categorisation of the call requests on the basis of severity of incidents. No Standard Operating Procedures were in place for pre-hospital triage and transport to appropriate hospitals in sync with the type and gravity of the emergency.

We noticed that EMTs reported the severity of the cases handled at the time of closing the cases. The PCR section supervised by ERCPs also segregated critical cases on the basis of a post incident review of the PCR. There were disparities in determination of the emergencies by the EMTs and ERCPs. While the call centre triage did not recognise the criticality of the cases, the number of critical cases reported by EMTs and number of cases assessed as critical by ERCPs were as detailed in **Table 2.2**.

Table 2.2: Disparity in determining the criticality of cases

Year	Number of critical cases as reported		
	PCR Section	EMTs (Closure)	ERO/DO
2014-15	69,106	71,220	NIL
2015-16	32,230	31,200	
2016-17	72,223	17,497	
2017-18	66,940	27,806	
2018-19	95,748	17,947	
Total	**3,36,247**	**1,65,670**	

Source: Extraction and analysis of data provided by the Partner

It could be seen from the above, that there was a huge mismatch between the figures reported by both ERCP and EMT during the years 2016-17 to 2018-19. Evidently, reconciliation of the figures was absent. In the absence of reconciliation, we could not ensure whether the EMTs under assessed the quantum of critical cases or the post incident review by ERCP was not effective. This was likely to have an adverse impact on the delivery of pre-hospital care.

Moreover, availing of the ERCP Service was left to the EMTs who were to call the ERCP service centre through mobile phone. We observed that EMTs sought the inputs of ERCPs in 1.34 lakh cases (81 *per cent)* during the period 2014-15 to 2018-19. Out of 3.36 lakh instances identified as critical by ERCPs, inputs of ERCP were sought by EMTs in only 40 *per cent* of the cases.

Thus, the non-integration of ERO module with ERCP module resulted in the pre-hospital care information, which could establish an evidence based delivery of pre-hospital care, being not captured.

The State Government replied that the proposed tender provided for sharing of data through integration of ERO and ERCP modules to ensure optimum pre-hospital care besides providing for video calling facility in each of the ambulance.

2.1.9.9 Data Integrity

Data integrity refers to the overall completeness, accuracy and consistency of data. Data integrity is addressed through incorporating adequate validation controls at the application level and controlling access to the database at the back-end. Absence of validation procedures results in capturing of incomplete or incorrect input data which affects the quality of the database and dependent management information. A few illustrative instances are discussed below:

- ***Inaccurate response time data***

Response Time is the most important performance metric in the delivery of an emergency response service. Hence, capturing time through automation and complete avoidance of manual intervention is vital for generating more reliable and accurate data. We observed that automatic time stamping methods were not used in capturing this vital information. According to the practice, the EMT manually enters the data on a PCR form and reports this to the call centre over voice phone after reaching the base location. The manual process was vulnerable to factors such as the EMT being under the pressure of attending to patients, the promptness in completing paperwork legibly and accurately *etc*.

Since these time series data are in terms of few minutes, it would not be advisable to rely on the memory skills of the EMT.

The responsiveness statistics are compiled based on data taken from the PCR which were prepared based on manual inputs from the ambulance crew as discussed above. Data analysis of the EMCA database for the period 2014-15 to 2018-19 showed that in 28,061 cases (< one *per cent*), the ambulances recorded extremely high speeds[23] of more than 150 km/hour and in 20,710 cases (< one *per cent*), the ambulances recorded a speed between 100 to 150 km/hour, which is inconceivable. This highlights the need for automated time stamping in the application system.

The State Government, during the exit conference, accepted the absence of automatic location identification system. It stated that the main issue in tracking the ambulance movement/time was manual recordings and the fresh tender proposed to replace the manual recording of ambulance movement and response time with an electronic automated reporting.

❖ ***Incomplete data and data inaccuracies***

We observed presence of large number of Null values indicating incomplete capturing of data. In 5.76 lakh emergency despatches, the time values were found to be Null and in 7,274 cases the type of emergency was found Null. The destination hospital id was recorded as Null in 1.57 lakh instances in the database. Incomplete data in respect of such key fields would impact the response time computation, follow-up and analysis of the patient outcomes. Instances of inadequate validation controls leading to acceptance of inaccurate input data by the Application and instances of database containing data which was inconsistent with the front-end validation controls in the Application are illustrated in **Appendix 2.3 (a)** to **2.3 (c)**.

The State Government replied that instructions have been issued to the Partner to set right the deficiencies pointed out and suitable action was being taken to prevent such data manipulation in the proposed tender.

❖ ***Manual insertion of cases resulting in overstatement of emergencies handled***

We noticed instances of manual insertion of ambulance cases and their closures in the database. Illustrative cases are shown in the **Appendix 2.3 (d)**. In the absence of audit trail[24], the reasons for such insertions could not be ascertained. However, the manual insertion of cases inflated the number of cases handled.

The State Government stated that reply would be furnished after obtaining the details from the Partner.

[23] Speed is calculated by using the formula, speed = distance travelled / time taken to cover the distance.

[24] An audit trail or audit log is a security-relevant chronological record, set of records, and/or destination and source of records that provide documentary evidence of the sequence of activities that affected at any time a specific operation, procedure or event.

❖ ***Back-end updates of response time and odometer reading without leaving audit trails***

We observed that during the period August 2016 to March 2019, there were at least 3,445 instances of updating, modifying the database entries relating to response time and odometer readings through the back end. The original entries in the database that were affected, the reasons for carrying out the updates *etc.,* were not maintained and no audit trail related to these activities was available. Such uncontrolled updates from back-end undermine the integrity of the entire database.

The State Government stated that reply would be furnished after obtaining the details from the Partner.

❖ ***Transportation of multiple persons***

We noticed abnormally large number of persons being transported in ambulances. During the period 2014-15 to 2018-19, more than 45 patients were transported in 3 cases, 21 to 45 patients were transported in 19 cases, 11 to 20 patients in 200 cases, 6 to 10 patients in 2,803 cases, 5 patients in 7,459 cases, 4 patients in 11,757 cases, 3 patients in 21,773 cases and 2 patients in 1.41 lakh instances. Considering the fact that ambulances are equipped to transport only single patient at a time, the transportation of abnormally large number of persons in a single ambulance calls for detailed investigation.

The State Government replied that it had also observed such instances and a notice had been served on the Partner seeking explanation in this regard. It further stated that instructions have been issued to prevent such instances in future.

It is recommended that the State Government should ensure periodical back-up of data and prepare business continuity and exit strategy plans[25]. The data integrity should be protected through effective input and validation controls. It should be ensured that the time values are captured automatically for generating more reliable and accurate data. It should also be ensured that manual intervention is minimized.

2.1.10 Automated Vehicle Location Tracking System

Automated Vehicle Location Tracking System (AVLTS) was implemented during March 2017 by outsourcing the service to a third party agency. AVLTS would monitor all operations from vehicle acquisition to disposal and would have features for live tracking of ambulances, navigation history playback and tracking, speed alert, geo-fencing alert, vehicle location alert, trip details, low battery alert, ignition status, easy device, vehicle and driver mapping features, SOS alerts *etc*.

[25] Exit plan is the strategy of handing over of the project at the culmination of the project. This includes providing all clearances, conducting all inspections, transfer of project assets, transfer of certain agreements *etc*. Exit management ensures smooth transition at contract expiry.

2.1.10.1 Non-integration with EMCA

According to the terms and conditions of the agreement, the agency was to integrate the AVLTS data with the EMCA. We noticed that the AVLTS data was not fully integrated with the ERO module that assigns the vehicles in response to emergencies. The actual distance between the ambulance and the scene was, therefore, not available for selecting the appropriate ambulances. AVLTS was also not integrated with DO module. Hence, the ambulance travel details such as base to scene, time at the scene, scene to hospital, hospital to base *etc*., were captured manually in the DO module.

The State Government accepted and stated that this would be addressed in the forthcoming tender.

2.1.10.2 Deployment of ambulances

There were 746 active ambulances including 35 back-up ambulances (as stated in the introductory paragraph) as at the end of October 2019, of which 181 were ALS ambulances and 565 were BLS ambulances.

The rationale for deployment of ambulances solely based on population was not on record. There was also no policy as regards the positioning/location of the ambulances. However, in accordance with the MOU, ambulances without ambulance stations can be less than or equal to five *per cent*.

For the response time to be effective, deployment of ambulances should be based on other parameters such as geographical conditions, traffic conditions, distance between ambulances, availability of medical facilities, demand for ambulances by people in a particular area, black spots *etc*. We observed that no ambulance stations were established. Consequently, the ambulances were not stationed in a dispersed manner and instead multiple ambulances were stationed at a single location. While 2 ambulances each were stationed in 20 location s, 3 ambulances were stationed in one location. Moreover, majority of the ambulances were stationed within the Government hospital premises. Out of 711 identified base locations, 645 were in hospitals, of which 207 hospitals were major destination hospitals like taluk hospitals, district hospitals and super-speciality hospitals. Positioning ambulances within hospital premises would result in round trips and impacts the response time.

The State Government replied that ambulances were stationed within the hospital premises as it was feasible to provide basic facilities to the ambulance crew. However, in the exit conference, it agreed to position ambulances by identifying black spots as was being done in Tamil Nadu. It also agreed to review the existing criteria of deployment of ambulances based on population.

2.1.10.3 Non-functional facilities in ambulances

According to the National Ambulance Code, Air Conditioning is optional in all categories of road ambulances and mandatory in ALS ambulances. The project provided air conditioning equipment in all the BLS and ALS ambulances.

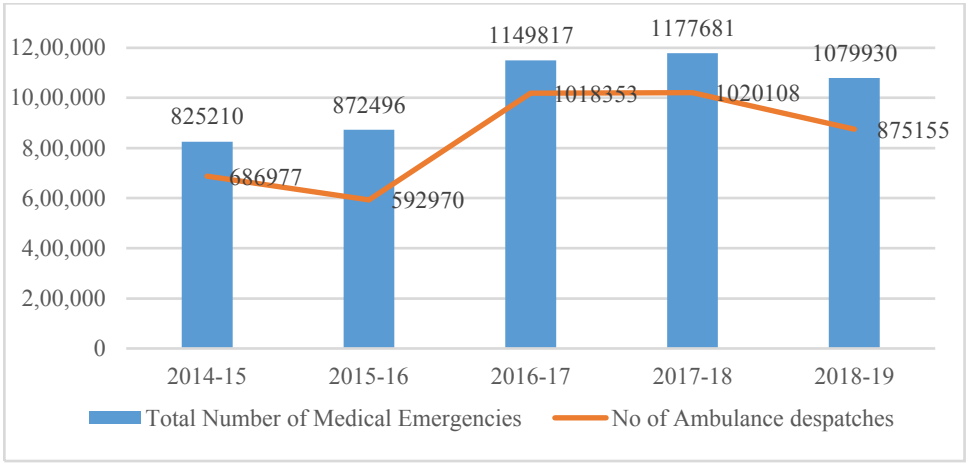
Joint physical verification of 24 ALS ambulances and 66 BLS ambulances during field visit showed that air conditioners were not functional in 7 ALS and 21 BLS ambulances respectively. In two ALS ambulances, ventilators and defibrillators were not functional. These vehicles, however, continued to be used as ALS ambulances.

2.1.10.4 Allocation of ambulances

The project employed three types of ambulances viz., ALS, BLS and Bike ambulances. The primary use of ALS is for trauma and cardiac related symptoms and ailments. Hence, it was important that the call centre interface recognises these ambulances distinctly for easy allocation of ALS in case of such emergencies. It was, however, observed that the application did not differentiate between ALS and BLS ambulances. Generalised responses to cardiac and trauma cases would risk the lives of the patients requiring Advanced Life Support.

Ambulances were despatched in 41.94 lakh cases (catering to 44.63 lakh patients) out of 51.05 lakh calls of medical emergencies during the period 2014-15 to 2018-19. Year-wise analysis showed large scale variations in despatch of ambulances as depicted in **Chart 2.2**.

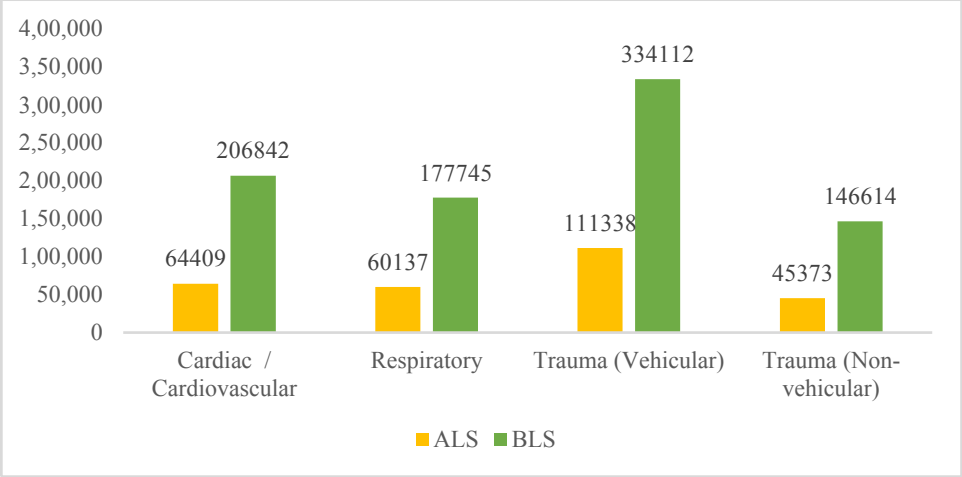
Chart 2.2: Year-wise despatch of ambulances



Source: Extraction and analysis of data provided by the Partner

Emergency-wise analysis further revealed that BLS ambulances were deployed in 75 *per cent* of the cases for critical emergencies such as cardiac, respiratory and trauma during the period 2014-15 to 2018-19 as depicted in **Chart 2.3**. Year-wise details are indicated in **Appendix 2.4**.

Chart 2.3: Deployment of ambulances for critical emergencies



Source: Extraction and analysis of data provided by the Partner

The State Government, in the exit conference, stated that when an emergency was notified, the nearest available ambulance was allocated irrespective of the type of ambulance and since the number of ALS ambulances were comparatively lesser, BLS ambulances were allocated for critical cases also. It further stated that the proposed tender provided for deployment of only ALS ambulances.

❖ ***Short messaging services (SMS)***

The project deployed a SMS routing application to notify the crew about the call-id, phone number, name of the victim, landmark and incident type when an ambulance was allocated to an emergency. Analysis of 1,374 SMS sent on 5 September 2018 showed that the SMS was delivered in 1,282 cases. The non-delivery in the remaining 92 cases was attributed to ambulance crew switching off their phones. Further analysis showed delay in delivery of SMS. SMS was delivered within 30 seconds in 1,128 cases, 31-60 seconds in 47 cases, 60-180 seconds in 2 cases, 180-600 seconds in 75 cases and beyond 600 seconds in 30 cases. The delay in delivery of SMS affects the response time. Since the data was made available for only one day, we could not assess the position for the entire period.

The State Government replied that directions have been issued to the Partner to take suitable action to prevent delays.

❖ ***Non-availability of Automated location identification***

The EMCA system does not provide for automatically capturing the location details of the caller from the telephone calls. The call centre personnel manually enter the location details on the basis of the voice inputs from the caller. This is prone to errors and could delay triaging. Absence of location details also hampers the identification of ambulances in the vicinity of an incident site. The application determines the nearby ambulances on the basis of the manually entered taluk names which represent a vast geography. In urban locations, upon entering the taluk names, the nearby ambulance list is exhibited on the basis of

the centre of the urban location even where the incident location could be in the periphery of the urban area. These deficiencies in information affect the proper allocation of the ambulances. We observed that during the period 2014-19, assigned ambulances had to be de-assigned and re-assigned in 19,870 cases indicating improper initial assignment.

The State Government, in the exit conference, accepted that non-availability of automated location identification contributed to delay in triage and stated that the provisions would be incorporated in the proposed new tender.

❖ ***Delay in release of de-assigned ambulances***

When an ambulance after assignment was found not to be required by the caller, the EMT informs the Despatch Centre for de-assignment. Until the Despatch centre de-assigns the case and releases the ambulance, the ambulance would be shown as busy in the ERO Application. We noticed that there was significant delay in de-assigning the ambulances in 2.09 lakh instances, which resulted in loss of 29.39 lakh ambulance hours.

❖ ***Cases transferred to vehicle busy desk***

In cases of non-availability of ambulances, the Emergency Response Centre transfers the call to a separate terminal referred to as Vehicle Busy (VB) Desk, which allocates an ambulance whenever an appropriate ambulance becomes available. Analysis of the VB desk data showed that more than 50 *per cent* of ambulance requests could not be met as indicated in **Table 2.3**.

Table 2.3: Statement showing the details of ambulance requests not met

Year	Number of calls transferred to VB Desk	Ambulance allotted at VB Desk	Ambulance not Allotted	Percentage of non-allotment
2014-15	82,437	18,027	64,410	78
2015-16	1,02,733	22,447	80,286	78
2016-17	1,38,751	53,752	84,999	61
2017-18	2,79,595	1,37,899	1,41,696	51
2018-19	2,83,771	1,42,168	1,41,603	50
Total	**8,87,287**	**3,74,293**	**5,12,994**	**58**

Source: Extraction and analysis of data provided by the Partner

The Partner attributed non-availability of sufficient number of ambulances for the large percentage of non-allotment. This was incorrect as illustrated below:

Illustrations - Non-allotment of ambulances at VB desk

On 4 April 2017, an emergency call was received at 21.21 hours requesting for an ambulance for a pregnant woman in Yadgir district. The call taker did not allot an ambulance recording that all the nearby ambulances were busy and the call was transferred to Vehicle Busy desk awaiting allocation of ambulance upon availability. The caller, however, did not get the ambulance service even after 23 hours and the baby expired.

We noticed that caller made seven calls in a span of 23 hours to the call centre before raising a complaint on the non-receipt of the ambulance service. Out of these, two calls were identified as medical emergencies, one call was disconnected, one call was marked as nuisance and three calls were marked as follow-up calls even though no ambulance was assigned. Non-allotment of an ambulance even after waiting for a period of 23 hours indicate the need for close monitoring of the Vehicle Busy Desk cases.

On 15 April 2018, an emergency call was received at 7.26 am requesting for an ambulance for a pregnant woman. The call taker could not allot an ambulance as the four nearby ambulances were not reachable as their mobile numbers were found switched off. The call was transferred to Vehicle Busy desk. The caller made a follow-up call at 7.41 am again and was informed that all the nearby ambulances were busy and he would be intimated as and when ambulances become available. The Vehicle Busy Desk did not return the call. The caller again called at 9.29 am and later at 10.23 am when an ambulance was assigned. However, the baby expired.

A complaint received on this issue was closed by the Partner stating that Basavapatna ambulance had problem with electrical parts, headlight and dynamo and there were problems with mobiles. We observed that though the ambulance at Basavapatna was stated to be having dynamo problem, it was not reported to the Emergency Centre. This also highlight the need for instituting alternate channels of communication in case the mobile phones were found to be switched off/not reachable.

It is recommended that in those cases where calls are transferred to the Vehicle Busy (VB) Desk, the desk should ensure that an ambulance is allocated as soon as an appropriate ambulance becomes available. If it is just not possible to allocate an ambulance within the specified response time, the caller should be informed, so that he/she does not indefinitely wait for the ambulance and can make his/her own arrangements.

❖ *Non-integration of government ambulances with 108 fleet*

The Government issued (July 2017) orders for integrating 827 government ambulances with the existing fleet of EMS-108. However, it provided the details of 542 ambulances to the Partner for integrating with the 108 ambulance fleet and these ambulances were made part of the allocation list of the EMCA from July 2017. The Partner also provided a special mapping for placing the ambulances at a distance of 10 to 15 km instead of 25 km as originally envisaged. According to the arrangement, ambulance maintenance and staff administration would continue with the Government. It was observed that out of 36,799 assignments given to the government ambulances, only 927 despatches were accepted. As there was poor response from the ambulance staff in responding to the despatch requests citing shortage of resources, lack of fuel *etc.*, the integration of the government ambulances to the 108 ambulance fleet and the objective of placing one ambulance per 10 to 15 km radius did not materialise.

No reply was furnished by the State Government. However, in the exit conference, it agreed to review the existing criteria of deployment of ambulances based on population.

❖ *Non-allotment of ambulances due to disruption in communication*

The emergency response system functions best when it is supported by an effective communications network. Upon receipt of an emergency call, the call centre should be able to immediately communicate with the ambulance crew and other responders. The ambulance crew were supplied with mobile phones for linking them to the 108-emergency centre. We observed at least four instances of failure of this linkage, because of which the call centre was not able to reach the ambulance crew, affecting the delivery of service to the emergency patients as below:

- During April 2018, in a case of breathing problem, the caller from Haveri district did not receive ambulance service and the patient expired. The two nearest ambulances were not reachable over the mobile even though the ambulances were available at their base locations.
- During August 2018, in a case of vomiting, the caller from Athani taluk was not provided ambulance service as the crew was not reachable over the mobile.
- During December 2018, in a case of an unconscious patient, the caller from Ron taluk did not receive the ambulance service as the crew was not reachable over phone.

We also observed that data on such link failures between the emergency management centre and the ambulance crew were not systematically captured and analysed. No standard operating procedures were in place to be followed by the emergency centre in case of ambulance crew mobiles not reachable.

❖ *Double despatch of ambulances*

We noticed 1,81,217 cases where two ambulances were despatched (double despatch) for transporting a single emergency case. After proceeding up to a distance, the patient was de-boarded from the first ambulance and taken to the destination hospital in a second ambulance. There was no formal procedure in place prescribing the handing over practices to be adopted, sharing of patient care information with the second ambulance. Year-wise cases of double despatches are indicated in **Table 2.4**.

Table 2.4: Statement showing the year-wise cases of double despatch

Year	Total number of cases	Number of double despatches
2014-15	7,01,735	16,239
2015-16	6,03,719	10,661
2016-17	10,57,154	48,945
2017-18	11,49,603	65,361
2018-19	9,50,699	40,011
Total	**44,62,910**	**1,81,217**

Source: Extraction and analysis of data provided by the Partner

Such a practice of double despatch lacked justification and also resulted in inconvenience to the patients. Further, it distorts the data relating to transport time, average response time *etc.* It was observed that while the triage information in respect of these patients was available in a particular case id, the destination information was found in a different case id making it difficult to undertake a follow-up of the outcome of the case.

The Partner stated that the double despatch was attempted to reduce the travel distance of one particular ambulance and to avoid absence of ambulance in a particular location for prolonged time. The State Government replied that it had also observed such instances and a notice had been served on the Partner seeking explanation in this regard. It further stated that instructions have been issued to prevent such instances in future.

❖ ***Ambulance uptime and average trips per day***

According to the MOU, the uptime of the ambulances was to be maintained at 98 *per cent* (at any point of time so many ambulances would be attending to emergencies). A database of all ambulance activation and de-activation were to be maintained to determine the ambulance uptime. According to the information provided by the Partner, the uptime of the ambulance ranged from 91 to 95 *per cent* during the period 2014-19. The reported uptime of the ambulance was not verifiable in audit as the Partner had not maintained any database of ambulance uptime.

Further, each ambulance was required to handle eight emergencies/despatches per day. In other words, the average performance level of each ambulance should be minimum eight trips per day. It was noticed that the ambulances performed an average of 3.32 to 4.36 trips per day during the period 2014-15 to 2018-19. Only five ambulances achieved the specified performance level of eight trips per day during the above period. The possibility of improving the average trips per day by ambulances needs to be examined in the back drop of the fact that in large number of calls the ambulances were not allocated as the ambulances were busy and precious ambulance hours were lost due to delay in transfer of patients at hospital, delay in closure of ambulance trips *etc*.

The State Government replied that it could not take any action in the absence of penalty clause in the MOU. It further stated that penalty clause would be included in the forthcoming tender for not achieving the targets as per service level agreement.

It is recommended that there should be no limit on the number of average trips per day per ambulance and the available ambulances should be mobilized as and when required irrespective of the number of trips already undertaken since making available the ambulance in a timely fashion to the patient should be the primary objective of the 108 Service. The Government may consider an appropriate revision of the relevant MOU provision, to ensure enforcement.

❖ ***Mismatch between onward and return journey***

Ideally the distance from hospital to base (return journey) should be equal or less than the distance from base to hospital via scene (onward journey). The database showed that during the period 2014-15 to 2018-19, there were 3.70

lakh cases wherein the return journey distance was in excess of five kilometres (km) than the onward journey distance. The difference between these two distances was as high as 500 km. The excess distance travelled in these cases was 86.49 lakh km.

For the period January 2019 to March 2019, there were 42,033 cases, of which we sampled 381 instances for comparison with the GPS data available in the Vehicle Tracking System. It was observed that GPS data was recorded only in 129 cases. Analysis showed that in 73 of these 129 cases, the distance manually reported and recorded in the database was in excess of five km when compared to the GPS data. The excess distance travelled in these 73 cases was 1,417 km. This showed that manual intervention resulted in inflating the distance travelled in these cases. The estimated impact of such inflated reporting in these 3.70 lakh cases alone worked out to more than ` 6.23 crore in terms of fuel cost.

❖ *Use of ambulance for non-emergency purposes*

The ambulance services under the project were intended for those with life threatening or serious medical illness or injury. During the analysis of the EMCA database, we observed that the ambulances were used for non-emergency purposes in several instances. During the period 2017-18 to 2018-19, the ambulances were used to drop back the discharged persons in 50,865 instances.

The State Government replied that necessary instructions were issued to the Partner.

❖ *Allocation of ambulances for mass/multi-casualty incidents*

A multi-casualty incident (MCI) is an emergency situation where the number of patients overwhelms the capacity of ambulance and other emergency resources. Often multiple ambulances need to be despatched to respond to such incidents. It also demands escalation of incidents to a higher level of command for ensuring effective co-ordination.

We observed that the EMCA did not provide for allocating multiple ambulances in case of multi-casualty incidents. If this feature were available, it would be possible to provide multiple ambulances based on a single call thereby reducing the response time for allocation of ambulances. The application, however, provided for tagging an incident as MCI. When an incident is tagged as MCI, the next call taker would be alerted about the need for additional ambulances. However, even in such cases, additional ambulances could be allocated only on receipt of additional calls resulting in longer response time.

Illustration

In November 2018, the call centre received a call related to an accident involving multiple casualties. The ERO who received the call did not identify it as a case of MCI and did not tag MCI flag in system. Only a single ambulance was assigned. After three minutes, again a call was received for requesting an ambulance relating to the same incident. As the ambulance was already assigned by the first ERO, the ERO who attended the call did not assign any ambulance. As a result, six patients were transported in a single ambulance. The call centre

received another call after 15 minutes from the same scene requesting for an ambulance. A second ambulance was then assigned and two patients were transported to the hospital. The second ambulance had reached the scene after 50 minutes from the first reporting of the MCI. Improper triage, thus, resulted in multiple patients being transported in single ambulance and inordinate delay in responding to the emergency.

Further, the ERO application, though provided with an escalation button, did not have any functionality to report the MCI to appropriate command centres of the State Government like police, district administration *etc*. We noticed that police were tagged in the application in 2,406 incidents out of 4,777 MCI during the period 2014-15 to 2018-19 but were actually not reported.

2.1.10.5 Ambulance Driving policy

Ambulance drivers are under great pressure to transport people to the closest hospital as quickly and safely as possible. Any risk the driver takes can endanger the passengers in the ambulance, as well as others in the vicinity. The speed and handling of the ambulance should ensure smooth transit to minimise any detrimental effects on the patients and also provide a safe environment for the ambulance crew attending to the patient. Hence, to promote and sustain a safe driving culture and to promote safety for all persons and property in EMS, the operation of the ambulances needs to be regulated using appropriate rules, regulations and various policies and all EMS personnel must be made aware of the need to comply with the laws, regulations and various policies with respect to operation of the ambulances. A detailed investigation also needs to be carried out in cases of ambulance crashes.

During the period 2014-15 to 2018-19, EMS-108 ambulances were involved in 453 accidents. However, these accidents were not investigated with a view to understanding the pre-crash activities of the persons involved and the circumstances contributing to the crash.

Illustration

Five people from a family were killed after a speeding ambulance jumped the median and collided with their car on the international airport road in Bengaluru on 27 May 2019. The ambulance was returning to base location after dropping a patient at NIMHANS and was driven at a speed of 80 km/hour. The police registered a case and it is under investigation.

❖ ***Patient Safety***

Protecting patients and providers during transport is essential. Best practices advocate equipping and designing ambulances to protect patients and providers during ambulance operation, and include cot securing systems, patient and provider restraints, and equipment mounting systems. Seats, seat belts, seat belt anchorages *etc.*, are critical items for the safety of the occupants in case of sudden accelerations/decelerations and accidents. Further, seats and their design, mounting *etc.,* constitute substantially to the ride comfort of the vehicle users. We, however, observed that belts for securing the cots/stretchers were not provided in the ambulances for securing the patients.

2.1.11 Fleet Management System

The project developed an in-house web-based Fleet Management Application System (FMS) for managing the ambulances. The status of utilisation of the functionalities of this application was as indicated in **Table 2.5**:

Table 2.5: Status of utilisation of various functionalities of FMS application

Functionality	Status of utilisation
Monitoring the compliance to statutory requirements like pollution under control, fitness, insurance *etc.*	The data related to pollution control certificate, fitness certificate and insurance renewal were not captured after June 2016 indicating non-utilisation.
Data on vehicle accidents	Vehicle accident details and investigation (NIL); cause of accidents; fatal accidents; major accidents; minor accidents and situation of accidents (till 2015).
Data on vehicle handing over	No records of handing over of the vehicles.
Tyre received details	Only 30 records available in the database.
Spare parts requisition, receipt and issue details	Only two records in requisition and nil records in receipt and issue.
Master data capturing the vehicle fabricators, spare parts master	Spare Parts master updated only till 2015. Only one record in fabricators master.
Inventory related to requisition, receipt and issue of battery and spare parts	Information related to 998 batteries available. Only 24 and 19 records related to battery receipts and issue respectively.
Tyre and battery replacement	Details not available in the database.
Data related to maintenance and repairs, vendor details, vehicle maintenance request and approval, vehicle schedule service request and approval.	No vendor details. Only 9 records in schedule service requests relating to 2015 and no records in schedule service alerts.
Petro card mapping, fuel entry	Data being captured and put to use.
Off road vehicle details and maintenance	Data being captured and put to use. However, the data was not being updated regularly.

Source: Extraction and analysis of data furnished by the Partner

Thus, the FMS was not put to complete use by the Partner for capturing the intended details. Consequently, monitoring of servicing, insurance and pollution certificates, tracking of fuel usage, parts replacement, running expenses *etc*., were manually undertaken which were prone to associated risks.

2.1.12 Hospital Information System Application

The ERO module and the DO Module fetch the details of the nearby hospitals in respect of an incident location from a web-based Hospital Information System (HIS), which is maintained and updated by the Partner. The HIS provides for capturing details such as the hospital name, locality, bed capacity, ownership type, facilities available like medical equipment, intensive care, diagnostics, specialist resources, ambulances, payment and insurance facilities. The HIS also provides for capturing data related to cases handled in emergencies indicating the treatment, stabilisation, cases referred to other hospitals *etc.*

In order to provide effective information to the users, the HIS was to be populated with relevant data on a periodical basis. It was, however, observed

that the HIS was not populated with envisaged level of information. Of the 3,202 government hospitals and 4,778 private hospitals listed in the HIS, details of medical equipment, intensive care facilities, specialist doctors and insurance facilities were available only for 414, 412, 409 and 396 hospitals respectively. Out of this such details were available only in respect of 159 government hospitals.

The absence of the complete data restricted the use of the HIS application for providing the requisite information to the users for determining the choice of the destination hospital and also for effective follow-up.

During the survey, 70 per cent of the EMTs stated that they were not supplied with information on the available hospital facilities in their regions catering to different types of emergencies. Also, 74 per cent of the EMTs and 86 per cent of the pilots stated that they had to transfer the patients to another hospital due to refusal/lack of facilities in the first destination hospital.

The State Government replied that action had been initiated to prepare a database containing all details of both the government and private hospitals and integrate it with e-hospital software. During the exit conference, it accepted that there was no facility for ambulance crew to be informed about the hospital facilities like availability of beds and ventilators and this led to visits by ambulances to multiple hospitals in search of appropriate facilities and stated that this would be addressed in the proposed tender.

2.1.13 Pre-Hospital Care Record Application

Pre-hospital emergency care refers to the care given to the patients before they reach the destination hospitals. The PCR in manual form was designed to capture several important data related to pre-hospital care. It was, however, observed that the EMTs had not collected the specified data completely. The manual data collected was not compiled and collated for further analysis. Non-digitisation of the PCR information and non-compilation limited the use of crucial information captured by the PCR formats such as medicines used for improvement of vitals during pre-hospital care.

Subsequently, a Pre-Hospital Care Record Application was introduced (February 2016), which had provisions for tracking the receipt of manual PCR formats from the EMTs. However, the application was not updated periodically rendering the data outdated. The number of PCR formats submitted by the EMTs, number of formats pending *etc*., was thus not ascertainable.

The State Government replied that provision for automating the PCR was incorporated in the proposed tender.

2.1.13.1 Follow-up

There is a need to track the progress in respect of all patients transferred to a hospital in order to know their outcome and confirm that the transport and pre-hospital care provided was appropriate. A follow-up would support continuous quality improvement activities and would help identify areas that require

increased training. Best practices use outcome indicators such as return of spontaneous circulation after a cardiac arrest, survival to discharge, outcomes from stroke, outcomes from trauma cases *etc.*, to measure performance. Outcome of the patients would be accurately known only if the information on ambulance care is linked with patient records in the destination hospitals. A feedback from the treating emergency staff in the hospitals would also help in ascertaining the quality of pre-hospital care provided and quality of patient management during transportation.

We observed that while no outcome indicators were specified, the linkage between the ambulance service and destination hospitals was also absent. The feedback from the Hospital Emergency Department was not collected. Hence, the clinical outcome of the patients transported to hospitals, their survival rate, effectiveness of pre-hospital care *etc.*, were not determinable.

However, the Patient Status Module of the application was used for monitoring the status of patients after 48 hours' period. The data from the DO module is pushed to this application for taking a feedback call after 48 hours from the patient or bystanders. This process involved contacting the patient/attender to enquire about the condition of the patient, the hospital in which they are admitted *etc*. It was observed that this feedback mechanism was highly ineffective as feedback was received only in one *per cent* of the total cases. The feedback mechanism was limited to knowing the status of patient after 48 hours. In more than 250 cases, the feedback indicated that the patient condition remained critical and in 37,407 cases, the patients were still in the hospital, during the 48-hour feedback survey. Further follow up was not conducted to ascertain the final outcome.

Analysis of the feedback data indicated that:

- Out of 5.65 lakh cases referred to the feedback desk during the period 2014-15 to 2018-19, feedback was obtained only in 42,484 cases indicating that the feedback mechanism to determine the outcome of the patients transported was deficient.

- Feedback in 4.07 lakh cases was closed in batches within few seconds time indicating bulk closure at the back-end. Resorting to back-end closures without actually completing the feedback process thus circumvented the established procedure for feedback.

During survey, 77 per cent and 71 per cent of the emergency staff at destination hospitals stated that they did not have a system of providing feedback to EMRI about the quality of handing over of patients to them and management of patients during transportation respectively.

The State Government, in the exit conference stated that the linkage between the ambulances and the hospitals would be improved.

2.1.13.2 Incorrect reporting

The ambulance crew reports the details of transport of patients to the DO desk and closes the case by indicating the hospital to which they were handed over for further definitive care. During feedback, the status of patients after 48 hours is collected including the hospital in which the patient was initially admitted. We noticed in 972 cases during 2014-15 to 2018-19, the ambulance crew reported handing over of patients at government hospitals but the feedback from the patients showed that they were taken to private hospitals.

Private hospital admissions - Illustrations

In July 2019, a request was made to 108-ambulance to shift a patient from Primary Health Centre, Sondekoppa to NIMHANS as referred by the doctors. The ambulance crew took the patient to Kanva hospital, a private hospital. The patient later complained that the hospital charged ` 7 lakh and he had to take loan pledging gold to pay the bill. The Quality wing of the project in their internal enquiry confirmed the facts.

In September 2018, ambulance crew transported the patient to a private hospital and the patient later complained about the difficulties faced in paying the bill. The internal enquiry confirmed these facts.

The State Government, in the exit conference, highlighted receiving complaints of patients being taken to private hospitals by ambulance crew. It further stated that GPS tracking of ambulances with time stamping was being proposed in the proposed tender to monitor ambulance movement.

Such incorrect reporting, thus, points to the possibility of personal interests of the ambulance crew.

2.1.13.3 Tracking of patients

We attempted to track the patients to the ten destination hospitals in 3,804 sampled cases during field study. The destination hospitals could trace the details of the emergency patients to the emergency department of the hospitals in only 1,952 cases leaving 1,852 cases untraced. On re-verification in four hospitals, the Partner traced an additional 406 patients and confirmed that in 235 cases, the patients had not reached the government hospitals to which the patients were reported as handed over. Inability of the destination hospitals to trace the patients handed over by the emergency services reaffirm the need for strengthening the linkages between ambulances and destination hospitals. Confirmation by the Partner in respect of 235 (15 *per cent*) out of 1,557 instances in four hospitals point to the possible diversion of cases to private hospitals by the ambulance crew.

2.1.14 Financial Management

The introductory paragraph of this report indicates the existing financial arrangement between the Government and the Partner for the Project. The centralised financial management system was maintained by the Partner at its Head Office in Secunderabad. An application front-end was provided to

selected users in the State. The year-wise and component-wise expenditure incurred during the period 2014-15 to 2018-19 is given in **Table 2.6**.

Table 2.6: Statement showing the year-wise and component-wise expenditure

(` in crore)

Component	2014-15	2015-16	2016-17	2017-18	2018-19	Total
Ambulance maintenance cost	33.83	32.3	38.61	39.21	38.63	182.58 (37)
Administrative cost	3.31	8.31	2.73	3.4	2.97	20.72 (4)
Communication cost	0.52	0.68	0.65	0.66	0.54	3.05 (1)
Employee benefits	44.44	51.57	56.46	56.42	56.93	265.82 (53)
Medical Consumables	1.33	1.71	1.58	1.69	1.42	7.73 (2)
Recruitment and Training	1.74	2.8	2.83	3.43	1.39	12.19 (2)
Travelling and Conveyance	1.62	1.34	1.33	1.21	0.87	6.37 (1)
Others	0.47	0.18	0.94	0.02	0	1.61 (0)
Total	**87.26**	**98.89**	**105.15**	**106.03**	**102.78**	**500.07 (100)**

Figures in parentheses indicate percentage of total expenditure
Source: Information furnished by the Department/Partner

The above table showed that expenditure on salaries was the highest (53 *per cent*) followed by ambulance maintenance cost (36 *per cent*). Analysis revealed that the operating cost per ambulance increased from ` 12.27 lakh to ` 14.46 lakh per year per ambulance excluding their replacement cost during the period 2014-15 to 2018-19. The cost per trip of the ambulance ranged from ` 1,023.26 to ` 1,664.68 and the cost of running of ambulance per kilometre ranged between ` 23.79 and ` 36.11 during the above period.

2.1.14.1 Non-issue of audit certificate

In accordance with the MOU, the Partner was to maintain separate financial accounts and records of its operations in Karnataka. These accounts were to be annually audited, by a Chartered Accountant (CA) firm approved by National Rural Health Mission/Government of Karnataka, by the end of the first quarter of the succeeding year in addition to any statutory audit.

The State Government had identified three CA firms[26] during the period 2014-15 to 2018-19 for conducting the annual audit of the accounts of the project. We observed that none of the CA firms had issued any auditor's report/audit certificate for the audits conducted and the MOU did not link the release of funds in subsequent years to the submission of audit certificate. Hence, there was no monitoring of the expenditure at the Government level.

The State Government agreed to take necessary action in this regard.

[26] M/s S B Jeedi & Co. (2014-15); M/s HR Alva& Co. (2015-16) and M/s Sanjay K & Co. (2016-17 to 2018-19).

2.1.14.2 Inadmissible expenditure borne by the State Government

Analysis showed that ` 56.27 lakh and ` 21.66 lakh being the salary expenditure and travelling and conveyance expenditure respectively of the senior management for the period 2014-15 to 2018-19, which was to be met by EMRI was claimed from the State Government. There was no mechanism in the State Government to verify the claims preferred by EMRI. This resulted in irregular payment of ` 77.93 lakh.

The State Government stated that action was initiated to recover the amount. The reply, however, does not address the mechanism put in place to prevent such claims.

2.1.14.3 e-visit (Travel Management System) module

The project developed another in-house application 'e-visit', a travel management system module for managing the supervisory visits of the regional, district and other functional level officers. The officers visiting ambulance locations were to obtain a visit id by dialling the e-visit application desk using the mobile numbers allocated for the ambulances. This was to act as an evidence for reaching the location of visit and would indicate the starting time and duration of the visits. The visiting officers were to close the visit id and obtain a new id at the next location. The visit ids were quoted in travel claims as proof of their location visits and travel.

The visit ids were to be generated based on an incoming call from a visiting ambulance location and ambulance number. We observed simultaneous creation of e-visit ids and their closing by manual entries at the e-visit module, overlapping of time between visits of different locations, bulk creation of e-visit ids and their closure *etc*., pointing to doubtful practices and travel claims. A few illustrative instances are indicated in **Appendix 2.5**.

2.1.15 Human Resource Management

EMRI was required to deploy the required personnel for the effective implementation of the project. We noticed the following shortcomings:

(i) As per the MOU, each ambulance was to be provided with pilots and EMTs each in the ratio of 2.75 per ambulance. For a fleet size of 711 ambulances, 1,955 pilots and EMTs each were required to be deployed. The status of pilots and EMTs as at the end of March 2019 was 1,556 and 1,548 respectively. The shortage of ambulance staff affected the functioning of ambulance service and the ambulances remained non-operational for 41,342 days during 2014-15 to 2018-19. There was also an additional burden on the existing staff to work for longer durations. We observed during field visit that

- in five instances, ALS ambulances were being operated by assigning the cases to pilots without any EMT support thus endangering the emergency victims.

- In two instances, ambulances were not operated during the night shifts due to inadequate staff.

(ii) As stated in Paragraph 2.1.9.8, ERCPs were required to provide virtual medical directions to EMTs who are in the field. Analysis of CCMS data available for two years 2017-18 and 2018-19 showed that the percentage of unanswered calls by ERCPs was 58.20 and 65.52 respectively. We observed that there were only three ERCPs available at the emergency response centre and it was apparent that they were too few to attend to all the calls. Besides, the MOU did not specify the number of ERCPs to be employed.

(iii) The MOU had not specified any qualification for the various personnel to be deployed under the project. We noticed that out of 1,563 EMTs working as of March 2019, 7 and 46 personnel with qualification in Laboratory Technology and Health Inspection respectively were appointed as EMTs. Absence of qualification norms resulted in deployment of personnel not authorised to administer medicines and pre-hospital care in the emergency cases. We observed during field visit that

- in one instance, the EMT with qualification in Laboratory Technology was deployed for ALS ambulance.

(iv) Though MOU envisaged deployment of police personnel to be provided by the police department as Police Dispatch Officers (PDOs) for taking care of exclusive police cases and medico-legal cases, no personnel were deployed by the department. Retired police personnel were appointed on contract basis for the day shift and no services were available for the night shift.

(v) According to MOU, ambulance staff were to work in two shifts of 12 hours each. Considering the highly stressful nature of work, the MOU provided that the personnel would get off after every three days of duty. It was, however, observed that the ambulance staff was given off only after every four days of duty. Analysis of the Patient Care data for the year 2018-19 showed that EMTs worked beyond 14 hours in 53,079 instances. In 17,297 instances the period of continuous work went beyond one day and ranged up to 25 days without any break. In the exit conference, the State Government attributed shortage of staff to the long continuous working hours. The findings of the survey are indicated in **Appendix 2.6**.

The State Government replied that a notice seeking explanation on the above issues had been served on the Partner.

It is recommended that for smooth running of the ambulances, the manpower deployment as agreed by the private partner in the MOU should be strictly adhered to. For this purpose, periodical review of the manpower deployment should be made and a penal provision be introduced in the MOU to safeguard breach in deployment provisions by the private partner.

2.1.16 General Information System controls

2.1.16.1 User Requirement Specifications

The user requirement specification (URS) is a document used in software engineering that specifies what the user expects the software to do and serves as a term of reference for the design, development or procurement of a software application. All users and stakeholders, both end-users and operators/maintainers, were required to be consulted during the preparation of a URS document. The URS document should be in all respects presented at a level and in a manner suitable for evaluation and approval by the appropriate project authority. We observed that the URS was not prepared and approved by the Government.

2.1.16.2 Obsolescence

Information Technology (IT) assets are characterised by rapid obsolescence. Planning for future technology needs is a key component of IT management. An obsolescence management plan would include a variety of different elements such as a technology roadmap, identification of criticality of the components, monitoring all components against obsolescence. Use of outdated or obsolete technology should be avoided as far as possible in critical systems.

We, however, observed that the software applications and the supporting hardware infrastructure used in the project were acquired during the year 2008-10. There was no up-gradation of the software and hardware used in the Emergency Response Centre or the Ambulances. The proposal submitted by the Partner for the upgradation of the software was yet to be considered by the Government.

In the exit conference, the State Government stated that the software system in the proposed tender would address the issues raised in Audit.

2.1.16.3 Incident management and business continuity plans

Every organisation is at risk from potential disasters that include power and energy disruptions, communications, transportation, safety and service sector failure, cyber-attacks and hacker activity, natural disasters such as earthquakes and fire, accidents, sabotage *etc*. These incidents could lead to loss of, or disruption to an organisation's operations, services or functions. Hence, there is a need for incident management and business continuity plans[27] which go hand-in-hand.

However, we observed there was neither an incident management plan nor a business continuity plan. This impaired the ability of the project to understand the minor, severe and critical cases for undertaking remedial measures.

[27] A business continuity plan is an organisation-wide group of processes and instructions to ensure the continuation of business processes–including, but not limited to IT - in the event of an interruption. It provides the plans for the enterprise to recover from minor incidents (e.g., localised disruptions of business components) to major disruptions (e.g., fire, natural disasters, extended power failures, equipment and/or telecommunications failure).

2.1.16.4 Single point of failure

A single point of failure (SPOF) is a part of a system that, if it fails, would stop the entire system from working. The Emergency Management Centre requires highest level of availability and accordingly was required to incorporate sufficient redundancy in its architecture to minimise the threat of single point of failures. We observed that a risk analysis on the single point of failure was not undertaken though there were major SPOFs in the architecture of the project as discussed below:

- **Single Public Safety Answering Point (PSAP) Location** - The 108 service is operated through a single PSAP location in Bengaluru. No disaster recovery site with a view to resume the site in the shortest possible time has been planned and implemented.

- **Single Telephone Exchange landing location** - All the calls to 108 were routed through a single exchange in Bengaluru. Any failure in the exchange operations would result in complete shut-down of the project activities.

2.1.17 Governance

The Quality of Management Systems has a major impact on the extent to which effectiveness, efficiency, asset safeguarding and data integrity objectives are achieved in a project environment. The absence of management systems at Government level and deficiencies noticed in the PPP of management of EMS-108 are discussed below:

2.1.17.1 Strategic planning exercise not undertaken

Strategic planning is a process, which results in a strategic plan. The plan should cover an assessment of the effective chain of response in respect of each emergency, identify the resources required, compare the resource requirement with the available resources to identify the gaps and plan the necessary interventions for bridging the gaps and improving the outcomes. Moreover, an EMS system is expected to meet the urgent healthcare needs of all patients, regardless of age or comorbidity, geography *etc*. Special groups include children, geriatric and disabled patients, and patients with limited access to healthcare due to geographic, demographic, socio-economic, or other reasons.

We observed that a strategic management plan oriented towards providing emergency medical services to the entire population in the State was not formulated. As a result,

- people living in remote/tribal areas did not have access to EMS. The critical locations on various roads for connecting to hilly and remote areas for placing appropriate transportation vehicles were yet to be identified.

- the project did not consider the emergency medical requirements of the fishermen[28] and there was no procedure in place to escalate a call from the fishermen at sea to appropriate command centres such as Coast Guard or the district authorities concerned. It is pertinent to mention here that states like Gujarat, Kerala and Odisha have launched boat ambulance services to respond to emergencies at sea.
- there was no mechanism to systematically transfer calls to the neighbouring states[29] and *vice-versa* for providing service to the caller in distress in respect of calls made from border areas of the State, which land at the control rooms located in the neighbouring states. We observed that 6,503 calls from other State geographies were received during the period 2014-19. The numbers of calls landed from Karnataka to other state emergency centres were not ascertainable.
- the Call Centre did not have the capability to receive and address calls from individuals[30] who are deaf or hard of hearing such as through use of video relay service and text messaging.
- the Government or the Partner had not taken any action to make available the emergency medical services to 869 of the 27,397 villages in the State, which were devoid of tele-connectivity facility.

Further, a spectrum of activities such as assessment of effective response time for different categories of emergencies, pre-arrival instructions from call centre, pre-alerting by ambulance staff to the hospitals, follow-up on patient outcomes, research on effectiveness of pre-hospital care, monitoring of patient outcomes, up gradation of the ICT infrastructure *etc.*, remained out of the consideration and due diligence of the top management at Government level.

The State Government replied that action was being taken to prepare suitable action plans to provide medical emergency services for all the disadvantaged sections.

It is recommended that the State Government should ensure access of EMS to all disadvantaged sections of the society such as people living in remote/hilly/border/coastal areas.

2.1.17.2 Management of Public Private Partnership Projects

PPPs are long term contracts and the regulatory authorities need to ensure that the project meets its objective on a continuous basis. Hence, monitoring the project activities was critical to maintain the project life in good health. It was to be ensured that monitoring processes and procedures are in place at the commencement of service, with roles and responsibilities clearly outlined and project requirements clearly specified, so that performance can be managed from the very beginning. The deficiencies noticed thereon are indicated in **Table 2.7**.

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[28] Karnataka has 320 km long coast line with around 3.28 lakh marine fishermen.

[29] All the States bordering Karnataka use the same emergency number 108.

[30] According to the Census data 2011, there were about 3.26 lakh hearing impaired and persons with speaking difficulties in the State.

Table 2.7: Statement showing the deficiencies noticed in management of the Project

Sl. No.	Issue	Audit comments	Government's response
1	Inadequate monitoring framework	Key performance indicators with respect to service delivery were insufficient. The MOU did not specify the monitoring mechanism that was to be in place.	The State Government accepted the audit observations and in the exit conference, agreed that the MOU was deficient as the detailed Service Level Agreement was not part of the MOU. It further stated that it had now initiated a tender process for identifying a Partner for continuing the Project and the deficiencies in the present MOU were addressed in the proposed tender document adding Service Level Agreements, penalty clause *etc*.
2	Management Information System	Though EMCA generates large volume of data capable of providing management information, no MIS reports were designed and generated as part of the application.	
3	Performance Security not prescribed	The MOU did not provide for furnishing of any performance security by the Partner for due performance of its obligations during the project operation phase.	
4	Non-inclusion of penalty clause	The MOU did not incorporate any penalty clauses for deficient delivery of services.	
5	Reporting arrangements	The MOU did not specify the exceptional reporting arrangements between the Government and Private Partner.	
6	Disruption of telecom infrastructure to call centre	There was no coordination with different civic agencies to ensure that the critical emergency telecom infrastructure was protected from the activities of the civil agencies such as water supply, public works *etc*. We noticed three instances of 108 call centre lines outage during the period 2014-19 on account of fibre and copper cable cuts by the civic authorities and in two separate incidents in March 2016 and June 2016, telecom lines were down for more than 10 minutes due to cable cut off during footpath work and underpass work near the call centre.	The State Government did not furnish any reply in this regard
7	Linkages among different emergency handling agencies not specified	Linkages between different departments was neither established nor a governance structure for ensuring inter-departmental co-ordination was instituted. The absence of data sharing and linkage between departments affected critical issues like accident mapping and identification of accident hotspots, which would have helped in effective deployment of ambulances near the accident prone zones so that the "Golden Hour" time could be reduced.	
8	Exit strategy plan	Neither the MOU contained any exit strategy plan indicating the contractual obligations to ensure full and final transfer of assets and Intellectual Property Rights nor did the Government prepare such a plan despite having decided to discontinue the association with the Partner before the scheduled 10-year period citing deficiencies in services. The absence of exit strategy plan was fraught with the risk of disruption in implementing the project besides continued dependence of the Government on the Partner.	The State Government replied that suitable action would be taken with regard to exit strategy plan.

Source: Information furnished by the Partner/State Government

2.1.17.3 Handling Public Concerns on Emergency Care

Emergency Medical Services are critical public services and adequate systems should be in place to ensure that public receives safe, effective, and quality health care. The management of emergencies should incorporate an approach to dealing with adverse incidents on the ground, the procedure for their investigation, remedial measures to be taken from the associated learning resulting from the investigation into adverse events. The MOU did not specify any mechanism for handling the public concerns and their resolution. The Partner did not classify the concerns on the basis of their severity for reporting to the Government. We observed that

- 6,411 complaints were received from emergency service users during the period 2014-15 to 2018-19.
- Out of the 591 complaints received in 2018-19, only 418 cases were taken up for processing by the Quality Wing, of which 34 cases related to death.
- Quality Wing after their investigation concluded 81 cases as proven, thus establishing the complaint.
- The proven cases included 4 cases leading to death of patients, 4 cases related to transporting the patients to private hospitals and 23 cases involving bribe.

However, no documents were available indicating a detailed investigation into the incident, lessons learnt and remedial measures taken. Further, the serious concerns on service delivery raised by the public and their resolution were not informed to the Government.

The State Government, in the exit conference, stated that MOU did not make the Partner responsible for reporting the grievances raised by the public to the Government. As a result, it was not getting any information on the concerns raised unless the public directly approached the department personnel. It further stated that appropriate reporting mechanism would be incorporated in the proposed tender.

2.1.17.4 Government Partner did not have access to project databases

It is well recognised that data is a critical resource and must be managed properly. The 108 Project generates large volume of data related to emergencies and for the Government to utilise and manage this data resource better, it should have access to the project database. Government should also be in possession of the data dictionaries that are key to understanding the databases, queries that are used to extract data from different data stores to reduce continued dependence on the vendor and vendor personnel beyond the contract period. A well-defined back up policy specifying multiple back-up locations would assist in ensuring the continued availability of the data and assist in ensuring the integrity of the data.

We noticed that Government did not specify any back up policy and method of periodically handing over the back-up data to it from the various database locations[31] maintained by the Partner. It did not have access to these databases and also had not obtained sufficient documentation in respect of the Project databases from the Partner. The data dictionaries, the database queries for extracting the regular management information *etc*., was not obtained. Multiple locations and multiple database management systems without a data repository implementation, access provisions and associated documentation impaired ability of the Government to utilise the project database. Lack of access to the project database also diminished the Government's ability to monitor the project activities. Further, in the absence of the access to data generated under the Project, the State Government could not use it for its planning and research purposes.

The State Government accepted that the Partner did not share the database with it and stated that the proposed tender provided for creating an exclusive dash board for use by the department. It further stated that plans for research and development through Institute of Public Health, Karnataka State Health System Resource Centre and other agencies would be formulated in the coming days.

2.1.17.5 Non-constitution of State/District level committees

According to the MOU, the State Government was to set up an appropriate Council/Committee both at State and district level to meet periodically and make recommendations to facilitate effective functioning of the EMS. The State and district level committees were, however, not constituted.

- Absence of a State Level Steering Committee affected the functioning of the Project as a comprehensive emergency management service. The Project which was envisioned to cover medical, fire and police emergencies remained largely an Emergency Medical Response Service. The linkages between other departmental agencies like fire, transport and police were not fully established. We noticed closure of 7,58,804 police and fire calls received without forwarding to these departments.

- Absence of District Steering Committees affected the linkages between ambulances and hospitals. The concerns raised by the beneficiaries and the public were not shared and discussed in the absence of a forum at the district level.

Had these committees been constituted and met periodically, the issues arising in EMS could have been addressed thereby improving upon the service delivery. The State Government also agreed to the need for strengthening effective monitoring and co-ordination. It stated that Deputy Commissioner of the

[31] Project 108 data was stored in various database applications at multiple locations. The call information database and fleet management module data was maintained at the project office in Bengaluru. The AVLT data was available with a cloud provider. The financial data, data related to procurement, data related to employees *etc*., were maintained at the Data Centres of the Partner.

districts would be made the Chairman of the monitoring committees at the district level.

2.1.17.6 Project evaluation

Evaluation studies are a rich source for learning lessons from experience and tools for improvement. We noticed that evaluation of the project, which was in operation for over a decade, was not undertaken by the State Government. The State Government replied that the Project would be got evaluated.

It is recommended that the State Government should devise a monitoring mechanism encompassing access to project databases, submission of periodical returns, conducting surprise inspections and generation of MIS reports. The State Government should also immediately arrange for evaluation of the project besides ensuring that the huge data generated is made use of for research and analysis towards improving the effectiveness of the EMS.

2.1.18 Results of beneficiary survey

We conducted a survey of 371 patients who were admitted and were available in the destination hospitals in the eight test-checked districts at the time of audit. The focus of the survey was with reference to the ambulance transport and pre-hospital care provided.

The survey results showed that the beneficiaries were generally satisfied with the services provided. However, 16 *per cent* of the patients stated that they had to pay money for the service provided by the ambulance and 49 *per cent* stated that no treatment was provided to them during transportation.

The State Government stated that action had been initiated against the concerned in respect of cases that have come to light. It further stated that the stringent provisions would be made in the proposed tender besides ensuring appropriate monitoring activities.

2.1.19 Conclusion

The noteworthy initiative of the State Government to provide Emergency Medical Services through Public Private Partnership to its citizens did not, however, achieve the desired objectives completely. The MOU lacked clearly specified deliverables, exit strategy, a comprehensive mechanism for resolution of public concerns (Paragraph 2.1.17.3), specific measures for people of remote/tribal areas, border areas *etc.* (Paragraph 2.1.17.1) and a robust monitoring mechanism. The stated deliverables such as the response time, number of emergencies/despatches per ambulance per day could not be achieved. The response time of 30 minutes was achieved only in 72 *per cent* of the cases during the period 2014-15 to 2018-19. As against 8.87 lakh ambulance requests transferred to Vehicle Busy desk, ambulances were despatched only in 3.74 lakh cases. The allocation of ambulances was not based on criticality of the emergencies. Large number of ineffective calls impaired the efficient functioning of the call centre.

The feedback mechanism was highly ineffective as feedback was received in only one *per cent* of the total cases. Instances of incorrect reporting, back-end insertion of data were observed raising concerns on data integrity. Back-up plans, incident management and Business Continuity Plans were not prepared for the project. Monitoring of the project implementation by the State Government was deficient. The State Government did not have access to the project databases and reporting arrangements between the Government and Partner were not specified. MIS reports were not designed and generated. Research and development activities were not carried out despite the availability of abundant data for improving patient care. The evaluation of the project was not undertaken by the State Government. The State Government, thus, lost the opportunity of learning from experience and bringing improvements in its effort to provide emergency response services to its citizens.

2.1.20 Recommendations

Specific audit recommendations have been made in this Performance Audit with respect to the related audit findings, which require immediate attention of the Government of Karnataka. In addition, important general recommendations relevant to the core issues of the Project are also being made to improve the functioning and performance of the Arogya Kavacha – 108 Project. These are enumerated below, and should also be prioritised for immediate implementation by the Government.

- ✓ ***In addition to strict adherence to the MOU conditions, a Standard Operating Procedure (SOP) should be chalked out specific to the operation of the Emergency Medical Service, which should govern the operations of the ambulances, address adequately the ineffective calls especially the nuisance calls and also should ensure pre-alerting the hospitals on the arrival of the patients. The SOP should be developed and implemented with better outcome measurement indicators.***
- ✓ ***Pre-hospital patient care data needs to be digitised to seamlessly integrate with the definitive care outcomes. Follow-up mechanism through linkage between pre-hospital care and actual hospital care should be strengthened for effective feedback.***