

William A Haseltine PhD

Every Second Counts
Saving Two Million Lives



INDIA'S EMERGENCY RESPONSE SYSTEM
The EMRI Story

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Saving Two Million Lives



TETHYS

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within India and overseas. And how that same successful, far seeing, creative man threw it all away. Despite Ramalinga Raju's misdoings and subsequent imprisonment in 2015, the very fact that EMRI is still in demand by the Indian state governments is proof of the success and viability of the project. In fact, the eventual success of EMRI would not have been possible without the government's interest and involvement in the project.

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Preface

by **William A Haseltine**

Role of Emergency Response Systems in Universal Healthcare Coverage

AN emergency medical response system is a critical and often overlooked requirement for universal healthcare coverage. Emergency medical care integrates different health system components that are required to deliver universal health coverage. Emergency response systems save lives by delivering prehospital care for several life threatening emergencies. An effective medical emergency response system can dramatically reduce neonatal and maternal mortality. Rapid response to transport of victims of two of the most frequent causes of death, heart attacks and stroke, require a well functioning emergency response system. Similarly, response to household accidents such as falls for the elderly and burns for children are best treated by rapid transport to nearby medical facilities.

Despite the vital role that emergency systems play in connecting urban, suburban, and rural communities, the role of effective ambulance systems is often neglected in the roadmap for sustainable development goals. This book on the Emergency Medical Research Institute of India describes the profound impact that a high quality, universally accessible, and affordable emergency system can have on the general population. I contend that no system of universal healthcare coverage is complete or even effective without a careful integration of the ambulance service with other medical facilities.

India created a near universal, world class emergency system,

known as the Emergency Management and Research Institute, within a decade. The impact has been astounding. It is validation of the idea that governments with the right design, intention, and partnership can create systems in a relatively short period to provide access to high quality affordable healthcare to its people.

The Emergency Management and Research Institute connects seven hundred and fifty million citizens in India to high quality universal emergency care. The institute has, to date, saved over two million lives, responded to fifty six million medical, police, and fire emergencies, served close to nineteen million pregnant women, and assisted close to five hundred thousand live births.

Daily, the Emergency Management and Research Institute saves nine hundred lives, receives one hundred and fifty thousand calls, and responds to twenty four thousand emergencies.

The Emergency Management and Research Institute assures on ground response to an emergency by an ambulance with lifesaving drugs and trained emergency technicians, within fifteen minutes in urban areas and twenty five minutes in rural and tribal areas.

The service costs less than US\$ fifteen per emergency, which is less than one percent of a United States 911 emergency cost. The service is universal and free to the beneficiary. The Emergency Management and Research Institute deploys more than ten thousand ambulances, and employs over forty five thousand highly skilled personnel, deployed in urban, peri urban, rural, and tribal areas. The institute has trained half a million emergency responders within the communities.

As of today, the Emergency Management and Research Institute, now known as GVK EMRI, is the world's largest integrated emergency service created in public private partnerships with fifteen state governments in India.

The institute uses world class quality and data monitoring and information management systems. This kind of an innovation was born in probably one of the most complicated and resource constrained environments in the world. Over the rest of the book, we tell you the story of how this was made possible and what lessons can be applied by other governments around the world in nurturing similar innovations in their local settings. ■

Why this book on the Emergency Management and Research Institute?

A breakthrough innovation in healthcare improves the quality, accessibility, and affordability of service. To be truly great, a breakthrough is equitable, replicable, and sustainable. As you read this book, you will discover that the emergency services in India, pioneered by the Emergency Management and Research Institute, is such a breakthrough.

The guiding vision of ACCESS Health International is that all people, no matter where they live, no matter what their age or income, have a right to access high quality and affordable healthcare. We look around the world to find outstanding examples of healthcare finance, delivery, and quality improvement. We assist governments and the private sector to implement these best practices.

At ACCESS Health, we examine how high functioning healthcare systems work. We seek to understand their genesis. We ask: What are the underpinnings? What are the elements that catalyze growth? What role do governments play? How do they deliver high quality services to all? These are some of the questions we ask so that we may help transfer best practices in health to governments and the private sector in many parts of the world. It is in this context that we present an outstanding example of high quality affordable universally accessible health care delivery, the emergency services pioneered by the Emergency Management and Research Institute in India.

The book is authored by William A Haseltine, PhD, Chairman and President of ACCESS Health International Inc., a Foundation active in the United States, India, China, Singapore, Sweden, and

the Philippines. Dr. Haseltine has an active career in science, business, and philanthropy. He was a professor at Harvard Medical School and Harvard School of Public Health from 1976 to 1993, where he was Founder and the Chair of two academic research departments, the Division of Biochemical Pharmacology and the Division of Human Retro virology.

He is well known for his pioneering work on cancer, HIV/AIDS, and genomics. He has authored more than two hundred manuscripts in peer reviewed journals. He is the Founder of Human Genome Sciences Inc., and served as the Chairman and Chief Executive Officer of the company until 2004. He is also the Founder of several other successful biotechnology companies. Eight pharmaceutical products from companies he founded are currently approved by US and international regulatory agencies. He is also Chairman of the Haseltine Foundation for Science and the Arts. He serves as an advisor and board member of several innovative healthcare companies.

The book has benefitted from the work of Siddhartha Bhattacharya and Stuti Shukla.

Siddhartha Bhattacharya is the Country Director of ACCESS Health India and is responsible for leadership and overall development and management of activities at ACCESS Health India. His responsibilities include the establishment of collaborations and management of partnerships with the public and private sectors as well as with research and development organizations. Previously, Siddhartha served as chief operating officer and technology head for the Emergency Management and Research Institute of GVK. In prior leadership roles, he has worked with Dell, Inc., in the US, Philips in India, and the government of Kerala in several cross functional global assignments.

Stuti Shukla is a research consultant at ACCESS Health India. She has worked on several projects at ACCESS Health India in collaboration with governments and development sector organizations. She provided valuable research support and project management for this book. Before joining ACCESS Health, Stuti worked as a journalist in Mumbai with The Indian Express. She holds a Bachelor's degree in Journalism from Mumbai University and a

Post Graduate in Public Policy and Management from the Indian Institute of Management, Bangalore.

Services of the Emergency Management and Research Institute in a Nutshell

The emergency services were started as a trial program by the founding organization the Emergency Management and Research Institute, with seventy five ambulances serving five cities and thirty major towns in the former undivided state of Andhra Pradesh in August of 2005. The Emergency Management and Research Institute now serves close to seven hundred and fifty million people in fifteen states and two union territories¹. The services, managed by the Emergency Management and Research Institute and other private sector organizations, field eleven thousand ambulances and employ over twenty thousand medical and paramedical professionals. Indian conglomerate GVK is currently in charge of the management of the Emergency Management and Research Institute. It is run as a corporate social responsibility initiative under the GVK Foundation. The organization is therefore often referred to as GVK EMRI. The current management is presently in talks with a few South Asian governments in taking the model to their countries. In 2016, the 108 Emergency Services were adopted by Sri Lanka with the help of the Emergency Management and Research Institute.

In this book, we will also outline the 104 Telemedicine Services that were started under the same leadership. The 104 services were initiated by the Health Management Research Institute as a Public Private Partnership with the Government of Andhra Pradesh in 2007 to run health information helpline services. The main objective of setting up the 104 services was to provide online medical assistance to people, particularly in rural and remote areas, with limited or no access to qualified medical practitioners. The helpline gives health advice to callers to bridge the information gap and provides information on referral service through a telephonic consultation.

¹ Territories governed directly by the Union Government of India.

The emergence of both these services is a story of political leadership working together with the nonprofit private sector with a common aim to improve availability and access to important public goods. In the case of the emergency services, the professionalism of the private sector, coupled with strong political backing and the indispensable support of the government, became an essential part of the story of how a small trial program became a national asset.

Numbers Tell the Story

As of August 31, 2017, the EMRI has:

Saved **2.3 Million** human lives

Responded to **56.1 million** emergencies

Served **18.9 million** pregnant women

Assisted **480 thousand** births

Daily, the EMRI Emergency Service:

Receives **150,000** calls

Responds to **24,000** emergencies

Saves **900** lives

Responds on time to **97 percent** of all emergency calls

Dispatches an ambulance in an emergency in **90-120 seconds** on average

Ensures ambulances reach the site of emergency on average in **15 minutes** in urban and **25 minutes** in rural areas

Operates approximately **11,000 ambulances** across 14 states and 2 union territories of India

Enable its ambulances travel on average **200 kilometers**

Spends close to **USD 0.30 per kilometer travelled** towards maintaining its ambulances

Employs close to **47,000** individuals

Serves **75 percent** of its beneficiaries from economically backward strata (according to EMRI estimate)

The Emergency Medicine Learning Center has, since its inception in 2007:

Trained close to **90,000** basic emergency medical technicians

Certified over **500** advanced paramedics

Breakup of cases for the total emergencies since inception till August 31, 2017:

	Count	Percentage
Total Emergencies	56.1 million	100
Medical	55.0 million	98
Police	897,338	1.6
Fire	224,335	0.4

Top Emergencies attended to since inception till August 31, 2017:

Year	Count of Emergencies
2005	16,444
2006	89,598
2007	384,323
2008	1,801,881
2009	3,158,233
2010	3,772,813
2011	3,692,629
2012	4,150,382
2013	6,703,003
2014	7,976,100
2015	8,507,710
2016	9,222,686
2017	6,607,886
Total	56,083,631

The Emergency Management and Research Center has also started the following services apart from Dial 108 for ambulances:

Mother and Child transfer under **Janani Shishu Suraksha Karyakram**: These are dedicated ambulances for obstetric emergencies

'**Drop back**' ambulances transport mother and child to their home post delivery

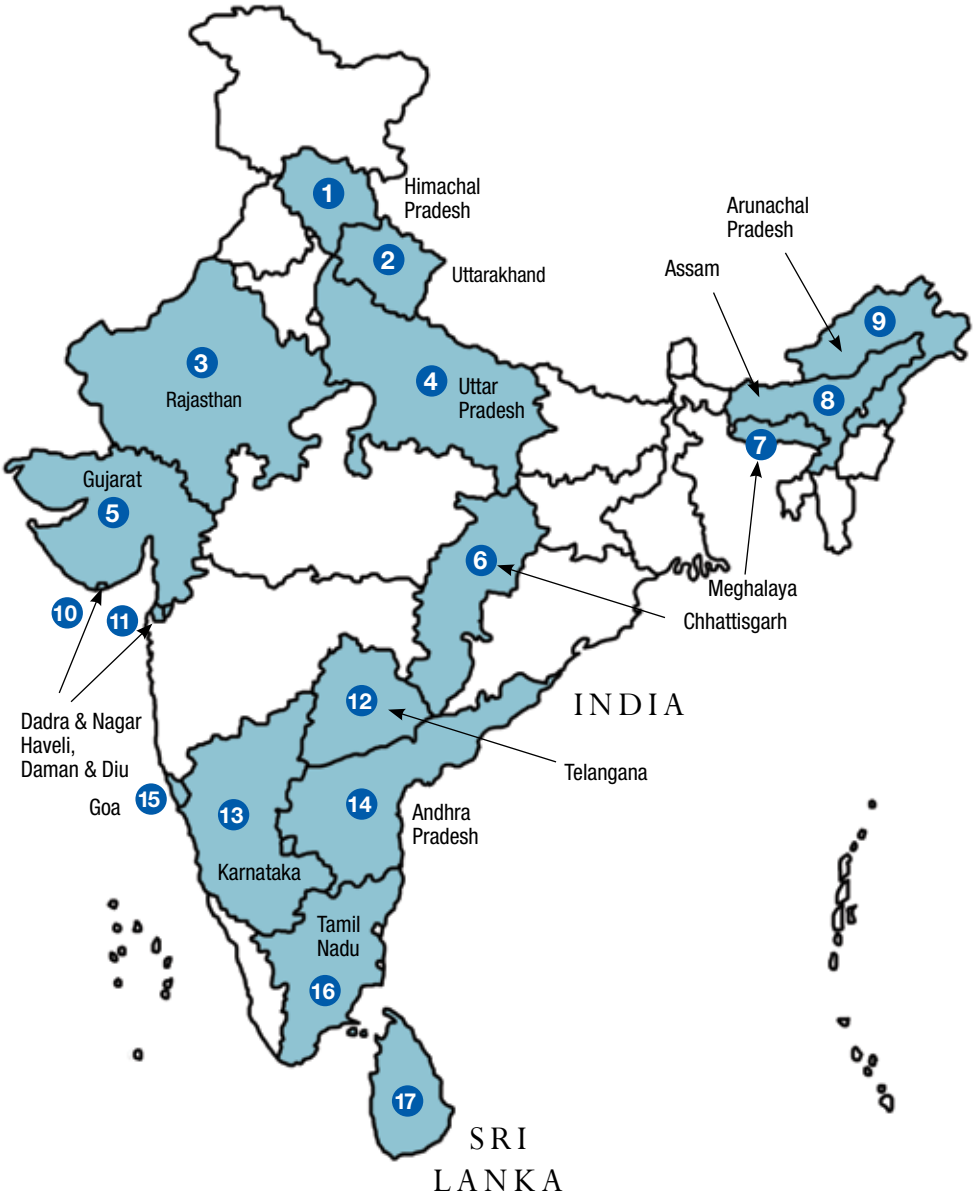
Total no. of Janani ambulances as on August 2017: **4,255**

Janani beneficiaries since inception: **28,314,104**

Janani beneficiaries in August 2017: **662,959**

Per day dispatches of Janani ambulances: **22,099**

States and Union Territories in which EMRI services are currently functional





	Name of the State Government	Number of 108 Ambulances	Number of Mother and Child Transfer Drop Back Ambulances
1	Himachal Pradesh	198	126
2	Uttarakhand	140	106
3	Rajasthan	638	582
4	Uttar Pradesh	1,488	2,270
5	Gujarat	585	256
6	Chhattisgarh	238	356
7	Meghalaya	48	-
8	Assam	701	235
9	Arunachal Pradesh	*	*
10	Daman & Diu	17	-
11	Dadra & Nagar Haveli		
12	Telangana	334	41
13	Karnataka	754	-
14	Andhra Pradesh	468	279
15	Goa	34	4
16	Tamil Nadu	839	-
Indian States Total		6,682	4,255
17	Sri Lanka	88	-

* Data not available at the time of publication

- Services not present

Mother and Child transfers under Janani Shishu Suraksha Karyakram:

Name of State	Number of Janani Ambulances as on Aug 2017	Janani Beneficiaries Since Inception	Janani Beneficiaries Aug 2017
Assam	235	1,168,724	17,252
Uttarakhand	106	315,942	1,982
Gujarat	256	1,578,659	50,497
Andhra Pradesh	279	494,362	19,904
Telangana	41	72,451	2,939
Chhattisgarh	356	2,364,606	66,873
Uttar Pradesh	2,270	21,546,206	430,947
Himachal Pradesh	126	137,082	4,073
Goa	4	4,683	86
Rajasthan	582	631,389	68,406
Total:	4,255	28,314,104	662,959

Other key services of the EMRI:

Call 104 health helpline service works in partnership with the Union Territories of Daman & Diu and Dadra & Nagar Haveli and the state of Tamil Nadu. To date, over two million calls were answered and advice was given to over five hundred thousand callers.

Dial 100 handles close to three thousand police emergencies per day in Andhra Pradesh and Telangana, and over two thousand police emergencies per day in Gujarat.

Call 181 women helpline is operational in Gujarat and Uttar Pradesh, to report incidents of crime against women and rescue women in distress with vans manned by a lady counselor and a lady police constable. It has received over two hundred thousand calls in Gujarat and over eleven thousand calls in Uttar Pradesh.

Neonatal ambulances were started with paramedics trained in neonatal care, to transport newborns in emergency. Sixty five ambulances in Tamil Nadu and two ambulances in Goa are operational currently.

Mobile medical units were started to meet healthcare needs in remote, inaccessible geographies. These are functional in Chhattisgarh, Gujarat, Madhya Pradesh, and Maharashtra with over a hundred units in total.

Boat ambulances are used for response to emergencies in riverine areas or during floods. These are operational in Assam, Uttarakhand, and Dadra & Nagar Haveli.

'Doli-Palki' (palanquin) ambulances are for hilly terrain or places with no roads. Five hundred of these ambulances are operational in Uttarakhand.

Mother and child tracking service is operational in Uttarakhand. Until December 2016, two hundred thousand calls were answered by frontline maternal and child health workers of the government.

CHAPTER 1

*Changing the Face of Emergency Services
in India*

Tenga Sangma, a farm worker in the small town of Tura in a hilly northeastern state of India, fell from a tree while cutting wood for fuel, impaling himself on a cut branch. His abdomen was bleeding profusely but no one was ready to transport him to the nearest hospital. Sangma's brother in law then called 108. Despite the hilly terrain, the ambulance reached within half an hour and transported him to hospital where he was immediately sent in for surgery. It was successful and Tenga was released from hospital within a few days.



When twenty six year old Vally was admitted to a private hospital in the suburb of a large southern city, doctors saw a potential complication because of a premature delivery. They referred her to a hospital thirty five kilometers away. It was raining heavily that evening and traffic had come to a standstill in many areas. The drive lasted a little over an hour. Upon arrival at the hospital, a baby girl was born. Both mother and child are well.



Jamaal Yusufi, a community health worker in a backward and hilly northern state of India says her area is inaccessible by road and dominated by endemically poor communities. She says that many pregnant women have benefited from the service in this area where earlier at least two women died due to complications during pregnancy every year. "This service is a ray of hope to poor people."

TWELVE years ago, these stories would have been unheard of in India. Until the arrival of the Emergency Management and Research Institute's emergency services, systematic prehospital emergency care was virtually nonexistent in the country. There was disparity in the quality of and access to emergency and trauma care across different parts of the country. Responses to civilian emergencies were haphazard, unstructured, and fragmented, and limited to a few government and private trust ambulances.

India has alarming statistics for medical and other emergencies. An estimate from 2007, based on data from the Ministry of Road Transport and Highways, Ministry of Home Affairs, and National Crime Records Bureau suggested that close to three hundred thousand emergencies take place in India every day with 9.5 percent of the population being affected by an emergency annually. Of this, eighty percent are medical emergencies, eighteen percent are police emergencies, and the remaining two percent are fire emergencies.

An analysis of the data generated at the Emergency Management and Research Institute suggested that of the three hundred thousand emergencies that occur in the country each day, eighty percent involve victims belonging to the bottom of the economic pyramid. Eighty percent of deaths in an emergency occur within the first hour. One of the main reasons is that patients are taken to hospitals or healthcare centers when it is often too late for

successful treatment¹.

The *Indian Emergency Journal* in its August 2005 issue states, “In cases of road accidents, there is at least a thirty to forty five minutes lapse between the time of a crash and arrival of the patient at the hospital. Twelve percent of institutions in the trauma care sector have no access to ambulances. Only fifty percent of the available ambulance services possess the acute care facilities needed to keep an accident victim alive during transportation, and only four percent of personnel staffing these services have certified formal training.”

The World Health Organization has projected that by 2020, road crashes will become a major killer in India, accounting for nearly five hundred and fifty thousand deaths per year. Current statistics indicate that cardiac diseases and stroke will be another major cause of death and disability by 2020. A report by the National Human Rights Commission in 2004 pointed out that four hundred thousand people, ten percent of all who died in India annually, died because of untreated or tardily treated injuries. A 2006 report by the Law Commission of India stated that accidents and injuries accounted for ten percent of all deaths in India. The accident rate per thousand vehicles in India is among the highest in the world.

As late as 2005, India had just a semblance of an emergency response system in the form of three toll free numbers, 100 for police emergencies, 101 for fire emergencies and 102 for medical emergencies. These were government services that worked inconsistently and independent of each other with little or no coordination in responding to an emergency. No one agency coordinated the various components of a trauma care and emergency response system at the national level.

The number of ambulances was disproportionately low as compared to the huge population of this country, a situation worsened by poor or no coverage in remote areas. Government run ambulances were few, with private trusts and hospitals only marginally supplementing this service. In rural areas, patients were often transported to health facilities in tractors or bullock carts. In the absence

1 EMRI's internal costing study, 2007

of a system of categorization of hospitals, emergency patients were often taken to the nearest medical facility, irrespective of the appropriateness of the center to treat that emergency.

A significant portion of deaths was also attributed to the untimely response to cardiovascular strokes and complications during childbirth. The 2013 annual report on the medical certification of the cause of death states that diseases of the circulatory system or heart diseases accounted for the highest number of medically certified deaths in India, at twenty nine percent. The Registrar General of India surveyed all deaths related to childbirth that occurred between 2001 and 2003 in more than one million nationally representative homes. The survey revealed that two thirds of women who died owing to complications of childbirth did seek some form of health-care, although they had by then reached a critical medical condition. The report also reveals that close to thirty percent of all births took place outside a medical institution with varying degrees of access to medical or paramedical care. Three quarters of maternal deaths were clustered in rural areas of poorer states although these regions have half the estimated live births in India.

The Vital Statistics and Civil Registration System data from 2013 has revealed that close to one fourths of all registered deaths in India took place in the absence of any medical attention. The data from 2013 further reveals that only forty three percent deaths occurred in medical institutions while another ten percent deaths occurred under the care of doctors outside a medical institution. Tragically, the numbers could be higher, as per the report, because only twenty percent of all deaths in India are medically certified and are mostly reported only from urban areas.

Before the introduction of the Emergency Management and Research Institute services, private transportation was often the only option available to transfer patients to a hospital facility. In urban areas, passersby were hesitant to help victims of road accidents, fearing police persecution along with the pressure to appear as a witness in unending legal battles in court. Very high payments to private agencies for transportation to a medical center often led to financial distress for the patients and their families. Hospitals also often re-

fused admission to patients who could not pay for services upfront. As a result, many patients lost their lives to inadequate medical care within the first hour of the emergency.

Private hospitals and medical practitioners often refused emergency medical care because of legal complications. Earlier, an accident case had to be registered with the police before a patient was treated. A Supreme Court ruling of 1989 required public and private health facilities to stabilize patients in emergency. The ruling protects them against laws of procedure that interfere with the discharge of this obligation. This ruling has been widely ignored.

The absence of assured emergency medical care to a vast majority of its citizens was a huge gap in the healthcare delivery system of India. There was an urgent need for an integrated approach to handling emergencies and providing prehospitalization or paramedical care.

In 2005, Ramalinga Raju, then the Chief Executive Officer of Satyam Computers, a Fortune 500 software company based in Hyderabad, took it upon himself to use India's technological competence to set up a centralized emergency response network. Impressed by the 911 system of the United States and the 112 of the European Union, Ramalinga Raju wanted to set up a similar structure modified to suit Indian conditions. He believed that India's advances in technology and data analytics coupled with workforce education and efficient management could become the basis of a high quality, cost effective means to provide emergency response services.

With some of the best minds from the fields of information technology and medicine available to him, he hired a professional management team and founded the Emergency Management and Research Institute in Hyderabad. The organization ran on the ethos of a nonprofit entity with the structure and strategy of the private sector. Ramalinga Raju went on to conceive the idea of a public private partnership to run these services, which he saw as critical in the spread of integrated emergency services across the length and breadth of the country.

Similar to the 911 service in the US, 108 is a toll free number that citizens can call to summon an ambulance. Additionally, by

dialing 108, citizens can also call for emergency response services from the police and fire departments. The call is received at a centralized, state of the art command center, which facilitates the dispatch of ambulances carrying emergency response equipment and trained paramedics.

The Emergency Management and Research Institute services began small scale tests in August 2005. Seventy five ambulances were introduced in five cities and nearby towns in Andhra Pradesh, a relatively prosperous state in southern India. Within two years of the launch, the services were expanded to the rest of the state of eighty million people in active partnership and with majority funding from the state government. The philanthropic goal of a corporate entity merged with the developmental agenda of the state government.

Other state governments were not far behind in recognizing the value of the Emergency Management and Research Institute emergency services in improving health outcomes. At present, within twelve years of conception, the emergency services are functional in twenty states and two union territories in India, covering over eight hundred and fifty million of the country's 1.3 billion people. Of this, the Emergency Management and Research Institute runs the service in fourteen states and two union territories with a total population of seven hundred fifty million.

What has changed since the Emergency Management and Research Institute emergency services came into being? For starters, close to eleven thousand state of the art ambulances are now available across different terrains and topographies of a country that had an abysmally low number of ambulances plying its roads earlier. In a decade, the Emergency Management and Research Institute services have managed to save over two million lives that could have otherwise been lost simply because there was no way to get to a hospital in time².

Evaluation studies of the Emergency Management and Research Institute services in limited geographies have shown a notable impact on health indicators of these regions. We will discuss some of these

2 Most recent data available on the website of EMRI. <http://www.emri.in/>

studies in later chapters. To give an example, as a direct result of its services, the Emergency Management and Research Institute services have estimated to have contributed to a fifteen percent reduction in maternal deaths in Andhra Pradesh by driving up the number of institutional deliveries, within the first four years of operation³. It has also contributed to a significant reduction in out of pocket household expenditure on transport to the hospital. In the case of Andhra Pradesh, the reduction has been thirty seven percent⁴.

Equally importantly, the number of trained emergency medicine technicians and paramedics continues to grow. Earlier, the absence of formal educational courses in emergency medicine meant there was no workforce for prehospital and hospital based critical emergency or paramedical care. EMRI's Emergency Medicine Learning Center, affiliated to the Osmania University of Hyderabad, produces trained graduates who work as ambulance personnel within the EMRI network and in trauma care facilities of public and private hospitals.

The founding team also recognized the importance of research in arriving at operational best practices. Research ensures quality of care and overcomes operational deficiencies. Leadership, innovation, technology, and research are the vital components of the Emergency Management and Research Institute services. Technology was not limited to information technology. Advanced technologies inform all aspects of the services adopted at multiple levels, be it medical technology or fleet related operational technology. Technology is the basis of the constant effort to reach a patient faster and cheaper. At present, all the EMRI ambulances are enabled with the Global Positioning System. This helps in significant reduction of time in locating patients and in monitoring the movement of ambulances on a real time basis.

3 Jena B, Bharadwaj D, Rao GV. *Strategy towards achieving a safe motherhood in India: a case study of GVK-EMRI*. In: Somauajulu UV, Prakasam CP, Audinarayana N, Vaidyanathan KF, editors. *Health, poverty and human development: perspectives and issues*. India: Serials Publications Pvt. Ltd; 2011

4 Rao M, Katyal A, Singh PV, et al. *Changes in addressing inequalities in access to hospital care in Andhra Pradesh and Maharashtra states of India: a difference-in-differences study using repeated cross sectional surveys*. *BMJ Open* 2014;4: e004471. doi:10.1136/bmjopen-2013- 004471

The concept behind the Emergency Management and Research Institute services is an innovation fully developed within India. The not for profit nature of the enterprise is a great advantage for public and government acceptance. Government acceptance is also key to public perceptions of legitimacy. This system is supported by the government for its operational and financial efficiency. The idea behind it was well received by the political leadership for its potential to touch a large number of lives. The result is a consistent government funding that has helped the system sustain and grow.



Financial sustainability and cost efficiency are important qualities of the Emergency Management and Research Institute system. It provides the entire range of integrated emergency care at a cost of USD 0.24 per citizen per year. The running and maintenance cost of one ambulance varies between USD fifteen thousand to eighteen thousand per month. Each ambulance travels about six thousand kilometers per month. The average cost of running an ambulance is USD 0.3 per kilometer. This is on par with the cost of running a good taxi service in India, with the added advantage of carrying emergency medical equipment and trained paramedics. The network can run and sustain the service at this cost even in the most remote parts of the country.

The concept behind the Emergency Management and Research Institute services is an innovation fully developed within India. The not for profit nature of the enterprise is a great advantage for public and government acceptance. Government acceptance is also key to public perceptions of legitimacy. The emergency response system is supported by the government for its operational and financial efficiency. The idea behind it was well received by the political leadership for its potential to touch many lives. The result is consistent

government funding that has helped the system sustain and grow.

The Emergency Management and Research Institute services are today the largest emergency care provider network in the world. Twelve years and two million saved lives later, the Emergency Management and Research Institute envisions saving one million lives annually.

In the following chapters, we will take you through the roots of the services and the early stages of designing and developing the initial idea. ■

CHAPTER 2

The Dream Behind the Dream

THE dream to establish a unified emergency response structure was not born in isolation. One of Ramalinga Raju's early philanthropic projects was the Byrraju Foundation which he set up in 2001 in the memory of his father Byrraju Satyanarayana Raju, a renowned farmer turned industrialist of the southern state of Andhra Pradesh and the founder of the Satyam Group of industries. In an interview with the authors, Ramalinga Raju said that his father strongly believed that the underprivileged in the rural areas could become financially self sustaining if they were introduced to and taught the best management practices and technology. It was the desire to see his father's dream come true that led him to set up the foundation and to try and provide these services at the village level.

Key among the many village level services started by the Byrraju Foundation were local water treatment plants, rural business process outsourcing centers, village level health centers, model schools equipped with computers, individual sanitary toilets, vermicomposting waste management plants, and emergency response services. Over more than fifteen years, the foundation's reach is now in nearly one hundred and twenty villages; it is running a primary health center in each village and over twenty drinking water plants in association with CARE Foundation.

The foundation recognized the urgent need for an emergency transportation service in rural areas and its priority was to set up this service. In August 2001, just a month after the foundation was

set up, three ambulances were coopted into covering West Godavari, East Godavari, and Guntur districts of Andhra Pradesh. In July 2003, the pilot project ‘Sahaya’, which is a Sanskrit word for ‘assistance’, was launched in the Undi region of the West Godavari district. It covered nineteen villages at the time. ‘Sahaya’ was the foundation of what went on to become in 2005 the Emergency Management and Research Institute.

Adopting a Village

The foundation followed a scientific process while adopting a village to implement its services. In coordination with the villagers, the foundation identified the needs of a village through a profiling activity. This activity gave information about the basic amenities currently available in the village, access to welfare institutions, resource base and utilization, employment status of the villagers, and existence of village based organizations.

Through this assessment, the foundation listed out the top priority needs of the villages and designed solutions that were tested on the ground before being formally introduced. The solutions were designed in such a way that the villagers would eventually be self-reliant, through training and skill building, and capable of taking over community leadership, franchising to use resources of the community, and the possibility of replication in other areas.

These processes are ultimately owned, managed, and led by the rural communities, enabling them to generate wealth and create value through their own enterprise. By 2006, there was an investment of over USD one million across the adopted villages, contributed by the people for their own development.

In implementing these initiatives, the foundation partnered with several organizations such as the George Institute of International Health, Sydney, CARE Hospital and CARE Foundation, Hyderabad, UNICEF, Azim Premji Foundation, Hindustan Latex Limited, and the Tata Consultancy Services Foundation.

The activities of the foundation were divided into two types of modules: delivery modules and support modules. Delivery modules

include health, education, and adult literacy; water, environment, and sanitation; livelihoods, community development, disaster recovery and readiness, and virtual delivery of services. Support modules include relations and communication, human resources management, knowledge and process management, administration and finance.

Involvement of the Community

The roles of the community ranged from that of beneficiaries, volunteers, service providers, and financial partners. Together they formed what is called a Gram Vikas Samiti or a Village Development Committee. A committee comprised nine members from the village selected through a democratic process. Its role was to own, manage, and lead rural transformation efforts in the villages by channeling the funds provided or raised by the Foundation.

An important initiative was the setting up of multipurpose village health centers in each village. Each center was assigned a qualified doctor providing two hours of consultancy every day. Each doctor was in turn assigned three villages. Additionally, a qualified auxiliary nurse and midwife was present in each center through the day. In total, there were fifty doctors and one hundred and seventy health workers serving in the health centers of these villages. Basic health services and the supply of essential medicines were supplemented with antenatal and neonatal care and treatment of noncommunicable diseases such as hypertension, diabetes, and epilepsy. Detection for hypertension using a digital sphygmomanometer was carried out at a cost of USD 0.15 per month. The centers also have facilities for the detection of cancer and vision correction. To reduce the dependence on specialists for maternal and child emergencies and ailments such as epilepsy, the auxiliary nurse cum midwife was trained to handle these cases. Eye camps and dental camps were also held regularly in villages and spectacles distributed free of cost.

Within the first four years of its existence, these health centers recorded three and a half million patient visits. In cases that could not be handled at the village level, the foundation ensured access to medical facilities through referral support for secondary and ter-

tiary care. Access to specialist consultation for hundred percent of the village population was ensured through telemedicine or remote consultation services. One third of all primary care was to be provided through telemedicine.

The foundation could provide safe drinking water at a cost of less than one cent per liter. This was done by setting up water purification plants at the village level. The plants have multilevel filtration beds with five levels of purification. Villagers made a fifty percent contribution in setting up the plant while the other half came from the foundation. The plants resulted in an assured supply of twelve liters of safe drinking water to each family per day. The foundation also built individual toilets in more than thirty thousand households.

In education, the foundation partnered with IBM to set up twenty KidSmart Learning Centers in primary schools, which had access to computers. Over three thousand children benefited from this initiative. Close to four thousand teachers were trained in the use of multimedia content in developing creative teaching skills. Part of the education effort was an annual health checkup program that screened over one hundred thousand students for their nutritional and physical wellbeing.

Employment Opportunities

Hordes of youth from these villages who would have otherwise migrated to an urban area did not do so because of the employment opportunities that the foundation activities created. An initiative such as GramIT meant access to computers for these rural youths in addition to training in English language and communication skills. The GramIT or village IT centers served as back offices of Indian corporates, government institutions, and other organizations. Selected unemployed educated youth from rural areas were provided free of cost training in written and spoken English, computer skills and general awareness. Each GramIT center was a fifty seater facility employing a hundred young people in two shifts. In 2005, two such centers were operational in Jallikakinada and Ethakota, employing two hundred process executives. Typically, these youths would work in the fields during the day and at the center during the evening.

Key among the many village level services started by the Byrraju Foundation were local water treatment plants, rural business process outsourcing centers, village level health centers, model schools equipped with computers, individual sanitary toilets, vermicomposting waste management plants, and emergency response services. Over more than fifteen years, the foundation's reach is now in nearly one hundred and twenty villages; it is running a primary health center in each village and over twenty drinking water plants in association with CARE Foundation.



“The idea behind setting up three business process outsourcing call centers was to stop migration from rural to urban areas. We wanted to do so by applying information technology capabilities and training manpower locally,” Ramalinga Raju said.

An important objective of the foundation was to use information and communications technology to level the playing field in economic, social, cultural, and political terms for the villages. Sahaya and Project Ashwini were two such initiatives. Project Ashwini involved delivery of quality healthcare, education, agriculture, livelihoods training, and e-governance to the chosen villages. Experts in various fields of knowledge and practice were connected to the village population from the studios in the state capital of Hyderabad or the coastal town of Bhimavaram with help of video conference equipment. Adoption of Six Sigma and implementation of Oracle financials in these initiatives have been the other aspects of the journey towards rural transformation.

Impact of the Foundation and Vision for the Future

Within the first four years of its inception, the Byrraju Foundation enabled more than three million patient visits, enabled the supply of

pure mineral water to all residents in one third of the villages it adopted, and attained near hundred percent literacy in twenty percent of the adopted villages.

During this time, the ambulances served nearly one hundred and thirty emergencies and assisted over twenty childbirths. These ambulances operated through a call center in Hyderabad. The paramedic in the ambulances was able to stay in touch with the call center agent and give updates on the health of the patient to the hospital. On a federative basis, the financial implication of the initiative turned out to be less than USD thirty per village per month.

Ramalinga Raju saw the acute need for a centralized emergency medical service that would cover the length and breadth of the country. The result was the Emergency Management and Research Institute that was formally established in April 2005. And a few months later, on India's Independence Day, August 15, emergency services were started from Hyderabad with seventy five state of the art ambulances in the five cities and thirty other major towns around these cities. ■

CHAPTER 3

The Dream Comes True

THE genesis of EMRI services is rooted in the backdrop of a telecom and information technology revolution in India at the time. Better physical access to remote areas through improved roadways and importantly the openness and the political will of the government toward private sector participation facilitated the growth and implementation of the 108 Emergency Services. Those at the forefront of operations at the 108 Emergency Services underline these factors as instrumental to its success. Through this chapter, we look at the conception and initial development of the idea.

A handful of local government agencies had tried to computerize emergency response processes. These efforts were met with limited success mainly because of the lack of a centralized and structured emergency response system. Having seen highly functional emergency response systems in developed economies, such as the 911 of the United States, Ramalinga Raju was convinced of the need for an equivalent, but adapted to suit the Indian context.

At the turn of the millennium, India had demonstrated its expertise in information and communications technology and was on its way to becoming a major global software industry player. The telecom revolution had just about taken off in the country. Information technology flourished as did the spread of mobile telephony. Almost every citizen had access to a mobile phone. Even if a person did not possess a mobile phone, it was not difficult to find someone nearby who did. By 2005, there were over thirty

million mobile phone users in the country. The number grew exponentially over the next decade.

2005 was an opportune time for EMRI emergency services to take off. Parliamentary elections were concluded, and a new government had come to power at the Center in 2004. National level reforms, such as the National Rural Health Mission and Prime Minister’s Rural Roads Scheme had begun to stabilize. In parallel, the use of mobile phones was growing rapidly. Many within the founding team believe that the large availability of mobile phones was instrumental in the success of EMRI emergency services. Venkat Changavalli, the first chief executive officer of the EMRI cites telecom revolution as being central to the success of EMRI. “Mobile phones meant immediate access to dial 108. But for the mobile phone revolution, EMRI emergency services would not have become such a huge success¹.”

Ramalinga Raju believed in the well managed application of technology to deliver timely and high quality emergency care. He felt that the support of the government coupled with the information technology expertise of India and a potential mobile phone revolution could enable the growth of a command center based emergency response network that was both efficient and replicable.

Satyam Foundation began the initial operations of the emergency services. These services were later integrated into EMRI that was founded as a separate nonprofit organization. Satyam Computers remained the technology partner of the EMRI. Satyam Computers was in 2009 acquired by and later merged with Indian software company Tech Mahindra. In 2009, GVK Foundation of the Indian conglomerate GVK took over the management of EMRI from Satyam Computers, rebranding it as GVK EMRI.

Close on the heels of the launch of EMRI services, the founding team of 108 put into place another breakthrough healthcare innovation. Following the same principle of improving access to healthcare using technology, Satyam Foundation launched the Health Management Research Institute in Andhra Pradesh towards the end of 2006. The initial objective of the Health Management Research Institute

1 Authors’ interview with Venkat Changavalli on July 6, 2016

services was to give appropriate medical advice through a telephonic consultation. The services later evolved to include mobile medical services in remote geographies. The services are currently operational in eleven Indian states and handle an average of fifty thousand to seventy thousand calls a day. The HMRI has been discussed in greater detail in Chapter 6.

In 2005, the core team of EMRI identified the absence of four critical factors as the problem of emergency care in India. These were access to a universal toll free number, availability of life saving ambulances, compassionate care by trained paramedics, and affordability.

Together with developing the model of the EMRI emergency services, the founding team of EMRI collaborated with politicians and government officials to spread the word about the service as a proven global best practice. Ramalinga Raju, like his father, was known for his affinity to political leadership of the state. His position as the founder and chief executive officer of one of the top software consultancy companies of the country at that time facilitated his access to top decision makers within the government. He was also the chairman of National Association of Software and Services Companies.

In his meetings with the then chief minister of Andhra Pradesh YS Rajasekhara Reddy, Ramalinga Raju sought the approval of the state government for running a pilot program in a few towns of Andhra Pradesh. “The need for a centralized ambulance service was very high in India. We constantly spoke to chief minister YS Rajasekhara Reddy about what 911 had achieved in the United States and how the same can easily be implemented in India, since we had the technology. We in fact had a better technology than 911 that ran on an old technology from 1968.”² To make it more attractive, Mr. Raju assured the government that the pilot program would be fully funded by EMRI till the model was proven successful in the field. EMRI was to design the technology, procure the ambulances, and run the operations. The organization sought only

2 Authors' interview with Ramalinga Raju on September 24, 2016

the support and cooperation from the state administration, police force, and fire services department.

In one of their earlier meetings, chief minister Mr. Reddy was shocked to learn that about ten thousand lives were lost annually in Hyderabad alone to untimely emergency care. The political leadership across the board was convinced of the urgency to introduce a centralized emergency response system. The finance minister of Andhra Pradesh K Rosaiah said that when Mr. Raju proposed the idea, the government looked at it as an experiment. “YS Rajasekhara Reddy had heard about this idea and one day he called for a meeting with the officers and myself. He explained at length about the need for strengthening the health department to serve the public in a better way,” he said.³

The institutional climate in Andhra Pradesh for radical restructuring of health services was favorable at the time EMRI was launched. The state government under the leadership of the Chief Minister had recently initiated a program to provide free universal healthcare coverage to most of the population. The program was called the Rajiv Aarogyasri. Aarogyasri is a state sponsored health insurance program that provides free in hospital healthcare for serious medical events for almost all citizens of the state in both public and private hospitals. Before launching Aarogyasri, the government had launched programs such as eHealth, mHealth, and telehealth services to improve the outreach and access of public healthcare services. The idea of universally accessible emergency services for the masses therefore found resounding support within a government that had committed to providing high quality affordable healthcare access to all. High level state government support has been an essential requirement for the launch and success of EMRI and other emergency response systems in India.

In early 2005, Ramalinga Raju put together a team of some professionals from Satyam’s top management and other proven minds from the corporate sector and the field of emergency medicine. The initial board of directors of EMRI included Professor Raj Reddy

3 Authors’ interview with K Rosaiah on September 23, 2016

from Carnegie Mellon University, Professor Krishna Palepu from Harvard Business School and JP Narayan of the Lok Satta Party of India. By 2007, several other distinguished people joined the board. These included the former President of India, the late Dr. APJ Abdul Kalam; former managing director of management consultancy firm McKinsey, Rajat Gupta; former chairman of Indian software company Infosys Limited, KV Kamath; Director in the central board of directors at the Reserve Bank of India, Kiran Karnik, and former chief mentor of the Confederation of Indian Industry, Tarun Das.

The goal was to create a computerized emergency management and response system implemented through a centralized network of ambulances across the country in response to emergencies, free of cost to all citizens. The vision was to save one million lives in emergencies annually across the country under a public private partnership framework. Anil Jampala, the Vice President of Satyam Computers in 2005, was one of the many Satyam employees who were brought in to EMRI. According to him, several iterations and discussions went in to the vision statement of saving a million lives a year. “It was more of an aspirational statement in a way, but it helped us keep our focus on what we needed to do to achieve that.”⁴

When the team set out to design the fundamentals of the system, the field of emergency medicine education in India was under developed. There were no formal training courses in emergency medicine. There were only a few trained experts in the field. The team sought the help of senior officials in the health ministry and other experts from academia both in India and from abroad.

Dr. AP Ranga Rao, senior official in the health ministry was especially helpful. He was trained in emergency medicine in the United Kingdom. Others involved in defining the problem were KG Krishna, Sudhakar Varanasi and YNS Kishore, who were Satyam employees. “The architecture, the core technology, and other software related aspects of EMRI were designed by Satyam employees. The expertise of the Satyam call center was used to run the emergency response center,” AS Murthy, former chief executive officer

4 Authors' interview with Anil Jampala on July 29, 2016

of Satyam, says.⁵

Experts helped the team work out broader and finer details of the model such as defining an emergency, identifying the customer, understanding the Indian context of medical emergencies, skill sets required to handle different types of emergencies, and designing the ambulance. EMRI appointed management consultancy firm McKinsey to study and present emergency response models from across the world. This included ambulance and call center designs and a cost analysis of starting emergency response services in India.

Those involved in early operations give sufficient credit to the government and bureaucracy for their support to the operations. Several state government officials played an active role in facilitating the partnership and ensuring smooth operations. The department of telecommunications within the Ministry of Communications and Information Technology of the Government of India made the number 108 a universal toll free number accessible through both landline and mobile phones.

State governments also allowed for the close integration of individual response systems of police and fire departments into the 108 system. Police and fire personnel were stationed within the EMRI command center. Government officials were receptive to undergoing basic training on handling an emergency.

The team also looked to other countries where sophisticated emergency response structures were already in place. The team made trips to the United States to understand and study the 911 system. They met officials at the National Emergency Number Association, American Association of Physicians of Indian Origin, and American Academy of Emergency Medicine.

Dr. GV Ramana Rao, head of EMRI's Emergency Medicine Learning Center, says that the team wanted to design a system that could take advantage of the latest advances in technology. The 911 system in the United States does not provide end to end services under one roof. Somebody owns the emergency number, somebody else owns the ambulances, somebody else takes care of medical ed-

5 Authors' interview with AS Murthy on July 22, 2016

EMRI fielded a new fleet of ambulances carrying state of the art emergency medical equipment, never seen before on Indian roads. The engineering services and manufacturing department at Satyam helped the team design the ambulance. A list of ten differentiating features, which we will discuss in detail in later chapters, was drawn up. These brought the 108 ambulances on par with some of the most advanced ambulances globally. All ambulances were Indian made, designed, and fabricated by the engineering design department at Satyam.



ucation and other aspects of an emergency. “While designing the system, we wanted to overcome this fragmentation. Our design was developed by studying what India requires and what practices are being followed outside India. This is how our concept of ‘sense, reach, care, and post forty eight hours follow up’ was developed as the paradigm of design in our operations,” Dr. Ramana Rao said.⁶

EMRI also drew heavily upon the expertise in emergency medicine from the Stanford School of Medicine. Stanford professors played a central role in the design of training programs for emergency medical technicians and paramedics. EMRI entered a formal agreement with Stanford for the creation of training and research centers in 2007. The final design of EMRI was developed in house with the help of external experts.

Based on global standards and ground realities in India, the EMRI set a goal of reaching the emergency spot within fifteen minutes in an urban area and twenty to twenty five minutes in rural areas. Based on this target, the team arrived at the required density of one ambulance per twenty five square kilometers. The original design provided one

6 Authors’ interview with Dr. GV Ramana Rao on October 9, 2016

ambulance per forty thousand people. One ambulance was placed for every mandal, an administrative block smaller than a district and bigger than a panchayat (a municipal body governing a cluster of villages), covering a population of close to forty thousand people.

The team also addressed questions about emergencies that are typical to India. For example, which emergencies can be tended to by basic equipment and which require advanced lifesaving equipment? How many paramedics and emergency medical technicians are required for each type of ambulance?

The EMRI team picked a number easy to remember, 108, that had never been used before to report emergencies. EMRI fielded a new fleet of ambulances carrying state of the art emergency medical equipment, never seen before on Indian roads. The engineering services and manufacturing department at Satyam helped the team design the ambulance. A list of ten differentiating features, which we will discuss in detail in later chapters, was drawn up. These brought the 108 ambulances on par with some of the most advanced ambulances globally. All ambulances were Indian made, designed, and fabricated by the engineering design department at Satyam. “It was truly an innovation because we introduced differentiation at all levels. It was not a copycat of any model,” Venkat Changavalli said.

Capacity building was another vital component owing to the unavailability of skilled manpower at the time. Training both the management team running the command center and the ground level staff who ran the ambulances was required. The center provided six weeks of training to the emergency medical technicians and paramedic personnel, four weeks of training to the drivers, and two weeks of training to call associates of the emergency response center before they started handling emergencies.

In April 2005, EMRI signed a state level public private partnership agreement. The state provided administrative support to EMRI to let 108 ambulances transport patients in emergency to a nearby government hospital. At the time the understanding was that the state would not provide any financial contribution to the service but would ensure the smooth integration of medical, fire, and police emergencies to the EMRI system.

With this, the first set of ambulances was introduced on August 15, 2005. A total of thirty ambulances were launched between August 15 to September 20, in Hyderabad, Tirupathi, Vizag, Vijayawada, and Warangal. The organization had about two thirty employees at the time. The launch was attended by both the state governor and chief minister along with substantial media coverage. “Ramalinga Raju wanted to make the launch a big affair. He was a well known personality already with his billion dollar company in Hyderabad and was well connected with politicians. The launch received enough media coverage. It was completely funded by him alone and therefore well appreciated,” Murthy said.⁷

After the first month, the services were expanded to include forty more ambulances to service other small towns with a population of more than a hundred thousand people. By June 30, 2006, EMRI had deployed seventy ambulances across fifteen towns and peripheral rural areas. An amount close to USD eleven million was spent for the pilot run. This included setting up the command center, buying and designing the seventy ambulances, training paramedics, and paying salaries. Ramalinga Raju’s personal contribution was USD half a million. The remaining amount was sourced as a bank loan.

Within forty five days of the launch, the call center had received more than one million calls, two thirds of which were related to accident injuries. EMRI saved three hundred and seventy five lives in those few days. The pilot run lasted close to a year, during which time, the center received an average of two thousand two hundred calls a day. Sustained media coverage raised the credibility of the service and increased the interest of the government. A press that is usually quite critical of the government carried positive stories about the success of EMRI emergency services. Radio channels aired news about the service. This meant those in villages without access to any other media were also educated about the availability of such a number.

“From day one it was a roaring success. People started to realize that it is actually true that you make a phone call and a vehicle would

7 Authors’ interview with AS Murthy on July 22, 2016

come to tend to the emergency,” says Keshav Desiraju.⁸ A former principal secretary of the Ministry of Health and Family Welfare, Government of India, Desiraju was also the health secretary in the state government of Uttarakhand when the services were adopted in the hill state in June 2008. “What worked in favor of EMRI was that it was an extremely professional organization at that time. They stuck to the commitment they made. Vehicles turned up as and when they were scheduled to come,” he added.

Many believe that EMRI emergency services were viewed favorably by all since the pilot run was funded privately as a corporate social responsibility activity and the services were being provided completely free of cost to the user. “The government would not have nominated the organization had it been a profit making organization. In a nonprofit, the focus is on providing the service more efficiently and not on making money. The moment you make it profitable, the focus shifts. A nonprofit model makes it uniform and equitable for all without getting into the economic categorization of people based on their income. EMRI is a good example of a good combination of good practices of a corporate environment and the ethos and image of a nonprofit entity,” Mr. Changavalli says.⁹

Other benefits of the system began to show. Before EMRI emergency services, private hospitals would deny treatment to patients of police emergencies owing to legal complications. These hospitals gradually began accepting emergency cases. This was made possible through the integration of police and fire emergency responses with the 108 network and formal tie ups between EMRI and the hospitals. This is an important breakthrough achieved as a direct result of EMRI emergency services.

The government also played a major role in increasing awareness about the number across communities. Politicians spoke about the 108 emergency services in their public addresses. Local administrators sanctioned awareness drives at the community level. “When YS Rajasekhara Reddy was reelected as the chief minister in 2008,

8 Authors’ interview with Keshav Desiraju on September 11, 2016

9 Authors’ interview with Venkat Changavalli on July 6, 2016

he said that three to four percent of the votes he got was because of the 108 ambulance services. He would often mimic the sound of the ambulance while speaking at political rallies,” Changavalli says. Additionally, operations, research, and training of emergency management staff was brought under one roof. EMRI was managed as a professional business. It was a nonprofit organization with a clear vision, structure, strategy, and performance evaluation systems.

Murthy believes Ramalinga Raju wanted to develop a software that could be replicated in other countries. “While Mr. Raju was keen on keeping the innovation nonprofit in India, he wanted to take the technology abroad. He wanted to develop a system which works well in the complex Indian conditions because he believed that if it worked in India, it could work anywhere.”¹⁰

Within two years of the launch, the EMRI network spread across the state of Andhra Pradesh. In March 2007, the government agreed to fund fifty percent of the operational costs. By March 2008, the government was funding ninety five percent of all capital and operational expenditure. The remaining funds came from EMRI to pay salaries of key managers.

Politicians in other Indian states were quick to recognize the services of EMRI as a solution to emergency care. “Politicians realized that government was receiving an extraordinary boost through EMRI operations and the credibility of the government itself was rising because of this,” Keshav Desiraju says.¹¹ In June 2007, the services were introduced in Gujarat. Gujarat was the second state after Andhra Pradesh to adopt the services. Within four years of the launch of EMRI, seven other states adopted the scheme.

By 2008, the Government of India was paying for ninety five percent of both capital and operational expenditure. This was done by reimbursing the states under the outlays marked in the budget of National Health Mission for each state. From 2009 onwards, state governments started contributing towards operational expenditure and since 2012 the entire operational expenditure has been taken

10 Authors’ interview with AS Murthy on July 22, 2016

11 Authors’ interview with Keshav Desiraju on September 11, 2016

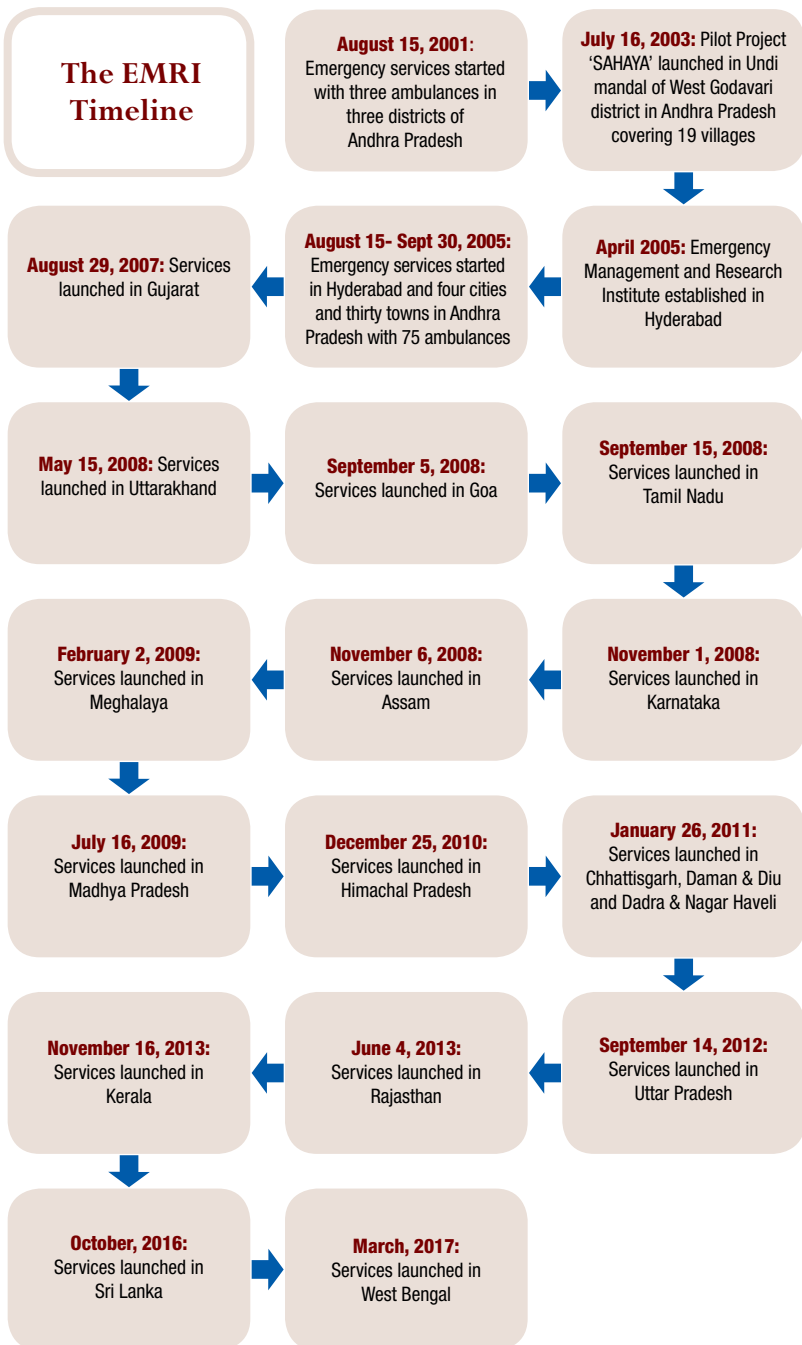
over by the state government and the capital expenditure continues to be borne by the Government of India.

Governments continue to provide complete autonomy to EMRI despite funding hundred percent of the operations. This is a key reason behind the ability of EMRI emergency services to grow. Both partners developed an understanding by which performance was monitored as an output and not as an input. Governments did not want to get into the management of the services and wanted it to stay with EMRI. The operations thus continued to flourish under the public private partnership arrangement.

The 108 Emergency Service evolved in to a country wide system of emergency management. As states started to implement the system, the Government of India endorsed and promoted it as a best practice to be adopted by other states. Other private organizations became a part of the network, running operations in five out of twenty states in which the 108 Emergency Service is currently functional.

Many factors are responsible for the quick expansion of EMRI emergency services to cover seventy percent of the population of the country. Mr. Jampala sums it up as, “A global best practice that was substantially enhanced to work in the Indian context, by bringing management, research and training under one wing and unifying all the three services of police, fire and medical emergencies. Technology, leadership and government support helped propel it to the national level.”¹² ■

12 Authors' interview with Anil Jampala on July 29, 2016



CHAPTER 4

The Process: Moments of Truth

AN emergency response service is defined as “A network of services coordinated to provide aid and medical assistance from primary response to definitive care, involving personnel trained in the rescue, stabilization, transportation, and advanced treatment of traumatic or medical emergencies. Linked by a communication system that operates on both a local and a regional level, emergency management service is a system of care, which is usually initiated by citizen action in the form of a telephone call to an emergency number.” (Mosby’s Medical Dictionary, 8th edition, 2009, Elsevier)

How exactly do EMRI emergency services work? What are the fundamental blocks of the system as it currently operates? How was technology harnessed at all levels to improve and optimize operations? In this chapter, we look at the process of handling an emergency at EMRI, from the moment the first call is received at the call center up till the time the call center takes feedback from the patient post discharge.

A functional emergency response system has several vital components. These include one universal toll free number accessible from landlines as well as mobile phones; well equipped ambulances to enable essential prehospital care; trained paramedics providing the prehospital care; online medical guidance to paramedics through call center physicians; and a network of hospitals that are willing and able to handle emergency cases. All or most of these components were missing in the Indian context before EMRI emergency ser-

vices came into being. EMRI, in partnership with the government, created a distinctive technology and a parallel infrastructure that is readily deployable and expandable.

The end to end service is divided into four major blocks: sense, reach, care, and forty eight hours follow up.

Sense is identifying and responding to an emergency.

Reach is the action taken to reach the emergency and transfer victims to a hospital.

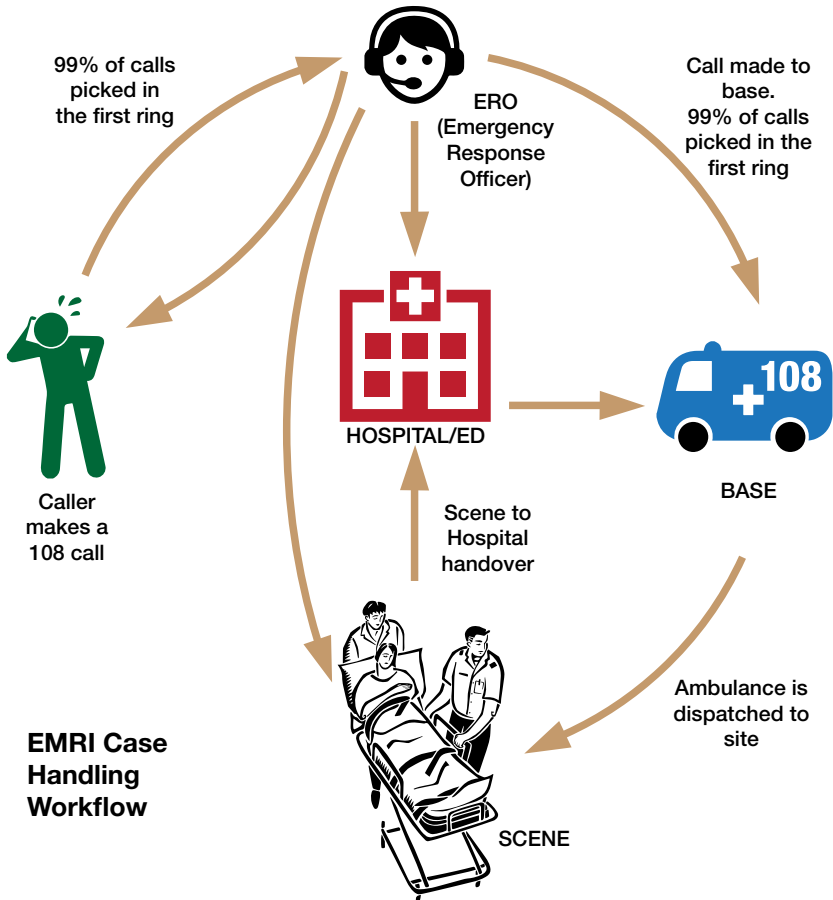
Care is prehospitalization treatment provided en route the hospital, successful handover at the hospital, and patient feedback.

Forty Eight Hours Follow up is a feedback mechanism to learn about the patient’s condition up to forty eight hours from admission time and the scope for improvement.



What follows is a description of the process in the original EMRI call center in Hyderabad, India.

The process begins with the caller dialing 108. The system routes this call to an Emergency response officer. About a hundred Emergency response officers are stationed at the Emergency Response Centre, a call center facility that acts as a command and control center, a sprawling facility on the outskirts of the city. With over one hundred phone lines available, rarely does the caller get a busy tone upon dialing 108. Emergency response officers have a ninety eight percent success rate of answering the call within the first two rings. All incoming and outgoing calls to the Emergency Response Centre are logged. The logs can be retrieved later and are used for conducting quality audit and for training personnel. Quality teams carry out quality audits for a minimum of five calls per Emergency



response officer per month. Those with a score of less than eighty percent are withdrawn from the floor for retraining.

Once a call is received, the computer telephone integration software generates a unique incident identity with the help of caller line identification wherever available. The ability of the software to integrate with telephones is a distinctive characteristic of the 108 systems. Using computer terminals, it is possible to integrate all field communication, fleet, and medical care functions. This was an important functionality introduced into the 108 systems. The software then retrieves related information like the location of the call, medical facilities in the vicinities, and past information on the caller

if he has called in the past from the telephone directory database that pops up on the screen of the Emergency response officer. The Emergency response officer assesses whether the call is a genuine medical, police, or fire emergency, a hoax call, a wrong number or a random call about government schemes. About ten to fifteen percent of all calls received in a day are genuine emergencies that need immediate action. Apart from providing the channels to make the 108 popular, the government continually issues public warnings against making hoax calls.

Upon identifying the emergency, the Emergency response officer asks the caller about the exact location. He then asks about the nature of the emergency. In case of a fire or police emergency, the Emergency response officer alerts the respective departments. Police personnel are stationed at the Emergency Response Center to facilitate the transfer of an emergency and to dispatch of the required services. In case of a fire emergency, the Emergency Response Center acts as a nodal point, enabling the simultaneous dispatch of both fire fighting vehicles and ambulances.

After feeding the address of the emergency into the computer, the Emergency response officer looks at the global positioning system enabled application on his screen. This shows the location of all nearby available ambulances. The precise latitude and longitude of each ambulance is displayed. Ambulances are listed in the increasing order of their distance from the location of the emergency.

The Geographic Information System and the geo positional satellite systems identify the incident location. “The global positioning system technology was nascent at that time in 2005. To locate the nearest ambulance, and dispatch it to the emergency spot, the global positioning system was critical to the success of 108. It has become an integral part of the system now,” AS Murthy says.¹

The Emergency response officer feeds the vehicle number of the closest available ambulance into the system, which reflects the contact numbers of the driver and the emergency medical technician on board the ambulance. The nearest vehicle reflects on top of the list

1 Authors' interview with AS Murthy on July 22, 2016

and in most of the cases, the Emergency response officer assigns that ambulance to the emergency. If for some reason the nearest ambulance is unable to take up the case, the Emergency response officer will assign the second nearest ambulance. If the second ambulance is unavailable too, the third on the list is assigned. In the eventuality that the top three ambulances are unable to take up the emergency, the emergency is tagged as “vehicle busy” and a separate desk tracks the case continuously till an ambulance is assigned. In such cases, the emergency response center physician interacts with the caller and assesses whether the patient is in a medical condition to wait any longer. If not, the physician advises the Emergency response officer to arrange for an alternate mode of transport.

The process has undergone many changes over the years to improve quality and reduce the average handling time. Prior to 2011, a Call Officer would filter calls and then forward legitimate calls to a Dispatch officer, who in turn would assign the ambulances. Analysis showed that this process resulted in a higher average handling time. The Dispatch officer would revalidate the basic details of the caller and the nature of the emergency. Such repetition resulted in an average call handling time of eight minutes. By eliminating the Dispatch officer, the Call Officer became a multi skilled Emergency response officer.

Krishnam Raju, the current Director of EMRI says that the elimination of the Dispatch officer has brought down the call handling time. “The change we brought about was, instead of two screens, we made it a single screen. Because of this change, the average handling time of eight and a half minutes was brought down to slightly over two minutes, saving almost six minutes in the response time.”² If the same person calls again, his history appears on the screen. This helps in optimizing the call handling time and reduces the overall response time.

Once the ambulance is assigned, the Emergency response officer places the caller and the emergency medical technician on a conference call. The conference helps reduce the time taken to reach the

2 Authors' interview with Krishnam Raju on September 23, 2016

location of the emergency, as most of the drivers are locals. As this call is in progress, the vehicle is assigned and given a unique case identification number. The Emergency response officer stays on line as a way of virtual hand holding till the ambulance reaches the accident scene. The caller is given advice on preliminary help that an untrained person can give, and actions or precaution that he can take as a lay person. If required, the Emergency Physician, a qualified doctor stationed at the command center, joins the call. This allows for virtual clinical oversight at a relatively low cost. The physicians are also linked to ambulances via telephone or webcam to provide help.

On arrival, the patient is transferred to the ambulance using the appropriate stretcher required for the injury. A scoop stretcher is used for patients with a spinal injury which prevents further damage to the body while being transferred to the ambulance. On the way to the hospital, the emergency medical technician and the paramedic provide the required prehospital care such as oxygen, wound cleaning, administering of intravenous fluids, or the use of a defibrillator. After admission to the hospital, the ambulance team returns to their base location and calls the emergency response center's closure team to close the case. This team records all details related to the emergency. A final call is made to the patient or his relative to enquire about the health of the patient and to seek feedback on the quality of service provided by the EMRI and the hospital. Patient records are updated and sent back to the Emergency Response Center.

The vehicle allocation system software enables vehicle deployment plans based upon the demand patterns daily. It allows for optimal ambulance deployment, automatic tracking of utilization, and the availability of the fleet at each center, including maintenance visits and backups for unplanned breakdowns. The Automatic Vehicle Location and Tracking, an electronic device, is installed in the ambulance to monitor the movement of the vehicle in real time. The device data is used to acquire the location coordinates and other associated vehicle information. It helps to identify the exact location of the ambulance on a real time basis. It also tracks other ambulances in the vicinity, which helps the dispatch officer in dispatching the nearest available ambulance.

Time logs are maintained throughout the exercise. EMRI introduced a system to record the entire cycle time of each case. After how much time within receiving the call did the ambulance start? Within how much time did the ambulance reach the scene? How much time did the emergency medical technicians spend at the scene? How much time was taken to reach the hospital with the patient? How much time did the emergency medical technician spend in the hospital? All this information is recorded, studied, and acted upon. Because of the subsequent fine tuning, what used to take up to an average of two hours has been brought down to an average of one hour in rural areas and forty five minutes in urban areas.

Emergency management is dynamic in nature. Data analytics is a continuous process, forming the basis of change management. EMRI created a robust digital electronic record for every emergency served. Right from the origin of the emergency call, the system monitors the cycle time for call response, vehicle dispatch logs, response time, adherence to medical protocols, hospital admission records, and patient medical record from the point of first contact till forty eight hours after emergency. EMRI sets goals for every metric and it monitors these parameters for every case in a near real time basis. All case records from field are closed within thirty minutes after the case is handed over to a hospital. This data is analyzed by the command and control center's quality and analytics team that provides real time feedback to the EMRI team members. The EMRI training faculty uses this case information for training and presenting case studies. The performance monitoring system has several automated dashboards that provide real time operational information to EMRI's management and to the Government, creating a transparent relationship based on operational excellence and a culture that prides itself on saving lives.

Ten Moments of Truth

Venkat Changavalli, the first chief executive officer of EMRI, while speaking about processes as a critical success factor, says there are “ten moments of truth” in handling an emergency. These moments

answer questions such as: what do you do in the ambulance upon receiving a call? How do you talk to the person in distress? These ten moments of truth span across the time when the patient calls 108 till he is discharged from the hospital. All these moments must be a positive experience for the caller.

The **first moment** is when the caller dials 108. This moment can be made positive by attending the call in less than two rings. The EMRI call centers have over a hundred lines so that the caller never gets a busy tone.

The **second moment of truth** is the response of the communications officer. He should adopt a warm way of greeting the caller.

The **third moment of truth** is the manner and speed in which the communications officer transfers the call to the dispatcher.

The **fourth moment of truth** when basic instructions are given from the dispatcher to those on the spot, the medical response before the ambulance arrives.

The **fifth moment** is when the emergency medical technician calls the caller from the ambulance while en route to the site of the emergency, assuring the caller that the ambulance is on its way.

The **sixth moment** is ensuring the ambulance reaches the spot within the promised time of fifteen minutes in urban areas and thirty minutes in rural areas.

The **seventh moment** is transferring the patient from the spot in to the ambulance in a comforting and medically safe fashion.

The **eighth moment** of truth is defined by the care and treatment provided in the ambulance to the patient and those accompanying him. This includes prehospital care provided to the patient such as oxygen supply, cleaning the wound, defibrillator, and intravenous fluid.

The **ninth moment of truth** is reflected in how the patient is handed over to the receiving hospital. This involves giving proper records and information about the patient to the hospital.

The **tenth and final moment of truth** is when a call is made to the patient within forty eight hours of admission to the hospital, asking him how he is doing.

“These ten moments of truth need to be handled with the greatest

care to ensure a smooth experience for the patient and his family,” says Venkat Changavalli.³

State of the Art Ambulances

The EMRI ambulances were designed indigenously by the engineering services department of Satyam Computers. Over time, modifications have been made to the design to suit evolving needs of emergency care. At present, there are two types of ambulances within the EMRI system. One is manned by a basic emergency medical technician and the other is manned by an advanced emergency medical technician.

The ambulance is divided into two compartments, the pilot, or driver’s compartment and the emergency medical technician compartment. Handling the patient carefully, that is, moving and lifting the patient is crucial. The ambulances are equipped with four types of equipment to ensure safe handling of the patient.

An auto loader stretcher which is easily and automatically collapsible on the ground. It acts like a stretcher and a bed. Once the patient is on it, it can be lifted again with minimum effort by a single person.

A wheelchair stretcher for patients living in high rise buildings where elevators are not working.

A Spine Motion Restriction Device stretcher for accidents which involve spinal injuries.

A scoop stretcher also for patients with spinal injuries which helps lift the patient without any jarring movements to his body.

Each ambulance is equipped with a manual defibrillator. The advanced ambulance carries an automatic defibrillator and a transport ventilator. An automatic defibrillator transmits data to the call center and monitors vital signs such as heart rate, blood pressure, pulse, and oxygen saturation. The ambulance technicians are trained to maintain the heartbeat of patients with pacemakers.

Unlike ambulances in other parts of the world, these EMRI ambulances have seating space for relatives of the patient. All

3 Authors’ interview with Venkat Changavalli on July 6, 2016

ambulances are air conditioned. Ambulances are adapted to the terrain in which they operate. Many accidents in Assam involve drowning. In Assam, there are challenges in terms of accessibility and lack of enough tertiary care centers and the emergencies there are highly skewed to communicable diseases and near drowning conditions. In this case, EMRI has ensured that fifty percent ambulances in Assam include a multi parameter monitor as well as a defibrillator and a ventilator.

Each ambulance has an extrication kit which is frequently used during accidents when the victim is stuck inside the vehicle.

Third Party Connect

The Emergency Response System is underpinned by a software that integrates with many critical third party systems for managing emergencies. The software automates all the activities of the call center and support activities of emergency handling. These include medical assistance to critical patients, ambulance management, and equipment management. Since its inception, Satyam Computers has been the technology partner of EMRI, a role that was taken over by Tech Mahindra when it took over Satyam Computers in 2009.

108 is a high priority number. All telecommunications operators forward the call to the government owned operator Bharat Sanchar Nigam Limited at a predefined truncation point. Bharat Sanchar takes it to the last mile premises and hands it to EMRI. This involves a hundred percent computer telephony integration. The telephone exchange is constantly polling the agent stations to determine which Emergency response officer has been available for the longest time and routes the call accordingly.

Many structural attributes of the EMRI emergency services have contributed to its success. The regional approach taken by EMRI under the public private partnership framework facilitated rapid replication of the model by other states. This approach involves a single corporate center with common finance and human resources departments and a uniform standardized adoption model of operations replicated across states with local support to achieve Sense, Reach, and Care services.

EMRI PERSONNEL AND PARTNERSHIP FACTSHEET

Total number of call center associates: **2,500**

Total number of emergency medical technicians: **More than 20,000**

Total number of pilots: **More than 20,000**

Total number of physicians stationed at the call center: **Approximately 100**

Number of hospitals signed memorandum of understanding (MoU) with EMRI for stabilizing emergency patients free of cost: **Approximately 10,000**

Break up of percentage share of cases handled by various types of hospitals
State and Government of India hospitals: 92 - 93 percent
Private hospitals: Approximately 5 percent
Trust hospitals, clinics: 2 - 3 percent
Urban rural break up of emergencies attended to
Urban: about twenty five percent
Rural: about seventy five percent

Economic status of callers of emergencies attended to: **more than eighty percent are economically backward**

Average Urban area response time: **15 minutes**

Average rural area response time: **25 minutes**

GVK EMRI replicates the 108 emergency response system for animals. The government of Telangana in partnership with GVK EMRI launched **100 mobile veterinary clinics** for animals across the state. Each unit is manned by a veterinary doctor, para vet, and a driver. Beneficiaries can call a toll free number 1962 for mobile veterinary clinic services or online advice from a veterinary doctor available in the call center.

The local support organizations adapt the operations to suit local needs. This approach ensures lower costs and greater speed of implementation. The uniform model also minimizes bureaucratic hurdles.

At the core of the functioning of EMRI emergency services are standardized processes and protocols. From the officer receiving calls, to the drivers manning the ambulances, every member has a clearly defined process flow with unambiguous guidelines for contingencies. There are close to two hundred and fifty documented processes. This allows for efficient monitoring of the service.

The government provides regulatory support to the operations of

EMRI emergency services. Regulatory support is critical to ensuring consistent operations. This support also protects the private providers of the 108 systems from legal exposure. The government has played an important role in governing the outcomes of the service without hindering the operational autonomy of the service. Through its contributions to the management and design of the service, EMRI and other private providers have helped improve the efficiency of the public money spent on emergency response management.

In the following chapter, we will discuss the integration of police and fire departments within EMRI's Dial 108 system.

Organizational Structure of EMRI

Each ambulance has one trained emergency medical technician and one trained driver. The functioning of fifteen to twenty ambulances is overseen and managed by an Emergency Management Executive. These Emergency Management Executives report to a district level program manager. For bigger states, there are regional managers in charge of program managers. A Chief Operating Officer provides leadership for the state operations.

At the national level, the senior leadership consists of a Director, a Vice President for North Indian states and another Vice President for South Indian states. In addition, there are Integrators who are otherwise called Functional Heads for each of the important activities or operations. For example, there is an integrator for operations, an integrator for fleet, an integrator for finance, an integrator for human resources, an integrator for the supply chain management, an integrator for the Emergency Medicine Learning Center and Research. These functional heads support the Director in addition to the Vice Presidents. These integrators act as a central knowledge pool and states draw their expertise as and where required. ■

CHAPTER 5

*An Integrated Approach with the Police
and Fire Departments*

EMRI services are known for an integrated approach to emergency care, and attending to medical, police, and fire emergencies. What does this integration mean and how is it achieved? Previously we looked at the call handling and ambulance dispatch process from the Emergency Response Center. In this chapter, we discuss how the Emergency Response Center coordinates with the police and fire departments for emergencies that involve them.

As per EMRI estimates, eighty percent of all emergencies are purely medical emergencies, while eighteen percent emergencies require police intervention and the remaining two percent are fire related emergencies. Most emergencies in India that require police intervention are cases of trauma that arise from vehicular accidents.

In India, different emergency response systems are in place for police, ambulance, fire brigade, civil defense, and disaster management. Each department had a special number such as 100 for police emergencies, 101 for fire emergencies, and 108 and 102 for ambulance dispatch. Complicating things further, debilitating legal procedures need to be addressed leading to long and lethal delays before any action relating to the emergency can be taken.

EMRI believes that an efficient emergency response service is one that applies immediate and correct emergency procedures in terms of immediate reporting to police or fire station and the first referral hospital. Integrating the police and fire departments in the system has been one of the most important aspects of the design of the

EMRI system.

This integration has been achieved at two levels in the states where EMRI currently operates. At one level, the coordination has been achieved by positioning police personnel within the Emergency Response Center. In the three states of Andhra Pradesh, Telangana, and Gujarat, however this coordination has meant integrating the Dial 100 center of the police with the Dial 108 center of EMRI. Let us look at both these systems in detail.

In all states where EMRI emergency services are operational, anywhere between three to six police personnel are stationed in the Emergency Response Center. Whenever a call coming in to the Emergency Response Center through the number 108 requires the police to be at the emergency spot or at the hospital, the emergency response officer alerts the police personnel about the case immediately after the ambulance is dispatched. Now, the police personnel, through their communication handsets or other forms of communication, get in touch with the police station that is closest to the emergency spot or the hospital where the victim is being transported, depending on the requirement. Similarly, in the case of emergencies requiring the intervention of the fire brigade, emergency response officers relay the information to the nearest fire station to enable speedy dispatch of fire fighting vehicles.

In the states of Andhra Pradesh, Telangana, and Gujarat, the police department has entered into an active partnership with EMRI by running a centralized Dial 100 center from the same campus as the Dial 108 center. This has meant better coordination between the responding agencies and the resultant improvement in the overall quality of the services, mainly reduction in the response time. As in the case of Dial 108, the citizen gets speedy access to police or fire help from a mobile or a landline phone of any service provider and anywhere in the state.

The Emergency Response Center of Andhra Pradesh receives an average of sixty two thousand calls per day. Of this, an average of three thousand calls are medical emergencies that require the dispatch of an ambulance. To date, the center has served close to seven million emergencies, saved close to two hundred and fifty thousand

Since the application used at Dial 100 is now integrated with the Global Positioning System server which has a digital map of the entire state, the location of the caller as well as the location of the nearest police station and hospital can immediately be pinpointed. The digital map also helps the dispatch officer track the location and movements of nearby police patrolling vehicles. The use of digital maps has made the operation more efficient, making it easier for the police dispatch officer to determine the appropriate police station.



lives and assisted close to seventy thousand births.¹

Both Dial 108 and Dial 100 centers use the same platform, the same database, the same servers, the same backend processes, and the same application to feed in the incident location. The interoperability of hardware and software platforms helps in better coordination between services. The EMRI application can track the nearest ambulance, hospital, and police station to the emergency spot. The entire emergency response process therefore is also like that of Dial 108. All calls to 100, from the entire state, are routed through a government owned telecom network to the Dial 100 center. The call is transferred through computer telephony integration with caller line identification and voice record system facilities. Apart from 108, the number 100 is also integrated with the existing numbers of other emergency response and disaster management agencies for effective coordination, command, and control during disasters and mass casualty incidents.

Dial 100 has got two different types of command center officers—a police communications officer who handles the Dial 100

¹ <http://www.emri.in/> (Accessed on November 2, 2017)

calls, triages effective and ineffective calls, documents basic information, and then transfers effective calls to the police dispatch officer. The police dispatch officer revalidates the call, connects to the nearest police station, and assigns cases. The Dial 100 command center jointly handling Andhra Pradesh and Telangana has a capacity of sixty seats, with thirty police communications officers and ten police dispatch officers working in each of the three shifts. There is a total of ninety police communications officers and thirty police dispatch officers.

Police communications officers are EMRI employees with a general graduate background. Police dispatch officers are generally constables and head constables from the police department of the State Government, chosen mainly for their knowledge about ground level situations and circumstances. The team of police personnel seated at the Dial 100 center is headed by a Deputy Superintendent of Police. Both police communications officers and police dispatch officers attend the first responder training program before they start working at the center. They are also trained for soft skills and communications. They undergo one week of training in the use of the EMRI application.

Whenever there is a need for police intervention in a call that lands on the number 108, the two centers interact through a closed loop communication process. The emergency response officer at Dial 108 collects all the necessary information and then selects “Police” under the categorization of the emergency in the application. Once this is done, all the information related to that emergency appears directly on the screen of a police dispatch officer seated in the Dial 100 center.

The calls that land directly at Dial 100 are received by the police communications officer, whose job is like that of the emergency response officer in Dial 108, minus the dispatch function. EMRI and the police have together developed about twenty five categories of police emergencies and sub emergencies. Based on the nature of the police emergency, the police communication officer transfers calls requiring police dispatch to the police dispatch officer. Similarly, when a call lands at 100 and they realize that it requires an ambu-

lance dispatch, the information is relayed at the 108 centers. The job of the police dispatch officers is to inform the nearest police station and respective police control room.

The queue of cases to be processed are listed in order of priority and all fire and high priority cases are dealt with first. Every police station has a nodal officer for Dial 100 whose contact number is listed at the Dial 100 center. Every police station also has a computer to view the emergency response application with independent user credentials. After the police officer attends to the case, he updates the case details in the application and submits it to the police control room.

Prior to the modernization of the Dial 100 center using the EMRI technology, calls made to 100 would land at nearby district control rooms of the police. The response to these calls was not prompt because of the time taken to determine the police station under whose geographic jurisdiction the emergency spot is located. Since the application used at Dial 100 is now integrated with the Global Positioning System server, which has a digital map of the entire state, the location of the caller as well as the location of the nearest police station and hospital can immediately be pinpointed. The digital map also helps the dispatch officer track the location and movements of nearby police patrolling vehicles. The use of digital maps has made the operation more efficient, making it easier for the police dispatch officer to determine the appropriate police station.

For fire related calls received at either Dial 100 or Dial 108 centers, the police communications officer or the emergency response officer enables the dispatch of fire fighting vehicles by directly alerting the nearest fire station. If the police communications officer or the emergency response officer recognize the need for police and ambulance dispatch along with the fire engine, the call is transferred to the police dispatch officer who immediately informs the police station as per the incident jurisdiction. Simultaneously, an ambulance is dispatched. As all three services are integrated with each other, the emergency response officer can send the information and follow up with all three departments.

One of the many visible outcomes of this integration is that hospi-

tals do not resist treating victims of medical cum legal emergencies such as vehicular accidents and assault. Before EMRI services came into the picture, hospitals by and large refused to admit such patients till the police arrived on the spot. They did so because they feared legal complexities. With the integration of emergency response services, police personnel register a first report either at the site or at the hospital when the emergency medical technician formally gets the patient admitted to the hospital and hands over the patient care report to the doctor.

Apart from the reduced response time, the system creates strong linkages among hospitals, doctors, police, and fire stations. This intricate network ensures that services are offered to the needy through the nearest and most appropriate network partner and provide the citizens access to immediate help. ■

CHAPTER 6

*Health Management and Research
Institute*

CLOSE on the heels of the launch of EMRI services, the founding team of 108 put into place another breakthrough healthcare innovation. Following the principle of improving access to healthcare using technology, Satyam Foundation launched the Health Management Research Institute in Andhra Pradesh towards the end of 2006. The initial objective of the Health Management Research Institute services was to give appropriate medical advice through a telephonic consultation. The services later evolved to include mobile medical services in remote geographies. The services are currently operational in eleven Indian states and handle an average of fifty thousand to seventy thousand calls a day.

The Health Management Research Institute was set up as a non-profit organization. The purpose was to improve health care delivery by supporting public health facilities with the use of modern management practices and information technology. Together with the Rajiv Aarogyasri Health Insurance Scheme and EMRI's 108, the Health Management Research Institute was a part of the larger health plan of the Government of Andhra Pradesh. The intent of the government was to bring basic healthcare services within the reach of the masses. Health Management Research Institute services ran as a public private partnership with the government of Andhra Pradesh till 2009. In 2011, Health Management Research Institute was transferred to the Government of Andhra Pradesh. The services are currently being run by the Piramal Foundation in eight out of

eleven states, with at least two other operators running it in the other three states. These include GVK EMRI and Ziqitza Healthcare Limited.

The core belief of the Health Management Research Institute is to give everyone access to health information. This has translated into three important programs, namely the 104 Health Information Helpline, the Fixed Date Health Services also known as Mobile Health Services, and telemedicine.

The toll free 104 Health Information Helpline is a round the clock health contact center that provides the following services to the callers:

Clinical advice based on triage classifying the condition of the caller into critical, serious, or stable and to provide appropriate advice to each of these three groups.

Directory information regarding providers, diagnostics services, and hospitals.

Counselling services around HIV/AIDS, suicide prevention, and psychological distress.

Complaint registry where citizens can register complaints against any public health facility or provider.

Mobile health services provide primary healthcare free of cost to people living beyond three kilometers of the nearest public health facility by deploying mobile health units carrying a team of doctor, pharmacist, lab technician, nurse on board.

Telemedicine delivers specialty healthcare by connecting remote populations to high quality urban physicians through telemedicine software and videoconferencing.

The main objective of establishing the health information helpline was to assist people, particularly in rural and interior areas, who find it difficult to visit a qualified doctor. Trained paramedics, counselors, and doctors use the base software to triage the medical condition of the callers. They use medically validated algorithms and disease summaries to deliver a high level of standardized care. The health information helpline advises the caller to bridge the initial information gap and provide referral services. This in turn enhances the capacity of the community to self manage minor ailments. It

The Health Management Research Institute was set up as a nonprofit organization. Together with the Rajiv Aarogyasri Health Insurance Scheme and EMRI's 108, the Health Management Research Institute was a part of the larger health plan of the Government of Andhra Pradesh. The core belief of the Health Management Research Institute is to give everyone access to health information. This has translated into three important programs, namely the 104 Health Information Helpline, the Fixed Date Health Services also known as Mobile Health Services, and telemedicine.



also increases their access to timely and appropriate advice for other health conditions.

Piramal Swasthya is the biggest operator of 104 and allied services currently in the country. At present, Piramal Swasthya runs the 104 health information helplines in the states of Assam, Maharashtra, Karnataka, Himachal Pradesh, Chhattisgarh, Jharkhand, and Arunachal Pradesh. These centers together employ close to four hundred paramedical workers, eighty eight counselling officers, and eighty three medical officers.

The 104 services largely offer health and medical advice, grievance redressal, counselling services, information on government schemes, Janani Shishu Suraksha Karyakaram services, helpline for accredited social health activists, adolescent, reproductive and sexual health counseling services, psychiatry services, neonatal mortality rate data capturing, monitoring the payment systems of Accredited Social Health Activities, food safety services, eye donations, blood on call, HIV AIDS helpline, and telemedicine. The services provided by the 104 helplines vary from state to state.

The call taking process is also standardized. A caller dials 104. The call is picked up by a health advisory officer. The health advisory

officer stores the demographic information and chief complaint of the caller to create a unique patient identity in the Health Management Research Institute software. If the patient calls again, the 104 advice staff can access his record using this identity number. After the registration process, the call may be handled in one of five ways. If there is an emergency, the call is transferred to 108 emergency services. If the patient is calling for medical advice for a non emergency, the health advisory officer uses a series of medically validated algorithms and disease summaries to provide treatment related advice to the caller. This ensures that similar conditions receive similar treatment. If the health advisory officer cannot respond appropriately to the call using algorithms and disease summaries, he transfers the call to a medical officer. If the patient is calling for counseling, the health advisory officer will transfer the call to a counseling officer. If the patient is calling for directory information, the health advisory officer will transfer the call to a health information officer. If the patient is calling to lodge a complaint against a public health facility, the health advisory officer will transfer the call to a service improvement officer. When a call is transferred, the patient record is transferred to and updated by the responding officer. The service does not cost the patient more than just a phone call as the 104 helpline does not charge any user fees.

A unique model of the services is the state funded 104 Health Advice Call Center in Maharashtra, located in Pune. This provides specialist advice, directory information, disaster management information, information on government health programs, and referrals to public health facilities to rural health workers. These include, accredited social health workers, auxiliary nurse midwives, aanganwadi (social) workers and primary health center physicians. The service helps public health workers to better diagnose, treat, and refer patients. It also helps the government to respond better to public health challenges. The call center staffs well trained paramedics and specialist doctors. They respond to calls using over seven hundred medically validated algorithms and disease summaries to standardize care.

Piramal Swasthya's mobile health services are operational in Assam,

Karnataka, Rajasthan, Jharkhand, Andhra Pradesh, Arunachal Pradesh, West Bengal, and Telangana. These fixed date health services deploy mobile medical units equipped with information technology tools, medical devices, medicines, and health workers, to villages where a public health system is not accessible. This service focuses on chronic diseases, maternal and child health, and minor ailments. This is done through screening and referrals, patient education, medication, monitoring, and follow up. The system allows for the generation of electronic health records of populations living in remote geographies.

The highest number of mobile medical units are run by Piramal Swasthya in Andhra Pradesh at two hundred and seventy seven, followed by Assam which has over one hundred operational mobile medical units across the state. Rajasthan has only six such units. Services in these three states are run with funding from the respective state governments. In the remaining six states, Piramal Swasthya has partnered with public and private sector companies and runs one mobile medical unit in each of these states. Together, the mobile health services employ close to twelve hundred paramedics and about four hundred medical officers. The services have attended to about nine million patients across the nine states. As of December 2014, there were about 1301 operational Mobile Medical Units in 368 districts across the country, as per the National Health Mission's operational guidelines for mobile medical units, published in June 2015.

The third component of the Health Management Research Institute services is telemedicine. Telemedicine can serve all basic primary and secondary healthcare needs of the population without having to create a physical infrastructure. Piramal Swasthya currently runs telemedicine services in Himachal Pradesh, Jharkhand, Andhra Pradesh, and Telangana. Telemedicine services bring specialist healthcare to remote areas of the country where a healthcare workforce is practically nonexistent. The services link such populations to high quality specialists through information technology, such as video conferencing. These doctors are equipped with the contextual medical data, which enhances the remote diagnosis. Piramal Swasthya has partnered with state governments and philanthropic

organizations to run the telemedicine initiatives. So far, their services have reached over fifteen thousand beneficiaries through forty four telehealth centers across India.

How did the Health Management Research Institute services come into existence? The services were started as a part of the Satyam Foundation in December 2006, a year after the launch of EMRI's 108 ambulance services. Under this six month long pilot program, a ten seater call center was set up in Hyderabad. The call center ran a health information help line where people with either minor ailments could call to receive medical advice or those with more complex health problems could call seeking help for a referral to an appropriate health facility. The number to call was 1056 at the time. During this time, the call center received about two hundred calls per day from Hyderabad alone. The pilot phase was funded by the Satyam Foundation.

The government of Andhra Pradesh, having already acknowledged the effective emergency response system put in place by EMRI, was quick to partner with the Health Management Research Institute. The Dial 104 health information helpline was set up under a public private partnership in Andhra Pradesh in August 2007 as part of the National Rural Health Mission. The state government recognized the Health Management Research Institute as the state level nodal agency for operating the call center. The capacity of the call center was increased to forty from the original ten with the ability to handle six thousand calls a day. By the end of 2008, the call center was expanded to a four hundred seater center. In 2009, the organization employed seven thousand people, had four hundred and seventy five mobile medical units, and served half a million people in Andhra Pradesh. During this time, it prevented three hundred and seventy five cases of suicide.

The government of Andhra Pradesh saw the 104 health information helpline as a response to the dearth of adequate healthcare centers, especially for minor ailments. According to the Rural Health Statistics Bulletin of 2010, Andhra Pradesh faced an eighteen percent shortfall in primary health centers and a sixty five percent shortfall in community health centers. The shortfall was greater in 2007, be-

...in the nearly seven years since its launch, over sixty million people had called HMRI for health related advice. More than a million pregnant women were provided antenatal checkups through its mobile medical units. More than a million plus people were screened for non communicable diseases such as hypertension and diabetes. Every year, the mobile medical units serve over twenty million people.



fore the 104 service was launched. This shortfall increases the load on doctors, and decreases the quality of care both for patients with minor ailments and those with more complex and chronic diseases. The 104 health information helpline has resolved this problem at a fraction of the cost of more traditional solutions, such as establishing additional medical infrastructure and hiring additional doctors and other medical practitioners. At its peak, the 104 health information helpline addressed roughly ten percent of Andhra Pradesh's minor ailment load, according to Dr. Balaji Utlala, the first chief executive officer of the Health Management Research Institute.

In 2009, the Health Management Research Institute introduced the "fixed day health services" as the second component of the 104 services in partnership with the government of Andhra Pradesh. Under this service, a medically equipped van visits an underserved area on a fixed date, once a month, to provide primary healthcare services and to screen the population for any health related problems. It was piloted in four districts of Andhra Pradesh with one hundred vans. Later, the services were expanded to twenty districts with four hundred and seventy five vans. "A pressing problem in India is the distance to the nearest health facility. It is an average of thirty to forty kilometers away. Sometimes these centers are ill equipped and understaffed. That is why the Health Management Research Institute expanded its approach from a health information

helpline to mobile medical services,” said Dr. Balaji Utla.¹

The mobile medical unit approach to take health services to underserved populations has been a key strategy under the National Health Mission, which has made funds available to the state government to run mobile health services in partnership with private sector organizations in the state. With the launch of the National Urban Health Mission, the mobile medical unit services cater to the urban poor too.

The Health Management Research Institute received two major setbacks in 2009. Following the problems with the parent company Satyam, EMRI was taken over by GVK. The Health Management Research Institute did not find any takers for over a year. At that time, its services were operational in five states in addition to Andhra Pradesh. The Memorandum of Understanding was restructured as a registered society in 2010 with the Government of Andhra Pradesh and the Health Management Research Institute as members. Finances of the Health Management Research Institute suffered as sanctions and releases from the government became irregular. This resulted in late payments not only of salaries but also other operational and connected expenditure. The services were interrupted due to frequent strikes by the staff. Piramal Foundation took over the Health Management Research Institute in August 2010. Consequently, the Piramal Foundation transitioned the 104 Advice Health Information Helpline to the government of Andhra Pradesh on September 30, 2011. It took charge of running the services again in April 2016.

Like EMRI, the Health Management Research Institute services ran on a robust technology platform. This enabled the system to store vast amounts of data for further analysis. Caller demographics, regional analysis of disease burden, and similar studies became possible. “We were able to predict the spread of communicable diseases in certain clusters based on the calls we were receiving. We were also able to arrive at growth trends based on geographies. For example, southern states have grown more in terms of the number of calls as compared to northern states,” said Dr. Balaji Utla.²

1 Authors’ interview with Dr. Balaji Utla on October 18, 2016

2 Authors’ interview with Dr. Balaji Utla on October 18, 2016

Vishal Phanse, the chief executive officer of Piramal Swasthya, says that the system gathers large data about disease burden across states and districts. According to him, “This is one source of information that no other agency has access to, not even the government. We have tried to bring about a lot of improvement in our technology and the analytics engine that we have loaded on it. Owing to privacy concerns, much of our analytics are at the aggregated level and it has helped the government predict health trends and relook at their policies in certain cases. Some states have been more aggressive and proactive at this than others. Some states have used this more than others.”³

With information and communications technology at its disposal, the Health Management Research Institute has created a large integrated digital health network in India. As of 2014, nearly seven years since its launch, over sixty million people had called HMRI for health related advice. More than a million pregnant women were provided antenatal checkups through its mobile medical units. More than a million plus people were screened for non communicable diseases such as hypertension and diabetes. Every year, the mobile medical units serve over twenty million people. “Even though these numbers seem big, India is a large country and anything we do here needs to be scalable, replicable, and low cost to achieve impact,” Dr. Balaji Utlal said.³ In that sense, the Health Management Research Institute has some distance left to cover.

The founding team of EMRI and Health Management Research Institute feels the 104 services could have been many times more impactful than the 108 services. “We believe that 104 was an even bigger opportunity. And in fact, those are the thoughts which in a way drive us passionately towards providing what we are calling the twenty first century assembly line as compared to the twentieth century assembly line. A twenty first century assembly line that deals with services in a transformational fashion. That is a thought which is making us do things in CallHealth,” Ramalinga Raju says. CallHealth is a smartphone application based service that functions as

3 Authors' interview with Vishal Phanse on December 24, 2016

an aggregator platform for health service providers. Among other services offered, patients can consult doctors through videoconferencing in the presence of a CallHealth representative in their homes.

“If you look at 104 from the perspective of an evolving industry that from a phone will evolve into mobile health it has very exciting prospects, especially for a country like India, if used well,” according to Vishal Phanse. ■

THE RISE AND FALL OF RAMALINGA RAJU

The personal history of Ramalinga Raju is important because of his key role in founding and developing the EMRI and the HMRI. The stories of the two organizations show the resilience of the systems he built that are not dependent on a single person or organization. What follows is a snapshot of the journey of Ramalinga Raju:

January 7, 2009 was a day that sent shockwaves through the Indian industry. Ramalinga Raju, a representation of India’s thriving information technology sector, confessed to spinning an accounting fraud to the tune of USD one thousand five hundred million. He was the founder and chairman of Satyam Computer Services, India’s fourth largest information technology company with a clientele of 185 Fortune 500 companies across sixty six countries.

“Satyam” in Sanskrit means the truth. The irony was hard to miss.

Within hours of his disclosure, Raju called Venkat Changavalli, then Chief Executive Officer of the Emergency Management and Research Institute. He urged Changavalli to save the EMRI from going down. Even as he readied himself to face the consequences of his admission, Raju’s commitment to the survival of EMRI was unwavering.

Such is the dichotomy that marked the life and character of Ramalinga Raju. Those who know him speak of his humility and social commitment. “Having known Raju well, the revelation came as a shock to say the least,” Venkat Changavalli said. Like him, the nation was struck with disbelief to see this young and

dynamic industry leader fall from favor after climbing his way to the very top.

Born into a family of farmers in the southern state of Andhra Pradesh, Raju graduated from Loyola College in Vijayawada. He later went to the United States to earn his Master's in business administration from Ohio University. In his later years, he attended an executive education program at the Harvard Business School.

After graduation and his return to India in 1977, he stayed away from the family's traditional agriculture business. He set up a spinning and weaving mill named Sri Satyam and soon shifted to real estate by founding Satyam Constructions. Eager to join the information technology chorus that was slowly rising in corporate India, Raju set up Satyam Computer Services in 1987 with his brother Rama Raju. It was made a public company with a stock market listing in 1992. He later went on to list the company in the USA.

Satyam grew steadily during the nineties, acquiring an enviable clientele within India and overseas. At the time of Ramalinga Raju's confession, there were over fifty three thousand Satyam employees and an illustrious board.

Colleagues describe Ramalinga Raju as a tough taskmaster who set challenging goals for his team and yet was soft spoken and generally unassuming at most times. They also talk about his passion for social development. After the untimely death of his father in June 2001, he founded the Byrraju Foundation in his memory. The Foundation was committed to rural transformation. He later founded the Health Management and Research Institute and the Emergency Management and Research Institute. "He was so passionate towards the cause these organizations worked for that he started spending about ten percent of his time on these organizations, personally making sure they are being managed well," a former employee of Satyam said.

Even as Satyam grew steadily, the big boost to the company had come at the turn of the millennium. Satyam gained substantial profits from making software solutions to tackle the famous

Y2K crisis. Post Y2K, however, the pace at which the company was expanding lost momentum. This is when Raju started cooking the books to overstate profits and attract new clients. The trend continued for years, without the knowledge of some of the top leaders within the company and soon it was beyond anyone's control. Any effort to put a check on this practice met with failure. In his letter to the board, Raju described it as "riding a tiger, not knowing how to get off without being eaten".

After the fraud came to light, the government ordered the auction of the company in the interest of investors and employees of Satyam. It was acquired by Tech Mahindra, then renamed as Mahindra Satyam and eventually merged with Tech Mahindra.

A special court sentenced Ramalinga Raju, his brothers Rama Raju and Satyanarayana Raju, and eight others to seven years of imprisonment in April 2015. They have spent thirty months in prison already. In July 2014, the regulatory body, the Stock Exchange Board of India, barred Ramalinga Raju and his associates from accessing market capital for fourteen years. Three years later, in May 2017, the Securities Appellate Tribunal set aside the market regulator's orders. It also directed the regulator to set aside its USD 280 million penalty on the Rajus. The regulator has been directed to pass fresh orders. These directives of the tribunal came around the time when CallHealth, a healthcare service startup founded by Raju's daughter in law, was looking to raise funds.

The story of Ramalinga Raju's life and career was to be marked with the promise of progress and national growth. Little was it known that it would be remembered as the a high profile case of white collar crime in corporate India.

CHAPTER 7

The Role and Support of the Government

THE success of EMRI would not have been possible without the government's interest and involvement in the project. EMRI director Krishnam Raju said that state governments have committed over USD two hundred and twenty five million for EMRI operations in the 2017-2018 fiscal year alone. The input of various governments is not restricted to financing alone. Under clear political direction the government machinery has made multiple shifts in its style of functioning to integrate the operational expertise of a private organization with the service delivery infrastructure of the public sector.

Strong political endorsement of EMRI's emergency services paved the way for its rapid expansion. As discussed earlier in the book, the late YS Rajasekhara Reddy, a doctor by profession, was the first politician to recognize the absolute need for a government backed systematic emergency response service. The partnership signed between EMRI and the government of undivided Andhra Pradesh in 2005 is believed to be the first successful public private partnership within healthcare in the country.

Local politicians have been largely instrumental in generating mass awareness about the ambulance services through their public rallies. Discussions around the need for emergency services have also taken place in the state legislative assemblies. Elected representatives from rural areas were especially happy about the outreach of the EMRI and came out in full support to committing large amounts of public funds for this.

Even so, it was the delicate relationship between the EMRI and the bureaucracy that made the statewide adoption of the services possible. Jwala Narsimha Rao Vanam, who served as an advisor on public private partnerships to EMRI from 2006 to 2009, said that getting bureaucratic support was one of the many challenges in the early days of EMRI. “We had to spend considerable time with the then Commissioner of Health and Family Welfare of Andhra Pradesh Mr. CBS Venkataramana and Chief Secretary of the state Mr. J Harnarayana to get them on board,” Vanam says.¹

At the Central Government level, officials of the Department of Telecom were instrumental in the easy adoption of the number 108 way back in 2005 and subsequently the other emergency numbers started by EMRI. Not only did the department assign the number to EMRI but it also gave it the status of a high priority number. This means that other telecom providers are mandated to aggregate this call from anywhere and hand it over to the government owned cellular service provider Bharat Sanchar Nigam Limited at a predefined truncation point. Under a government order through the Telecom Regulatory Authority of India, all providers bore the expenditure of the 108 calls going out of their network into Bharat Sanchar Nigam Limited, which then hands it over to EMRI. This enables the call to land at the Emergency Response Center of the EMRI in each state and further enables computer telephone integration.²

“Government officials were helpful at many levels. Across government departments, they saw the need for effective emergency management services that the EMRI was proposing. Several bureaucrats played a big role in ensuring that the partnership ran smoothly,” said Mr. Anil Jampala. Large scale community awareness programs were run at the district level, administered by the Central Government and state governments. These programs targeted the grass root levels in all states in the form of large scale Information, Education, and Communication campaigns.

1 Authors' conversation with Jwala Narsimha Rao Vanam on November 25, 2016

2 Information provided by Siddhartha Bhattacharya, former chief operating officer and technology head at EMRI

So how exactly does this public private partnership work? The financial responsibility lies with the government while the operational responsibility lies with EMRI. The Memorandum of Understanding signed between the EMRI and the state governments has evolved over the years. While the roles and responsibilities of both partners have become clearer with time, the nature of this partnership has evolved significantly.

Till 2009, state governments were inviting EMRI on a nomination basis to provide emergency services in the state. Under this form of partnership, the government paid EMRI both capital and operational expenditure required to set up and run the services on an actual cost basis. At present, the nomination basis still operates in six states. Owing to increasing legal opposition and charges of lack of financial transparency against EMRI, the Government of India mandated that all states adopt the tendering route of contracting the service. This essentially means that competing organizations bid for running the emergency services in the state. This process of bidding for the service is under way.

The first financial partnership started in September 2006, within one year of the launch of the pilot program in Andhra Pradesh. The state government decided to fund fifty percent of the total capital and operational expenditure of running three hundred plus ambulances in the state. This was also the time the National Rural Health Mission started gaining visibility at the national level. “Till this time there was no talk about expanding ambulance services at the government level. The commissioner of Health and Family Welfare of Andhra Pradesh Venkatramana brought the services provided by EMRI in Andhra Pradesh to the notice of the central government and showed them that it is working well. It later went on to become a national movement,” says Venkat Changavalli.

Recognizing the rising demand among states for the adoption of EMRI services, the Central Government decided to support it through central government funds. It also encouraged other states to adopt the services. Assurances were given that hundred percent of the expenditure would be refunded to the state through its individual annual plans under the National Rural Health Mission, with

the percentage of reimbursement coming down progressively every year. Bureaucrats believe that it was for this reason that smaller states with limited budgets were also able to adopt the services. “The decision of the state governments was driven by the political call made by the chief ministers. But it was the financial support by the central government under National Rural Health Mission that allowed the services to continue,” says Keshav Desiraju, former principal secretary of the health ministry of the Government of India and also the health secretary in the Uttarakhand government when the services were adopted in the hill state in June 2008.

As per the latest available data on the website of the National Health Mission, the entire capital expenditure of ambulances under the Dial 108 scheme is supported by the Health Mission from the budget outlay earmarked for each state. Capital expenses include purchase of ambulances and medical equipment, and setting up of the call center. The operational cost is supported on a diminishing scale of sixty percent in the first year, forty percent in the second year and twenty percent thereafter. 8061 ambulances are being supported under Dial 108. For Dial 102 transports, both capital and operational cost are fully supported under the Health Mission. 8252 ambulances are operating as 102 patient transports. The Health Mission mandates the implementation of National Ambulance Service guidelines for all ambulances under their ambit of operations.³

In states where EMRI functions on a nomination basis, the state government pays for both the capital and operational expenditure. Most state governments leave the procurement process to EMRI. EMRI procures the ambulances and equips them with medical equipment by placing orders in the name of the government. The government pays an average of USD ten thousand and seven hundred for a basic lifesaving ambulance and USD seventeen thousand for an advanced lifesaving ambulance. For setting up the Emergency Response Center and hiring human resources, the government provides an amount ranging from USD three hundred thousand to five hundred thousand depending on the capacity of the center and the

3 As per National Health Mission website, accessed on November 2, 2017

size and requirement of the state.

The operational expenditure is uniform across states. This includes operation and maintenance costs of the ambulances, including the cost of human resources and medicines. Typically, this amount is to the tune of USD fifteen hundred per month per ambulance. The amount varies depending on terrain. In some states, the government pays for the operational expenditure three months in advance.

The cost sharing ratio between the government and EMRI is ninety five percent to five percent. In the early years of the operation, this five percent accounted for salaries of professionals earning more than USD seven hundred and fifty a month, among other components. The current management of EMRI only pays the salaries of those in the management team. In effect, EMRI provides for the leadership, the technology platform, the processes, research and development activities, training institute, partners, and global collaborations. EMRI's technology partner, Tech Mahindra, provides the technological solution at no cost to EMRI. Krishnam Raju, the current director of EMRI, says that the organization spends roughly USD 1.2 million to 1.4 million for its component every year.

The partnership between EMRI and the government is a first of its kind arrangement, where the salaries of people who are not employed by the government are paid by the government without being part of the salary brackets of the government. The government is not involved in the recruitment of the employees who run the call center or serve as emergency medical technicians or pilots on the ambulance.

“As per our budget for this year, we will receive an amount totaling USD 225 million from all the state governments. But if you divide this amount by fifteen states, the average cost per one state government is USD fifteen million. Each state government is operating with an annual budget of over USD 1.5 billion. Six to eight percent of this annual budget will be the size of the health budget typically,” says Krishnam Raju. This means that the state governments are allocating an average of close to fifteen percent of their annual health budget for emergency services provided by EMRI.

The partnership was not entirely free of doubts and resistance

from the government. Several states questioned the basis on which governments were to pay blanket sums of money to EMRI. For instance, when the services were adopted in the state of Uttarakhand in 2008, the finance secretary insisted on comparable standards to justify the state's share to EMRI. He however abandoned the effort stating that he had no basis on which the offer could be estimated. Despite that, with the larger consensus within departments towards the need for this service, the proposal was presented to the cabinet of ministers and approved.

States such as Rajasthan remained skeptical. The services were started there in September 2008 with one hundred and sixty four ambulances. The agreement was cancelled in June 2010. Another emergency service provider was appointed through the open tender route from July 2010 to May 2013. EMRI won the tender in June 2013 and then July 2016 to continue to serve in the state till now.

Even the government in undivided Andhra Pradesh, the birthplace of EMRI, questioned the services on a few occasions. According to PV Ramesh, former Principal Secretary of Health and Finance departments, "We have had ups and downs with regards to 108. We have had doubts. We have had situations in which we did not believe that there was enough capacity on the other side. We did not think that there was adequate transparency." He added that this was overcome because of the common goal that both partners shared. "I think in cases of public private partnership, it has to be more of a public social partnership. Because you see, if you are driven by a profit motive you cannot deliver a public provision." In that regard, the nonprofit status of EMRI helped the governments retain their trust in the organization.⁴

Governments give EMRI autonomy in handling operations. When launching the services in a state, EMRI follows a systematic plan of adoption. Typically, EMRI initiates the services after four months of signing the memorandum of understanding with the state government. It starts the services in the urban areas and gradually expands them to rural areas to eventually cover the entire state within six

4 Authors' interview with Dr. PV Ramesh on September 24, 2016

After the exposure of the Satyam financial fraud in 2009, the future of EMRI hung in limbo for a few months. Acknowledging the large scale benefit of this service, however, made governments realize that it cannot discontinue the scheme anymore. Doubts were overcome because of the common goal that both partners shared and the nonprofit status of EMRI helped the governments retain their trust in the organization.



months to one year of the launch. “We have been able to show to the governments that working with EMRI has resulted in cost benefits and improvement in quality emergency services. They have given us full autonomy. That always prompts us to show better results,” said Krishnam Raju.

EMRI has the autonomy to position ambulances as per the requirement reflected through its system of data analytics but in states with difficult topographies, the adoption stages are planned in consultation with the government and tweaked to suit the state. For example, a state like Assam is geographically widespread. Distances between health centers are large and the presence of tertiary care centers is limited. An analysis of this situation led to organizing an inter facility transfer service in addition to 108 ambulances. Since the state has the largest river island and many rivers, EMRI has also launched boat services in the state.

The state governments and EMRI have created a monitoring mechanism under which the state governments conduct review meetings at the district level. The service delivery component is evaluated by high powered committees. Top level state bureaucrats, such as the Chief Secretary and Principal Secretary of health, are members of these committees. EMRI designates a Public Private Partnership officer for each state to coordinate these platforms of evaluation. At times, an internal auditor from the government visits

the Emergency Response Center to take stock of EMRI's activities.

One of the main benefits for the government in partnering with EMRI is the sharing of expertise. EMRI helped the government design emergency rooms in government health facilities, such as Community Health Centers and Primary Health Centers. Casualty wards at these facilities were converted into emergency rooms with the help of EMRI. A mixed benefit on the other hand was that as more and more emergency patients started being admitted to government hospitals, cases of absenteeism in medical and paramedical staff at these hospitals started being noticed. The absence or unavailability of doctors at government facilities were recorded by the EMRI's computer systems and strong action was finally taken against absconding doctors.

The partnership between EMRI and governments has seen its share of uncertainties. After the exposure of the Satyam financial fraud in 2009, the future of EMRI hung in limbo for a few months. Several state governments had not received the five percent share of the expenditure from the organization. Acknowledging the large scale benefit of this service, however, made governments realize that it cannot discontinue the scheme anymore. They continued the implementation of the scheme as they existed or were planned. "It survived the bad times because the Government of India threw its weight behind the state governments to help the system survive the storm. I remember speaking to a senior official within the National Rural Health Mission at that time and he told me that the Government of India did not want to back out of the system. The government at no stage went back on the initial approval given to this whole scheme and continued to invest in it. The political payoff was so phenomenal that no government was prepared to let go of it," says Keshav Desiraju.

This was also demonstrated by the fact that opposition ruled states like Gujarat and Uttarakhand adopted the scheme in recognition of the need to let the services sustain operations.

Ever since the days of its inception, EMRI founder Ramalinga Raju believed that if the services were to succeed, they would succeed because of a public private partnership. "It goes without saying that

the success of EMRI is owed to many professionals and even more importantly [to] the commitment levels that various governments have shown. We must give credit to governments in recognizing the importance of this and in most instances for being very supportive. Obviously without their help this would not have happened.” ■

CHAPTER 8

Research Part-1
Operations and Systems Research

THE EMRI is created and run by professionals from the corporate sector and the medical community. These people are experts in the fields of information technology, operations management, and emergency medicine. They see the organization's strong technological base as an opportunity to analyze large scale data towards refining practices and improving outcomes. The result of this is a matrix and process driven organization that attaches high value to evidence based practices. Research at EMRI takes places across three fundamental levels. These are categorized as operations research, systems research, and medical research. EMRI is the only emergency response service provider in the world that conducts research in all three areas. In this chapter we will look at research in the first two areas.

Since the days of its inception, EMRI has worked towards not only addressing emergencies but also towards doing research in components coterminous with its services. "It is a constant endeavor for us at the organization to improve and refine practices using data. Because unless we do that, the level of services tends to stay where they are. For improvement, there is a strong need for data through the documentation of evidence," says Dr. Ramana Rao, the key person to driving the research component at EMRI.¹

The EMRI organization has invested considerable resources in making sense of its operational numbers. Each of EMRI's eleven

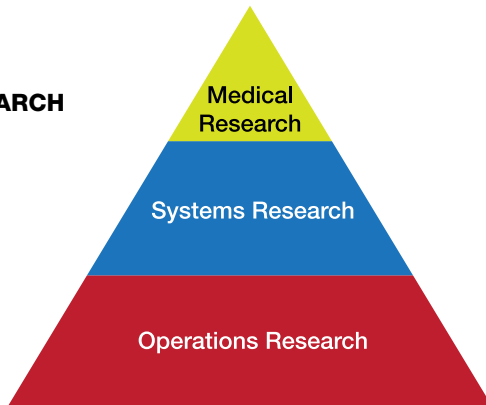
1 Authors' interview with Dr. GV Ramana Rao on October 9, 2016

thousand ambulances makes an average of two thousand trips a year. All its relevant operational details and time logs are recorded at the Emergency Response Center and stored. This means a vast amount of data collected every day at the Emergency Response Center of each state. In serving more than fifty thousand cases daily through its ambulances, EMRI collects patient demography and medical data from fifty thousand people through patient care records. Since all operations are computerized, it is easy to collect, collate, and analyze data. “We knew that if we are able to analyze this data, we can be prepared to handle emergencies better in the future. Research and analysis has therefore remained an important component of the EMRI services,” Venkat Changavalli said.

Broadly, EMRI analyzes and interprets the data to estimate trends in technology, education systems, training, and standards in the speed and quality of care delivered during emergencies. This analysis also helps in policy making, integrating developments into practice, impacting policies, and transferring knowledge to improve or enhance relevant areas of the service.

EMRI has created an organizational research tier according to its research output in the three areas of research. The complexity and resources commitment increase as the organization moves up the pyramid from operations research to medical research. As a process driven organization, operations research or analytics form the biggest chunk of the research component.

**EMRI RESEARCH
FOCUS**



What does operations research mean at EMRI? The organization conducts operations research to largely improve the use of resources by reconfiguring its processes. This results not only in the optimum use of resources but also improvement in the quality of its emergency response. In short, the question it constantly seeks to answer is “How can we optimize to reach a patient faster and cheaper?” Since time is of the essence during an emergency, operations research plays a very critical role in improving overall processes.

Every case generates case closure data. This includes details, such as the location of the caller, the nature of the emergency, the time logs of all the activities under “sense, reach, and care”, the route taken by the ambulance on its way to the hospital, and the condition of the road. With the help of this kind of data, the organization is able to derive useful insights, such as accident prone areas and peak and nonpeak hours for emergencies.

A few years into its operation, EMRI’s executives realized the need to record time logs for every activity of a case. For example, the time between the emergency response officer receiving a call and the actual physical dispatch of the ambulance from its location is called the “Call to Wheel” time. The average Call to Wheel time is between one hundred and twenty seconds to one hundred and eighty seconds at present. EMRI is trying ways to bring this down to under one hundred twenty seconds. Now, the emergency management technician must note the start time of each activity of the emergency, beginning with the time of the ambulance dispatch till the time the ambulance becomes available again. These include the time of arrival of the ambulance at the hospital, the amount of time spent by the emergency medical technicians at the scene, the time of arrival of the ambulance at the hospital, and the time of official hand over of the patient to the hospital authorities. “Earlier, the start to end process would take up to two hours. We have managed to bring that down to half,” said Director Krishnam Raju.

Technology facilitates the collection of big data and its analysis. Huge structured and unstructured data is generated and stored through the system. The storage of this voluminous data for long periods is a costly proposition. Recently, Tech Mahindra started us-

ing cloud systems to minimize the operational cost of storing data.

Another example of operations research is the creation of emergency hotspots. Earlier, EMRI used to keep the ambulances static at the base station of the ambulance. Analysis of time log data showed that the number of calls differ from hour to hour. This helped EMRI identify peak and nonpeak hours. Accordingly, more emergency response officers are available on standby at the Emergency Response Centers during these times.

Data analysis based on information gathered every three months also helps to identify locations from where emergency calls are more frequently received. Since the direction of the flow of heavy traffic at different times of the day is known, the data is taken into consideration to create emergency hotspots. Ambulances are placed close to these hotspots so that they can take the best route to navigate through the traffic and reach the location faster. Called the Dynamic Positioning of the Ambulances, this has helped EMRI cut down the response time by twenty five to forty percent. Not only does this save time during the precious golden hour of an emergency but it also helps reduce travel time, eventually saving both time and money. Before ambulances started being positioned dynamically, they would make a maximum of two trips per day. With the reduced response time, ambulances are now handling up to four cases in a day. Ambulances are now available to attend more cases.

The findings of an EMRI study to assess the impact of operational research stated that the adoption of these kind of operational changes have resulted in reducing thirty percent of the operational expenditure for five years (2011 to 2016). “The amount of money that EMRI was spending on the operations and maintenance cost of an ambulance per month was USD two thousand in 2011. Five years later, we are spending the same amount despite the annual increase in salaries by about eight to ten percent, inflation, and escalation of so many other related costs year to year,” Krishnam Raju says.

Another matrix used to gauge the cost efficiency of the ambulances is the kilometers per liter ratio. Research revealed that ambulances running for more than a certain number of years will provide a higher fuel efficiency if they undertake a hundred percent of all

...the question it constantly seeks to answer is “How can we optimize to reach a patient faster and cheaper?” Since time is of the essence during an emergency, operations research plays a very critical role in improving overall processes..



scheduled servicing sessions and maintain adequate air in the tires. Local benchmarks for fuel efficiency also depends upon the terrain. For example, the kilometers per liter ratio will be lower in the hilly state of Uttarakhand as compared to Andhra Pradesh, which largely comprises flat ground.

Systems research is carried out to arrive at contextual best practices in emergency medical services, improve processes, and enhance education and training. An example of systems research is to see how many emergency medical technicians are positioned in an ambulance as per global standards. Dr. Ramana Rao said that EMRI tries to reach the standards within contextual limitations such as cost. “We have only one emergency medical technician and one pilot in an ambulance while in the developed world, there is a crew or a team of paramedics for one ambulance. We want to prove that one emergency medical technician, along with some training given to the pilot, can have about 1.3 units of competencies for prehospital care in our ambulances. Not only will this create cost effectiveness but also increase coverage in our country. But unless and until we do research about things like this we cannot improve our systems. This is therefore referred to as systems research,” Dr. Rao said.

Systems research also involves analyzing the geographic trends in emergencies. Based on this, the organization can place basic life support ambulances and advanced life support ambulances in the relevant areas. This kind of “hot spot” analysis also shows if there is greater need for more advanced lifesaving ambulances in a district as against basic lifesaving ambulances and vice versa. The hot spot analysis is carried out during peak and nonpeak hours based on the

same quarter's data for the previous year, festive season, and large events to relocate ambulance to reduce response time.

Other examples of systems research to optimize operations:

- Analysis of zero call villages help to increase ambulance utilization.
- Analysis of activity wise cost to reduce wasteful expenses and to make the program most cost effective.
- Monitoring of performance index of each team member to improve productivity and for better preparedness.

Over thirty percent of all emergencies attended to by EMRI are related to pregnancies. A geographic analysis of pregnancy related emergencies can help EMRI position more female emergency medical technicians in areas that see a high frequency of such emergencies.

Rural areas report many cases of attempts to suicide by the consumption of pesticides amongst the farming community. Ambulances in these regions stock up more on antidote drugs. In the state of Himachal Pradesh, the high incidence of snake bites has led to ambulances carrying polyvalent anti venom.

Another example of the insight generated at the research wing at EMRI in 2007 for optimal deployment of assets was as follows:

Research insight: **Seventy five percent of suicides due to poisoning**

EMRI Response:

EMTs trained to respond to poisoning cases

Specific medicines carried in ambulance

'Suction' or stomach wash equipment in ambulances

Research insight: **Forty percent of emergencies EMRI responds to are Road Traffic Accidents**

EMRI Response:

Tie-ups with hospitals near highways

Extrication equipment in ambulance

Splints, IV, and oxygen equipment placed in ambulance for accident victims

Research insight: **Sixty percent accidents between 11 pm and 4 am**

EMRI Response:

Ambulances strategically deployed near highways during 'peak' hours

Call center staff re-deployed during peak hours

Research insight: **Fifteen percent calls related to pregnancies**

EMRI Response:

Ambulance with female EMTs deployed

Fetus monitor placed in rural ambulances

In the early years of operation, in eighty percent of the cases, even for relatively minor problems, patients were taken to the district hospitals. These are big tertiary level hospitals. To change this, EMRI categorized emergencies into broadly twenty six or twenty seven different types of problems and the appropriate health facility for each. When the emergency response officer receives the call, and feeds the nature of emergency into the computer, the screen automatically comes up with a list of appropriate hospitals nearby. All the above practices are examples of changes adopted by carrying out systems research.

EMRI has developed an intense monitoring and customer feedback mechanism. There are two types of operations desks at EMRI. One is the Operations Support Desk that handles mundane issues of operations. The other is the Operations Excellence Desk, which seeks to refine best practices in both real time and handling future emergencies. Since technology is one of the core competencies of the system, monitoring can be done on a real time basis. An example of this is when the screens at the emergency response center flash information about a waiting call and immediate steps are taken to address this. There are mechanisms in place for multi casualty incidents where the resource mobilization must be different. This helps the organization evaluate the efficiency of its closed loop communication and allocation systems.

Several performance matrices are looked at, at the ambulance

level, at the Emergency Management Executive level, and at the district level. The performance of the overall emergency response system is categorized into various performance indicators. The performance is assessed against localized benchmarks and is monitored closely. In the case of a deviation, the organization considers the cause and applies corrective measures. For example, records from the post forty eight hours follow up helps the analysis wing identify instances where the emergency medical technician was unable to perform up to the mark. They bring it to the notice of their department heads who then send the emergency medical technician to a refresher training program.

State government deliverables for EMRI are articulated clearly in most instances. An example of this is the expectation of the government to keep ninety five percent of all the commissioned ambulances on the road and functional at any given time. Interaction with the state and the district level officials take place at regular intervals to get government feedback and to take stock of the performance indicators.

EMRI is an organization with efficient management practices. Technology further enables it to arrive at measurable indicators for better implementation. All major and minor components of operations are documented in the processes at the micro level and macro level. This is one reason why the organization has faced minimum difficulties in scaling up its operations from one state to another. In the next chapter, we will look at the development of paramedic education and medical research. ■

CHAPTER 9

Research Part-2
Medical Education and Clinical Research

AN integral part of EMRI's operations has been the Emergency Medicine Learning Center. Set up in 2007, it is the first institute in the country to formalize education in the field of emergency medicine. A critical factor behind the success of EMRI's emergency services is the number of formally trained emergency medical technicians and paramedics that were trained by the organization. EMRI is today the only emergency responder in the world with a training and research institute attached to it. It is responsible for starting India's first post graduate program in advanced paramedics and conducting crucial clinical research in emergency medicine.

The Emergency Medicine Learning Center is an advanced educational institution with a team of qualified emergency medical professionals and clinical educators. The institute collaborates with global emergency care institutions that include the Stanford School of Medicine, the American Academy of Family Physicians, the American Heart Association, and the American College of Emergency Physicians. It is a certified International Training Center with accreditation to the American Heart Association for courses in Advanced Cardiac Life Support and Basic Life Support. It has received the International Trauma Life Support certification from the American Association of Family Physicians for conducting training programs that are globally recognized in basic and advanced life support. Recently, the Center was given accreditation by the Osmania University of Hyderabad for its post graduate

program in advanced paramedics.

Over seventy two thousand basic emergency medical technicians and over five hundred advanced paramedics have been certified by the Learning Center so far. EMRI currently employs eighteen thousand basic emergency medical technicians and close to one hundred and fifty advanced paramedics. Twenty percent of trained paramedics are working in the Middle Eastern countries and the rest of them are manning trauma and emergency care departments in various hospitals in India. As per EMRI records, as on October 2017, the Emergency Medicine Learning Center has accomplished emergency management training for close to three hundred and fifty thousand healthcare professionals operating across all levels of the healthcare chain.

Paramedicine or emergency medicine is a branch of medical education dealing with medical interventions needed mostly in out of hospital situations. Globally, emergency medicine is a young specialty, about fifty years old. In 2005, paramedicine was underdeveloped as an academic subject in India. Government medical colleges did not offer courses in emergency medicine within the structured curriculum. The absence of training standards for paramedics led to unskilled individuals attempting life support tasks. The leadership at EMRI was quick to recognize the scope and need to develop this field to achieve both efficiency and scale.

Dr. GV Ramana Rao, head of the Emergency Medicine Learning Center, says that the organization felt the urgent need to develop a paramedic cadre as the only way to improve health care and medical emergency services. “Since health is a state subject in India, policies differ from one state to another. To ensure that we have a smooth and standardized scale up of operations across states, we knew that we had to create these human resource capacities within the organization. As a natural extension, we created a cadre of emergency medical technicians that was nonexistent earlier,” he said.

At present, the biggest Emergency Medicine Learning Center is located at the EMRI campus in Hyderabad and is the only place where you can avail a two year post graduate program. The other states that have an EMRI Emergency Medicine Learning Center are Karnataka, Tamil Nadu, Gujarat, Assam, Meghalaya, Chhattisgarh,

Himachal Pradesh, Goa, and Uttarakhand. Most of these, except Chhattisgarh and Himachal Pradesh, administer the foundation training course for basic emergency medical technicians. All the centers are capable of conducting the refresher program for emergency medical technicians and pilots.

The early focus of the research at EMRI was limited to understanding numbers and matrices to arrive at patterns or trends in emergencies. As discussed in the earlier chapter, this research deals largely with systems and operations. With the development of the training institute and the involvement of global medical and academic institutions, such as Stanford School of Medicine, rigorous clinical research in emergency medicine has become a standard practice at EMRI. The system collects patient data on each of its ten thousand ambulances. Up to the forty eight hours follow up call, the system collects data on the condition of patients. This is a rich source of information to dynamically introduce and implement newer and appropriate emergency care practices. EMRI also conducts research in medical technology and the latest medical equipment inside the ambulances.

The founding leadership of EMRI believed in going beyond operating an ambulance service. They saw the need for a training institute and a research wing that can analyze, and study data collected during operations. Ramalinga Raju told the authors that the team had a grand vision for creating training and research capacity within the organization. “The idea was that we should create a world class institution that dealt with emergency related health practices. And the early relationship with Stanford School was in that direction. But more importantly, we gave enormous importance to research. That is the reason why we call this institution Emergency Management and Research Institute. Research was to be one of the most important focus areas.”

Before the launch of the pilot project, EMRI needed four months to appoint people who could be trained to become emergency medical technicians and pilots to man the ambulances. EMRI representatives had to do a lot of head hunting in the local colleges in urban, semi urban, and rural areas. They tried to work with existing para-

medical staff in hospitals and train them to be ambulance personnel but soon realized that these persons did not possess the desired expertise to handle emergencies in an ambulance set up. “These doctors and nurses were used to a hierarchical institutional set up, such as that in hospitals. We realized that we require people who can work independently and who can leverage technology, are good at multitasking, and have got a heart to help people in distress. These are some of the attributes that we looked for when hiring potential emergency medical technicians,” Dr. Ramana Rao says.

Prior to the formal collaboration with Stanford in 2007, EMRI consulted experts such as Dr. Prasad Rajan, Dr. Shriram, and Dr. AP Ranga Rao, then senior official in the health ministry of Andhra Pradesh who had undergone training in emergency medicine in United Kingdom. EMRI also consulted anesthesia experts to provide basic training to emergency medical technicians.

In 2006, EMRI designed its first basic emergency medical technician program. It is a six week long training curriculum having hospital, institutional, and ambulance facets. During this time, the organization received support from Dr. SV Mahadevan, Professor of Emergency Medicine at Stanford University Medical Center. Over the years, he has been central to the collaborative activities between EMRI and Stanford. Back then, he was working with EMRI in an individual capacity. EMRI also requested doctors from government hospitals who were appointed under an external committee of examiners to assess the capacity of the basic emergency medical technicians who underwent the training.

Those typically chosen to undergo training as emergency medical technicians were science graduates from urban, semi urban, and rural areas. “These were young men and women who at one stage in their lives wanted to become doctors but could not. While hiring them, we not only screened them for their educational qualifications but also assessed them for their attitude towards helping people in distress. We conducted detailed interviews to assess these aspects of their personality and other things, such as their fitness and psychological make up,” according to Dr. Ramana Rao.²⁹

The course included training in basic life support activities, such

“...we gave enormous importance to research. That is the reason why we call this institution Emergency Management and Research Institute. Research was to be one of the most important focus areas.” —*Ramalinga Raju*



as breathing, monitoring of vitals, and oxygen delivery. Medical technicians gained practical experience in emergency activities with the help of mannequins in a simulated environment. They were also sent to hospitals for hands on clinical experience in the Emergency Rooms. The center also trained them in soft skills, such as communicating with the patient, handling crowds, and managing situations under pressure. At the end of the course, an objectively structured clinical evaluation program assessed the skills of a trained emergency medical technician for his life support skills. It is an internationally recognized method of evaluation. Evaluation practices of globally recognized certificates, such as that of the American Heart Association, American College of Emergency Physicians, and American Academy of Family Physicians, were also taken into consideration.

Data collected from the first year of operations revealed that twenty eight percent of all emergencies require advanced life support care in the ambulance. “While we had indigenously developed good insights in to how to develop a basic emergency medical technician course, we soon realized that advanced emergency medical technicians are needed in over one fourth of all cases. Since we did not have that bandwidth, we believed we should collaborate with individuals and institutions who can bring that medical expertise to us,” says Dr. Ramana Rao.

In 2007, the EMRI formally tied up with the Stanford School of Medicine for the development of paramedic education leading to India’s first advanced post graduate paramedic program called the Post Graduate Program in Emergency Care. The course, which was recently affiliated to Hyderabad’s Osmania University, is now called

the Advanced Post Graduate Diploma in Emergency Care. It is the first full fledged two year academic course in advanced paramedicine in the country. It is currently in its eighth batch.

Being a global leader in emergency medicine, Stanford provided a methodical and scientific approach to designing the curriculum. This was supplemented by the input of EMRI on what is required in the Indian context. An example of this was snake bites, the high number of pregnancy related emergencies, and poisoning through the consumption of pesticides. Such emergencies are uncommon in the American context. EMRI and Stanford conducted a week long workshop in which they examined EMRI's own data from a year of operations. There was no earlier government data in this respect. After over a hundred hours of work, they jointly designed the curriculum for advanced paramedics.

The program teaches skill development with the help of emergency management modules, language modules, leadership modules, and other soft skills modules. The first batch in 2007 followed the “train the trainer” and “train the student” approaches. This means that the first group of students took classes together with potential course instructors called Advanced Clinical Educators. Dr. SV Mahadevan of Stanford School said that this was done to ensure that the instructors knew exactly what the Stanford team wanted them to teach. “We modeled our teaching style and behaviors for them as well. We introduced many elements of teaching such as high fidelity simulation using mannequins connected to computers that could generate different cardiac rhythms and simulate an arrest. We used novel ways of teaching, adapted to the needs of both the students and the trainers.”¹

The course standards and curriculum get the trainee up to the level of an advanced emergency medical technician or a paramedic. Students are trained to handle emergencies on the ambulance and in the emergency wards of both public and private hospitals. Students graduating from this course are employed across different roles including advanced emergency medical technicians in Advanced Life

1 Authors' interview with Dr. SV Mahadevan on September 28, 2016

Support Ambulances, emergency room technicians in hospitals, and instructors or clinical research associates for paramedic training in other Emergency Management Services institutes.

What is an advanced emergency medical technician, or an advanced paramedic trained to do? He can perform an endotracheal intubation which is an advanced method of stabilizing the breathing. He can conduct an electrocardiogram tracing and other advanced cardiac life support interventions, which can't be done by the basic emergency technician. He can also handle some complex neonatal problems, emergency obstetrics situations, critical somatic brain injuries, and blunt injuries of the thorax and the abdomen.

The Emergency Medicine Learning Center also carries out a foundation training program for pilots called the Ambulance Drivers Training program. This is a five day course in basic emergency medicine for pilots. Apart from this, the center also mandates a three day long refresher course for all basic and advanced emergency medical technicians and a one day refresher course for pilots once every six months. Designed with the help of Stanford School of Medicine, the refresher course is an intensive program focused on re-establishing key critical skills of providing emergency care. The refresher course is also mandated for all the senior staff, such as emergency management executives, program managers, and regional managers.

As mentioned earlier, a basic emergency medical technician mans a basic lifesaving ambulance and an advanced emergency medical technician mans an advanced lifesaving ambulance. Since the EMRI currently employs only about one hundred and fifty advanced paramedics as against its fleet of nine hundred and ninety advanced lifesaving ambulances, the Emergency Medicine Learning Center conducts a two week "functional advanced lifesaving" program to train senior basic emergency medical technicians who have served for more than two years. The course equips them to perform five major advanced lifesaving functions.

The Emergency Medicine Learning Center offers other training programs for people across the spectrum, from medical and paramedical personnel to government officials and lay citizens. It currently offers seventeen different courses designed to suit the

specific roles that the participants play in the larger emergency response continuum.

To fulfill its vision of creating universal basic life support capacities among citizens, the Emergency Medicine Learning Center offers the first responder course. This course was designed with the idea of training citizens from the community to perform basic but vital activities during an emergency, such as resuscitation for a cardiac emergency. The first responder course has been conducted for over forty five thousand police and fire personnel.²⁹ The Center also offers courses in specific areas of emergency care, such as handling cardiovascular emergencies, through the Advanced Cardiac Life Support training program, or assisting pregnancy related emergencies, through the Advanced Life Support Obstetrics.

India faces an acute shortage of advanced paramedics, particularly in government hospitals. In May 2010, the Emergency Medicine Learning Center developed the District Hospital Physician Training program. This is a four day program on emergency medicine intended for doctors serving in government health facilities who may not have received formal training in emergency medicine. The training includes managing trauma, snake bites, acute heart attacks, and strokes. “This was by no means a replacement for formal education in emergency medicine, but it was a way to introduce emergency concepts and improve care in what we call the chain of survival,” Dr. Mahadevan said. The course is so comprehensive that some poorer states like Chhattisgarh have even enrolled some of their doctors, nurses, and medical officials for the two year post graduate program.

The contribution of the Stanford School of Medicine has been multi dimensional. Apart from designing and conducting the advanced paramedic program, an obstetric program, a trauma program, a pediatric program, and refresher programs, it has developed fourteen clinical modules for training, one for each category of emergency. For example, there is one module for cardiovascular emergencies and one for respiratory emergencies. The Stanford staff would conduct knowledge and skill components in small groups of emergency medical technicians. Based on these modules, the emergency medical technicians would be sent to hospitals for hands on

Both Stanford and EMRI believed analyzing such data would support the introduction and large scale adoption of emergency medical services in India and even outside it. India is a new case study in clinical research in emergency medicine for countries with similar populations and shortage of resources.

practice to assess the module. This was a unique practice started in the country.

Stanford also developed a set of acute care emergency protocols. “We turned our attention to the output of our research which suggested that the care varied from provider to provider and from ambulance to ambulance within the state or across states. The reason for this was that there was no set protocol for handling a specific kind of emergency in India. There was a need for protocols to ensure that the care was standardized from ambulance to ambulance, from provider to provider, from state to state,” Dr. Mahadevan said.

EMRI and Stanford finally came up with fifty five unique emergency protocols. A manual with all the protocols, published jointly by EMRI and Stanford, speaks of standardized care for patients. For example, in case of chest pain, the manual clearly outlines the procedures and sequence to be followed by the emergency medical technician. EMRI has printed over ten thousand manuals and equipped each of their ambulances with the protocols. Every basic and advanced emergency medical technician who is trained at the Emergency Medicine Learning Center is given the manual and it is kept at the call centers so that everybody is on the same page. The emergency response center physicians use this manual extensively during an emergency while guiding the ambulance personnel over the phone. “I believe this is one of the most advanced pre-hospital paramedic protocols in the world because it incorporates all the best evidence at that time,” Dr. Mahadevan says.

The Stanford School of Medicine has also played a key role in the development of EMRI's medical research protocols. It has helped EMRI develop capacities to carry out online medical research. This has involved collecting real time data to analyze the emergencies, the kind of care that was administered, and the outcomes of specific medical interventions. This type of information had neither been collected nor analyzed in India prior to this. Both Stanford and EMRI believed analyzing such data would support the introduction and large scale adoption of emergency medical services in India and even outside it. India is a new case study in clinical research in emergency medicine for countries with similar populations and shortage of resources. Any research in this field will not only be beneficial for India but could also be beneficial for other low and middle income countries that are trying to develop their own emergency medical services.

The Ministry of Health and Family Welfare, Government of India is very keen on standardizing emergency medical technician and paramedic education. EMRI is being consulted by the ministry in this matter. The experience of EMRI was also considered while formulating the National Ambulance Code and other medical guidelines during disasters and emergencies.

Even as the Emergency Medicine Learning Center has started the delivery of paramedic education in the country, there is a considerable distance that is left to be covered. A district level hospital in India today should ideally have ten advanced paramedics. There are over six hundred districts in India. The country therefore requires one hundred and eighty thousand paramedics today to man the emergency departments in hospitals. The demand is abysmally high as compared to the supply. This spells out the urgent need to increase the availability of and access to paramedic education. ■

CHAPTER 10

Expansion and Future Challenges

EMRI continues its efforts to evolve, not just in the outreach and quality of its services but also in the diversity of its offering. As its fleet of 108 ambulances continues to expand, the organization has ventured into other services using its existing set of expertise. Currently operating in fifteen states, EMRI will expand services in West Bengal and Sikkim by the end of November 2017.

EMRI is also expanding its services outside India. When Sri Lanka showed an interest in the services, the Government of India sanctioned a grant in aid of USD 7.56 million for initiating the service on pilot basis in two provinces of Sri Lanka, Southern and Western. The funding will cover the cost of establishing an emergency command and control center, eighty eight fully equipped basic life support ambulances, and the operational cost. The Ministry of Health, Government of Sri Lanka signed a memorandum of understanding with GVK EMRI and the services were formally launched on July 28, 2016. The emergency command center at Rajagiriya, Colombo receives about three hundred calls every day. EMRI provided fifty two days training for two hundred and forty Lankan emergency medical technicians in Hyderabad. An equal number of pilots were trained in Colombo.

EMRI has further diversified into various allied areas of service. For example, it has launched neonatal ambulances that cater specifically to the needs of a sick newborn. It also started an ambulatory service for mothers and children under the Janani Shishu

Suraksha Karyakram, a government of India initiative under the National Health Mission. This service is run across ten states with over three thousand five hundred ambulances. These ambulances are specifically meant to transport mothers and infants from the hospital back to their homes in a medically safe and sterile condition. EMRI has also started mobile medical units to bring primary health access in remote geographies, boat ambulances and palanquin ambulances for difficult terrains, a Dial 104 health information helpline, a Dial 181 helpline to report incidents of crime against women, animal husbandry ambulances for sick animals, and inter facility transfer ambulances that shift patients from one hospital to another in case of emergencies.

The organization also wants to establish its presence in other areas of healthcare delivery. A top of the agenda plan of EMRI is venturing into the privatization of primary health centers and community health centers. “In hospitals, especially government hospitals, proper care facilities are not present. We are propagating to the governments that we want to privatize the primary health centers, community health centers, and district hospitals so that proper care is delivered. If you want to increase the institutional deliveries, primary health centers and community health centers must be functional,” said Mr. Krishnam Raju. EMRI is currently in talks with the government of Uttar Pradesh to privatize new government Mother and Child hospitals built specifically for mother and child health services. “The Government of Uttar Pradesh is going to float tenders for this project shortly. Maybe we can take part in this and go for five hospitals at most to start with and then aim to run more hospitals at a later stage,” Krishnam Raju says.

While EMRI has grown, other service operators have also entered the space. Some of the other private sector operators of Dial 108 ambulance services include Ziqitza Healthcare Private Limited that runs 108 in Bihar, Odisha, Punjab, and Madhya Pradesh, and Bharat Vikas Group that runs 108 in Maharashtra and Delhi. These are social enterprises that run on a profit making, cross subsidy model. Several other integrated platform service providers have also entered the medical care space. Providers like Murgency

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and CallHealth use information technology to aggregate and offer a range of medical services.

Even as EMRI continues to grow, it faces many challenges. Sustainability in terms of cost efficiency and investment in research and development is one of the biggest challenges faced by the organization. With an ageing fleet of ambulances and a constantly decreasing share of central government funding, EMRI needs to work towards improving and retaining cost efficiencies. The capital expenditure burden has grown over time. With the share of the central government funding coming down, states must pay for both capital expenditure and operational expenditure. States have several other priorities within health and it is not always easy to get the required funding from the state, especially under the tendering route.

Research requires high budgetary provisions. Corporate social responsibility funding by GVK alone will be difficult to sustain in the long run. In the face of growing competition, EMRI needs to continue evolving its services and for that it needs to invest in more research and development.

The growing legal complexity around states appointing EMRI to run emergency services on a nomination basis has forced state governments to eventually opt for the tender route. With time, all states will adopt this route. In such a scenario, as EMRI would compete with profit making organizations, it must evolve to retain its efficiency and expertise in this field.

Another challenge is that of human resources. EMRI needs

to set a career path for people within the organization. Currently the progression stages for employees are limited and the supervisory structure is lean. Retaining skilled human resources personnel is a challenge. An increasing area of concern is around reports of decreasing quality of services by EMRI's paramedical staff. EMRI needs to hone its capacity building, specifically its refresher training programs. ■

CHAPTER 11

Impact and Evolution

THIS chapter showcases three external evaluation studies of the EMRI services. Included are a few individual examples of emergency cases handled by EMRI staff.

An Evaluation Study on Emergency Response Services by EMRI 108 in Karnataka¹

SEPTEMBER 2013

The study was carried out by the Institute of Health Management Research for the Department of Health and Family Welfare, Government of Karnataka. This study brings out the various perspectives of EMRI model in terms of operations, finance, utilization patterns, community needs, challenges, and issues in managing the emergency response system in the state of Karnataka. The study was conducted in ten districts in Karnataka. It involved the assessment of awareness and intervention in the community, evaluation of performance of service providers and identification of gaps, inadequacies, and inaccessibility.

The purpose of this evaluation is to enable the Department of Health and Family Welfare, Government of Karnataka to understand the functioning of the program in the field, its successes and failures, gaps, ways to address them, to suggest replication and improvement

¹ [http://kea.karnataka.gov.in/sites/default/files/IHMRB_Draft%20_Report_EMRI_03.09.2013%20\(1\)_1.pdf](http://kea.karnataka.gov.in/sites/default/files/IHMRB_Draft%20_Report_EMRI_03.09.2013%20(1)_1.pdf)

of the program, and help build systematic linkages to maximize health outcomes from this scheme.

SCOPE OF THE STUDY:

The study aimed at evaluating the following components of EMRI's 108 services:

Access to medical, police, and fire emergencies

Proportion of services in each area, such as pregnancy related, neonates, infants, children

Impact on health indicators, such as maternal mortality rate, infant mortality rate, and rate of institutional deliveries

Operational coverage of the EMRI services

Processes and implementation

Maintenance of records

Both quantitative and qualitative assessment was carried out. Quantitative assessment included service record analysis, desk surveys, and household surveys in the areas of primary health centers; and available data and management information systems data at district hospitals, block hospitals, primary health centers, and EMRI offices for the financial years 2010-11, 2011-12, and 2012-13.

Qualitative assessment was based on interviews with community people, stakeholders, and service providers in the ten districts. This was arrived at by Probability Proportional to Size sampling. All concerned staff at EMRI, district hospitals, block hospitals, and primary health centers were interviewed.

FINDINGS:

The broad observation of the study was that there has been a constant increase in the utilization of the EMRI service in the state from the date of initiation. There is one ambulance for a population of one hundred and twenty five thousand people in the state. A total of five hundred and seventeen ambulances were operational in the state at the time of the study, after five years of existence. On an average, the ambulances made seventeen hundred trips each day and about two hundred and twenty five referrals.

There is greater utilization of the 108 services for pregnancy and

road traffic accidents or trauma care related emergencies. After the introduction of the 108 services, there is a greater increase in the number of institutional deliveries. Ninety nine percent of services utilized out of all the emergency services availed through EMRI 108 were mainly medical emergencies within which fifty one percent of the cases were pregnancy related.

Responses from the community revealed that ninety five percent of the respondents were aware of the 108 ambulance services. Over eighty percent of the respondents were fully satisfied with the various aspects of the 108 services. Close to sixty percent of those who used the service were satisfied with the behavior and skills of the ambulance staff.

The average time to reach the emergency spot for 108 ambulances was found to be within thirty minutes in most areas. Over eighty percent of the respondents said so. However, a few cases of delay were reported. Respondents said that the reasons why fifteen percent of the people were not availing the services could either be the lack of awareness or the delay in reaching the spot. This data, when verified with the records maintained by the EMRI office from the financial year 2010-13, showed that the average response time was around twenty nine minutes in rural areas and seventeen minutes in urban areas. The average time reported was around twenty seven minutes.

Even though the services are free of cost, some cases of the beneficiaries being charged were reported. Twelve percent of the beneficiaries interviewed said they were charged for the ambulance services.

The state still does not meet the standard norm of having one ambulance for a population of one hundred thousand. Many respondents and officers in charge felt that the delay was due to insufficient ambulances provided to their district. However, the study observed delays in ambulances even in districts where the number of ambulances met the standard. The reasons were attributed to distances, vehicle breakdowns, route problems, uneven terrain, bad road conditions, traffic congestion, and delay in dispatch owing to unavailability of ambulances at that time. Among the study districts, the percentage of busy vehicles increased drastically from the financial years 2010 to 2013. It was only 3.9 percent in 2010-11. In 2011-12 the number was almost stable at 3.7 percent, but it increased drastically in 2012-13 to 11.1 percent.

There were around 2.5 emergency medical technicians and pilots on an average per ambulance between financial years 2010 to 2013. Some lag in the training was reported by the facility in charge and revealed during the interviews with the staff.

Assessment of Emergency Response Service Performance in Madhya Pradesh under DFID Contract for Technical and Management Support to implement the Madhya Pradesh Health Sector Reform Program by Family Health International 360²

The Government of Madhya Pradesh entered in to a memorandum of understanding with EMRI to provide integrated emergency response services across the state in a phased manner. The services were launched in July 2009 and covered ten districts with one hundred and two Basic Life Support ambulances till December 2012. The service was further extended to the other forty districts in 2013 with three hundred and fifty two BLS ambulances. The evaluation is limited to data as of December 2012 when one hundred and two ambulances were operational.

The Government of Madhya Pradesh sought an external evaluation of the status of emergency management services being provided by EMRI to identify strengths and areas of improvement of the services. The Madhya Pradesh Technical Assistance Support Team was assigned to carry out the evaluation. It contracted the international auditing firm Deloitte for the evaluation.

Field visits were carried out in three representative sample districts of Madhya Pradesh, covering urban and rural areas. Three blocks per district were visited. The selection of districts and blocks was based on analysis of data sought from EMRI on parameters such as geographic coverage, years of operations, number of emergencies handled, and response times. The list of districts and blocks was then finalized in discussions with the Government of Madhya Pradesh and

2 http://www.nhmmp.gov.in/WebContent/MPTast/Research_studies/EMRI_Assessment_report.pdf

the Madhya Pradesh Technical Assistance Support Team.

The broad aim of the study was to assess the contractual and institutional appropriateness of the public private partnership framework; the efficiency of the “Sense, Reach, Care,” model; the key performance indicators and monitoring aspects; the analysis of all support functions within EMRI; feedback on the service from users, nonusers, and field functionaries; analysis of the cost data in terms of key cost indicators; and trend of expenditure.

The study methodology followed included desk reviews and field visits. Field visits included discussion with state level and EMRI officials, EMRI staff, hospitals, and beneficiaries.

The Following is the assessment summary on certain predefined indicators:

SENSE

Well defined and clear processes in place guide the call handling process at the Emergency Response Center backed by well structured and implemented hardware and software. Emergency response officers were found to be motivated and adhered to defined processes. Adequate monitoring systems were in place for call center operations and are well handled by the team leads.

The manpower planning process, however, would need to be more robust. At an organization level, the high percentage of ineffective calls, unattended calls, and vehicle busy cases would need to be addressed jointly by the management, sense, field operations, and human resources, and marketing teams.

REACH

The Reach processes were found to be well defined, implemented and managed by the fleet and field teams. Strong district level vendor tie ups and a comprehensive vehicle performance tracking mechanism were seen to drive vehicle efficiencies. Initiatives such as the servicing manual, accident reporting formats, and the fleet management system improved adherence to protocols. Some areas of improvement included more frequent analysis of reach times and distances to address the increasing trends and introducing variable

daily financial limits for fuel refilling based on urban or rural base station, trip distances, and proximity to fuel stations.

The field operations team were seen to manage and handle staff and operations reasonably well. Emergency Medical Technicians and pilots reflected a high level of confidence and motivation in carrying out their daily tasks. Areas of improvement included delays in case closures, un-planned field marketing activities, weak liaising with district administration, and weak hospital relationship processes.

CARE

The availability of well-defined standard operating procedures, around the clock online medical support from emergency response center physicians, and the availability of trained medical technicians in all ambulances as well as their knowledge of systems and adherence to protocols were the key strengths of the Care function.

Areas of improvement that need to be addressed by EMRI include shortage of emergency response center physicians, inadequate processes for evaluation of care provided by an emergency response center physician and emergency medical technician, and poor coordination with government health facilities.

Additionally, EMRI would need to conduct a comprehensive evaluation of the effectiveness of the revised preparatory training schedule to identify specific skills gaps.

HUMAN RESOURCES

The planning, recruitment, and annual appraisal processes were robust and well handled by the recruitment team, supported by comprehensive review mechanisms by the national human resources team. An area of improvement is the manpower planning process, which should be done based on call and emergency forecasts, and trends of call handle time.

Overall, it was observed that emergency response officers, emergency medical technicians and pilots handled processes and documentation well, and were empathetic to beneficiaries.

Emergency medical technicians were conversant with standard management protocols of conditions they had attended themselves

but not with those with which they were mandated to be aware of theoretically. They also required frequent advice from the emergency response center physician for conditions that occur infrequently. This highlights the need for more robust mechanisms of refresher training, especially for new emergency medical technicians.

QUALITY

The Quality Management System is certified by the International Organization for Standards 9001:2008. Processes are well defined for all core and support functions. Audits for all core functions are done diligently by the quality team including new ambulance audits, evaluation of sense manpower on the parameters of skill, attitude and process knowledge, audits on vehicle busy and unattended cases, and on field ambulance audits.

There is a need for the team to increase its focus on monitoring and auditing support functions. Currently, no internal audits are done by the team to track and drive process adherence of support functions. Other areas of focus for the team need to be audits of medical direction and ineffective calls. Overall, apart from the processes, the team should also champion driving service parameters through thorough analyses of existing data.

MARKETING

The team needs to focus on following a more strategic approach towards its communication strategies with respect to identification of target messages, development of need based plans, and addressing key gaps, such as ineffective calls and medical emergencies in addition to trauma and pregnancies.

At a policy level, the Government of Madhya Pradesh and EMRI would have to evaluate developing joint behavior change along with information and educational communication plans and define mechanisms for review of additional budgets required for them.

INFORMATION TECHNOLOGY

The information technology systems of EMRI are well designed to enable efficient call handling, safe data storage, and data analysis.

This support function is a mainstay for smooth functioning of the Dial 108 services in the state. Through its partnerships with Tech Mahindra to develop core applications, EMRI designs, reviews, and updates its IT systems nationally.

The state IT team does a commendable job of ensuring more than 99.9 percent uptime and undertaking adequate preventive steps to keep a check on the technology. Overall technology and data are some of the key strengths of the organization. However, there is scope to increase the level of data analysis done at the organization.

CONTRACTUAL AND INSTITUTIONAL FRAMEWORK

The Memorandum of Understanding signed in December 2012 is well documented and clearly details the roles and responsibilities of the Government of Madhya Pradesh and GVK EMRI. In comparison to the older memorandum of understanding, this one specifies service parameters and budget caps to enable the Government of Madhya Pradesh to monitor operational and financial performance. The operational service parameters could further be improved to increase objectivity of the parameters.

The level of monitoring could further be strengthened by ensuring regular meetings of defined committees at various levels and improving the reporting requirement and their analysis. This would help Government of Madhya Pradesh to constantly supervise EMRI's implementation plan and provide input for performance improvement

COSTS

The key costing indicators related to 108 operations in Madhya Pradesh have shown a decreasing trend and are largely comparable with the performance of the 108 services across other operationally mature states of EMRI.

An analysis of year wise trends of select expense heads shows an overall decreasing trend especially across salaries, fuel, medical consumables, communication, and administration, indicating steps taken by the organization towards bringing in cost efficiencies through improved operational and monitoring processes.

A quick analysis of the current operational costs for the period April-Dec 2012 and Jan-Jun 2013 with respect to the cost estimates provided in the memorandum of understanding indicates that current costs are in line with the target. Administration, medical consumables, and repairs and maintenance are the potential areas of cost reduction as the expansion phase stabilizes.

OVERALL AREAS OF IMPROVEMENT

Awareness is low on service utilization for medical emergencies, other than pregnancies and accidents, due to inadequate Information, education, and communication. Ambiguity on roles and responsibilities amongst Government of Madhya Pradesh and EMRI with respect to these activities needs to be removed.

High percentage of ineffective calls leading to ineffective utilization of emergency response center resources.

Gaps in technical knowledge of emergency medical technicians.

Insufficient demand assessment practices in respect of drugs and consumables.

Weak hospital tie ups.

Inadequate monitoring of operations including key service parameters, adherence to memorandum of understanding clauses, financial parameters, and procurement processes by Government of Madhya Pradesh.

Inadequate monitoring of support function processes and closure of noncompliances from ambulance audits

Potential cost reduction in the areas of administration, medical consumables and repairs and maintenance as the expansion phase stabilizes.

Kimberly S. Babiarz, Swaminatha V. Mahadevan, Nomita Divi, and Grant Miller Ambulance Service Associated with Reduced Probabilities of Neonatal And Infant Mortality in Two Indian States Health Affairs 35, no.10 (2016):1774-1782 doi: 10.1377/hlthaff.2016.0564 published in October 2016.

This study provides the first quantitative evidence of the early im-

pact of EMRI services on infant and maternal health outcomes in Andhra Pradesh and Gujarat. The two Indian states have a combined population of about one hundred and forty five million people.

Data for this study was taken from three sources. These are the EMRI's electronic service records, the International Institute for Population Sciences District Level Household and Facility Survey wave three in Andhra Pradesh, and the research team's own household survey conducted in Gujarat.

The records used were from the beginning of the time of EMRI program implementation in each state. That is, August 2005 for Andhra Pradesh and August 2007 for Gujarat, till the end of September 2010. The collected data detailed the precise date, city, and district in which each EMRI ambulance began service. In total, the sample included the initiation date and location of eight hundred and four ambulances operating in Andhra Pradesh and four hundred and sixty eight ambulances serving Gujarat. The states together received 1.2 million maternity calls during the study period.

BROAD FINDINGS

The study found that EMRI coverage is associated with reductions in neonatal and infant mortality as well as delivery complications. These results were true statewide for Andhra Pradesh and in high mortality districts in Gujarat. However, the study found little change in the probability of institutional delivery or skilled birth attendance. Overall, the findings suggest that population level health gains were achieved through improvements in the quality, rather than quantity, of maternal and neonatal health services.

Maternity care accounted for the largest number of emergencies served by EMRI services in the two states during the study period. The study utilized the substantial variation in EMRI's implementation timing, intensity, and pace of scale up across districts in both Andhra Pradesh and Gujarat to estimate changes in outcomes associated with EMRI services.

STUDY RESULTS

Andhra Pradesh: The study found an overall significant reduction

in neonatal and infant mortality in areas associated with EMRI ambulances. At mean ambulance service intensity of 0.16 ambulances per million people, the probability of neonatal death fell by 7.5 per 1,000 and the probability of infant death declined by 11 per 1,000. The study did not find that the association between EMRI services and infant or neonatal mortality rates varied significantly by districts' prior mortality environment.

Gujarat: The study found a different pattern of results in Gujarat. On average, EMRI service intensity was not associated with statistically significant changes in either neonatal or infant survival or in maternal health. However, the relationship between EMRI services and neonatal and infant mortality varies substantially by pre implementation mortality conditions, with larger reductions in districts with higher initial mortality rates. Specifically, the study found that among districts with higher mortality rates, that is, above average prior to EMRI, ambulance services were associated with a reduction of 4.5 per 1,000 population.

The study found reductions in neonatal and infant mortality rates associated with EMRI services in both Andhra Pradesh and Gujarat, although the nature of this relationship varies between the two states. In Andhra Pradesh, health indicators improved in all districts under EMRI, while in Gujarat, gains were concentrated in districts with higher initial neonatal and infant mortality rates. Because EMRI first operated in Andhra Pradesh and then expanded to Gujarat, these findings might also suggest institutional learning over time about how to target ambulance services to vulnerable populations.

CONCLUSION

Overall, the study suggests that ambulance services can be an effective component of large-scale infant and neonatal mortality strategies. Although the study focused on an area with a combined population of around one hundred and forty five million people, it is important to note that research on emergency medical services in other states and by other providers is needed to strengthen our understanding of the impact and mechanisms through which these services can benefit infants and mothers.

Cases

These are taken from EMRI's biannual magazine EM Care.

Uttar Pradesh State Team: **Sant Kabir Nagar district**

Emergency Medical Technician: **Bhagwat Prasad**

Pilot: **Ramjeeyavan Yadav**

Ambulance Location: **Community Health Center Mehdaival Hospital, Sant Kabir Nagar**

Case ID: **4917*****

Date: **May 5, 2016** Call Time: **10:04 pm**

Emergency Response Center Physician: **Dr. Rastogi**

Receiving Hospital: **District Hospital, Sant Kabir Nagar**



On May 5, 2016 at 10:04 pm, emergency medical technician Bhagwat Prasad was dispatched to attend to a case of assault. It was a quarrel between two groups. On reaching the scene, the emergency medical technician performed a brief survey of the scene and noticed that nearly twelve people were injured. The pilot, along with the help of the emergency medical technician, called the emergency response center and requested additional help from the emergency response center physician. The emergency medical technician performed a triage and found a deep cut on the head of one of the victims and blunt force trauma to the chest and abdomen. The victim also complained of tenderness in the pelvic region and difficulty in breathing. He was immediately shifted into the ambulance and given appropriate prehospital care.

On the advice of the emergency center physician, the pilot and the emergency medical technician, in consultation with the concerned police personnel took the decision to transport the victim to the nearest hospital. In the meantime, police and additional ambulances reached the scene and helped transport the other victims. Subsequently, as per the triage, all the victims were shifted to Sant Kabir Nagar district hospital, for further management. Upon forty eight hours follow up, it was found that the all twelve victims had survived and were kept under observation.

Andhra Pradesh State Team: **East Godavari District**

Emergency Medical Technician: **Abdul H Babu Md**

Pilot: **Venkata Ramana Seeramreddy**

Ambulance Location: **Maredumilli**

Case ID: **13507*****

Date: **May 9, 2016** Call Time: **6:51 am**

Emergency Response Center Physician: **Dr. Rajesh**

Receiving Hospital: **Area Hospital, Rampachodavaram**



On May 9, about forty five tourists from Manchiryala of Adilabad district were traveling from Annavaram to Bhadrachalam. The group was returning from Varanasi. Due to sharp turns along the hilly road, the sleepy driver lost control of the vehicle at one such turn. The bus rolled over into the valley. Fortunately, the bus stopped rolling upon landing on a flat surface. The incident happened at about 5:30 am in an area with limited cellular network. No information about the incident could be passed to the emergency response center till 6:50 am when some passengers finally managed to call 108.

On reaching the scene, emergency medical technician Abdul performed a rapid trauma survey and found that one victim, the fifty year old Mrs. Vijaya Kumari, had lost her life and about fifteen passengers were severely injured. The driver of the bus Krishna Murthy had an open fracture on his right hand. Another victim Mrs. Lakshmi Bai, aged sixty years, had lost her right arm. Many other victims had sustained multiple fractures and severe bleeding. One person was stuck beneath the bus. The emergency medical technician used extrication tools to get him out. Some victims were lifted to the road with the help of ropes.

The ambulance staff provided appropriate prehospital care such as wound dressing, splinting, and immobilization of the fractured limbs of the victims. They shifted the victims using the appropriate stretchers, to the ambulance and other police vehicles. The ambulance made multiple trips before other nearby ambulances were pressed into action. Eventually all victims were transported to the nearby Area Hospital, Rampachodavaram, for further care and management. Thus, the EMRI team could handle a multi casualty incident.

Gujarat State Team: **Dang District**

Emergency Medical Technician: **Kapil S Bagul**

Pilot: **Mohshin Khan**

Ambulance Location: **Ahwa**

Case ID: **2016000116******

Date: **April 30, 2016** Call Time: **6:21 am**

Emergency Response Center Physician: **Dr. Milan N Chaudhary, Dr. Navikkumar J Gondaliya**

Receiving Hospital: **Ahwa Civil, Dang**



Twenty one year old Rita Chaudhari from Vanjar Godhi was pregnant with her second child. On April 30 at around 6:20 am, she began experiencing abdominal pain. The pain soon became intense. Her husband Sunil dialed 108 to call for an ambulance.

The call was forwarded to the ambulance stationed at Ahwa. The emergency medical technician asked Sunil for the necessary case details over the phone and advised him to keep an attendant ready with the patient. He also asked him to keep all medical documents ready. When the ambulance arrived at Sunil and Rita's residence, the emergency medical technician found Rita responding well to commands but slowly losing consciousness. The emergency medical technician quickly loaded her on to the ambulance with the help of a collapsible stretcher.

In the ambulance, oxygen supply was given to the patient, a thorough physical examination was conducted, and vitals were recorded. As the ambulance travelled a few miles, it was noted that Rita's water sac had broken and she was about to deliver soon. The vehicle was asked to make an unscheduled stop. With the help of the pilot and as per the guidance of Emergency Response Centre Physician Dr. Milan N Chaudhary, delivery was conducted by the emergency medical technician. Necessary baby care and medication were given.

Heading towards the hospital, Rita started experiencing abdominal pain again. Further examination by the emergency medical technician revealed the crowning of second baby at the vagina. The ambulance was parked at a safe location once again and the second baby was delivered in the same way.

For both babies the airway was cleared, they were mopped with towels, covered in blankets and their vitals recorded. Examination revealed critical vitals with low respiratory rate, low pulse, and cyanotic skin of second baby. At once, the emergency medical technician began chest compression and oxygenation with the bag valve mask. The emergency medical technician sought online medical direction from emergency response center Physician Dr. Navikumar J. The ambulance drove to Ahwa Civil, Dang where doctors said that both the mother and the twins were in good health.



Telangana State Team: **Adilabad District**
 Emergency Medical Technician: **Suresh Dharmaji**
 Pilot: **Raja Kumar Satkuri**
 Ambulance Location: **Fire Station, Kaghaznagar**
 Case ID: **15268*****
 Date: **May 23, 2016** Call Time: **11:20 am**
 Emergency Response Center Physician: **Dr. Kalpana**
 Receiving Hospital: **Suraksha Hospital, Kaghaznagar**



Twenty nine year old daily wage worker Sikhander cleaned wells for a living. On the morning of May 23, Sikhander was assigned to clean a deep well which was not in regular usage. Sikhander went down the forty feet well with the help of a rope. After some time, Sikhander stopped giving indications to the helper outside to pull the rope. The helper raised an alarm when Sikhander did not respond to his questions. The owner of the well immediately called 108, asking for an ambulance and the local police for help.

On reaching the spot, the emergency medical technician found that police personnel had arrived and were already in the process of trying to bring the victim out. The emergency medical technician assessed the situation. They found that the victim was not visible from the ground. The emergency medical technician suspected the victim to be semi conscious because of inadequate

oxygen supply in the deep and narrow well. The emergency medical technician took the advice of emergency response center physician Dr. Kalpana to provide oxygen to the victim with the help of a hundred meter long pipe, which was procured at that moment and attached to the oxygen tube available in the ambulance. The emergency medical technician connected a simple face mask to the other end of the tube and slid it inside the well with high flow of oxygen. The emergency medical technician and the police personnel started giving loud commands to the victim to apply mask to his face. Soon, the victim inside the well began taking in the oxygen and started responding to the commands. The emergency medical technician then slid an additional rope in to the well and asked the victim to tie it around his waist. He was then given indications to pull himself up as they tried to pull the rope. The emergency medical technician, pilot, and the police personnel slowly helped him come up.

The victim was given oxygen supply continuously. The entire process took about two hours. The victim was shifted carefully into the ambulance. Baseline vitals were monitored. And on the advice of Dr. Kalpana, intravenous fluids were initiated. The victim was transported to Suraksha Hospital, Kaghaznagar for further management and care. EMRI associates learnt from the forty eight hours follow up that the victim had recovered completely.



Gasuapara Base: **West Garo Hills District**

Emergency Medical Technician: **Hafizur Rahman**

Pilot: **Ananda Banai**

Ambulance Location: **Gasuapara Base**

Case ID: **67*****

Date: **April 16, 2014** Call Time: **11:03 pm**

Emergency Response Center Physician: **Dr. J Nongtdu**

Receiving Hospital: **Dalu Community Health Center**



The ambulance located at Gasuapara was assigned a case of a woman in labor pain just before midnight. On reaching the scene,

the emergency medical technician took a brief obstetric history of Purnima Koch. She was pregnant for the third time and was in the seventh month of the pregnancy. She had not received any antenatal checkup through the course of her pregnancy and was therefore unaware that she was likely to deliver prematurely. Upon assessing the vitals, the emergency medical technician found her to be stable and decided to shift her into the ambulance.

The delivery process progressed into the crowning stage as the ambulance was on its way to the hospital. Anticipating an imminent delivery, the emergency medical technician asked the pilot to pull onto the side of the road to conduct the delivery inside the ambulance. The emergency medical technician immediately assisted the delivery of a female baby without encountering any problem. As the emergency medical technician was giving care to the newborn, Purnima felt another surge of strong contractions. The emergency medical technician noticed crowning again and realized that it was a case of multiple deliveries. The second baby girl was also delivered without much difficulty. Immediate care was given to both the newborn babies and oxygen was administered. As per the advice of emergency response center physician Dr. Nongdu, while the emergency medical technician was monitoring Purnima, she complained of pain once again. The emergency medical technician noticed the crowning of the third baby. This happened after a gap of fifteen minutes and the third baby girl was delivered. She did not cry, and the emergency medical technician immediately initiated neonatal resuscitation along with artificial ventilation. Sensing the need for higher care, the emergency medical technician asked the pilot to proceed to the nearest hospital.

The mother and all her babies were then shifted to Dalu Community Health Center for further management. It was later learnt that the third baby did not survive. The doctors and staff at the receiving hospital appreciated the efforts put in by the ambulance team in handling a difficult delivery.

Gujarat Team: **Patan District**

Emergency Medical Technician: **Ketan Chaudhari**

Pilot: **Bharat Vyas**

Ambulance Location: **Patan City**

Case ID: **2014000090******

Date: **April 10, 2014** Call Time: **1:14 pm**

Emergency Physician: **Dr. Ketul Joshi**

Receiving Hospital: **GMERS Medical College and Hospital, Patan**



While at home, fifty five years old Raiben Amratbhai Prajapa from Ganget village suddenly experienced severe chest pain in the afternoon hours on April 10. She started having trouble in breathing and was sweating profusely. Family members took her to a private clinic at the neighboring Ranuj village. After initial stabilization, the attending physician Dr. Dhirubhai Shah referred the case further to the nearest higher medical facility. He dialed 108 and asked for an ambulance. The case was assigned to the ambulance located at Patan.

When the 108 team reached the given address, Raiben was still conscious but with unbearable chest pain and severe breathlessness. After a quick assessment, the emergency medical technician quickly loaded Raiben into the ambulance and made her sit in a semi reclining position so that she could breathe easily. After initiating high flow oxygen administration, the emergency medical technician assessed all the vital health parameters. He then promptly secured an intravenous line before consulting Emergency Physician Dr. Ketul Joshi. As per Dr. Joshi's advice, all the necessary drugs were administered to alleviate the chest pain and ease the breathing.

On the way to the hospital, the vital health parameters were reassessed at regular intervals. Finally, Raiben was handed over to GMERS Hospital at Patan. As reported through the follow up call, she was discharged after six days of hospitalization.

Madhya Pradesh Team: **Betul District**
 Emergency Medical Technician: **Yogesh Pawar**
 Pilot: **Rajendra Karole**
 Ambulance Location: **Kotwali**
 Case ID: **2015000615******
 Date: **October 15, 2015** Call Time: **6:18 am**
 Emergency Response Center Physician: **Dr. Rohit Singh**
 Receiving Hospital: **District Hospital Betul**



Shyamwati, a laborer by occupation, was in her full term of pregnancy. Shyamwati and her husband Hiralal had moved to the nearby urban center to earn their livelihood and were on the way back to their village. Shyamwati and Hiralal boarded the train. In the morning, Shyamwati had gone to the toilet where she started experiencing labor pains. The train had halted at a station. Hiralal quickly informed his friend Ashok, who was a press reporter, about the situation. Ashok acted promptly and contacted the station master who called 108. The train waited at the station till the ambulance arrived. An ambulance from Kotwali location was assigned the case. The ambulance reached the railway station within minutes.

The emergency medical technician reached the scene and observed that the delivery was imminent. He contacted the emergency response center physician on duty, Dr. Rohit, for medical advice. The emergency medical technician laid the victim in the lithotomy position and prepared for the delivery. Soon the labor pains grew more severe. Crowning was observed soon after, followed by the birth of a healthy female baby with vertex presentation. The emergency medical technician carried out oral and nasal suction. The baby cried immediately after birth. The emergency medical technician then clamped the umbilical cord and cut the umbilical cord between clamps. He wiped the baby and wrapped the baby in a dry blanket. This was followed by expulsion of the placenta. The emergency medical technician and the pilot shifted the mother and baby in the ambulance. Shyamwati and her baby were shifted to the hospital in a stable condition.

CHAPTER 12

Global Lessons

NOT all innovations are newfound ideas. An innovation may be born out of an existing idea. EMRI took the core idea of a 911 service and adapted it to Indian conditions. It became the first emergency response service network in the country to integrate medical, police, and fire emergencies. It is also the first emergency response organization in the world to make research and training a vital part of its operations. The EMRI experience has come to hold valuable lessons and unexplored opportunities for policymakers, the private sector, and the larger medical community.

There are several internal and external reasons why the EMRI was successful in India. For starters, the organization identified the large problem that needed to be addressed. EMRI estimated nearly four million deaths every year due to medical, police, and fire emergencies. To address this problem, EMRI developed a technology based solution that could overcome the barriers where other innovations often fail. This solution was low cost, cutting across the differences in language and local complexities with a common template without compromising on quality.

One of the biggest extrinsic reasons was the formation of the National Rural Health Mission, which encouraged states to adopt this program. The Government of India provided sustainable financing in terms of both capital and operational expenditure under this program. This model of sustainable financing that allowed states to spend funds on innovation was by far the single largest factor

that drove the success of EMRI. A common vision of saving lives in emergencies, the commitment of leadership from both partners towards this common cause, effective governance within the EMRI, and constant feedback from the government made the relationship grow and succeed.

The main reason for the efficiency of the EMRI system is the fact of its being integrated. The three essential components of the service namely the call center, fleet management, and prehospital care management are all run by EMRI instead of being run by three different organizations. EMRI opted for system optimization and shifted the focus to outcome and efficiency that integrated technology led systems bring. The scale of operations eventually brought down fixed costs. This helped EMRI develop a powerful information monitoring system that delivered high output quality and customer centered operations with minimal input costs.

The successful relationship between EMRI and the government brings out the critical elements of a well executed public private partnership. These include a well articulated memorandum of understanding with clearly defined complementary roles, a shared vision of improving lives, mutual trust, and operational transparency. EMRI demonstrated process and cost efficiencies and the ability to deliver high quality world class services, paving the way for the government's trust in the organization. In return, governments provided complete autonomy to EMRI to deliver a largely public good in its own manner. Key operational aspects, such as recruitment of personnel, procurement, fabrication, and deployment of ambulances continue to remain the prerogative of the EMRI with minimum involvement from the governments.

EMRI demonstrates the best practices of the private sector while upholding the ethos of a nonprofit entity. Many interviewees in this book believe that the government's confidence in the organization stemmed from the nonprofit structure of the EMRI. This nonprofit model allowed the services to be run in a standardized and equitable fashion for all. The service did not distinguish people based on their socioeconomic status in the society. Those who have worked closely with the system say that the glory years of EMRI and HMRI were

A common vision of saving lives in emergencies, the commitment of leadership from both partners towards this common cause, effective governance within the EMRI, and constant feedback from the government made the relationship grow and succeed.

when these services were being run as completely philanthropic initiatives. The government was appointing the organizations on a nomination basis. Presently, states are awarding these contracts through the tender route. EMRI is now competing against profit making organizations, making sustainability a long term challenge. If left to the discretion of states and shifting political priorities, essential fleet replacements and necessary repairs may suffer due to paucity of funds and this may impact quality. This is one of the top risks that the program faces.

The EMRI model has been tried both in the for profit and not for profit versions. EMRI itself tried the two different models in different states. In a for profit version, there is a need for higher monitoring and accountability as the operator may prioritize the cases that will involve shorter travel and easier response. The lowest bidder who bags the tender to run the emergency services may not operate with the same ethos as that of the EMRI. Unfortunately, governments have limited capacity to analyze and monitor sophisticated operations like that of EMRI's 108 emergency systems. In theory, however, both the versions can work with appropriate safeguards and proper monitoring.

Political leadership plays an indispensable role in bringing about any significant policy changes. Political leaders who pioneered the service in their states held healthcare at the heart of their political agenda. The story of EMRI brings out the importance of this unwavering political support behind the success of any major policy initiative. Bureaucratic

support follows a political push, highlighting the importance of a buy in and commitment from the government at all levels.

Leadership was given due significance within the organization. Despite having health and technology specific functions, the founding team recognized the need for an experienced private sector team to provide the leadership management, imbibe a corporate ethos, and guide collaborative team work that operations of this nature and scale would require. They knew that doctors and engineers alone could not run the show. The founding management team laid out a clear vision for employees, with structured goals to be achieved within specified timelines. The commitment and charisma of this team won the support of the political leadership and the various government departments. It kept guiding changes that helped the organization evolve continuously. Leadership is thus considered a key reason why EMRI surpassed other ambulance services in the country.

EMRI has created impact in more than one ways. In the process of making high quality, affordable emergency care available to the masses, employment has been created for fifty thousand people across the states, creating many livelihood opportunities in rural areas. The ambulance staff, being locals of the area, they operate in, have received social recognition in addition to a valuable work experience. To an extent, the organization has shown how the pace of rural to urban migration can be slowed down through the creation of local employment and growth opportunities.

In India, or any other developed country with similar socio economic conditions, impact cannot be achieved without scale. Scale cannot be achieved without driving down the unit cost of providing the service. It is therefore important for an innovation to bring with it cost efficiencies. To this end, technology is an up and coming enabler of most major innovations in healthcare today. Social entrepreneurs are using technology to its full potential to make healthcare accessible and affordable. The leadership at EMRI and HMRI realized the potential application of technology in both the preventive and curative aspects of healthcare more than a decade ago. Not only did the use of technology make the EMRI operations cutting edge, the strong base of computerization and automation made it possible

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to provide the services at a very low cost. Its state of the art ambulances, call center expertise, the effective use of global positioning systems and cloud storage to minimize cost are only a few examples of how the organization utilized technology.

Gathering reliable patient data to identify epidemiological shifts and other health and social trends is a must to drive any form of corrective policy action. Inadequate data collection and lack of data integrity are a big challenge to generating evidence in the country today. Governments in India have, slowly yet steadily, begun using electronic health records in the management of population health with varying levels of success. The Mother and Child Tracking System and the issuance of Aadhaar cards for newborn babies are a few examples of the government's efforts to digitize health records.

Availability of big data is a valuable outcome of the modern day use of information technology. The country still has a long way to go in this regard. The voluminous medical data available with EMRI, making it one of the few agencies in the country to have access to such big data, holds significant potential for present and future clinical research. Generating evidence in the form of hard numbers at EMRI and HMRI and the subsequent data analysis have helped both the government and the organization take informed policy decisions on several occasions. The Emergency Medical and Learning Center makes use of this data regularly to drive meaningful research to continue improving the quality of EMRI's services. But the utilization of this data is far from its full potential at the level of the governments. For this to happen, the demand for evidence must come from the government itself.

Why the Public Private Partnership Succeeded

THERE are many reasons behind the undisputed success of the public private partnership between the Emergency Management and Research Institute and state governments in India. These are:

Trust between the state government and the service operator.

Transparency in operational successes and failures, and in books of account.

Complementing each other on respective strengths, challenging their own achievements, and creating benchmarks for continuous improvement.

Faster resolution of issues to move forward.

Appreciating each other's achievements instead of fighting for credit.

Creation of performance parameters, agreement on those parameters by both partners, for critical assessment of self performance to understand areas of improvement and to create an alert system for areas needing immediate corrective action.

Expanded operations help in restricting costs to make the program more cost effective.

Owing to the above reasons, the transfer of knowledge between the two parties was always smooth, adaptive, and replicable. With a decade long uninterrupted engagement, continuous process improvement and mutual trust, a strong process and system has been established within the partnership. This can be termed as a standard operating process. Once the process and system are challenged, altered, tested, and eventually stabilized for long periods, dependency on the service operator is reduced.

The effectiveness of such a program does not depend on whether the operator is not for profit or for profit. This was proven on multiple occasions in states like Rajasthan and Madhya Pradesh where other emergency service operators replaced the EMRI. What is imperative though is that the knowledge is transferred to

a static partner, the state governments in this case. As the systems and processes are already in place, the state government can continue implementation with relative ease even with a new partner. After the initial stage, the state government may infuse selected new ideas and initiatives of the new partner, keeping tabs on the performance parameters at all times.

In such a partnership, it is usually not a good idea for the state government to take on the operational responsibility. Understanding of systems and processes always cannot be converted into operational efficiency. Emergency management is dynamic in nature, requiring strong data analytics, continuous monitoring and evaluation, and change management across a large and scattered manpower. High expectations from this program, from satisfied beneficiaries are a clear indicator of its success. The state machinery may not be aligned to this requirement with a high likelihood of failure. Kerala's state run emergency services are an example, though functioning at a relatively smaller level. A long standing successful public private partnership may therefore not be suitable for conversion into a completely government owned and run program.

As discussed earlier, in a successful public private partnership with established systems and processes, the legal entity of private partner may not have any implication on the desired outcomes. The current mode of selecting emergency operators, followed by state governments, involve a tender process. This process does not filter out based on the legal status of the operator, whether nonprofit or for profit. We need to question whether this will have a long term implication on the quality of emergency services, whether commercial values will count more to safe guard cost than the quality of service, and whether the priority of service delivery will change from saving lives to saving costs.

A cost effective program of international standards like the EMRI, replicable in any part of the world, needs to be encouraged and publicized to add value to human lives

India's public health delivery system faces a shortfall of human resources across all levels. As per a report published by *The Lancet*, as of March 2015, more than eight percent of the twenty five thousand three hundred primary health centres in the country functioned without a doctor, thirty eight percent were without a laboratory technician, and twenty two percent had no pharmacist. Nearly half of the posts for female health assistants and over sixty percent for male health assistants remain vacant. In the community health centers, the shortfall is more acute with eighty three percent of posts for surgeons, seventy six percent of posts for obstetricians and gynecologists, eighty three percent of posts for physicians, eighty two percent of posts for pediatricians lying vacant. A report of the World Health Organization from 2010 quoted the Indian Nursing Council that pegged the shortfall of nurses at close to two and a half million, to provide a nurse patient ratio of one nurse per five hundred patients.

The paramedics training center at EMRI is an example of institutions working to bridge this gap. EMRI's capacity building initiatives have come a long way in not only building its own operations but also in building a paramedical cadre in the country. The success of EMRI, for the large part, may be attributed to its significant investment in the education and training of its personnel. The institute has certified over seventy two thousand basic emergency medical technicians and over five hundred advanced paramedics so far. It currently employs eighteen thousand basic emergency medical technicians and close to one hundred and fifty advanced paramedics. Twenty percent of paramedics trained by EMRI are working in the Middle East while the rest of them are manning trauma and emergency care departments in various hospitals in India. It is time the EMRI starts to think of a long term career path for the paramedics within its system. Holding a rich experience of dealing with a wide range of medical emergencies, these paramedics can be further trained to deal with the glaring shortfall of health personnel in the country.

The collaboration with Stanford School of Medicine and the EMRI has shown how global expertise can be applied to local needs. The commitment of the collaborators at Stanford in studying the complexity of the Indian healthcare system helped in imparting

world class training with protocols relevant to the Indian context. International standards of training with customization achieved through local collaborations can be taken to other developing countries through similar partnerships.

The ethos of EMRI can be summed up in the words of its top employees, Venkat Changavalli and Anil Jampala: “EMRI is a well done philanthropy, well done public private partnership, well done corporate responsibility project to serve people in collaboration with the government.” And: “A global best practice that was substantially enhanced by bringing management, research, and training under one wing and unifying all the three services of police, fire, and medical. Leadership and government support helped propel it to the national level.”

For this innovation to be replicated in other countries, essential input factors such as sustainable financing, telecom infrastructure, computer telephony software with integrated emergency protocols, and training facilities are required. Governments will also need a local technical partner who can bring management leadership and integrated delivery expertise to the field. For the poor, emerging and wealthy nations, the big challenge in implementing an equivalent system will be to remove the legacy systems. It is natural to resist change as any system benefits some stakeholders who maybe resisting to hand their control to a transparent and efficient outfit.

A program operating at the scale of EMRI should be embedded into the sustainable financing structure and not in line item budgets of governments. An example of sustainable financing can be for the government to levy a surcharge of one US cent per month for all mobile phone users, as a value added surcharge. This will provide sufficient capital and operational funds to run these operations. Other possible forms of financing could be tried as well, such as giving recognition to corporates who fund this program under their corporate social responsibility. Large Indian conglomerates Tata and Birla have unofficially expressed interest in the past to fund the program as partners with GVK.

Even as EMRI expands its footprint outside of India, the future of

For Profit vs. Not for Profit Model

THE Emergency Medical Research Institute of India started as a philanthropic model that attracted contributions by both the Government of India and Satyam Computers, founded by Ramalinga Raju. As the size of the operations grew, the financial resources required to provide services across the different states grew in proportion. The funding by Governments increased significantly and reached a point where Governments started funding the entire operational and capital expenses required to run the emergency operations. Ramalinga Raju, GVK Group, and Tech Mahindra contributed by funding the leadership, technology improvements, research and development, and collaboration costs.

Some of the States in India recognized that as Government funds reached a critical threshold where they were willing to bid the services out on a competitive tender that was open to both for profit and not for profits. The tender process affected an important aspect of the program. If the emergency services were run without profit objective, the values which drove the services were humanitarian. Saving a life often involved making operational tradeoffs that are not compatible with a lowest cost mindset and operations of the lowest cost, for profit bidders. Important changes were made to the program that resulted in increasing short term operational efficiencies as opposed to longer term health benefits for population. Budgets on innovation, research, and future product extensions are minimized by the lowest bidders.

In pursuit of universal health coverage, this holds an important lesson for all Governments. The financing model of a system will eventually drive the values and longer term outcomes from the system and its administrators. In our opinion, emergency services delivered higher value and health outcomes under not for profit partnerships than a for profit structure. It is an important paradigm where the Government's need for transparency should not come at the cost of services and population health outcomes.

this proficient system should not be restricted to emergency management alone. Within the area of emergencies, EMRI has shown the potential in dealing with bigger emergencies such as earthquakes, cyclones, and terror attacks. Augmentation of the existing emergency response infrastructure to include disaster management components is a likely natural extension. Lessons from the EMRI story can and must be applied to broader issues of health systems design integration, public private partnerships, capacity building, research, and data analytics among others such.

If health systems are looked at as three blocks of community, healthcare providers, and healthcare facilitators or connectors, the system created by EMRI currently excels at the last block. EMRI created a unique way of connecting the community to hospitals, two blocks that have very large legacies. EMRI only trained doctors for better integration of emergency systems with points of definite care. EMRI never went deep into how Police and Fire should work differently, they showed how integrated medical responses can work in a better way. Can lessons from EMRI be applied to the other two blocks? A model like EMRI did not work in other parts of the government as EMRI did not get into hospitals or managing emergency rooms. EMRI, however, is currently in talks with the government of Uttar Pradesh towards “privatization” of upcoming mother and child hospitals in the state. Can management of public health services by an organization such as EMRI help overcome the bottlenecks of inequity and inefficiency? These questions need collective and open deliberations. ■

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