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ORIGINAL ARTICLE

Trauma care – a participant observer study of trauma centers at Delhi, Lucknow and Mumbai

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Abstract

Background Trained doctors and para-medical personnel in accident and emergency services are scant in India. Teaching and training in trauma and emergency medical system (EMS) as a specialty accredited by the Medical Council of India is yet to be started as a postgraduate medical education program. The MI and CMO (casualty medical officer) rooms at military and civilian hospitals in India that practice triage, first-aid, medico-legal formalities, reference and organize transport to respective departments leads to undue delays and lack multidisciplinary approach. Comprehensive trauma and emergency infrastructure were created only at a few cities and none in the rural areas of India in last few years.

Aim To study the infrastructure, human resource allocation, working, future plans and vision of the established trauma centers at the 3 capital cities of India – Delhi (2 centres), Lucknow and Mumbai.

Setting and design Participant observer structured open ended qualitative research by 7 days direct observation of the facilities and working of above trauma centers**.**

Material and methods Information on, *1. Infrastructure;* space and building, operating, ventilator, and diagnostic and blood bank facilities, finance and costs and pre-hospital care infrastructure, *2. Human resource;* consultant and resident doctors, para-medical staff and specialists and *3. Work style;* first responder, type of patients undertaken, burn management, surgical management and referral system, follow up patient management, social support, bereavement and postmortem services were recorded on a pre-structured open ended instrument interviewing the officials, staff and by direct observation. Data were compressed, peer-analyzed as for qualitative research and presented in explicit tables.

Results Union and state governments of Delhi, Maharashtra and Uttar Pradesh have spent heavily to create trauma and emergency infrastructure in their capital cities. Mostly general and orthopedics surgeons with their resident staff were managing the facilities. Comprehensively trained accident and emergency (AandE) personnel were not available at any of the centers. Expert management of cardiac peri-arrest arrhythmias, peripheral and microvascular repair were occasionally available. Maxillo-facial, dental and prosthodontic facilities, evenomation grading and treatment of poisoning – anti venom were not integrated. Ventilators, anesthetist, neuro and plastic surgeons were available on call for emergency care at all the 4 centers. Emergency diagnostic radiology (X-ray, CT scan, and ultrasound) and pathology were available at all the 4 centers. On the spot blood bank and component blood therapy was available only at the Delhi centers. Pre-hospital care, though envisioned by the officials, was lacking. Comprehensively trained senior

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A and E personnel as first responders were unavailable. Double barrier nursing for burn victims was not witnessed. Laparoscopic and fibreoptic endoscopic emergency procedures were also available only at Delhi. Delay in treatment on account of incomplete medico-legal formalities was not seen. Social and legal assistance, bereavement service and cold room for dead body were universally absent. Free treatment at Delhi and partial financial support at Lucknow were available for poor and destitute.

Conclusion Though a late start, evolution of trauma services was observed and huge infrastructure for trauma have come up at Delhi and Lucknow. Postgraduate accreditation in Trauma and EMS and creation of National Injury Control Program must be mandated to improve trauma care in India. Integration of medical, non traumatic surgical and pediatric emergency along with pre-hospital care is recommended.

Keywords Trauma Care · India · Trauma Centers · Participant observer

Introduction

Trauma is the fourth leading cause of death in India and accounts for 8.5% of all deaths [1]. Trauma care is combined with emergency services because both require life saving measures and cardio-respiratory support. Cardio-respiratory support and other life saving measures are now taught as a drill with theory and practice on simulators to all medical personnel, paramedical staff and some of the basic components of life support system to public in general in order to capacity build the community to attend to an emergency in the vicinity. This initiative has been called interCEPT or International Community Emergency Preparedness Training. India is the world's 10th most powerful ranks 3rd most rapidly growing economy [2]. It has though lacked behind in providing infrastructure for high profile trauma and emergency care. On the face value it is known that there is not a single example of an ideal or to be proud of pre-hospital and emergency and trauma care service in India. A diverse set of illnesses ranging from communicable infections, non communicable, obstetrics and injuries are addressed by emergency medical system (EMS) for example an acute presentation of a concurrent illness like diabetic hypoglycemia or an acute illness like septicemia, premature labor, asthma, myocardial infarction, poisoning, bites, acute hemorrhage and injuries etc. There are no epidemiological studies from India on the burden of illness that is addressed by pre-hospital and emergency services. On a global scale injuries were responsible for 21.7% of global deaths and 31.1% of DALYs (disease adjusted life years) lost in 2001 [3]. Burden of death and disability resulting from lack of EMS is very high in low and middle income countries (LMIC) [4]. Combining provisions of emergency and trauma services under one roof avoid costs. Injuries most commonly accrue from road traffic accidents[5], surface fall (mostly elderly) and fall from height (mostly children), burns, drowning, natural calamities (floods, earthquakes, landslides, tsunami and tornados), civilian and industrial accidents, sports, attempted suicide, civilian violence and combats of the armed forces. Delhi and Lucknow recently established discrete trauma centers whereas in Mumbai a center was established in 1974 which is not a stand–alone or a dedicated trauma centre; but a specialized emergency service provided by a tertiary medical college hospital. The study undertook an analysis of their infrastructure; human resource and work style and compared it to desired standards in order to provide data and *lessons learnt*, to help other city planners to establish similar facility.

Method

Common knowledge, general discussions with peers and focused search revealed that 4 major trauma centers viz.; two centers at Delhi and 1 each at Lucknow and Mumbai.

On site visits, inspection of the infrastructure, facilities and functioning of the above 4 trauma centers was consented by the in-charge of respective centre. Qualitative research methodology by observer participation method was followed. The available infrastructure was thoroughly inspected. A structured questionnaire with open ended format of the views and opinions, work environment and work style were carefully recorded in detail by a trained participant who himself was a surgeon (SC). At least 7 days were spent at each trauma centre and a daily working diary was maintained taking notes on how each patient that came to centre was treated.

The data were compressed, peer analyzed as for qualitative research and presented in three explicit tables. Table 1 depicts the infra-structure facilities – civil facilities and building, operating facility, ventilator facility, diagnostics facility, blood bank, financial resource and pre-hospital care component. Table 2 depicts human resource of 1st responder, full time doctors, surgeons, orthopedic surgeons, sub and super specialists, trained para-medicals and referral system. Table 3 depicts work style and patient care related variables. Constant evolution and changes in the system may render some information to be different at the time of publication of this report. Missing data was taken telephonically.

Results

Delhi state has population of approximately 10 million and New Delhi is the national capital. The All India Institute of Medical Sciences, a 50-year-old apex medical institution

Table 1 Infrastructure

	JPN Trauma Centre, All India Institute of Medical Sciences, Ring Road, New Delhi- south	Sushrut Trauma Centre, Maulana Azad Medical College, Ring Road, Delhi- north	Trauma and Emergency Centre, King Georges Medical University Hospital, Shahmina Road, Lucknow, UP	Lokmanya Tilak Municipal General Hospital, SION, Mumbai, Maharashtra
1. Civil facilities and building				
Building, whether new, purpose built, dedicated or old modified?	New purpose built Dedicated	New purpose built Dedicated	New purpose built Dedicated	Old modified, purpose built Dedicated
Resuscitation and TRIAGE	Ground Floor	Ground Floor	First Floor	Ground Floor
Waiting area for relatives and attendant sm, seating inside the hospital, Outside night halt facility	Yes No	No No	No Open tin shed	Yes Open tin shed
Indoor beds	120	120	200	About 1500
Beds with CV monitoring	20		10	14
Cold storage for dead bodies	Functional	No	No	No
2. Operating Facility				
How many operating rooms does the Trauma Centre have?	5	3	2	1(+3)
Is there Central Suction and O_2	Yes	Yes	Yes	Yes
3. Ventilator facility				
Is there provision for ventilators and how many	Yes, 30	Yes, 6+2	Yes, 4	Yes, 8
How many ventilators are functional Who manages ventilators and CCU	36 (6 transport venti) Anesthetist (SR + Consultant)	8	4 Resident Anesthetist	8
4. Diagnostics facility				
X-ray	Yes	Yes	Yes	Yes
Ultrasound	Yes	Yes	Yes	Yes
CAT scanning	Yes	Yes	Yes	Yes
MRI	Yes	No	No	No
Nuclear Medicine	No	No	No	No
5. Blood Bank				
On-site blood bank available	Yes	Yes	No	Yes
Blood components available	Yes	No	No	Yes
Liaison with organ donation bank?	Yes	No	No	Yes
6. Finances and Costs				
Civil work and Infrastructure cost	Central government	Delhi government	UP state government	Municipal Corporation of Greater Mumbai

Table 1 *Continued*

Table 1 *Continued*

Salaries of personnel	Central government	Delhi government	UP state government, Welfare society	Municipal Corporation of Greater Mumbai
Running cost	Central government	Delhi government	Patient + UP Government	Patient + Municipal Corporation of Greater Mumbai
Major cost of Medicines and appliances used	Central government	Delhi government	Patient himself	Municipal Corporation of Greater Mumbai
Hospital charges to patients	Yes	Nil	Subsidized	Nil
Hbgram, KFT, ABG paid by patient?	Not paid by patient	Not paid by patient	Paid by patient	Paid by patient
7. Pre-hospital care				
What is the number of ambulances with Trauma Centre?	CATS Ambulance PCR Vans	2	10	2
Emergency Helpline, central command and ambulance fleet	Proposed	No	No	No

The table above depicts the infra-structure facilities at the 4 trauma centers studied

Table 2 Human resource

	JPN Trauma Centre, All India Institute of Medical Sciences, Ring Road, New Delhi-south	Sushrut Trauma Centre, Maulana Azad Medical College, Ring Road, Delhi-north	Trauma and Emergency Centre, King Georges Medical University Hospital, Shahmina Road, Lucknow, UP	Lokmanya Tilak Municipal General Hospital, Sion, Mumbai, Maharashtra
Consultant doctors				
AandE Consultants - full time and trained	3	Nil	Nil	Nil
A andE Consultants-full time, untrained	Nil	Nil	Nil	Nil
Visiting / Attending Consultants Surgeons, Orthopedic surgeons, Plastic, Neuro, Fascio Maxillary and ENT Surgeons	On Rota basis dedicated for Trauma center available in house except ENT	On Rota basis from the main teaching hospital	On Rota basis from the main teaching hospital	On Rota basis from the main teaching hospital
Anesthetist Consultant--Full time	2 (Sanctioned 6)	Nil	Nil	Nil
Anesthetist Consultant Visiting/ Attending	NIL	On Rota basis from the main teaching hospital	On Rota basis from the main teaching hospital	On Rota basis from the main teaching hospital
Resident doctors				
Senior Resident doctors-full time with post graduate qualifications	79	-	3	-
Resident doctors – full time undergoing Postgraduate training – Junior residents General Surgery Orthopedics Plastic Neuro, Fascio Maxillary, ENT Surgery Anesthesiology	6 4 On call 4	6 4 On call 4	6 4 On call 4	6 4 On call 4

Table 2 *Continued*

Table 2 *Continued*

Duration of shift of resident doctors	6 hours	24 hours	24 hours	6 hours
Casualty medical officer				
CMO as 1st responder for BLS ALS, Medico-legal formalities, Triage, transfer and transport to appropriate facility	Senior and Junior Residents on duty perform MLC work	At least 1 CMO 24*7	None	At least 1 CMO 24*7
Paramedical medical staff				
Nurses on shift duty—8,8,12 hours night	40	40	40	40
Technicians- Operating room, sample collection, physiotherapy and dressings	4	4	4	4
Subspecialties/Superspecialties				
Plastic Surgery Neurosurgery Facio Maxillary ENT CTVS Micro-vascular – reimplantation	Residents and Consultants on call Available	Residents and Consultants on call Unavailable	Residents and Consultants on call Occasionally	Residents and Consultants on call Available
Physicians, Cardiologists, Pulmonologists, Intensivists	3 Physicians consultants and 4 Senior Residents Available at JPNATC Rest on call when needed	Residents and Consultants on call	Residents and Consultants on call	Residents and Consultants on call
Psychologists, Social support personnel, Legal assistance	Medical Social workers available	None	None	Yes, Yes, No

Table above depicts human resource of 1st responder, full time doctors, surgeons, orthopedic surgeons, sub and super specialists, trained para-medicals and referral system

Table 3 Workstyle

	JPN Apex Trauma Centre, All India Institute of Medical Sciences, Ring Road, New Delhi- south	Sushrut Trauma Centre, Maulana Azad Medical College, Ring Road, Delhi- north	Trauma and Emergency Centre, King Georges Medical University Hospital, Shahmina Road, Lucknow, UP	Lokmanya Tilak Municipal General Hospital, Sion, Mumbai, Maharashtra
First responder				
When emergency arrives on the door who attends first	Senior Resident-Surgery/Orthopedics	Junior Resident-Surgery/Orthopedics	Pharmacist- Untrained Junior Resident-Surgery/Orthopedics	Junior Resident-Surgery/Orthopedics
Which surgical emergencies?				
Are non-traumatic surgical cases (e.g. perforated appendicitis) also managed in Trauma Centre?	NO	No	Yes, Medical, cardiac, ObGy and pediatric emergencies separately	Yes, as it is not a stand-alone trauma centre
Emergency burn management				
Are burn related emergencies dealt in Trauma Centre?	No	No	Yes	Yes

Table 3 ***Continued***

Table 3 *Continued*

Emergency surgery in > 80% instance is performed by				
Wound debridement and stitching, laparotomies, bone immobilization, vascular access, bowel resection and anastomosis, visceral strangulation and traumatic viscera repair / removal	Senior Resident and Consultants	Junior resident	Junior resident	Junior resident
Thoracotomies, esophageal anastomosis, gastric resection, peripheral vascular anastomosis	Consultant / Attending Surgeons	Consultant / Attending Surgeons	Consultant / Attending Surgeons	Consultant / Attending Surgeons
Craniotomy, micro-vascular surgery, major facio-maxillary surgery, major congenital malformations in neonates	Senior Residents / Consultants	Senior Residents / Consultants after shifting the patients in respective departments	Senior Residents / Consultants after shifting the patients in respective departments	Senior Residents / Consultants after shifting the patients in respective departments
Advance investigations/surgical procedures				
Are trauma surgeons "FAST" trained?	Yes	No	No	No
Is laparoscopy/ thoracoscopy/ endoscopy available in trauma center for trauma victims	Yes * [6, 7]	No	No	Yes, as it is a part of medical college hospital
Patient management and rehabilitation				
Is a trauma victim who is hemodyna-mically stable shifted to low dependency ward after wound management?	ICU/ Ward	Yes	Yes	Yes
Are the trauma victims shifted from Trauma Centre to cold wards?	No	No	Yes	Yes
Are there dedicated trauma follow up OPDs	Yes	Yes	No	No
Who provides medicines and consumables, appliances for destitute patients?	Free for all	Free for all	Welfare society	Social worker through poor box fund
Referral system				
Are sub/super specialist i.e. Plastic Surgery, Neurosurgery, Facio Maxillary, ENT, CTVS, Micro-vascular – re-implantation	On duty senior residents are first responders for sub / super specialty referrals	On call senior residents are first responders for sub / super specialty referrals	On call senior residents are first responders for sub / super specialty referrals	On call senior residents are first responders for sub / super specialty referrals

Table above depicts work style and patient care related variables

*6, 7 Diagnostic laparoscopy reduces non-therapeutic laparotomy rate by 25–58%

of patient care, teaching and training established a new facility in a new campus only about a kilometer away from the main campus on the southern crescent of Delhi state's Ring road named Jai Prakash Narayan Apex Trauma Centre (JPNATC) with a dedicated new purpose built multistory complex. Similarly, in old Delhi more than 100-year-old Irwin Hospital that is now known as Maulana Azad Medical College and Hospital with a super specialty, GB Pant Hospital created a brand new purpose built Sushrut Trauma Center on the northern crescent of Delhi state's Ring Road. Though, strategically placed these two centers do not function in an integrated manner so far. Lucknow, the capital city of India's most populous state (population approximately 160 million) recently established a dedicated new trauma center at the reputed 100-year-old King Georges Medical University hospital campus (now known as CSM Medical University). Mumbai, the economic capital of India and the capital city of the state of Maharashtra has established and created a modified old building at the Lokmanya Tilak Municipal Medical College at the center of greater Mumbai peninsula. The results have been summarized in three tables viz.; infrastructure, human resource and work style.

Infrastructure

The building space and campus decorum was adequate at the 2 centers of Delhi and Lucknow but grossly inadequate at Mumbai. Operating rooms were adequately present at two centers at Delhi, at Lucknow out of 5 operating rooms only 2 were furnished and functional. Mumbai had only 1 dedicated operating room that was grossly inadequate for the work load. Ventilator facility was present at all the centers but there was a heavy demand for more ventilator support at all the 4 centers.

Dedicated X-ray, ultrasound and CT scan were present at all the centers but MRI was available at JPNATC only and nuclear medicine diagnostic procedures were not available at any of these centers. Emergency routine pathology was present at all centers. On site blood bank was present at Delhi and Mumbai centers but not at Lucknow. Component blood therapy was available at JPNATC, New Delhi and Mumbai. Organ donation facility for the brain dead has been taken up JPNATC, New Delhi where 3 donations have taken place so far. All the 4 facilities were funded for infrastructural development and equipment from public funds. The cost of drugs and appliances used were borne by the hospital at Delhi and at discounted price paid by the patient at Lucknow and Mumbai. No professional or major hospital charges were incurred from patient for providing acute care within 24 hours and all life saving investigations and medications are provided by the hospital.

An emergency medical system i.e. comprehensive pre-hospital care with radio controlled ambulance fleet having trained personnel for basic and advanced life support, private public partnership, integrated all around city trauma and emergency facility was not there. However in Delhi there is some pre-hospital care provided by a fleet of 30 ambulances of Centralized Accidents and Trauma Services (CATS) and Police Control Room (PCR) vans. Both have been providing a reasonable service by bringing in most patients within the *Golden first hour* following injury.

Human resource

Only JPNATC, New Delhi had full time comprehensively trained accident and emergency senior resident doctors as first responders on arrival of the patient. However, five full time post MS general surgery, orthopedics and neurosurgery consultants have been appointed at the trauma centers, AIIMS, New Delhi along with 6 full time anesthetists (2 in-position). Pro-Rota consultant specialist from Orthopedics, plastic surgery, neuro-surgery, facio-maxillary surgery and ENT departments were available along with their on-call-resident staff in other centers. Full time resident staff, pro-rota was adequately available mostly from departments of general surgery, orthopedics and anesthesiology at all the 4 centers. For the resident doctors each shift was 24 hours at Sushrut Trauma Center, Delhi and Lucknow and 12 hours at AIIMS and Mumbai. Casualty medical officers (CMO) for triage and medico-legal purposes were present at all the centers (temporarily non-functional at Lucknow) except at JPNATC where concept of Casualty Medical Officer (CMO) has been done away and all MLC work is done by Senior and Junior residents on duty. Physicians (present at JPNATC – 3 Faculty and 4 Senior Residents including one endocrinologist), cardiologist, pulmonologist and intensivist (at JPNATC 4 posts of intensivists are waiting to be filled) were on call whenever required. Clinical psychologist, social support personnel, legal assistance, bereavement service were not available.

Work style

At the all-4 centers medical, pediatric, gynecological and obstetrical emergencies if arrived were diverted to respective facilities. Trauma and non-traumatic surgical emergencies were dealt by junior resident of surgery and orthopedics departments as first responders at 3 centers and consultants as first responders at JPN apex trauma center, AIIMS, New Delhi. Burn patients were accepted at AIIMS, New Delhi and Lucknow and were not taken at Sushrut Trauma Center, Delhi. There is a dedicated burn facility at LTMG, Mumbai. Resident staff at 3 centers performs majority emergency surgeries except at JPNATC where newly appointed faculty (consultant) involvement was is being maximized. FAST (focused abdominal sonography by trauma surgeons) was performed only at JPNATC, New Delhi and LTMG, Mumbai. Endoscopic emergency procedures were not performed at any of the 4 centers. There was provision for special out patient follow-up service on patients at Delhi centers but not at Lucknow and Mumbai Centers.

Post discharge medical and surgical needs of neuro-physicians and neuro-surgeons, plastic and prosthodontic surgeons, facio-maxillary surgeons, micro-vascular re-implantation, etc. were provided through specialty out patient in the regular hospital setting.

Discussion

There is no doubt that society reaps dividends from investments devoted to research and disease. Although trauma is a well-recognized public health problem its primary prevention has remained in the domain of town planners and railroad builders and planners [8]. An integrated research on primary prevention of road traffic accidents, domestic injuries, industrial trauma and civil mass casualty has not taken up in India so far.

Secondary trauma prevention and its research have been in the domain of medical and public health professionals. Injury severity and early expert management determines the probability of survival in trauma victims [9]. Biological and surgical research conducted in the advanced western countries of critically ill and trauma subjects can easily be extrapolated and applied to Indian subjects. However, operational research for secondary prevention of trauma must be conducted locally in its own environment and is the important duty of providers of trauma care and health care professionals. It is in this context that, "A Study of Knowledge, Attitude and Practice of Hospital Consultant, Resident Doctors and Private Practitioners," with regards to pre-hospital and emergency care in Lucknow was recently published [10]. It is in the continuum that we undertook a participant observer study of the 4 most recently established and modern trauma care facility in India. Two new facilities at Delhi – the national capital, one centre at Mumbai, the economic capital and one centre at Lucknow, the political capital of India were studied as described above. There were no similar trauma centers in other major cities of India like Chennai, Kolkata, Bangalore, Hyderabad, Pune, Chandigarh, Ahemdabad, Surat, Gurgaon, etc.

Every injured person deserves certain set of services deemed essential by the WHO. This has been called the *Needs of the Injured Patients* [11] and the provision of these services ideally, should not be dependant on the ability to pay. Undoubtedly, high cost in the delivery of these services must not preclude the provision of initial emergency care nor of the critical elements of definitive care. The provision of this in emerging economies can come from public-private pathways. Similarly an injured subject in emergency is always caught unaware giving no chance to choose the desired centre or doctor for treatment. This is unfortunate that trauma centers in India are reputed to gain hands on practice for those novice in trauma care rather than a S*anctum-Santorum* to provide trauma care by most experienced and practiced doctors. This scenario must be reversed.

India, beaming to host Commonwealth games, wooing tourism by advertising, *Incredible India!* a burgeoning information technology hub and now all set to entice medical tourism, it is appalling that there are only 4 major trauma centers in over 20 Indian cities with more than 1 million population. The above study of the 4 premier centers has revealed that there is indeed a long way to go in achieving international standards of trauma and emergency care. Following the adage of *better late than never* the efforts rendered in creating the above 4 trauma centers are laudable and the following is the constructive discussion of the facility that have been created in the public sector hospitals with a noble thought.

A large enough land area has been allocated at Delhi and Lucknow centers. Similarly huge infrastructure has been provided. It is now apparent that further development in infrastructure and work style will take place once the Medical Council of India will mandate postgraduate training and accrediting in specialty of accident and emergency. It has been recommended to incorporate undertaking Advanced Trauma Life Support (ATLS) courses mandatory for all postgraduate students prior to their taking final exit examination and only then they are allowed to take the examination by the Medical Council of India. ATLS in its original form under copy right from American College of Surgeons is due to be promulgated in India. ATCI (Association of Trauma care of India) and ACS have signed a Memorandum of Understanding and the process is underway. Dedicated super- specialty in Accident and Emergency are unavailable in India. There is an acute need to start the specialty of Emergency Medicine in India with the award of MD in Emergency Medicine. Accrediting of those interested and possess masters in surgery and orthopedics in AandE (MCh in AandE) or similar program will fill this void in the beginning. Once a highly specialized human resource is created from the nodal centers of India they will automatically propagate the infrastructure building in other townships and subsequently in rural areas as it happened with the specialty of plastic surgery, vascular surgery, pediatric surgery, etc. In our suggestion the centers at Delhi, Lucknow and Mumbai are well equipped to take a lead to start such a program. It is also good news that under the initiative under *Pradhan Mantri Swasthya Suraksha Yojana (PMSSY)* 13 Hospitals are being funded by the Federal Government to upgrade as Trauma Care. These include Govt. Medical College, Jammu (JandK), Govt. Medical College, Srinagar (JandK), Kolkatta Medical College, Kolkatta (W.B.), Sanjay Gandhi Post Graduate Institute of Medical Sciences, Lucknow (U.P), Institute of Medical Sciences, BHU, Varanasi (UP), Nizam Institute of Medical Sciences, Hyderabad (A.P), Sri Venkateshwara Institute of Medical Sciences, Tirupati (A.P) (50% cost of upgradation will be borne by the TTD Trust), Govt. Medical College, Salem (T.N.), Rajendra Institute of Medical Science (RIMS), Ranchi (Jharkhand), B.J. Medical College, Ahmedabad (Gujarat), Bangalore Medical

College, Bangalore (Karnataka), Grant Medical College and Sir J.J. Group of hospitals, Mumbai, (Maharashtra), Medical College, Thrivananthapuram, (Kerala).

That emergency medical system with its essential pre-hospital care, private-public partnership, interCEPT or International Community Emergency Preparedness Training, are some of the areas that are totally lacking and require an immediate execution after proper training of paramedics. The above 4 trauma centers appear as appropriate nodal centers to operationalize the above system. Public education program to dispel the widely held belief that emergency treatment is withheld till medico-legal formalities are complete must be urgently undertaken as in no case we observed that immediate resuscitation or medical attention was lacking by the 1st responder in the deserving emergency patient.

Integration of trauma centers with non-traumatic surgical, medical, pediatric, obstetric and gynecological emergencies, treatment of poisoning and outreach for civilian mass casualties are some of the areas found missing in all the 4 centers and need to be deliberated for providing optimal support. However, it may be a good idea not to mix trauma with non-trauma emergencies to improve results for both and the matter can be further debated. Out reach trauma and disaster management may be taken up provided adequate human resource is available.

It was beyond the scope of this study to discuss who should provide for the cost of pre-hospital care and the initial cost of acutely ill and injured patient. It is however, at present the responsibility of public fund managers to allocate adequate funds for acutely injured patients who are unable to afford treatment. Delhi Government has taken up the project in view of forthcoming commonwealth games in 2010. A fleet of approximately 150 Ambulances is being planned to put into service with in the framework of public – private partnership but 95-98% funding from the taxpayer on the same lines as EMRI in Andhra Pradesh.

India is one of the few countries of the world where routine human organ transplantation surgery is undertaken. It is well known that 90% of such transplantation in India is done by live related donor program. One reason that the cadaver donor program of India has not become popular may be lack of hospital based organized trauma service from where the maximum organs for transplantation come in the advanced countries. Besides there are several ethical, social, religious, political and practical issues involved in running a cadaver organ transplantation programme – most importantly is the lack of public awareness. The 4 centers that were studied can provide organ-harvesting facility after duly undertaking public education program, social support system and formulating *brain-dead* triage team.

Conclusion

This study concludes that after a head start in the above centers the Indian Society and Government need to realize that injury is a public health problem reaching epidemic proportions and that there is an urgent need to initiate National Injury Control Program and develop a comprehensive EMS or Emergency Medical System for India.

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