

CAPACITY BUILDING FOR DEVELOPING TRAUMA CARE FACILITIES ON NATIONAL HIGHWAYS

OPERATIONAL GUIDELINES

GOVERNMENT OF INDIA

MINISTRY OF HEALTH & FAMILY WELFARE



Table of Contents

PREAMBLE	3
BACKGROUND	6
INTRODUCTION	7
TRAUMA SYSTEM DESIGN	10
TRAUMA CENTER vs EMERGENCY DEPARTMENT	12
TRAUMA CARE FACILITY: PLANNING CONSIDERATIONS.....	14
CORE AREAS IN A TRAUMA CARE FACILITY.....	14
GUIDING PRINCIPLES.....	15
ENTRANCE AREA.....	17
WAITING AREA.....	18
TRIAGE & RECEPTION AREA.....	18
TRAUMA RESUSCITATION AREA (RED AREA).....	20
COMBINED TRAUMA TREATMENT AND IMAGING ROOM.....	23
TREATMENT AREAS (YELLOW AREA).....	24
TRAUMA OPERATING ROOM	25
TRAUMA CARE FACILITY NORMS.....	28
<i>INFRASTRUCTURE</i>	<i>28</i>
<i>EQUIPMENT.....</i>	<i>28</i>
<i>HUMAN RESOURCES</i>	<i>30</i>
NEW TRAUMA CARE FACILITIES.....	32
Steps in Identification of a new Trauma Care Facility.....	35
Steps in Operationalizing a Trauma Care Facility.....	36
FINANCIAL GUIDELINES	37
MONITORING & SURVEILLANCE	40
INFORMATION, EDUCATION & COMMUNICATION	Error! Bookmark not defined.
ANNEXURE I: STATE REQUISITION FORMAT FOR ESTABLISHING TRAUMA CENTRE	41

PREAMBLE

Over the past decade, the Govt. of India has taken progressive initiatives towards Road Safety including improving Trauma Care Services along the Highways. The scheme - “**Capacity Building for developing Trauma Care Facilities on National Highways**” was launched during the 11th Plan as a 100% central grant-in-aid scheme, with an aim to augment Trauma Care Services at existing 140 public healthcare facilities along the National Highways.

*The overall **objective** of the scheme is to bring down preventable deaths because of road accidents to 10 per cent by developing a pan-India trauma care network in which no trauma victim has to be transported for more than 50 kilometers and a designated trauma center is available at every 100 Km.*

This scheme has now been extended during the 12th Plan to include upgradation of additional 85 healthcare facilities apart from completing the pending works in the existing facilities and setting up a robust trauma registry & injury surveillance mechanism. The funding pattern during the 12th Plan has been changed to include State’s share of expenditure as well and the funding modality has been to change to ensure that the funds are now released with the consolidated funds for the State and not to the Trauma Care Facilities directly to ensure better monitoring and accountability.

The operational guidelines of the scheme are being released as a reference tool for the policy makers at the State & the Trauma Care

Facility level with an aim to bring clarity and uniformity in the scheme norms. These guidelines present an overall framework for the Operational Model to support the State Government for various activities and options relevant to successful implementation of the scheme & incorporate the various activity, stages & processes, starting from the Trauma Care facility site identification to project conceptualization, planning & implementation. Major roles, responsibilities and deliverables of various stakeholders and agencies along with options at different stages are also described.

**Incidence and rate of deaths due to road accidents during 2012
(State/UT wise)**

S.N.	States/UT	No. of cases of road accidents	Total registered motor vehicles as on 31.03.2011 (In 000')	No. of deaths due to road accidents in 2012	Rate of accidental deaths per 000' vehicles (Col.5 / Col. 4)	Rate of deaths (Col.5 / Col.3) x 100
(1)	(2)	(3)	(4)	(5)	(6)	(7)
STATES:						
1.	ANDHRA PRADESH	39344	10189	14966	1.5	38.0
2.	ARUNACHAL PRADESH	204	145	136	0.9	66.7
3.	ASSAM	6535	1582	2291	1.4	35.1
4.	BIHAR	10320	2673	5056	1.9	49.0
5.	CHHATTISGARH	13511	27662	3167	1.1	23.4
6.	GOA	4288	790	302	0.4	7.0
7.	GUJARAT	27267	12993	7855	0.6	28.8
8.	HARYANA	9971	5377	4598	0.9	46.1
9.	HIMACHAL PRADESH	2899	622	1109	1.8	38.3
10.	JAMMU & KASHMIR	6637	927	1426	1.5	21.5
11.	JHARKHAND	4625	3113	2512	0.8	54.3
12.	KARNATAKA	44448	9930	9448	1.0	21.3
13.	KERALA	36174	6072	4286	0.7	11.8
14.	MADHYA PRADESH	29173	7356	8506	1.2	29.2
15.	MAHARASHTRA	45247	17434	13936	0.8	30.8
16.	MANIPUR	771	207	158	0.8	20.5
17.	MEGHALAYA	355	176	213	1.2	60.0
18.	MIZORAM	110	93	77	0.8	70.0
19.	NAGALAND	42	273	56	0.2	133.3
20.	ODISHA	9285	3338	3701	1.1	39.9
21.	PUNJAB	6328	5274	4795	0.9	75.8
22.	RAJASTHAN	22969	7986	9528	1.2	41.5
23.	SIKKIM	123	39	44	1.1	35.8
24.	TAMIL NADU	67757	15638	16175	1.0	23.9
25.	TRIPURA	888	188	272	1.4	30.6
26.	UTTAR PRADESH	24478	13287	15109	1.1	61.7
27.	UTTARAKHAND	1455	997	827	0.8	56.8
28.	WEST BENTAL	15608	3261	6222	1.9	39.9
TOTAL (STATES):		430812	132726	136771	1.0	31.7
UNION TERRITORIES						
29.	A & N ISLANDS	236	69	25	0.4	10.6
30.	CHANDIGARH	412	1008	114	0.1	27.7
31.	D & N HAVELI	85	76	53	0.7	62.4
32.	DAMAN & DIU	50	78	29	0.4	58.0
33.	DELHI (UT)	6937	7228	1866	0.3	26.9
34.	LAKSHDWEEP	0	9	0	-	-
35.	PUDUCHERRY	1510	673	233	0.3	15.4
TOTAL (UTS):		9230	9141	2320	0.3	25.1
TOTAL (ALL INDIA):		440042	141867	139091	1.0	31.6

Source: Accidental Deaths & Suicides in India - 2012, National Crime Record Bureau, Govt. of India

BACKGROUND

In India, the number of deaths in road crashes, both in absolute terms and per 1,00,000 population, is increasing monotonically. India has the highest number of road deaths globally & the mortality rate in India is 11.6 per 1,00,000 population (MoRTH 2013) compared to 10.3 in Europe and 16.1 in the US (WHO 2013). The number of fatalities has been steadily increasing with the growth in vehicle population. In terms of mortality per 10,000 vehicles, the rate in India is as high as 10.5 (MoRTH 2013), compared to less than 2.0 in the developed world. Should the correlation between fatalities and vehicle growth continue, the number of fatalities in 2030 could be staggering.

Road safety, as the World Health Organization (WHO) has noted, is not an accident. Road traffic deaths and injuries are predictable and preventable. The experience of many developed & developing countries has demonstrated a significant reduction in road-related deaths and injuries in the last two decades. The interventions made by these countries are not based on rocket science and are often in sync with the five pillars of Road Safety detailed by WHO viz.: management, safe vehicles, safe roads, road user behavior & post-crash response.

It is an accepted strategy of Trauma Care that if basic life support, first aid and replacement of fluids can be arranged within first hour of the injury (the golden hour), lives of many of the accident victims can be saved. The critical factor for this strategy is to provide initial stabilization to the injured within the golden hour. The time between

injury and initial stabilization is the most critical period for the patient's survival. Thus disability and death following road accidents are preventable to some extent. Strategic activities to achieve this objective include:

- Initial stabilization by trained manpower
- Rapid transportation and
- Developed medical facilities to treat such cases

INTRODUCTION

“The Government will strive to aim that all persons involved in road accidents benefit from speedy and effective trauma care and health management. The essential functions of such a service would include the provision of rescue operation and administration of first aid at the site of an accident, the transport of the victim from accident site to an appropriate nearby trauma care hospital.”

- Road Safety Policy, Govt. of India

The Ministry of Health & FW started a pilot project (1999) during the Ninth five year plan to augment and upgrade the accidents and emergency services in selected State Govt. hospital that are located in most accident prone areas of national highways. The scheme envisaged providing financial assistance for upgrading emergency services of selected Government hospitals.

In the light of the feedback received and the general consensus that emerged during consultations with various stakeholders, it was proposed

to design and develop a network of Trauma Care Centres that would in the first phase cover the entire Golden Quadrilateral connecting Delhi-Kolkata-Chennai-Mumbai-Delhi and North-South-East-West Corridors. This project would be a major stepping stone in moving towards the desired objective of bringing down preventable deaths in road accidents to around 10%. As the creation of new integrated and isolated trauma care system is highly cost intensive in terms of infrastructure and manpower, hence it was decided to:

- Upgrade and strengthen the existing hospitals,
- Provide a rapid mode of transportation of trauma victim under supervision so as to reach the hospital within the golden hour
- Supported by state of art communication, rather than simply focusing on creation of new infrastructure for trauma care in a piecemeal manner

The Ministry of Health & Family Welfare while initiating the first definitive steps towards building an **inclusive Trauma Care System** across the country, launched the scheme - **“Capacity Building for Developing Trauma Care Facilities in Govt. Hospitals on National Highways”**.

This scheme was started in the 11th Plan during which it was to cover the Golden Quadrilateral Corridor (5846Kms) & N-S, E-W Corridor (7716Kms) by establishing 140 trauma centres at a cost of 732.25 Crores. The scheme has now been extended under the 12th Plan as well, with an aim to establish 85 more trauma care centres (5 Level-I; 25 Level-II; and 55 Level-III) in government hospitals in or around national and state

highways, preferably in accident prone areas on these highways and states not covered earlier, at an estimated cost of 534.64 crore.

*The overall **objective** of the scheme is to bring down preventable deaths because of road accidents to 10 per cent by developing a pan-India trauma care network in which no trauma victim has to be transported for more than 50 kilometers and a designated trauma center is available at every 100 Km.*

The main **strategies** of the scheme are as under:

- Ensure definitive treatment for the injured within the Golden Hour
- Basic Life Support Ambulances at every 50km along the Highways
- Designated Trauma Care Facilities viz. Level I, II & III - at every 100kms on the Highways by upgrading the existing Govt. healthcare facilities to the appropriate level in terms of Infrastructure, Equipment & Manpower
- Advanced Life Support Ambulance at Trauma Care Facilities for inter-facility transfer
- Integrated communication network to enable the public to reach the Trauma Care System and for the various components of the System viz. Trauma Centers, Ambulances, etc. to interface with each other
- Appropriate skill training to various Human Resources viz. Doctors, Paramedics, etc. working in the Trauma Care System
- To develop a National Injury Surveillance System & Trauma Registry
- To spread awareness regarding injury prevention and road safety

TRAUMA SYSTEM DESIGN

The trauma care network has been so envisaged that no trauma victim has to be transported for more than 50 kilometers and a designated trauma care facility is available at every 100 Km. A **Trauma Care Facility** often referred to as '**Trauma Center**' is a healthcare institution that has the resources and capabilities necessary to provide trauma services at a particular level to injured patients. Trauma center designation criteria set strict requirements for staffing, specialist availability, response times, training, quality improvement and community education. This facility verification and designation is an important foundation for the success of an inclusive trauma system. Under this scheme, Trauma Care Facilities have been categorized into four levels:

Level IV trauma care: This would be provided by appropriately equipped and manned mobile hospital / ambulances. These shall be provided by MoRTH / NHAI / NRHM / State Govts., etc as the case maybe.

Level III Trauma Care Facility provides initial evaluation and stabilization (surgically if appropriate) to the trauma patient. Comprehensive medical and surgical inpatient services would be made available to those patients who can be maintained in a stable or improving condition without specialized care. Emergency doctors and nurses are available round the clock. Physicians, surgeons, Orthopaedic surgeon and Anaesthetist would be available round the clock to assess, resuscitate, stabilize and initiate transfer as necessary to a higher-level Trauma Care Service. Such hospitals will have limited intensive care facility, diagnostic

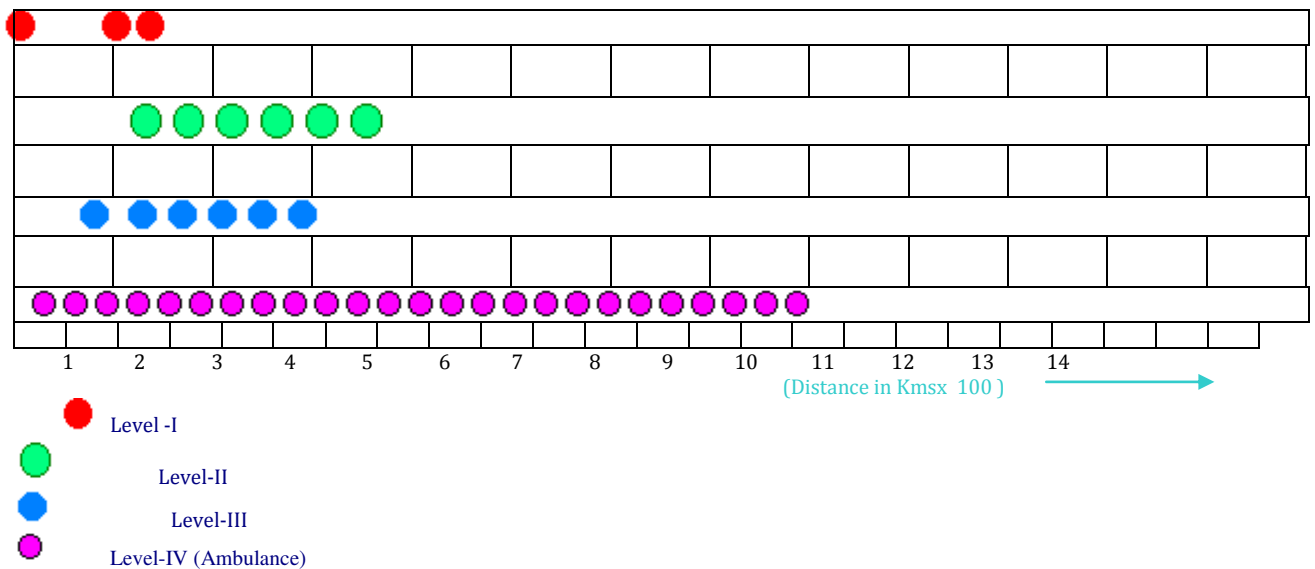
capability, blood bank and other supportive services. The district/ tehsil hospitals with a bed capacity of 100 to 200 beds would be selected for level III care.

Level II Trauma Care Facility provides definitive care for severe trauma patients. Emergency physicians, surgeons, Orthopaedicians and Anaesthetists are in-house and available to the trauma patients immediately on arrival. It would also have on-call facility for neurosurgeons, pediatricians. If neurosurgeons are not available, general surgeons trained in neuro surgery for a period of 6 months in eminent institutions would be made available 24*7. The center should be equipped with emergency department, intensive care unit, blood bank, rehabilitation services, broad range of comprehensive diagnostic capabilities, and supportive services. The existing medical college hospitals or hospitals with bed strength of 300 to 500 should be identified as Level II Trauma Center.

Level I Trauma Care Facility will provide the highest level of definitive and comprehensive care for patient with complex injuries. Emergency physicians, nurses and surgeons would be in-house and available to the trauma patient immediately on their arrival. The services of all major super specialties associated with trauma care would be available 24*7. It should be situated at essentially at a distance of less than 750 to 800 kms apart; these Level I Trauma Centers need not necessarily be along with the Highways corridor. These should be tertiary care centers to which patients requiring highly specialized medical care are referred.

Due to high levels of skill, specialists and infrastructure required, Level I Trauma Centers should be only in medical college hospitals.

A schematic diagram representing the positioning of level I/II/III/IV over a 1400 Km stretch is at given below:



For example, for every 1400 km, the requirement would be as follows:

- Level I Trauma center: 2
- Level II Trauma center: 6
- Level III Trauma center: 6-8
- Level IV (ambulance): 28

TRAUMA CENTER vs EMERGENCY DEPARTMENT

The difference between an emergency department and a trauma center is both a matter of law and a matter of degree.

- As a matter of law, all hospitals are required to promptly attend to all medical emergencies and hence must have emergency services.

- As a matter of degree, emergency departments are designed for a broad scope of minor to severe medical emergencies while a trauma center has a focused scope of practice and strict requirements for staffing, specialist availability and response times to cater specifically to the critically injured.

Based upon its capability to treat serious injuries, an emergency department can be given the appropriate designation of a Trauma Care Facility as well. *The emergency departments of hospitals that are not designated trauma centers may not have organized multi-specialty teams ready to respond to trauma calls or access to the immediate, high level of surgical care available at a designated trauma center.*

Trauma Center based care not only saves lives, it is a cost-effective way of treating major trauma. The costs per quality-adjusted life-year gained (QALY) themselves fund for a Trauma Care Facility. **What needs to be understood is that a Trauma Center is not an infrastructure concept but a SYSTEMS CONCEPT in which the appropriate infrastructure, equipment& human resources work in tandem to provide the necessary trauma care services to a patient.**

TRAUMA CARE FACILITY: PLANNING CONSIDERATIONS

A Trauma Care Facility can be a specialized area within a hospital building, a separate building adjunct to an existing hospital or a standalone facility self-sufficient in all aspects. The core areas in all these three types remain consistently the same as detailed below, the difference being primarily in the scope of support facilities that needs to be planned for.

CORE AREAS IN A TRAUMA CARE FACILITY

- **Patient access**
 - Ambulance entrance
 - Walking entrance
- **Patient care areas**
 - Triage & Reception area
 - Resuscitation area
 - Treatment area
 - Ambulatory care area
 - Waiting Area
 - Observation Ward
 - Isolation rooms
- **Clinical Support Services**
 - Lab Services
 - Radiology
 - Blood Bank
 - Pharmacy
 - Communications
- **CSSD**
- **Manifold**
- **Security**
- **Facilities for patients relatives**
 - Waiting Area
 - Communication Room
 - Toilets
 - Refreshment Area
- **Staff facilities**
 - Staff changing rooms
 - Staff shower and toilets
 - Staff dining area
- **Office accommodation:**
 - Administrative support
 - Staff offices

GUIDING PRINCIPLES

Patient care in a Trauma Care Facility is uniquely time-dependent. The length of time spent by patients waiting for, or receiving care, the number of patients attending and the scope of services offered influences the design requirements for each component of the facility. As **form follows function**, it is important to understand that the reception/triage, the trauma bay, the OR, the postoperative care unit, the intensive care unit (ICU), and the surgery ward form an interdependent system through which the trauma patient will transit during their stay at the hospital.

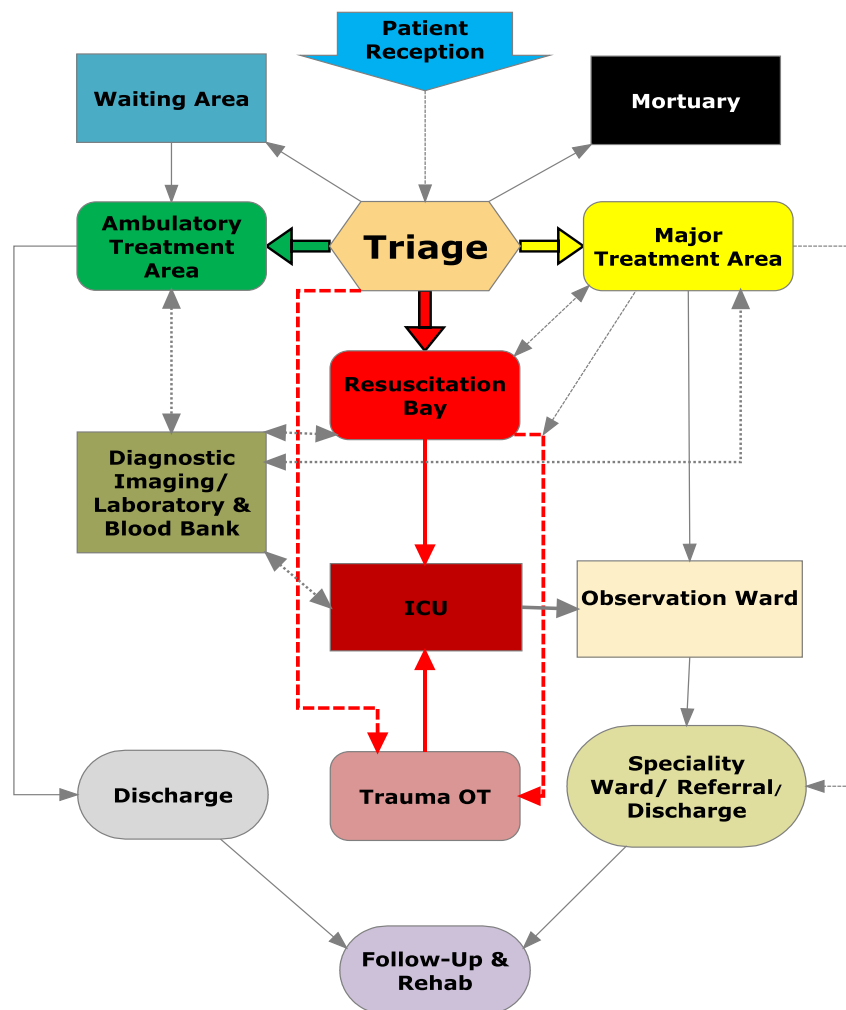


Figure: Workflow & Functional Relationships in a Trauma Care Facility

It is important to note that **when a Trauma Center is built within an existing hospital premises, it should preferably be located adjacent to the existing emergency department with common entry, registration point and triage areas.** This will allow patients whose needs are best met in an area other than the Trauma Care Facility to be redirected, depending on their clinical condition and local operational policies. Conjoint triage ensures that patients who require resuscitation have the quickest route to the care they need, rather than being subsequently redirected from another access point or clinical area.

This also enables provision of two **key connectivities** between the two facilities; namely the sterile connectivity and diagnostic connectivity.

- **Sterile Connectivity:** It is a sterile corridor between the Operating Rooms situated on the same floor in the two buildings. This helps the operating rooms staff and surgeons to travel between both OR's seamlessly.
- **Diagnostic Connectivity:** This represents a corridor between two buildings at the level of laboratory and radiological services; which helps in sharing the diagnostic facilities between both facilities thereby enabling optimal utilization of the resources.

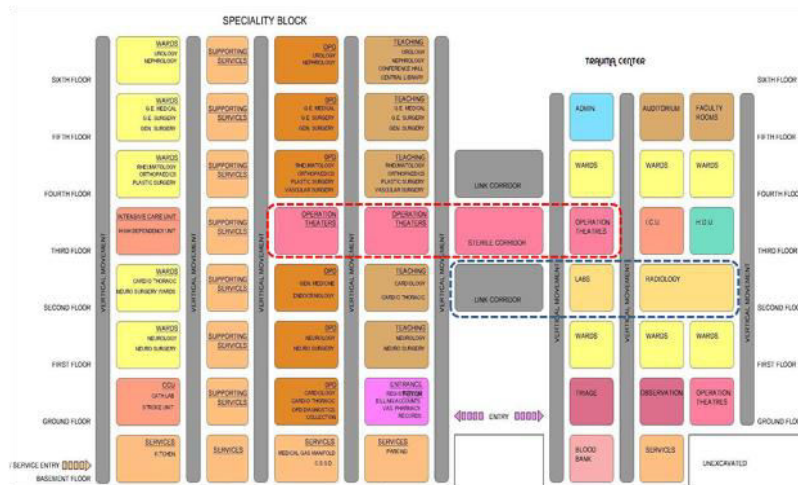


Figure: Stack Diagram showing sterile and diagnostic connectivity

ENTRANCE AREA

The Trauma Care Facility should be preferably accessible by two separate entrances: one for ambulance patients and the other for ambulant patients. These entrances must be at grade-level, well-marked, illuminated, and covered. There should be direct access from public roads for ambulance and vehicle traffic, with the entrance and driveway clearly marked and paved. Temporary parking should be provided close to the entrance.

In an existing hospital, these entrances must be common with the hospital's emergency entrance or close to the emergency entrance to ensure a single point of arrival for a patient in acute distress. In case the entrance to the Trauma Care Facility is necessarily separated from the hospital's emergency entrance due to limitations of space, patient load, etc., it must be ensured that there are appropriate internal logistics and access to rush trauma patients mistakenly arriving at hospital emergency entrance and non-trauma patients arriving at trauma center entrance to their respective areas of definitive care. If this cannot be achieved due to certain constraints, then adequate provision must be made to stabilize such kind of patients at the inappropriate facility as well before shifting them to the respective areas for definitive care. However, **in no case should a patient in acute distress be refused or left to fend for himself after entering the hospital premises.**

WAITING AREA

The Waiting Area should provide sufficient space for waiting patients as well as relatives / escorts. It should be preferably open and nearer to the Triage and Reception areas. Seating should be comfortable and adequate. Space should be allowed for wheelchairs, walking aids and patients being assisted. Waiting Areas shall be negatively pressured vis a vis the other other areas of the Trauma Care Facility.

TRIAGE & RECEPTION AREA

Triage is the sorting of patients for prioritisation according to clinical acuity.

Triage may occur before or instantaneously upon patient arrival, within minutes of arrival, at the bed-side or in a designated area. The Triage/ Assessment area may include a designated area for ambulance patients and an area for ambulant patients.

The Reception / Triage and Staff Station shall be located where staff can observe and control access to treatment areas, pedestrian and ambulance entrances, and waiting areas. Patient movement between Triage and the following areas should be given special consideration: Reception, Waiting area, Resuscitation, Treatment & Ambulatory Care, patient toilets and Diagnostic Imaging.

Each Triage/Assessment space should be of not less than 16m² in size and should be trolley and wheelchair accessible. It should at least have an examination light, equipment for physiological

measurement & examination, wound dressings, documentation desk, etc. The minimum combined Reception and Triage area must be 1.8 m²/1000 patient attendances per annum and there should be a minimum allocation of one triage/assessment cubicle per 10,000 annual attendances.

It is important to note that triage / assessment spaces may not be necessarily physically divided by fixed infrastructure but instead maybe even dynamically demarcated in a specified area or divided by removable partitions / curtains. In certain cases, an appropriate space in a facility being demarcated as Triage / assessment area is adequate till the objective of immediate assessment and sorting of patients by acuity is being met.

It must be understood is that the purpose of Triage is not to delay the treatment any further but to ensure that the patients are provided resources commensurate with their clinical condition and also to ensure that the most precious resources are not being wasted on those who don't require it the most. Hence, separate processes for pre-triaged & pre-notified patients being brought in by the ambulance service should be put in place to ensure that such patients are directly rushed to the resuscitation / treatment area as the case maybe. Also, care should be taken to ensure that no patient spends an unduly long time being triaged and at all costs, over / under triage needs to be avoided in an acute care setting and more so in a Trauma Care Facility.

TRAUMA RESUSCITATION AREA (RED AREA)

The resuscitative phase of trauma is the specific period of time when events that have transpired during the pre-hospital phase are linked to the care which will be provided in the hospital. **Organization and preparedness, along with clear communication and expert support from all members of the multidisciplinary trauma team, constitute the keys to success in trauma resuscitation.**

The size of the trauma resuscitation area largely depends on the volume and acuity of trauma managed by the facility. Figure ... below illustrates a potential layout for a dedicated trauma resuscitation area.

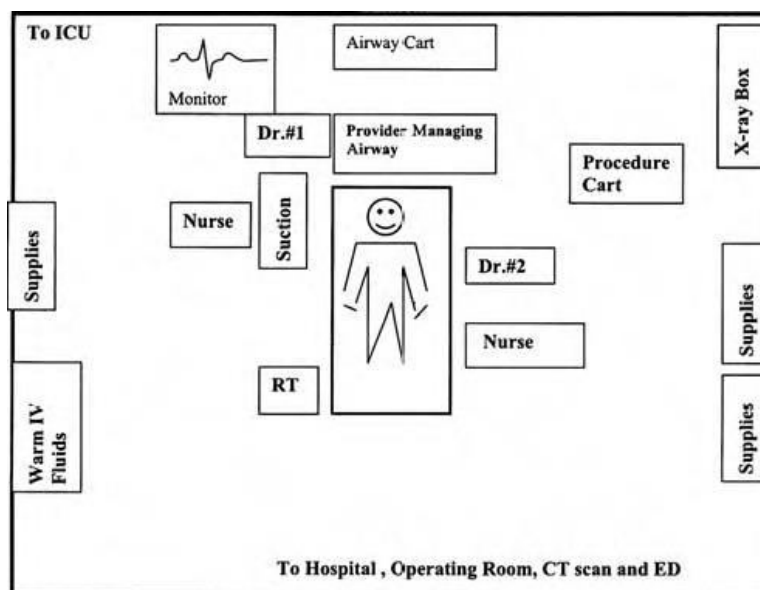


Figure: Sample Trauma Resuscitation Area Layout

Whenever possible, the trauma resuscitation area should be adjacent but physically separate from the remaining facility to enable the trauma team to focus on trauma resuscitation and care only. Sufficient room lighting and an overhead operating room light for

each trauma stretcher are imperative and fixtures should not impede movement around the patient. To permit unimpeded 360° circumferential access to the patient, monitoring equipment, suction, and gases should be mounted above the patient on fixed columns or movable overhead booms; the floors should be free of fixed hardware to avoid tripping! The ceiling mounts should be higher than the height of tall members while being accessible when standing.

- There should be a minimum of 25 m² per resuscitation bay excluding storage space. An additional one quarter to one third of this figure should be allowed for storage.
- For an average case-mix of 20,000 patients per year, a Trauma Center should have a minimum of two Resuscitation bays with one additional bay per 10,000 patients per year.

Each Resuscitation Area patient space must have:

- Sufficient space to ensure 360 degree access to the patient
- Operating room light with minimum intensity of 80,000 lux
- High-specification patient trolley suitable for portable x-ray acquisition
- Individual physiological monitoring including ECG, NIBP, Oxygen saturation, core temperature, invasive monitoring, EtCO² monitoring etc.
- Resuscitation equipment in each space for intubation, defibrillation with external pacing capabilities, cannulation etc.
- Non-Invasive & Invasive Ventilation Equipment
- Rapid infusion device, infusion pumps & provision to hang IV fluids

- Overhead X-ray gantry or alternative accessible imaging system
- Emergency Ultrasound
- Standard Anaesthesia Machine
- At least three oxygen, suction and other manifold outlets
- Proximity to Blood Bank, Trauma OT, ICU, Radiology, etc.



Figure ...: A multi-bay Trauma Resuscitation Unit



Figure ...: A single bay Trauma Resuscitation Room

COMBINED TRAUMA TREATMENT AND IMAGING ROOM

Combined trauma treatment and imaging facilities allows for poly-traumatised or severely injured patients to be stabilised and examined according to ATLS guidelines including the use of diagnostic imaging within 20 minutes of arrival at the hospital. The combined trauma imaging and treatment area is best viable in a **multi-bay environment design** and allows for the treatment and imaging of a minimum of four patients. A single ceiling-mounted mobile X-ray unit can be used to image all the patients who may be brought into such an integrated treatment and imaging room.



Figure 10: Combined trauma treatment and imaging facility

The regulatory framework for controlling radiation safety in design, installation and operation of X-ray equipment for medical diagnostic purposes in India is governed by “The Safety Code for Medical Diagnostic X-ray Equipment and Installations” published by Atomic Energy Regulatory Board (AERB), Govt. of India. Therefore care must

be taken that the installation and room layout should be in accordance with the specifications of the Safety Code.

TREATMENT AREAS (YELLOW AREA)

A typical treatment cubicle should be minimum 12m² in size and the minimum space between two beds should be atleast 2.4 metres. Each cubicle should have a patient trolley, examination light of atleast 30,000 lux, manifold points including two each for oxygen & suction, physiological monitoring equipment, etc. The total number of treatment areas should be at least 1/1100 yearly attendances or 1/400 yearly admissions, whichever is greater in number. At least 50% of treatment cubicles should have centrally monitored physiological monitoring and should be directly observable from the Staff Duty Station. Special function treatment areas like plaster / dental / ophthalmic examination room, etc. should be planned as per the requirement and are not considered in the calculation for treatment area cubicle numbers.

All treatment areas should be equipped identically, irrespective of whether the cubicle is likely to be used for ambulatory care or for 'major' care. This will facilitate the safe immediate management of patients in the event of unexpected deterioration in a patient's clinical status and will allow the flexible use of the cubicles in times of MCI or disaster and in future expansion.



Figure ...: Sample Multiple Bay Treatment Area

TRAUMA OPERATING ROOM

Ideally, the trauma ORs should be located nearby or adjacent to the Resuscitation Suite to minimize transportation time for an unstable trauma patient. On the basis of functional program and the schematic design, the size of the OR and the layout of the surgical suite should be established. An OR size between 600 and 750 sqft can accommodate most surgical procedures required in trauma care with portable imaging equipment being used. If considering fixed imaging equipment in the OR, room sizing requires specific planning in the context of the modality and type of procedures to be performed.

For a Trauma OR, a vertical downdraft air curtain system with terminal HEPA Filtration is recommended. The diffuser panels in the ceiling should be located above the predominant position of the OR table (patient) to provide maximum benefit of the vertical downdraft air curtain effect. Return air should be located near the floor level as

far from each other as possible. This system must ensure a minimum of 15 air changes per hour with a relative humidity range of 30% to 60% and a design temperature between 60°F and 85°F.

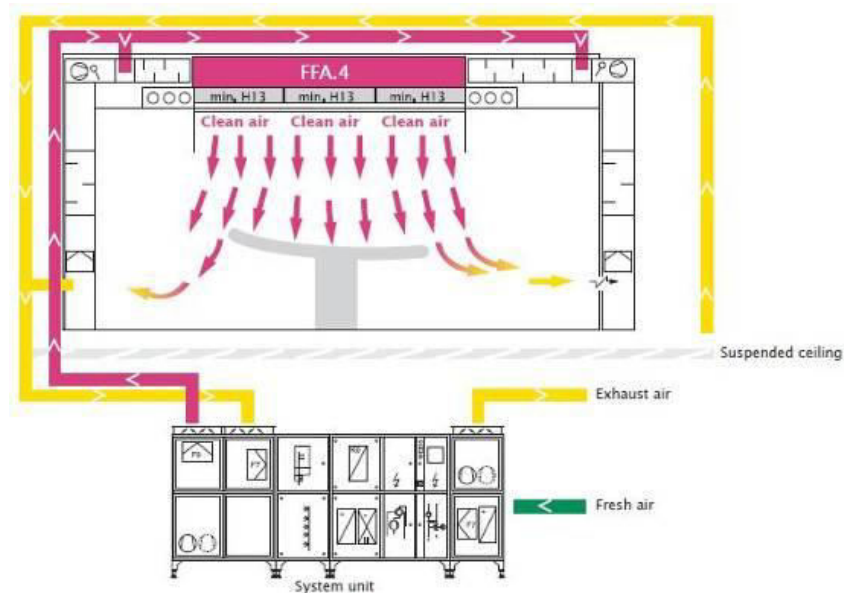


Figure....: Recommended Laminar Airflow in a Trauma OR

Trauma ORs should have general lighting as well as surgical lighting units. Surgical lights should be dual dome lights capable of delivering a maximum central luminance of at least 1,50,000 lux in the operating field when measured at 1m distance. These lights should be mounted on articulating arms to provide a wide range of motion during various surgical procedures and should be capable of delivering cool shadow less light with variable intensity / colour as per requirement. To avoid adaptation problems for the human eye when lines of sight switch between the operating field and the surrounding area, the luminance of the general room lighting needs to be graduated up to 2,000 lux in the immediate vicinity of the operating table (3m x 3m) and to 1,000 lux beyond that.

Further the interior fit and finish in a Trauma OR should be focused towards an infection free environment. All floor, wall, and ceiling-mounted fixtures and access panels are should be sealed to prevent entry of dust & contaminants in the OR. The floor in the OR should be conductive, monolithic, joint-free, nonporous, slip-resistant in wet and dry conditions, handle frequent hard cleaning, and capable of handling heavy rolling loads. Wall finishes should be impermeable to fluids, free of fissures, open joints, or crevices that may retain dirt particles, and washable. The ceiling should be monolithic and free from cracks or perforations.



Figure...: Indicative Layout & Interiors of a Trauma OR

TRAUMA CARE FACILITY NORMS

INFRASTRUCTURE

Infrastructure			
	L-I	L-II	L-III
1 ICU beds	30 beds (10- ICU 20 -General trauma beds)	20 beds (10-ICU 10 General trauma beds)	10 beds (5-ICU 5- General trauma beds)
2 Operation Theatres	4	2	1

EQUIPMENT

S.N.	Equipment	Level I	Level II	Level III
Radiology Equipments				
1	Image intensifier (C-Arm) - with CD Rom, Printer, 12" CCD, Double Monitor, Facilities for Electronic Transmission and Networking for Tele-Radiology with X-ray and DSA facilities for O.T	1	1	-
2	3-D Ultrasonography - Trolley based	1	1	-
3	Ultrasonography - Trolley based	-	-	1
4	800 mA digital X-ray machine with processor	1	-	-
5	500 mA X-ray Machine with CR System and camera for both X-Ray machine	-	1	1
6	100 mA Portable X-ray machine	1	1	1
7	CT scan -64 slices	1	-	-
8	CT Scan-16 or more slice	-	1	-
9	Portable ultrasound	1	-	-
Rehabilitation Equipments				
10	SW Diathermy	1	1	NA
11	IFT machine	1	1	-

12	Cervical traction & Lumbar traction	1	1	-
13	Physiotherapy Equipments	1	1	-
Anaesthesia Equipments				
14	O.T. Table - 4 segments, translucent top with Orthopedics attachment	2	2	-
15	O.T. Table - 3 segments, translucent top with Orthopaedic attachment	-	-	2
16	Cautery machine - mono & bi polar with underwater cutting	2	-	-
17	Cautery machine - mono & bi-polar	-	2	2
18	O.T ceiling light - shadow less with inbuilt camera & monitor	2	-	-
19	O.T. ceiling light- shadow less	-	2	2
20	Central suction & central pipe line	1	1	-
21	High vacuum suction machine	2	2	-
22	Suction machine	-	-	4
23	Anesthesia machine with monitor 6-8 channel (Parameters: Agent monitoring, NIBP, SPO2, ET CO2, ECG, Temp., IBP)	4	2	-
24	Anesthesia machine with monitor Parameters: Agent monitoring, NIBP, SPO2, ET CO2, ECG, Temp., IBP)	-	-	2
25	Transport ventilator	1	1	1
26	Ventilator with high end compressor	10	10	5
27	ABG Machine-Hand held analyzer	-	-	1
28	Defibrillator with monitor (Parameters: NIBP, ECG, SPO2 with AED)	10	10	5
29	Monitor (Large screen with ECG, SPO2, NIBP,ATCo2)	20	10	5
30	Operating microscope	2	-	-
31	Operating head lights	2	2	-

32	Manifold system in ICU	1	1	-
33	Patient warming system	1	1	-
34	Syringe infusion pump	5	3	1
Orthopedic Equipments				
35	Pneumatic tourniquet	2	2	2
36	Power drill & power saw	2	1	1
37	Splints & traction devices	2	2	
38	General orthopedic instrument sets	2	2	1set
OT Equipments				
39	General surgical instrument	2 sets	2 sets	2 sets
40	Thoracotomy instrument	1 set	1 set	-
41	Spinal surgery instrument	1 set	1 set	-
42	Facio-maxillary instrument	1	-	-
43	Craniotomy instrument	2 sets	2 sets	1set
44	Lab automatic blood gas analyzer	1	1	-
45	Humidity control meter	1	1	1
Other Facilities				
46	Blood bank & Microbiology facility	1	1	-
47	Electricity back up	1	1	1
48	Laminar air flow	1	1	-
49	ICU beds	10	10	5
50	10 bedded step down/recovery unit with 5 monitors with(4 channels)	1	-	-
51	5 bedded step down/recovery unit with 3 monitors with(4 channels)	-	1	1

HUMAN RESOURCES

S.N.	Human Resource	Level I	Level II	Level III
1	Neuro Surgeon	4	1	-
2	Radiologist	2	2	-
3	Plastic Surgeon	1	-	-
4	Anaesthetist	6	3	2
5	Orthopaedic Surgeon	4	3	2

6	General Surgeon	6	2	2
7	Casualty Medical Officer	30	8	6
8	Staff Nurse (including Trauma Nurse Coordinators)	100	40	25
9	Nursing attendant	24	16	13
10	OT Technician	10	5	5
11	Radiographer	4	4	4
12	Lab Technician	4	2	2
13	MRI Technician	2	-	-
14	Multi task worker	40	15	12
	Total	237	101	73

** Preferably PG / Diploma in General Surgery / Anaesthesia*

** The specialists can be engaged under public private mode in case they are not available on contractual basis. A one-time remuneration between Rs. 5000-10000 per visit may be fixed by the states on the basis of specialists and the nature of emergency.*

NEW TRAUMA CARE FACILITIES

Under the 12th Five Year Plan, 85 new trauma care facilities (5 Level-I; 25 Level-II; and 55 Level-III) will be established in existing government hospitals in or around national and state highways, preferably in accident prone areas on these highways.

These new Trauma Care Facilities would be identified on the following national / state highways:

- ❑ Connecting two capital cities
- ❑ Connecting major cities other than capital cities
- ❑ Connecting ports to major cities
- ❑ Connecting industrial townships with capital city

The criteria for the north eastern and other hilly states will be relaxed in respect of hospital beds and distance, keeping in view, their location and vulnerability to accidents and difficult access due to hilly terrain. Further, preference will be given to States, which were not covered in the 11th Plan.

The Ministry of Road Transport & Highways, Govt. of India & various State Governments maintain a database of **Accident Blackspots** – viz. locations / stretches where road traffic accidents have historically been concentrated. These blackspots are often due to improper road engineering, unsafe driving behavior, absence of pedestrian crossings, etc. and contribute for almost 2/3rd of accidental deaths. Hence it is

extremely important to co-locate the Trauma Care Facilities within a reasonable distance from the Blackspot so as to ensure definitive care to the injured with the Golden Hour.

Consequently, while identifying healthcare facilities for upgradation of Trauma Care Services under this scheme, priority should be accorded to those existing hospitals in the State, which are within 100km radius of these identified Blackspots and the mortality due to Trauma has been consistently high there despite all possible road safety interventions.



Under this scheme, the State Governments are required to nominate an appropriate official as the **State Nodal Officer** who shall be the single point of contact with MoHFW for all activities related to the Scheme. The State Nodal Officers are required to submit self-contained proposals to MoHFW in the prescribed format placed at **Annexure I** to requisition for upgradation of Trauma Care Services in identified Government

Hospitals after seeking the requisite administrative / technical approvals within the State. The said proposals must explicitly convey the commitment of the State Government to contribute its share of expenditure in a time bound manner.

Following the receipt of proposals from the State Governments, MoHFW shall initially evaluate the same internally on a case-to-case basis. Shortlisted hospitals will be visited by a team of MoHFW for a detailed gap analysis and feasibility study based on the findings of which the decision to recommend a particular hospital for upgradation shall be taken. The designation of the identified Trauma Care Facility as Level I, II or III shall be decided by MoHFW based on the expected load, morbidity and mortality profile of the trauma cases in the catchment area, level of other trauma care facilities around the said hospital, status of existing services at the hospital, etc. Further, as the hospitals being identified for upgradation will already be functional with major facilities in place, funding under this scheme will be given only to fill the deficiencies identified with regard to Trauma Care in each sub component, subject to the maximum cap as permissible under the scheme guidelines.

Steps in Identification of a new Trauma Care Facility

Step I

- Request for proposals by MoHFW to upgrade Trauma Care Facilities in existing Hospitals along National / State Highways
- The proposals must be supported by justification in terms of accident blackspot data, status of existing trauma care facilities, etc.

Step II

- Submission of self contained proposal by State Governments for upgradation of appropriate Hospitals along the Highways.
- The proposal must contain preliminary estimates and commitment of State Govt. to contribute its share of expenses

Step III

- Gap analysis & feasibility study at shortlisted hospitals to finalize location /designation of Trauma Care Facilities.
- Formal approval of State Govt. proposal by MoHFW

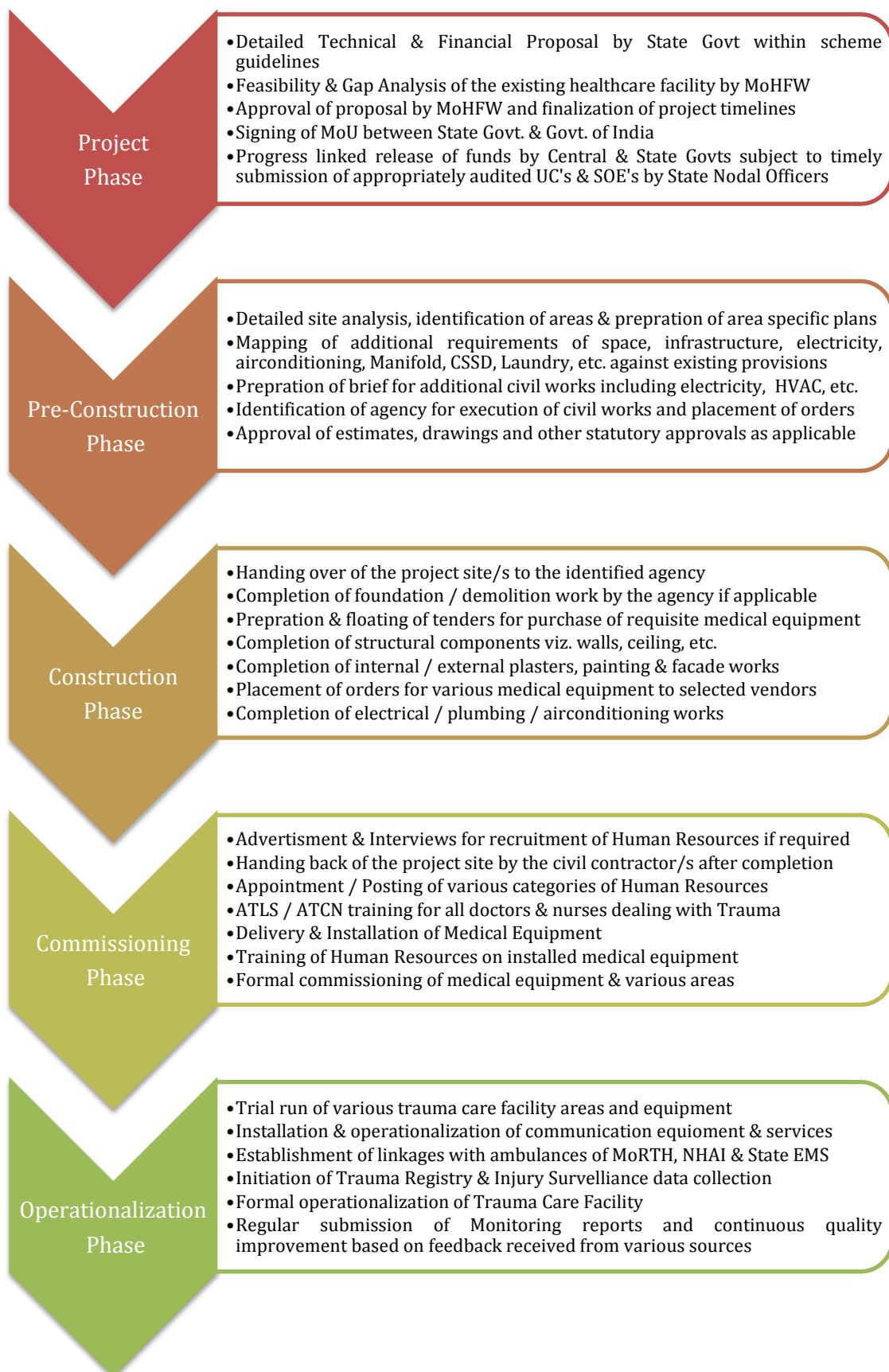
Step IV

- Submission of a hospital specific detailed project report by State Nodal Officers for the approved proposals
- Signing of MoU's with State Governments clearly delineating Central & State Government commitments.

Step V

- Progress linked release of Central & State Government funds
- Timely submission of audited UC's by the State Nodal Officers
- Continuous monitoring & surveillance at the Central & State Level

Steps in Operationalizing a Trauma Care Facility]



FINANCIAL GUIDELINES

AnMoU shall be signed between the State Government & Ministry of Health & Family Welfare, Govt. of India detailing the exact financial assistance to be provided. For reference, the normative costs and funding details for Trauma Care Facilities under this scheme are given below:

I. Normative Cost Levels for Trauma Center's sanctioned during the 12th FYP

A. Non-recurring cost

S.N.	Normative cost	12 th FYP (in Crore)		
		Level I TC	Level II TC	Level III TC
1	Building**	2.0000	1.5000	1.0000
2	Equipment	12.0000	6.0000	2.4000
3	Communication	0.0240	0.0240	0.0240
4	Legal Services & Data Entry	0.0120	0.0120	0.0060
5	Training	0.1200	-	-
6	Total (inclusive of State's share)	14.1560	7.5360	3.4300

*** Building cost should not exceed ₹ 30, 000 per square meter*

B. Recurring cost

S.N.	Normative cost	12 th FYP (in Crore)		
		Level I TC	Level II TC	Level III TC
1	Cost for Human Resource cost per year (Maximum for 3 years)	5.16000	4.56000	2.52000
2	Total (inclusive of State's share)	5.16000	4.56000	2.52000

- During the **12th Plan**, the scheme has been incorporated into the centrally sponsored scheme – “Human Resources for Health and Medical Education” and the funds would be released along with the consolidated funds for the states.
- The funding for the new trauma centers identified during the 12th Plan would be shared between the centre and the states in the ratio of 70:30 while for the north-east and hill states of Uttarakhand, Himachal Pradesh and Jammu & Kashmir, it would be in the ratio of 90:10.

II. Normative Cost Levels for Trauma Center's sanctioned during the 11th FYP

C. Non-recurring cost

S.N.	Normative cost	11 th FYP (in Crore)		
1	Building	1.5000	0.8000	0.6500
2	Equipment	10.0000	5.0000	2.0000
3	Communication	0.0200	0.0200	0.0200
4	Legal Services & Data Entry	0.0100	0.0100	0.0050
5	Training	0.1000	-	-
6	Total (100% funded by Central Govt. Grant in Aid)	11.6300	5.8300	2.6750

D. Recurring cost

S.N.	Normative cost	11 th FYP (in Crore)		
		Level I TC	Level II TC	Level III TC
1	Cost for Human Resource cost per year (Maximum for 3 years)	4.30000	3.80000	2.10000
2	Total (100% funded by Central Govt. Grant in Aid)	4.30000	3.80000	2.10000

The funding for the 11th Plan trauma care centres would be continued on 100 per cent central grant-in-aid basis to the states, except for those centres, where work could not commence during

the 11th Plan, where funding would be on the aforementioned cost sharing basis.

MONITORING & SURVEILLANCE

MoHFW, GoI is establishing a National Trauma Registry & Injury Surveillance System. All Trauma Care Facilities under this scheme shall have to mandatorily provide all relevant information to the said Registry in the prescribed format from time to time. Registry, National Injury Surveillance System (NISS), Monitoring and Capacity Building of the personnel at the Trauma Center.

ANNEXURE I: STATE REQUISITION FORMAT FOR ESTABLISHING TRAUMA CENTRE

Title of the Scheme: *Capacity building for developing trauma care facilities in Government Hospitals on National Highways*

Name of State	
Name of Hospital for proposed Trauma Center	
Level of Trauma Center	
Name of Hospital In-Charge	
Designation of Hospital In-Charge	
Address of Hospital	
Email id	
Telephone/Mobile No:	
Fax No:	
Is the hospital receiving funding for Trauma Care from any Central Government Scheme viz. NRHM, etc. If, yes then please furnish details.	

I. GENERAL INFORMATION OF HOSPITAL

S.N.	Proposed Trauma Center	Status (Put a ✓ mark wherever applicable)		
1	Name of National Highway			
2	Distance from the National Highway (in Km)			
3	Accessibility of Hospital from Highway/Main Road	1. Yes 2. No		
4	Level of health care	1. Community Health Center 2. District Hospital 3. Medical College & Hospital 4. Others		
5	Name of nearest referral hospital			
6	Distance of nearest referral hospital (in Km)			
7	No. of Ambulance in hospital			
8	Total No. of Beds in Hospital	Female	Male	Total
	1. General Surgery			
	2. Orthopaedic Surgery			
	3. Nuero Surgery			
4. Casualty Department				
9	No. of Operation Theatres			
	Availability of ICU	1. Yes 2. No		
10	Availability of 24*7 hour service	1. Yes 2. No		
11	Availability of 24*7 hours Blood Bank	1. Yes 2. No		
12	Availability of Pharmacy in hospital	1. Yes 2. No		
13	Availability of casualty department	1. Yes 2. No		
14	No. of patients admitted in IPD in a month (Average)			
15	No. of trauma cases in a month (Average)			
16	No. of burn cases in a month (Average)			
17	No. of deaths related to trauma in a month (Average)			
18	Space available for proposed Trauma Center (in sqft)			

II. STATUS OF HUMAN RESOURCE

Level – I Trauma Center (Put a ✓ mark wherever applicable)

S.N.	Human Resource		Requirement as per scheme	Status		Remarks
				Available	Not Available	
1	Specialist*	Neuro Surgeon	4			
2		Radiologist	2			
3		Plastic Surgeon	1			
4		Anaesthetist	6			
5		Orthopaedic Surgeon	4			
6		General Surgeon	6			
7		Casualty Medical Officer	30			
8	Nursing Staff	Staff Nurse	100			
9		Nursing attendant	24			
10	Para Medics	OT Technician	10			
11		Radiographer	4			
12		Lab Technician	4			
13		MRI Technician	2			
14	Multi task worker	Multi task worker	40			

- Preferably PG/Diploma in General Surgery/Anaesthesia.

II. STATUS OF HUMAN RESOURCE

Level - II Trauma Center (Put a ✓ mark wherever applicable)

S.N.	Human Resource		Requirement as per scheme	Status		Remarks
				Available	Not Available	
1	Specialist*	General Surgeon	2			
2		Radiologist	2			
3		Orthopaedic Surgeon	3			
4		Anaesthetist	3			
5		Neuro Surgeon	1			
6		Casualty Medical Officer	8			
7	Nursing Staff	Staff Nurse	40			
8		Nursing attendant	16			
9	Para Medics	OT Technician	5			
10		Radiographer	4			
11		Lab Technician	2			
12	Multi task worker	Multi task worker	15			

*The HR under specialists can be engaged under public private mode in case they are not available on contractual basis. A one-time remuneration between Rs. 5000-10000 per visit may be fixed by the states on the basis of specialists and the nature of emergency.

II. STATUS OF HUMAN RESOURCE

Level - III Trauma Center (Put a ✓ mark wherever applicable)

S.N.		Human Resource	Requirement as per scheme	Status		Remarks
				Available	Not Available	
1	Specialist*	General Surgeon	2			
2		Orthopaedic Surgeon	2			
3		Anaesthetist	2			
4		Casualty Medical Officer	6			
5	Nursing Staff	Staff Nurse	25			
6		Nursing attendant	13			
7	Para Medics	OT Technician	5			
8		Radiographer	4			
9		Lab Technician	2			
10	Multi task worker	Multi task worker	12			

*The HR under specialists can be engaged under public private mode in case they are not available on contractual basis. A one-time remuneration between Rs. 5000-10000 per visit may be fixed by the states on the basis of specialists and the nature of emergency.

III. STATUS OF EQUIPMENT:

Level I:

(Put a ✓ mark wherever applicable)

S.N.	Equipment	Requirement as per scheme	Available but Functional	Available but Non Functional	Not Available	Remarks
1	Image intensifier (C-Arm)	1				
2	4D Ultrasonography - Trolley based	1				
3	1000 MA digital X-ray machine with processor	1				
4	CT scan more than 32 slices	1				
5	3.0 Tesla MRI	1				
6	Angiography C-Arm based+ - angiosuite	1				
7	100 mA Portable X-ray machine	1				
8	O.T. Table - 4 segments, translucent top with orthopaedic attachment	2				
9	Cautery machine - mono & bi polar with underwater cutting	2				
10	O.T ceiling light - shadow less with inbuilt camera & monitor	2				
11	Central suction & central pipe line	1				
12	High vacuum suction machine	2				
13	Anaesthesia machine with monitor 6-8 channel	4				
14	Standard ventilator	15				
15	Pneumatic tourniquet	2				
16	General surgical instrument	2				
17	Thoracotomy instrument	1				
18	Spinal surgery instrument	1				
19	Faciomaxillary instrument	1				
20	Power drill & power saw	2				
21	Craniotomy instrument	2				
22	Splints & traction	2				
23	Lab automatic blood gas analyser	1				

S.N.	Equipment	Requirement as per scheme	Available but Functional	Available but Non Functional	Not Available	Remarks
24	Automatic Bio-Analyser	1				
25	Patient warming system	1				
26	Defibrillator	4				
27	Defibrillator with monitor	15				
28	Portable ultrasound fast	1				
29	Operating microscope	2				
30	Operating head lights	2				
31	Digital bed	25				
32	10 bedded step down/recovery unit with 5 monitors with 4 channels					
33	Rehabilitation Equipments	SW Diathermy				
34	Rehabilitation Equipments	IFT machine				
35	Rehabilitation Equipments	Cervical traction				
36	Rehabilitation Equipments	Lumbar traction				
37	Rehabilitation Equipments	Physiotherapy Equipments				
38	Blood bank	Required				
39	Microbiology facility	Required				
40	Ventilator with 6 channels	25				
41	Monitor	25				
42	Suction machine	2				
43	Humidity control meter	1				
44	Laminar air flow	2				
45	Manifold system in ICU	1				
46	Bed mattress & linen	35				
47	Electricity back up	1				
48	O.T with all accessory	4				

III. STATUS OF EQUIPMENT:

Level II

(Put a ✓ mark wherever applicable)

S.N	Equipment	Requirement as per scheme	Available but Functional	Available but Non Functional	Not Available	Remarks
1	Image intensifier (C-Arm)	1				
2	3 D Ultrasonography - Trolley based	1				
3	500 mA X ray machine with dark room facility	1				
4	CT scan multi slice	1				
5	100 mA Portable X-ray machine	1				
6	O.T table - 4 segment, translucent top with orthopaedic attachment	1				
7	Cautery machine - mono & bi polar with underwater cutting	2				
8	O.T ceiling light - shadow less	2				
9	High vacuum suction machine	2				
10	Anaesthesia machine with monitor 6-8 channel	2				
11	Central suction & central pipe line	1				
12	Standard ventilator	2				
13	Pneumatic tourniquet	2				
14	General surgical instrument	2 set				
15	Thoracotomy instrument	1 set				
16	Spinal surgery instrument	1 set				
17	Power drill & power saw	1				
18	Craniotomy instrument	2 set				

S.N.	Equipment	Requirement as per scheme	Available but Functional	Available but Non Functional	Not Available	Remarks
19	Splints & traction	2				
20	Lab automatic blood gas analyser	1				
21	Patient warming system	1				
22	Defibrillator	2				
23	Operating microscope	1				
24	Fowler's bed	20				
25	10 bedded step down/recovery unit with 5 monitors with 4 channels					
26	Rehabilitation Equipments	SW Diathermy				
27	Rehabilitation Equipments	IFT machine				
28	Rehabilitation Equipments	Cervical traction				
29	Rehabilitation Equipments	Lumbar traction				
30	Rehabilitation Equipments	Physiotherapy Equipments				
31	Blood bank	Required				
32	Microbiology facility	Required				
33	Ventilator with 6 channels	20				
34	Monitor	20				
35	Laminar air flow	1				
36	Electricity back-up for 8 hours	1				
37	General orthopaedic instrument sets	2				
38	500 mA X-ray machine	1				

II. **STATUS OF EQUIPMENT: Level III:** (Put a ✓ mark wherever applicable)

S.N.	Equipment	Requirement as per scheme	Available but Functional	Available but Non Functional	Not Available	Remarks
1	500 mA X-ray machine	1				
2	Ultrasonography – Trolley based	1				
3	O.T. Table – 3 segments, translucent top with orthopaedics attachment	2				
4	Cautery machine – Monopolar	2				
5	O.T. ceiling light	2				
6	Suction Machine	4				
7	Anesthesia Machine with monitor	2				
8	Portable ventilator	1				
9	Pneumatic tourniquet	2				
10	General surgical instruments	2				
11	I.V. Fluids & Drugs (recurring expenditure)	1				
12	Defibrillator	1				
13	Beds with I.V. stands with head raising – 5 Nos	14				
14	Patient Trolleys on 6'' wheels	2				
15	Splints and traction	1				
16	ABG machine	1				
17	Ventilator	10				
18	Monitor	10				
19	Bed mattresses plus linen	14				
20	Electricity back up for 8 hrs	1				
21	Craniotomy set	1				
22	Thoracotomy set	1				
23	Power drill	1				
24	Power saw	1				
25	Slice CT scan	1				

IV. STATUS OF INFRASTRUCTURE:

Level I

(Put a ✓ mark wherever applicable)

S.N.	Infrastructure	Requirement as per scheme	Available & Functional	Available but Non Functional	Not Available	Remarks
1	ICU Beds for Trauma	10				
2	General Trauma Beds	20				
3	Operation Theatres	4				

Level II

(Put a ✓ mark wherever applicable)

S.N.	Infrastructure	Requirement as per scheme	Available & Functional	Available but Non Functional	Not Available	Remarks
1	ICU Beds for Trauma	10				
2	General Trauma Beds	10				
3	Operation Theatres	2				

Level III

(Put a ✓ mark wherever applicable)

S.N.	Infrastructure	Requirement as per scheme	Available & Functional	Available but Non Functional	Not Available	Remarks
1	ICU Beds for Trauma	5				
2	General Trauma Beds	5				
3	Operation Theatres	1				

Sign & seal of Medical Superintendent