Pre-Hospital care for trauma patients

Dr Mathew Varghese

St Stephen’s Hospital, Delhi, India
Care of the injured

Includes

Resuscitation
Stabilisation
Definitive care
Rehabilitation
Pre-hospital care

TRAUMA DEATHS

TRUNKEY’S CLASSIFICATION

• Immediate (0-1hr)  50%

• Early (1 hr - 1 wk)  30%

• Late (> 1wk)  20%

(Trunkey 00 SC Am 249(28)1983)
Pre-hospital care

Trauma deaths

- 60% AT SITE
- 40% IN HOSPITAL
- 50% CNS DEATHS

21% PREVENTABLE

(32% ICU, 34% ER 25% OR, 5.8% WR, 1.9% RR)

(KREIS DAVID JT 26(7) 1986)
Pre-hospital care

SUPPORTIVE CARE
TILL
DEFINITIVE CARE
Pre-hospital care

The best

The worst

The optimum
Pre-hospital care

TRIAGE

Classification of patients according to medical needs and matching of these patients with available care resources
Pre-hospital care

BLS

• Basic airway support
• Spine immobilisation
• Supplemental oxygen
Pre-hospital care

RESUSCITATION

A  AIRWAY
B  BREATHING
C  CIRCULATION

Now  CAB
Pre-hospital care

Airway/breathing

• Cleaning of airway
• Extension
• Lifting of jaw
• Mouth-to-mouth respiration.
• Intubation
Pre-hospital care

Circulation

• Control of bleeding
• Blood transfusion
• IV fluids
• PASG/MAST.
Pre-hospital care

Control of bleeding

• Elevation
• Pressure
• Tourniquet
• Surgical
Pre-hospital care

Blood transfusion

- O-Vs BLOOD
- AVAILABILITY
- AIDS
- BLOOD GROUPS
Pre-hospital care

IV fluids

Bleeding

B P

Severe vasoconstriction

Local blood flow

Facilities clot formation

(KRAUSZMM JT 33(1)1992)
Pre-hospital care

IV access

Problems

- Shocked patients
- Children
- Trained personnel
- > Time taken
- Rate of infusion?
Pre-hospital care

IV FLUIDS

New technologies

- Very large bore catheters
- Rapid infusion devices
- Hypertonic saline
- Intraosseous fluids
Pre-hospital care

IV FLUIDS

Computer modelling

IV fluids benefit only when

• Bleeding rate > 25-100ml/min
• Prehospital time > 30 min
• Iv infusion rate = bleeding rate
Pre-hospital care

IV access

- Failed in 27% (10-30%)
- Time taken 10-12 min
- Rate 500-il

(KRAUSZMM JT 33(1)1992)
Pre-hospital care

IV fluids
Penetrating truncal injury patients
300 patients

No significant difference in

• Survival rate
• Hospital discharge
• Complications

(RUSSEL MARTIN R JT 33(3) 1992)
Pre-hospital care

IV Fluids

Improved survival

• Peri-operative complications

In patients with penetrating torso injuries with delayed resuscitation

(BICKELL et. al NEJM 1994)
Pre-hospital care

IV Fluids

**ATLS** Protocol (Earlier than 2008)

- 2 large bore (16 G or >) catheters introduced
- Ringer’s lactate
  - 1-2 ltrs in adults
# Pre-hospital care

Mortality rates in patients with and without iv fluids

<table>
<thead>
<tr>
<th>ISS</th>
<th>FLUIDS</th>
<th>NO FLUIDS</th>
<th>SIGNIFICANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;25</td>
<td>1.0%</td>
<td>1.0%</td>
<td>NS</td>
</tr>
<tr>
<td>25 - 50 / BP&gt;90</td>
<td>16%</td>
<td>14%</td>
<td>NS</td>
</tr>
<tr>
<td>25 - 50 / BP&gt;90</td>
<td>37%</td>
<td>38%</td>
<td>NS</td>
</tr>
<tr>
<td>&gt;50 / BP&gt;90</td>
<td>74%</td>
<td>71%</td>
<td>NS</td>
</tr>
<tr>
<td>&gt;50 / BP&lt;90</td>
<td>90%</td>
<td>86%</td>
<td>NS</td>
</tr>
</tbody>
</table>

KAWESKI SM JT 30(10) 1990
Pre-hospital care

PASG/MAST

• Used since late 1970s
• Corrects hypotension by
  >Peripheral resistance
  Auto transfusion
Pre-hospital care

PASG/MAST

Survival not improved
Despite increase in BP

(RUSSELMARTIN R JT 33(3) 1992)
Pre-hospital care

Surgical control of hemorrhage key to reducing mortality following trauma

(CIRCULATION SUSAN MK JT 30(10)1990)
Pre-hospital care

THE GOLDEN HOUR
(COWLEY RA 1977)

THE PLATINUM 1/2 HOUR
(PEPE PE 1990)
Pre-hospital care

The Golden hour

The golden hour scientific fact or urban legend ?

Lerner EB, Mascati R, Academic Emerg. Medicine, 8(7); 758-760, 2001
The Golden Hour: Scientific Fact or Medical "Urban Legend"?

E. BROOKE LERNER, MS, EMT-P, RONALD M. MOSCATI, MD

Abstract. The term "golden hour" is commonly used to characterize the urgent need for the care of trauma patients. This term implies that morbidity and mortality are affected if care is not instituted within the first hour after injury. This concept justifies much of our current trauma system. However, definitive references are generally not provided when this concept is discussed. It remains unclear whether objective data exist. This article discusses a detailed literature and historical record search for support of the "golden hour" concept. None is identified. Key words: emergency medical services; time; transportation; trauma; golden hour. ACADEMIC EMERGENCY MEDICINE 2001; 8:758-760

There are no large, well-controlled studies in the civilian population that either strongly support or refute the idea that faster is universally better in trauma care. The numerous smaller studies are not sufficiently similar to use meta-analysis to resolve the question. While it appears the term most
## Pre-hospital care

### TRANSPORTATION TIMES

<table>
<thead>
<tr>
<th>WAR</th>
<th>TRANSPORTATION TIMES</th>
<th>MORTALITY</th>
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</thead>
<tbody>
<tr>
<td>WW I</td>
<td>12-18 HRS</td>
<td>8.0%</td>
</tr>
<tr>
<td>WW II</td>
<td>6-12 HRS</td>
<td>4.5%</td>
</tr>
<tr>
<td>KOREAN</td>
<td>2-4 HRS</td>
<td>2.5%</td>
</tr>
<tr>
<td>VIETNAM</td>
<td>1.5 - 2 HRS</td>
<td>2.0%</td>
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</table>
# Pre-hospital care

## Mean Prehospital Times Found in Several Studies

<table>
<thead>
<tr>
<th>SITE</th>
<th>Response</th>
<th>Scene</th>
<th>Transfer.</th>
<th>TOTAL</th>
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<tbody>
<tr>
<td>HOUSTON</td>
<td>5.32</td>
<td>15.6</td>
<td>11.7</td>
<td>32.06</td>
</tr>
<tr>
<td>WASHINGTON</td>
<td>12.3</td>
<td>24.9</td>
<td>19.4</td>
<td>58.08</td>
</tr>
<tr>
<td>ORANGE COUNTY CALIFORNIA</td>
<td>-</td>
<td>-</td>
<td>8.00</td>
<td>23.00</td>
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<tr>
<td>DENVER</td>
<td>4.66</td>
<td>9.79</td>
<td>8.04</td>
<td>20.49</td>
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<tr>
<td>OHIO</td>
<td>4.6</td>
<td>-</td>
<td>-</td>
<td>20.00</td>
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<tr>
<td>BELFAST</td>
<td>4.57</td>
<td>4.96</td>
<td>4.83</td>
<td>14.36</td>
</tr>
</tbody>
</table>

TIME (MINUTES)

VR. J. SURG (FEB 1992)
Pre-hospital care

TRANSPORTATION

- Personal vehicles
- Taxies
- Police vehicles
- Air ambulances
- Boat ambulances
Time taken to reach hospital

AllIMS Casualty Study 1989
Pre-hospital care

Ghana Transfer Modes

- Taxis 58%
- Pvt. Cars 22%
- Bus 7%
- Police 2%
- Unspecified 11%
- Ambulance none
Pre-hospital care

AMBULANCES

Surely speed matters?

What about sirens and flashing lights?
Pre-hospital care

AMBULANCES

With sirens and flashing lights

Mean saving of time

In 50 trips 43.5 seconds

(STUDY DONE IN A POPULATION OF 48,0000)
Lights and Sirens Can Be Dangerous!
Pre-hospital care

Higher incidence of fatal crashes during emergency use of ambulances

Pre-hospital care

Helicopter ambulances

In a study on 30,339 subjects in 11 countries

Patients transported by ambulance

51% Austria

41% Germany

30% Australia

Roudsari BS et al Injury 38 ((9) 1001 – 13, 2007
Pre-hospital care

Helicopter ambulances

Trauma centers with helipads are fashionable as state-of-the-art trauma care facility
Pre-hospital care

Helicopter ambulances

Transfer by helicopter ambulances

Did not affect the estimated odds of Survival

(BRAITHWAIT , CEM JT 45 (1) 1998)
Pre-hospital care

Transportation

Flying squads more on Emotional appeal
Rather than scientific Evidence of their value

(LARSEN OF IAATM 1992)
DARE
To
Save a Heart
Save a Life
Dispatcher-Assisted First Responder Programme
Pre-hospital care

MEDICATIONS

No evidence to show any benefit
Pre-hospital care

Medications

Most are pain killers

Narcotics and Propofol
Pre-hospital care

Medications

Recently some promise with Tranexamic acid to reduce bleeding

Pre-hospital care

First aid

• Wound care
• Modern vs Traditional
• Water the best medicine
• Splinting
Pre-hospital care

Bystander CPR

Attempted CPR incorrect in more than 60% of cases
Pre-hospital care

Pre-hospital cardiac arrest

138 CASES HAD CPR (1% OF INJURED)

23 CASES HAD CPR

NO SURVIVORS

ROSE MURGY AS JT 35(3) 1993
Pre-hospital care

Resuscitation skills

- Cognitive
- Psychomotor

Who should do?

Medic?  Paramedic?  Lay person?
Pre-hospital care

BLS VS ALS

Outcome of trauma not affected by ALS on the scene

(SAMPALIS J JT 34(2) 1993)
Pre Hospital care

Research
EMS vs NON EMS transfer of critically ill patients

Los Angeles county
103 Patients, ISS 13 or more
Non EMS patients reached faster than EMS patients
Deaths, hospital stay and complications similar

Cornwell EE, Arch of Surg. 2000
Bertram JP et al 2009
Pre Hospital care

Research

OPALS Major trauma study: impact of ALS on survival and morbidity

Ontario prehospital ALS study 17 cities
2867 patients

Outcome did not differ with ALS vs BLS
In GCS <9 Survival lower in the ALS group

Prehospital ALS, Intubation, >> mortality with
Prehospital IV fluids showing No benefit

Steill IJ et al CMAJ 2008
Pre-hospital care

On site ATLS increases scene time
Without providing any benefit

(SAMPALIS JS JT 39(12) 1997)
Pre-hospital care

BLS VS ALS

Better outcome when ATLS given

In hospital setting

(JAME L JT 34(6) 1993)
Pre-hospital care

BLS VS ALS

Cochrane Review

At this time evidence suggests that there is no benefit of ALS training for Ambulance crews

Cochrane Database systematic reviews, Journal of trauma 2010, 20(1)
ALS vs BLS

Patients with out-of-hospital cardiac arrest who received BLS had higher survival at hospital discharge and at 90 days compared with those who received ALS and were less likely to experience poor neurological functioning.

Sanghvi P et al, JAMA, E1–E9, 2014
Pre-hospital care

Improvements in pre-hospital care almost useless if quality of hospital care not improved

(STOCHETTI N et al JT 36(3) 1994)
Pre-hospital care

Where does this all lead to?

?
Pre-hospital care

What should we do to save the lives and limbs of the injured?
Pre-hospital care

Scoop and run

Or

Stay and stabilise?
Pre-hospital care

What is scoop & run?

- Extrication
- Maintenance of airway
- Protection of the spine
- Stopping of hemorrhage
Pre-hospital care

VIP working groups focus

Identifying the most essential

- Skills
- Equipment
- Training

Regardless of resources to provide optimal care for the injured
Issues in pre-hospital care

Lack of data

All that is done is not evidence based

Inequitable distribution of resources
Issues in pre-hospital care

EMS

Little scientific evidence validating its impact on morbidity and mortality

Mann NC et al 2004
Issues in pre-hospital care

EMS

Significant barrier to the evidence is lack of Reliable Uniform DATA

Mann NC et al 2004
Issues in pre-hospital care

There are difficult issues

ETHICAL
LEGAL
Pre Hospital Care

Presumption

Improved survival and functional outcome of injured in the developed countries can be partly attributed to high cost equipment and technology.
Pre hospital Care

WHO guideline recognises

- Lack of evidence about benefits of advanced technology

- Lack of a system
Pre Hospital Care

Committee on future of Emergency Care in the US Health System

- ED overloading
- Ambulance Diversions
- Patient care delays
- Lack of specialists
- Ill prepared for Disasters
Issues in pre-hospital care

Cochrane Reviews
Issues in Pre-hospital care

COCHRANE REVIEW RESULTS

I V fluids

- Hypertonic vs isotonic crystalloid

Review does not give enough data to be able to say clearly a hypertonic crystalloid is better than isotonic crystalloid
Issues in Pre-hospital care

COCHRANE REVIEW RESULTS

SPINAL IMMOBILISATION

- Type of intervention
- Back board
- Rigid and soft collars
- Sand bags, straps or tapes
- Collar and back board combinations
- Holding the head in mid line
- Log rolling the patient
Issues in Pre-hospital care

Cochrane review results

Type of outcome measures

- Mortality
- Neurological injury
- Degree of spinal stability
- Adverse effects

NO TRUE RANDOMISED TRIALS WERE FOUND
Issues in Pre-hospital care

COCHRANE REVIEW RESULTS

1. Ambulance crew with ALS training vs BLS training

2. ATLS vs BLS

ONLY ONE STUDY MET THE CRITERIA
NO TRUE RANDOMISED TRIALS WERE FOUND
SUMMARY OF COCHRANE GROUP FINDINGS

• Early fluid resuscitation in bleeding trauma patients
• No evidence from randomised controlled trials to support
• Hypertonic versus isotonic iv fluid resuscitation
• No evidence that hypertonic saline is better than isotonic saline
SUMMARY OF COCHRANE GROUP FINDINGS

• Spinal immobilisation in trauma patients

  No randomised clinical trials to fit inclusion criteria; therefore issue remains uncertain and increased morbidity and mortality from immobilisation cannot be excluded

• Advanced vs Basic life support training

  One study of insufficient size. Otherwise, no evidence to support the effectiveness of prehospital advanced life support
Issues in pre-hospital care

What is ATLS Protocol?

Essentially a skills based protocol training system for trauma care that requires licensing by the American College of surgeons
Issues in pre-hospital care

ATLS Protocol

Procedures adopted were a consensus approach to trauma management
Issues in pre-hospital care

Consensus statements

‘Danger in consensus guidelines endorsed by clinicians may feel pressured to adopt interventions that may, in the longer term to cost more or do more harm than good.’

Liu B, Finfer S, BMJ, 339 4th July; 3-4, 2009
Issues in pre-hospital care

ATLS Protocol
Taught in 50 countries
Over 1 million trained
International ATLS subcommittee
COT (Committee on trauma) approved
Issues in pre-hospital care

Levels of evidence

1. RCTs with significant differences
   Systematic reviews of level 1
2. Prospective cohort study
   Systematic reviews of level 2 studies
3. Case control study
   Retrospective cohort study
4. Case series
5. Expert opinion

Wright et al JBJS(A)
Issues in pre-hospital care

Guidelines for Fluids in injured

Vascular access in Prehospital setting

A. No level I evidence
B. Level II not in Prehospital for it delays
C. Level III may be tried in transit

Cotton BA et al  Journal of trauma,67; 2, 2009
Issues in pre-hospital care

Guidelines for Fluids in injured

Where should Vascular access be?

A. No level I evidence
B. Level II evidence; should be withheld
C. Level III evidence; withhold until bleeding controlled

Cotton BA et al  Journal of trauma, 67; 2, 2009
Issues in pre-hospital care

Guidelines for Fluids in injured

Which Fluid?

A. No level I evidence
B. Level II evidence; insufficient data

Cotton BA et al. Journal of trauma, 67; 2, 2009
Issues in pre-hospital care

Guidelines for Fluids in injured

How Much?

A. No level I evidence
B. Level II evidence; keep vein open
C. Rapid infusion systems should not be used

Cotton BA et al  Journal of trauma, 67; 2, 2009
Issues in pre-hospital care


23 level 3, 4 or 5 evidence
Only 3 level 1 evidences

Issues in pre-hospital care
ATLS Protocol 8th Edition

Shock management

Hypertonic saline: current literature does not show any survival advantage

Persistent infusion of large volumes of fluids in an attempt to achieve a normal BP is not a substitute for control of bleeding

Balancing the goal of normal organ perfusion with the risk of rebleeding by accepting a lower than normal BP has been called “Controlled resuscitation” or “Balanced Resuscitation”

Issues in pre-hospital care

ATLS Protocol 9th Edition

From 8th Edition trend to include evidence based interventions

- Focus on team training
- Balanced Fluid Resuscitation instead of aggressive resuscitation
- Thermal Injuries inclusion

Issues in pre-hospital care

Training
Practical team training in hospitals improved the participants perceived knowledge and confidence

Small hospitals may reach levels comparable to major hospitals

Wisborg T J Trauma 64: 6, 2008
Issues in pre-hospital care

EMS

Research is the key to maintaining focus on improving health status

Pre-hospital care 2002
Issues in pre-hospital care

Uncontrolled Studies
Specificity 11%

Randomised Controlled Studies
Specificity 88%

Pre-hospital care / EMS

Appropriate communication

Need for a unified country wide number

Recognised by all but not implemented
Technologically easy now
Pre-hospital care

Transportation

Need is for a safe vehicle to transport the patient to a definitive care facility

Sufficient evidence lacking on interventions within the ambulance other than providing BLS
Ambulance services

Legal, Legislation

Gujarat State has already passed the Emergency Medical Services Legislative Bill

Other states may follow soon
Ambulance services

Legal, Legislation

Legislation for Delhi Paramedical Council Act
Draft prepared
Guidelines are being reviewed

A bill to provide for independent practice by paramedics at pre-hospital stage in treatment of accident and trauma patients and constitution of a Delhi Paramedic Council for purposes of a degree scheme for paramedics....
Majority of Indian population

No unified EMS

No uniform access

Health is a state subject and individual states decide local policies on health so a wide variation in standards of care
PREHOSPITAL CARE

EMS in India

First Response at a crash site
Crowd gathers
Intuitive Triaging
Stops the nearest taxi usually 3W
  picks up the patient and shift to nearest hospital
PREHOSPITAL CARE

EMS in India

Now cell phones to 100 or whatever is the local police number

A decade back no cell phones calls from scene

All RTIs are registered as Medico Legal Cases (MLCs)

Police always investigate all cases of RTI
PREHOSPITAL CARE

Communication

No uniform number

Delhi Police 100
Ambulance 102

Haryana First aid post 1033

Karnataka Bangalore OS 1062

Punjab Ludhiana AMAR 104

Andhra and Gujarat EMRI 108
Ambulance services

A wide range of ambulance services available
Wholly owned by state
Private Ambulance services
NGO Ambulance services
Integrated Ambulance services

From fully *loaded* ambulances to empty containers

Individual ambulances may be good or bad but as of today there is no system of a formal ambulance service
Ambulance services

Looking at a selection of services that are now available in some parts of the country from Delhi to other states
PREHOSPITAL CARE

CATS

Centralised Accident and Trauma Services

Started in 1991

1700 patients transferred

Ambulances 37  (This Year 45)

Want to move from

Patient Carrying Ambulances to

Patient Caring Ambulances
Pre-hospital care
CATS
PREHOSPITAL CARE

CATS

2 Paramedic Staff
  1 Driver cum Paramedic
  1 Asst Paramedic
Both trained in BLS
Plan to have 800 EMS trained Nurses cum Drivers
Now rethinking on Persons with High School PCB
PREHOSPITAL CARE

CATS

One Control centre

Ambulances placed in different parts of the city

Transportation as per Triaging

3 Designated Trauma Centres

AIIMS Loknayak trauma centre

Sushrut Trauma Centre

DDU
PREHOSPITAL CARE

CATS

Annual Budget 6 crores for 37 Ambulances
(60 Million Rs)

Per trip cost of about 450 Rs if the daily average is 10 calls per ambulance.
The actual number is much less
PREHOSPITAL CARE

Highway Traffic Aid Centre

State of Haryana
On NH 1,2,8,10
Each centre has 1 Jeep, 1 ambulance
Crane between Centres
Manned by a Pharmacist and a Police Constable

28 centres

2003 - 2004
PREHOSPITAL CARE

Bangalore - Mangalore Highway EMS programme

40 Ambulances for 200 Km
80% not working
40% Empty
20% only transported by Ambulances
23% by Private vehicles
43% by Autos

Gururaj 2003
PREHOSPITAL CARE

Lifeline Foundation

Highway Rescue project

3500 Km of Golden Quadrilateral Project

Key Principles

Use of existing Ambulances and Resources

Minimal Infrastructure creation

Non Profit to operate Corporates to fund under CSR  Govt to Facilitate
Lifeline Control Centre
Lifeline Foundation

167 Hospitals network across the country
489 Ambulances
192 Cranes
67 Metal Cutters

Training First Responders
  2 Days Course  UNDP Recognised
  Also does AHA ACLS, BLS courses
PREHOSPITAL CARE

AMAR

Started in 2003

Integrated Protocol Driven System

Motorcycle driver Ambulance System

AMAR Ambulance Motorcycle Rescue System

Phone Number 104

20 Paramedics trained for 6 weeks
PREHOSPITAL CARE

Pune Heart Brigade

Helpline 1050

An EMS council has unified EMS players with a consortium of Hospitals

Symbiosis of different hospitals
Ambulance Access for All
45 GPS based advanced ambulances
Partnering with London Ambulance Services and New York Presbyterian Hospital
Inspired by Dr Sam Pitroda
Now official agency for EMS Mumbai
PREHOSPITAL CARE

EMRI

Emergency Medicine and Research Institute

Offshoot of corporate activity –
Satyam Computers
PREHOSPITAL CARE

Air Ambulance

We do have a private air ambulance system operating from Delhi - East West Rescue
Essentially targets tourists covered by insurance
Inside of an Ambulance Container
Transportation used by road crash victims

- Personal: 12%
- Taxi: 17%
- 3-W taxi: 34%
- Ambulance: 4%
- Police van: 19%
- Others: 14%
PREHOSPITAL CARE

Evaluation of pre-hospital care in 1989

Lessons learnt

Majority of patients are transported by bystanders to hospitals

Triaging is intuitive

Ambulances are used very infrequently

3 Wheeler Taxis are the most commonly used vehicles for the transportation of the injured

Majority reach the hospital in < 30 Minutes
TRANSPORTATION MODE USED

- Taxi: 29
- Auto: 34
- Amb: 4
- PCR: 33
- Others: 14

2004
1989
<table>
<thead>
<tr>
<th>Interval between Injury and Hospital contact (Gururaj G)</th>
<th>Bangalore</th>
<th>Charlottsville USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1 hr.</td>
<td>24.1</td>
<td>50.2</td>
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<tr>
<td>2 - 3 hrs.</td>
<td>30.5</td>
<td>38.5</td>
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<tr>
<td>4 - 6 hrs.</td>
<td>19.0</td>
<td>7.1</td>
</tr>
<tr>
<td>&gt; 6 hrs.</td>
<td>26.4</td>
<td>3.0</td>
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## Bangalore Mode of Transportation (%)

<table>
<thead>
<tr>
<th>Mode of Transportation</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td>Autorickshaw</td>
<td>31.0</td>
</tr>
<tr>
<td>(local 3 wheeler vehicles)</td>
<td></td>
</tr>
<tr>
<td>Private Vehicle</td>
<td>23.0</td>
</tr>
<tr>
<td>Ambulance</td>
<td>21.0</td>
</tr>
<tr>
<td>Not known</td>
<td>14.0</td>
</tr>
<tr>
<td>Hoysala / police vehicle</td>
<td>5.0</td>
</tr>
<tr>
<td>Public Vehicle</td>
<td>4.0</td>
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<tr>
<td>Others</td>
<td>0.8</td>
</tr>
<tr>
<td>Own Vehicle</td>
<td>0.7</td>
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</table>

Gururaj G 2003
# Pune Mode of Transportation

<table>
<thead>
<tr>
<th>Mode</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family members</td>
<td>58%</td>
</tr>
<tr>
<td>Ambulance</td>
<td>12%</td>
</tr>
<tr>
<td>Police</td>
<td>6%</td>
</tr>
<tr>
<td>Friends</td>
<td>12%</td>
</tr>
</tbody>
</table>

Tambe MP ICMR 2007
## Pune First Aid

<table>
<thead>
<tr>
<th>First aid</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>60%</td>
</tr>
<tr>
<td>At site Site</td>
<td>10%</td>
</tr>
<tr>
<td>At first contact medical facility</td>
<td>25%</td>
</tr>
</tbody>
</table>

Tambe MP ICMR 2007
PREHOSPITAL CARE

EMRI

First in Hyderabad
Then Gujarat State
Now MOU with Rajasthan Government
Ambulance services

Gujarat Government Ambulance Service

Funded by State Government in Partnership with EMRI Hyderabad

Creation of an autonomous 108 Emergency Response Services
Ambulance services

Advances

Attempt to create a system
Excellent communication network
Uses advanced technology
Uniform transportation
Trained manpower
Good data keeping
Ambulance services

Costing estimates

Budget of Rs 550 Million for 400 Ambulances

Rs 1.33 Million per Ambulance

Each Ambulance Makes 2 trips per day or 730 trips per year
Ambulance services

Costing

Per trip costing
1.33 Million / 730 = Rs 18,291

If each ambulance makes 20 trips instead of two trips per day each trip would still cost Rs1,829

Practically at best 10 to 12 trips per day
Ambulance services

Costing

Each trip of about 10 Km Round trip
  or 100 Km per day
  or 36500 Km per year
  or over 200,000 km in 5-6 years

Each Ambulance costs Rs 1.5 million
Every 5 years investment of Rs 600 Million
for 400 Ambulances assuming an investment of 1.5 million per ambulance
Ambulance services

Lessons learnt
Move from a local service to a state wide System
Communications system excellent

Equipment intensive
Manpower intensive
Resource intensive
Ambulance services

Lessons learnt

In hospital systems?
Sustainability?
Evaluation?  Lives saved?
Ambulance services

Human Resources

With the increase in injuries
   Need for trained Manpower recognised
No lead Agency for training Manpower
   Paramedics, Nurses, Physicians
MCI, NCI  Working on this
Not a separate Specialty of Emergency Medical Physicians
MCI announcing, National Board Fellowship
EMS

Areas of Concern
We are adopting technologies but what about:
Long term strategy?
Is it truly Public health?
Sustainability?
Before and after analysis?

We saved 4297 lives!
Or is it that we transferred 4297 patients?
PREHOSPITAL CARE

Access to trauma care

Usually located in major urban centers
Injury morbidity

American college of Surgeons established in 1922 evolved with the evolution of technology. Optimal hospital resources for care of injured was evolved in 1976

ACS has moved to optimal care of the injured over the years from exclusive care to inclusive care

From trauma centers to trauma systems

COT ACS 2006
Issues in Injury Management

• Trauma care is still an evolving specialty
• Primary physicians have no skills in wound care and first aid of injuries
• Orthopaedic and Neurosurgery beds are predominantly occupied by trauma patients from RTI
Issues in Road Traffic Injuries

• Trauma Centres
  – Not sustainable long term
  – Staff burn out high
  – Medical problem neglect
  – Cost intensive

Stand alone Trauma centers not recommended What we need is trauma systems in our peripheral hospitals also.
Injury morbidity

Developing pre-hospital care without developing hospital care may only change the on-site mortality statistics.
Injury morbidity

The system evolved with the evolution of technology
We are in a unique situation where there is a juxtaposition of

*high tech with extreme low tech*

From digital technology to bullock carts

There is a challenge and an opportunity
EMS

Challenge

High income economies never had to deal with this level of heterogeneous mix

There is a lack of knowledge and expertise on the solutions

There is a lack of a lead Agency

Lack of sufficient Evidence in this area
Resources are always scarce
Opportunity

To collect Data. Digital and software technologies make data management and networking so much more easy.

We can leap frog to GPS, Telemedicine and other areas of technology.

To adopt only evidence based interventions.

To generate evidence where it is lacking.
Pre Hospital care

Research

Can the Golden Hour be safely extended in blunt polytrauma patients?

In trauma systems where EMS physicians are involved in emergency care the golden hour can be extended

Osterwalder JJ, Pre hospital disaster medicine, 2002
EMS

Implications

Where would I put my money?

Primary prevention
  Speed control
  Helmetisation
  Pedestrian safety – Traffic calming

Bystander training for transfer of crash victims – Target people that are most likely to be on the scene: the commercial drivers 3WT, PCR
EMS

Where would I put my money?

Coupon Scheme for taxies which transport victims of crashes

Communication system and a unified number for emergencies

Networking of Ambulance providers and ambulances
Pre Hospital Care

Lead Agency

Lack of a National or a State Lead Agency with budgetary provisions
Pre Hospital Care

Lead Agency essential

To evolve Guidelines
To set standards
To enforce regulations
To collect and distribute data
To ensure Quality
To do research
Pre Hospital Care

Problems

Lack of a Unified number for communication

Create Unified Number
EMS

Where would I put my money?

Upgrading trauma capacity among health professionals and hospitals for a trauma systems approach not just in tertiary care centres but also in peripheral hospitals

Curriculum change for health professionals education

Legislative change wherever required
Priority setting

Current Road traffic injury statistics clearly show that the most vulnerable group are

Motorised two wheeler drivers and Pedestrians

If we were to follow the Haddon’s Matrix setting up an ambulance service is a small part of the list of possible actions.

The most cost effective of these would perhaps be enforcement of helmet laws.
## Injury vs Mortalities

<table>
<thead>
<tr>
<th>Deaths</th>
<th>Major Injuries</th>
<th>Minor Injuries</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td>1</td>
<td>30</td>
<td>70</td>
</tr>
</tbody>
</table>

Gururaj et al

Mohan et al
Injury Surveillance

1 Year Pune and Bangalore surveillance

In Pune alone in one year 16,947 injuries of all 58,122 casualty attendance

Age group most commonly injured

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-24</td>
<td>29%</td>
</tr>
<tr>
<td>25-34</td>
<td>27%</td>
</tr>
<tr>
<td>35-44</td>
<td>19%</td>
</tr>
<tr>
<td>45-54</td>
<td>10%</td>
</tr>
</tbody>
</table>

Tambe MP 2007 ICMR/WHO
Pre Hospital Care

Problems
Finance

What are the estimates?

11\textsuperscript{th} Plan 732.75 Crores 140 trauma centres

Shortage of Manpower
Infrastructure inadequate
Report of the 1st Phase of the Study
STUDY OF EMERGENCY RESPONSE SERVICE (EMRI MODEL)
IN SELECTED STATES IN INDIA
2009
<table>
<thead>
<tr>
<th>State</th>
<th>Launching Date</th>
<th>Ambulances</th>
<th>Coverage Details</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andhra Pradesh</td>
<td>August 15, 2005</td>
<td>652</td>
<td>covering the entire state</td>
<td>100% cover</td>
</tr>
<tr>
<td>Gujarat</td>
<td>August 29, 2007</td>
<td>402</td>
<td>covering entire state</td>
<td>100% cover</td>
</tr>
<tr>
<td>Uttarakhand</td>
<td>May 15, 2008</td>
<td>90</td>
<td>covering entire state</td>
<td>100% COVER</td>
</tr>
<tr>
<td>Tamil Nadu</td>
<td>September 15, 2008</td>
<td>172</td>
<td>covering 18 of 32 districts</td>
<td>62% COVER</td>
</tr>
<tr>
<td>Rajasthan</td>
<td>September 20, 2008</td>
<td>100</td>
<td>covering all 33 districts</td>
<td>21% COVER</td>
</tr>
<tr>
<td>Goa</td>
<td>September 5, 2008</td>
<td>18</td>
<td>covering all districts</td>
<td>100% COVER</td>
</tr>
<tr>
<td>Karnataka</td>
<td>November 1, 2008</td>
<td>150</td>
<td>covering 17 of 29 districts</td>
<td>72% cover</td>
</tr>
<tr>
<td>Assam</td>
<td>November 6, 2008</td>
<td>83</td>
<td>covering 12 of 28 districts</td>
<td>50% cover</td>
</tr>
<tr>
<td>Meghalaya</td>
<td>February 2, 2009</td>
<td>15</td>
<td>covering 2 of 7 districts</td>
<td>41% cover</td>
</tr>
</tbody>
</table>

Presently eleven5 states have already signed the MOU with EMRI for running the ERS in their
<table>
<thead>
<tr>
<th></th>
<th>AP</th>
<th>Gujarat</th>
<th>Rajasthan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance travelled per trip</td>
<td>14.38</td>
<td>29 km</td>
<td>30 km</td>
</tr>
<tr>
<td>Average no. of trips per ambulance per day</td>
<td>8.1</td>
<td>4.31</td>
<td>1.14</td>
</tr>
<tr>
<td>Operating cost per trip</td>
<td>Rs. 565/-</td>
<td>Rs. 635/-</td>
<td>Rs 2,700/-</td>
</tr>
</tbody>
</table>
The Govt. of AP was contributing 50% of the operating cost in the 3rd year.

From the 4th year onwards (2008-09), as per the MOU, the government is contributing 95% of the operating cost.

The rest of the capital costs however are borne by EMRI- an arrangement that differs from that of all other states.
Andhra Pradesh

652 ambulances in 23 districts

The call centre receives around 54,000 calls in a day.

Of these, ambulances are dispatched for around 8% calls.
Comparing the audited statements of expenditures and the daily reports of ambulance usage,

Each ambulance is averaging 8.1 trips per day, thus resulting in

an operating cost per ambulance of Rs. 565.13 per trip per day

or Rs. 12.59 lakhs per year, approximately.
The Govt. of Gujarat is contributing 95% of the operating cost and 100% of the capital cost (of ambulance purchase, fittings, land and building for the state level Call Centre).

The Govt. of Gujarat’s share of the cost is charged under the NRHM.
Pre Hospital Care

Problems

We try to copy the West in evolving models

We need to innovate what is required for our system
Pre Hospital Care

Need of the hour is the creation of a unified, comprehensive Pre hospital trauma care system integrated with good hospital trauma care
Thank You

mathewvarghese.ms@gmail.com
<table>
<thead>
<tr>
<th>Month</th>
<th>No of cases</th>
<th>No admitted</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>215</td>
<td>49</td>
</tr>
<tr>
<td>February</td>
<td>242</td>
<td>47</td>
</tr>
<tr>
<td>March</td>
<td>266</td>
<td>66</td>
</tr>
<tr>
<td>April</td>
<td>213</td>
<td>54</td>
</tr>
<tr>
<td>May</td>
<td>261</td>
<td>53 (57 with 4 Poisonings)</td>
</tr>
<tr>
<td>June</td>
<td>207</td>
<td>53</td>
</tr>
<tr>
<td><strong>Sub Total</strong></td>
<td><strong>1404</strong></td>
<td><strong>326</strong></td>
</tr>
<tr>
<td>Month</td>
<td>No of cases</td>
<td>No admitted</td>
</tr>
<tr>
<td>------------</td>
<td>-------------</td>
<td>-------------</td>
</tr>
<tr>
<td>July</td>
<td>211</td>
<td>54</td>
</tr>
<tr>
<td>August</td>
<td>193</td>
<td>61</td>
</tr>
<tr>
<td>September</td>
<td>30</td>
<td>07</td>
</tr>
<tr>
<td>October</td>
<td>134</td>
<td>43</td>
</tr>
<tr>
<td>November</td>
<td>108</td>
<td>30</td>
</tr>
<tr>
<td>December</td>
<td>100</td>
<td>30</td>
</tr>
<tr>
<td><strong>SubTotal</strong></td>
<td><strong>776</strong></td>
<td><strong>229</strong></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>2180</strong></td>
<td><strong>505</strong></td>
</tr>
<tr>
<td>Gender</td>
<td>Number of cases admitted</td>
<td></td>
</tr>
<tr>
<td>---------</td>
<td>-------------------------</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>359</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>128</td>
<td></td>
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</table>

Figures till October 2011
<table>
<thead>
<tr>
<th>Type of injury</th>
<th>Number of cases admitted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blunt</td>
<td>308</td>
</tr>
<tr>
<td>Penetrating</td>
<td>120</td>
</tr>
<tr>
<td>Unknown</td>
<td>56</td>
</tr>
</tbody>
</table>

Figures till October 2011
<table>
<thead>
<tr>
<th>Mechanism of injury</th>
<th>Number of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor vehicle accidents</td>
<td>39</td>
</tr>
<tr>
<td>Motorcycle accidents</td>
<td>74</td>
</tr>
<tr>
<td>Bicycle accidents</td>
<td>5</td>
</tr>
<tr>
<td>Pedestrians</td>
<td>19</td>
</tr>
<tr>
<td>Other Traffic</td>
<td>8</td>
</tr>
<tr>
<td>Firearm injury</td>
<td>1</td>
</tr>
<tr>
<td>Stab injury</td>
<td>5</td>
</tr>
<tr>
<td>Hit by a blunt Object</td>
<td>11</td>
</tr>
<tr>
<td>Low energy fall</td>
<td>40</td>
</tr>
<tr>
<td>High energy Fall</td>
<td>68</td>
</tr>
<tr>
<td>Others</td>
<td>33</td>
</tr>
<tr>
<td>Unknown</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>236</strong></td>
</tr>
<tr>
<td>Intention of injury</td>
<td>Number of cases</td>
</tr>
<tr>
<td>--------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Accidental</td>
<td>250</td>
</tr>
<tr>
<td>Self inflicted</td>
<td>24</td>
</tr>
<tr>
<td>Assault</td>
<td>28</td>
</tr>
<tr>
<td>Others</td>
<td>20</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>322</strong></td>
</tr>
<tr>
<td>GCS in ER</td>
<td>Number of cases</td>
</tr>
<tr>
<td>-----------</td>
<td>----------------</td>
</tr>
<tr>
<td>1-3</td>
<td>8</td>
</tr>
<tr>
<td>4-7</td>
<td>9</td>
</tr>
<tr>
<td>8-11</td>
<td>13</td>
</tr>
<tr>
<td>11-14</td>
<td>31</td>
</tr>
<tr>
<td>15</td>
<td>245</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>306</strong> (excludes 20 cases of poisoning)</td>
</tr>
<tr>
<td>ISS</td>
<td>No of patients</td>
</tr>
<tr>
<td>---------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>&lt;15</td>
<td>255</td>
</tr>
<tr>
<td>15-25</td>
<td>31</td>
</tr>
<tr>
<td>26-35</td>
<td>7</td>
</tr>
<tr>
<td>&gt;35</td>
<td>1</td>
</tr>
<tr>
<td>Could not be determined (poisoning, NFS injury etc)</td>
<td>32</td>
</tr>
<tr>
<td>Duration of Stay in Days</td>
<td>Number of patients</td>
</tr>
<tr>
<td>-------------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>1 - 5</td>
<td>173</td>
</tr>
<tr>
<td>6 – 10</td>
<td>76</td>
</tr>
<tr>
<td>11 – 15</td>
<td>31</td>
</tr>
<tr>
<td>16 – 20</td>
<td>10</td>
</tr>
<tr>
<td>21 – 25</td>
<td>7</td>
</tr>
<tr>
<td>26 - 30</td>
<td>2</td>
</tr>
<tr>
<td>&gt; 30</td>
<td>7</td>
</tr>
<tr>
<td>Time from alarm to arrival at ER</td>
<td>Number of patients</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>&lt; 30 Minutes</td>
<td>37</td>
</tr>
<tr>
<td>30 Minutes – 1 Hour</td>
<td>47</td>
</tr>
<tr>
<td>1 – 2 Hours</td>
<td>38</td>
</tr>
<tr>
<td>2 – 6 Hours</td>
<td>100</td>
</tr>
<tr>
<td>&gt; 6 Hours</td>
<td>84</td>
</tr>
<tr>
<td>Type of transportation</td>
<td>Number of patients</td>
</tr>
<tr>
<td>------------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>Ambulance</td>
<td>59</td>
</tr>
<tr>
<td>Private/Public vehicle</td>
<td>238</td>
</tr>
<tr>
<td>Walk in</td>
<td>2</td>
</tr>
<tr>
<td>Others</td>
<td>7</td>
</tr>
<tr>
<td>Survival Status</td>
<td>Number of patients</td>
</tr>
<tr>
<td>------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>Alive</td>
<td>294</td>
</tr>
<tr>
<td>Not survived</td>
<td>12</td>
</tr>
</tbody>
</table>
Detailed Evaluation of some of the severely injured

- Selected all the GCS < 10
- Selected all the ISS more than 20
Detailed Evaluation of some of the severely injured

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>GCS &lt; 10</td>
<td>14</td>
</tr>
<tr>
<td>ISS more than 20</td>
<td>18</td>
</tr>
<tr>
<td>GCS &lt;10 and ISS &gt; 20</td>
<td>6</td>
</tr>
</tbody>
</table>
Thank You