Perinatal resuscitation in the developing EMS setting

(1045-1100 am)
2nd August Singapore

Global Resuscitation Alliance (GRA) Utstein-Style Consensus Meeting on 10- Programs/Actions Recommendations for Developing EMS Systems

Dr G. V. Ramana Rao
Director EMLC & Research
GVKEMRI
India
Flow of presentation:

• About 108 GVK EMRI (EMS organization in India)
• Neonatal Mortality- India
• Neonatal Resuscitation – experiences at GVKEMRI
• Future perspectives
Innovative Process

- Developed detailed process understanding and well defined responsibilities throughout the organization.
- Maintained all information related to emergency in Patient Care Records (PCRs).
- Patient information is shared with the hospital on arrival.
- 48 hour follow up with the patients admitted to hospital.
Launched on 15th Aug, '05 in Hyderabad and expanded to 2 Countries
In India 14 States and 2 Union Territories, In Sri Lanka 2 Provinces

Population covered: 750 M
Emergencies attended: 54 M
Ambulances: 10,850
## Number of child births 2010 and 2016

<table>
<thead>
<tr>
<th>Year</th>
<th>Child Birth Count during the Year</th>
<th>Cumulative</th>
<th>Average / Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009 - 10</td>
<td>31166</td>
<td>77588</td>
<td>85/Day</td>
</tr>
<tr>
<td>2010 - 11</td>
<td>36409</td>
<td>113997</td>
<td>100/Day</td>
</tr>
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<td>2011 - 12</td>
<td>38547</td>
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<tr>
<td>2012 - 13</td>
<td>46399</td>
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<td>2014 – 15</td>
<td>67879</td>
<td>367170</td>
<td>186/Day</td>
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<td>2015 - 16</td>
<td>53147</td>
<td>420317</td>
<td>145/Day</td>
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<tr>
<td>2016 - 17</td>
<td>30290</td>
<td>450607</td>
<td>110/Day</td>
</tr>
</tbody>
</table>
### Neonatal Cases Served - 2016

**States of Andhra Pradesh (AP) and Telangana (TS)**

(Source: 108 GVKEMRI)

<table>
<thead>
<tr>
<th>State</th>
<th>Total Availed Emergencies</th>
<th>Neonatal</th>
<th>%</th>
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<tbody>
<tr>
<td>AP</td>
<td>641238</td>
<td>7908</td>
<td>1.2%</td>
</tr>
<tr>
<td>TS</td>
<td>448711</td>
<td>5758</td>
<td>1.4%</td>
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</table>

<table>
<thead>
<tr>
<th>2016</th>
<th>AP</th>
<th>Neonatal</th>
<th>%</th>
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<tbody>
<tr>
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</tr>
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<td>50507</td>
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<tr>
<td>Mar</td>
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<tr>
<td>Apr</td>
<td>58648</td>
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<td>1.3%</td>
</tr>
<tr>
<td>May</td>
<td>60228</td>
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<tr>
<td>Jun</td>
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<tr>
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<td>61009</td>
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<td>Aug</td>
<td>57103</td>
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<tr>
<td>Sep</td>
<td>50734</td>
<td>638</td>
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<tr>
<td>Oct</td>
<td>46969</td>
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<tr>
<td>Nov</td>
<td>42794</td>
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<tr>
<td>Dec</td>
<td>44560</td>
<td>548</td>
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<tr>
<td>Total</td>
<td>641238</td>
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<table>
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<th>Neonatal</th>
<th>%</th>
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<td>Apr</td>
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<td>509</td>
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<td>May</td>
<td>41187</td>
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<td>Jun</td>
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<td>Aug</td>
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<td>455</td>
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<td>Sep</td>
<td>35918</td>
<td>464</td>
<td>1.4%</td>
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<tr>
<td>Oct</td>
<td>37458</td>
<td>463</td>
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<tr>
<td>Nov</td>
<td>35839</td>
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</tr>
<tr>
<td>Dec</td>
<td>36543</td>
<td>485</td>
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<tr>
<td>Total</td>
<td>448711</td>
<td>5758</td>
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<tr>
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<td>------------</td>
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</tr>
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<td>34</td>
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<tr>
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<tr>
<td>Delhi</td>
<td>18</td>
<td>25</td>
<td>17</td>
</tr>
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</table>
Causes of neonatal deaths in India

- Birth asphyxia: 20%
- Pneumonia: 16%
- Sepsis: 15%
- Preterm: 35%
- Diarrhea: 9%
- Malformations: 3%
- Other: 2%

India – NNM- Causes (Sources – GOI)
• **Child and Adolescent Health:** The policy endorses the national consensus on accelerated achievement of neonatal mortality targets and "single digit" stillbirth rates through improved home based and facility based management of sick new-borns.

• **Secondary Care Services:** The policy aspires to provide at the district level most of the secondary care which is currently provided at a medical college hospital. Basic secondary care services, such as caesarean section and neonatal care would be made available at the least at sub-divisional level in a cluster of few blocks.
Education / Training

- Basic EMT
- Neonatal EMT
- Advanced EMT
- Basic Life Support in Obstetric (BLSO) certification – Affiliated to American Academy of Family Physician
- Basic Life Support (BLS) - Affiliated to American Heart Association

Pre hospital Care

- Manual of pre-hospital emergency care protocol
- Pre hospital Care Records
Resuscitation Overview
Training EMT
Skill practice with manikins
**NEONATAL RESUSCITATION**

**Definition**
- Resuscitation of a newborn to 1 month old

**Key points**
- Do not take longer than 60 sec to warm, dry, stimulate and clear airway if obstructed, and begin ventilation if required
- Assessment of HR should be done by palpation of the umbilical cord stump or auscultation
- Respiratory distress (apnea, gasping, or labored breathing)
- Heart rate <100

**Routine Care of Neonate**

- Stay with mother
- Provide warmth
- Position, clear airway as needed
- Dry and stimulate
- Clamp and cut cord
- Monitor breathing and HR

**Breathing or crying?**

- Good tone?
  - Yes
  - No

  **WARM**
  - Clear airway as needed
  - Dry and stimulate

  **HR <100 bpm, gasping, or apnea**

  - Clamp and cut cord
  - BMV (check for chest rise)
  - Check SpO2, if available

  **HR >60**

  **HR <60**

**Target predicted SpO2**

- 1 min: 80-85%
- 2 min: 85-75%
- 3 min: 70-65%
- 4 min: 65-60%
- 5 min: 60-55%
- 10 min: 55-50%

**CONTACT ERC PHYSICIAN**

- Adrenaline (1:10,000) 0.01-0.03 mg/kg dose IV
- Consider repeat dose every 2-5 minutes
- Consider 10 mL/kg IV NS bolus

**Apgar Score**

<table>
<thead>
<tr>
<th>Appearance</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
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<tbody>
<tr>
<td>Blue / pale</td>
<td>Body pink, hands blue</td>
<td>Pink</td>
<td></td>
</tr>
<tr>
<td>Pulse</td>
<td>Absent</td>
<td>Below 100</td>
<td>Above 100</td>
</tr>
<tr>
<td>Grimace</td>
<td>None</td>
<td>Grimace</td>
<td>Cough, sneeze, cry</td>
</tr>
<tr>
<td>Activity</td>
<td>Fleeting</td>
<td>Some</td>
<td>Active motion</td>
</tr>
<tr>
<td>Respiration</td>
<td>Absent</td>
<td>Weak, slow</td>
<td>Good, crying</td>
</tr>
</tbody>
</table>

**References**
NEONATAL RESUSCITATION

Definition
- Resuscitation of a newborn to 1 month old

Key points
- Do not take longer than 60 sec to warm, dry, stimulate and clear airway if obstructed, and begin ventilation if required
- Assessment of HR should be done by palpation of the umbilical cord stump or auscultation

Serious signs and symptoms
- Respiratory distress (apnea, gasping, or labored breathing)
- Heart rate <100

Breathing or crying?
Good tone?

Yes → Routine Care of Neonate
- Stay with mother
- Provide warmth
- Position, clear airway as needed
- Dry and stimulate
- Clamp and cut cord
- Monitor breathing and HR
- See Childbirth (Post delivery care) of mother

No →
• Warm
• Clear airway as needed
• Dry and stimulate
HR < 100 bpm, gasping, or apnea?

Yes

- Clamp and cut cord
- BMV (check for chest rise)
- Check SpO₂ if available

HR < 60

- Chest compressions
  (coordinate 3:1 with BMV)

HR < 60

CONTACT ERC PHYSICIAN

- Adrenaline (1:10,000) 0.01-0.03 mg/kg IV
- Consider repeat dose every 3-5 minutes
- Consider 10 mL/kg IV NS bolus

No

HR > 60

Target preductal SpO₂ after birth
- 1 min 60-65%
- 2 min 65-70%
- 3 min 70-75%
- 4 min 75-80%
- 5 min 80-85%
- 10 min 85-90%

Reassessment and continue transport
Protocol

**Key Points:**
- Suction only for obvious obstruction to spontaneous breathing
- Suctioning of meconium has not been shown to improve mortality
- Bradycardia (HR <100) in newborns is usually from inadequate lung inflation or profound ↓ O₂
- Adequate ventilation is the most important intervention
- Pulse checks every 30 seconds until HR >100 and ventilating

**Prehospital management options:**
- Rewarming techniques include placing skin-to-skin with mother, blankets, and wrap in plastic
- BMV
  - If provider inexperienced with advanced airway management, BMV preferred
  - Lungs easily injured by over inflation; inflate only enough to see chest wall begin to rise
  - Use ventilation rates 40-60 breaths per minute
  - Measure of adequate initial ventilation is prompt improvement in HR (HR >100)
- LMA (size 1): effective for ventilating newborns weighing >2000 g or ≥34 weeks gestation
- ETT indications (use size 3.0):
  - Initial endotracheal succioning of nonvigorou meconium-stained newborns
  - If BMV is ineffective or prolonged
  - If chest compressions are performed

**Chest compressions (See Figure)**
- Indicated for HR <60 despite adequate ventilation with oxygen for 30 seconds.
- Do compressions on lower third of sternum
  - 3:1 ratio of compressions to ventilations
  - (90 compressions and 30 breaths/min)

**Medications**
- Adrenaline (1:10,000) 0.01-0.03 mg/kg/dose IV
  - Can consider 0.05-0.1 mg/kg through endotracheal tube if no IV
  - 10 mL/kg IV NS (especially if pale skin, poor perfusion, weak pulse)

**Postresuscitation care**
- Consider Glucose 1 mg/kg IV (mix D25 with equal parts water to obtain D12.5)

<table>
<thead>
<tr>
<th>APGAR SCORE</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Blue / pale</td>
<td>Body pink, hands blue</td>
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</tr>
<tr>
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<td>Absent</td>
<td>Below 100</td>
<td>Above 100</td>
</tr>
<tr>
<td>Grasme</td>
<td>None</td>
<td>Grasme</td>
<td>Cough, sneeze, cry</td>
</tr>
<tr>
<td>Activity</td>
<td>Flaccid</td>
<td>Some</td>
<td>Active motion</td>
</tr>
<tr>
<td>Respiration</td>
<td>Absent</td>
<td>Weak, slow</td>
<td>Good, crying</td>
</tr>
</tbody>
</table>

Table 1: Determine APGAR score at 1 and 5 minutes after birth.

**References**
Neonatal resuscitation

1) “You are preparing the ambulance to go out to a delivery. What is in the delivery kit?”
   - lists components of standard ambulance kit including newborn ambu bag, blanket for baby, cord clamp

2) “You are called to a delivery and the baby is delivered as you arrive. What should you do for the newborn?”
   - Rapid Initial Assessment of newborn (Term? Breathing or crying? Good muscle tone?)
     If yes to all – dry, wrap, hat, put baby to breast

3) “Is it better to wait a few minutes to resuscitate baby or to start right away?”
   - start during the Golden Minute, the first minute after delivery
   - baby much more likely to survive if you start during the Golden Minute

4) “You are called to a delivery and the baby is delivered as you arrive. The baby is limp and not breathing. What do you do?”
   - dry and stimulate (rub back, tap feet – no shaking, no dangling)
   - put fetus in ‘sniffing position’
   - HR and RR and color of newborn
     - if abnormal HR, RR or color of newborn with positive pressure ventilation
       (correct size mask and bag, uses room air, 40-60 breaths per minute)
     - if abnormal HR following ventilation then do chest compressions
     - teacher should make sure that participants practice 30 seconds of ventilation
       so that participants learn how long that actually is
Advanced Post Graduate Diploma in Emergency Care
Under Osmania University- Industry Hub

With effect from 2009-2010

The Syllabi & scheme of Instruction and Examination rules for the Advanced Post Graduate Diploma in Emergency Care have been approved by the Board of Studies. This course will be started from year 2009-10:

Teaching & Examination pattern approved by the University.

The course comprises of four semesters.

Theory classes and practicals for this course will be conducted by EMRI as per the scheme of instruction approved by OU board of studies.

Semester I, II, and III have four theory and four practical papers. Semester four has 480 Hours of hospital internship and 720 Hours of ambulance internship time.

Theory and Practical examinations:

There will be internal assessment and university examination for all four semesters.

All Examinations will be conducted by Osmania University at EMRI. All the University Examinations will be conducted by the Examiners appointed from a Panel by the University:

Unit-III

16. Neonatology – Introduction, General pathophysiology and assessment, Specific interventions and resuscitation steps, Special conditions, Pre-mature and low birth weight infants, Thermoregulation, hypoglycemia, vomiting and diarrhea
17. Common birth injuries in new born
18. Pediatrics – Introduction, Approach to pediatric patients, Pediatric assessment, Respiratory, cardiovascular, medical and toxicological emergencies
19. SIDS, apparent life threatening event, Child abuse and neglect, Burns, Children with special health care needs and Pediatric mental health
Disposal Delivery Kit
The classification of waste in a health care facility is as briefed below:

<table>
<thead>
<tr>
<th>Color Coding</th>
<th>Type of Container</th>
<th>Waste Category</th>
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<tbody>
<tr>
<td>Yellow</td>
<td>Plastic Bag</td>
<td>Human Anatomical Waste <em>(human tissues, organs, body parts)</em> organs, body. Fluid, blood. Items contaminated with blood, and body fluids including cotton, dressings, soiled plaster casts. other material contaminated with blood</td>
</tr>
<tr>
<td>Red</td>
<td>Disinfected Container/Plastic bag</td>
<td>Tubing's, catheters, intravenous sets etc.</td>
</tr>
<tr>
<td>Blue / white translucent</td>
<td>Plastic bag/Puncture proof container</td>
<td>Waste sharps <em>(needles, syringes, scalpels, blades, glass, etc. that may cause puncture and cuts. This includes both used and unused sharps)</em></td>
</tr>
</tbody>
</table>
Steps for Successful resuscitation

All the health care Professionals who attend the mother at birth must be skilled at Resuscitation and know to recognize babies who are at Risk they Must

• Anticipate
• Be prepared
• Know what to do in Order
• Should be able to work in co-ordination
Neonatal Ambulance - Tamil Nadu State
## Referral Protocol

<table>
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<tr>
<th>Scenario</th>
<th>Referring Institution</th>
<th>Receiving Institution</th>
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<tbody>
<tr>
<td>1</td>
<td>PHC</td>
<td>NICU</td>
</tr>
<tr>
<td>2</td>
<td>GH</td>
<td>NICU</td>
</tr>
<tr>
<td>3</td>
<td>Medical College</td>
<td>Medical College</td>
</tr>
<tr>
<td>4</td>
<td>Private Nursing Home</td>
<td>Government Hospital</td>
</tr>
<tr>
<td>5</td>
<td>Private Hospital</td>
<td>Private Hospital</td>
</tr>
<tr>
<td>6</td>
<td>Government</td>
<td>Private Hospital</td>
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## Duration of Neonatal training

<table>
<thead>
<tr>
<th>Duration of Training</th>
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<tr>
<td>Theory Phase Training</td>
<td>10 days</td>
</tr>
<tr>
<td>Hospital phase Training</td>
<td>15 days</td>
</tr>
<tr>
<td>Ambulance phase Training</td>
<td>10 days</td>
</tr>
</tbody>
</table>
• Introduction to neonatal emergencies
• Neonatal resuscitation
• Sick new born assessment
• Common neonatal problems thermoregulation
• Neonatal transport
• Management of various disorders- hypoglycemia, neonatal shock, neonatal seizures, respiratory distress, neonatal sepsis, neonatal jaundice
• Fluid management
• Breastfeeding
• Assessment of newborn:
  • Identification of risk factors
  • DOWNES score
  • Weighing newborns
  • Krammer’s rule
• Monitoring of neonates:
  • Clinically with monitors
  • CRT
  • CBG
• Thermoregulation
  • Axillary temperature
  • KMC
  • Use of radiant warmer
• Use of incubators
• Phototherapy
• Gastric lavage
• IV cannulation
• Use of infusion pump and syringe pump

i Bag Valve Mask Ventilation
ii Oxygen administration
iii IV cannulation
iv Administration of medications:
  a. Calculation of drugs
  b. IM
  c. IV
v Setting, Use & Maintenance of basic equipment
  a. O2 analyzer
  b. Monitors
  c. Infusion and syringe pump
  d. Radiant warmer
  e. Incubator
  f. Ventilator
vi Feeding the infant
  a. Breastfeeding
  b. Expression of breast milk
  c. Naso gastric feeding
  d. Paladai feeding/ cup feeding
vii Gastric lavage
Neonatal Ambulance - Interior View
Communication Protocol- NNA

Follow up

Case ID closed

Handing over

Call centre “108”

Destination Hospital

Enroute Stabilization

Enroute NERCP

Pre hospital stabilization

NERCP

ERO

Case assigned

Referral centre

NEMT

Referral centre
## District wise distribution of NNA- TN

<table>
<thead>
<tr>
<th>S.No</th>
<th>District</th>
<th>No. Ambulance</th>
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<tbody>
<tr>
<td>1</td>
<td>ARIYALUR</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>CHENNAI</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>COIMBATORE</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>CUDDALORE</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>DHARMAPURI</td>
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<td>6</td>
<td>DINDIGUL</td>
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</tr>
<tr>
<td>7</td>
<td>ERODE</td>
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<td>PERAMBALUR</td>
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<td>25</td>
<td>THIRUVARUR</td>
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<td>27</td>
<td>TIRUCHIRAPPALLI</td>
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</tr>
<tr>
<td>28</td>
<td>TIRUNELVELI</td>
<td>2</td>
</tr>
<tr>
<td>29</td>
<td>TIRUPUR</td>
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</tr>
<tr>
<td>30</td>
<td>VELLORE</td>
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<tr>
<td>31</td>
<td>VILLUPURAM</td>
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<tr>
<td>32</td>
<td>VIRUDHUNAGAR</td>
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</table>

**Total number of neonatal ambulances = 60**
Neonatal Ambulance cases- TN

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Average per Year</th>
<th>Month</th>
<th>Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average No. Cases</td>
<td>18364</td>
<td>1530</td>
<td>51</td>
</tr>
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</table>
On 13th June, Chetpet Neonatal ambulance was assigned for IFT case at 02:37hrs from Porur PHC. Baby of Samsath, 2 hrs old male with birth weight of 2.8kg was referred to ICH,Egmore for the complaints of Birth Asphyxia and Cord around the neck. At birth baby not cried and had apnea. They started BVM after that baby had weak cry.

On arrival at the scene, baby was comatose and very poor activity. NEMT assess vitals, Skin color- Pale, CRT >3sec, Temperature -36 F, HR- 78 beats/minutes, Respiration – On Bag Valve Mask ventilation, SpO2- 88-94% (with O2), CBG-139mg/dl.

After stabilization baby shifted to ambulance and placed in sniffing position. In ambulance NEMT reassess the vitals. Baby had bradycardia and pale skin color. Immediately our NEMT started the CPR and BVM. ERCP advice taken and 10ml/kg of Normal saline bolus and Injection adrenaline were given. Airway was cleared with frequent suction. Enroute to the hospital continuous Compression and ventilation given. TABC was maintained. Tactile stimulation done. Then the Neonate was safely shifted to ICH.

Vitals signs at handing over were HR – 96/min, SpO2 – 90-96%. With timely proper pre hospital care by NEMT saved the baby's lives.
EXCEPTIONAL CASE - HOSPICIO NEO - FEBRUARY 2017

SOUTH DISTRICT
- EMT: LINA ROSA DE BRAGANCA (075676)
- PILOT: MANOHAR VELIP (070564)

NEED OF VENTILATORY SUPPORT

On 29th of Feb 2017, at 16:47 neonatal ambulance Margao received a call from ERC saying that there was an IFT from GMC Bambolim to Royal hospital Margao. During conference with an duty doctor EMT A Lina realized that the baby is c/o abdominal distention with Respiratory distress requiring Ventilator support.

The Neonatal ambulance staff reaches GMC after preheating the incubator. EMT-A Lina took care detail from the doctor on duty. Immediately after taking history EMT-A went and found that the neonate a 22 days old male term baby born to G2P1 by SVF has abdominal distention with sepsis. Intestinal surgery is needed and the neonate is intubated and has to be referred for Ventilator support. With the help of pilot, the neonate shifted in ambulance.

In the ambulance EMT-A Lina attached the monitor and assisted ventilation and recorded baseline vitals are as follows:

L.O.C Alert Pulse 158bpm Respiration 48breaths/min Spo2 94% RBSL 84mg/dl

Then en route to hospital ERCP conference was taken and ERCP advised EMT to continue positive pressure ventilation with oxygen. The neonate was maintaining saturation of 94 to 100% with body temperature of 37 degree Celsius and incubator care. The baby was later shifted to Royal hospital, Margao.

REFLECTION By:

EMT: LINA ROSA DE BRAGANCA
I am very happy that I got an opportunity to be associated with GVK EMRI 108 Ambulance services. It is very challenging to deal with chest pain emergency.

PILOT: MANOHAR VELIP
I would like to thank GVK EMRI for giving me an opportunity to be a part of life saving mission.
Summary
Neonatal resuscitation – EMS- DVC

• EMT Training including neonatal resuscitation
• Advanced EMT training, as a long term strategy
• Inter-facility Transfer of high risk new-borns in special Neonatal ambulances
• Prehospital care Protocol for primary transportation and IFT
• Ambulance equipment, drugs and consumables
• Medical oversight (On-line medical Direction)
• Referral System (NBC- SNCU- NICU)
• Monitoring
• Retraining
• Case studies, retrospective analysis, clinical audits
• Align with national health care delivery systems
Future

- Six pillars of intervention packages impacting stillbirths and newborn health have been identified, which include:
  - Preconception and antenatal care
  - Care during labour and child birth
  - Immediate new-born care
  - Care of healthy new-born
  - Care of small and sick new-born
  - Care beyond new-born survival
Future – EMS DVC- Neonatal Resuscitation @ GVKEMRI

• Expansion of Neonatal ambulances
• Newer medical equipment – LMA (example)
• RQI – field trials (Little Anne)- cost effective- mobile van based
• Valid certified EMTs
Thank you

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