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A STUDY ON THE ROLE OF 'INTRAVENOUS ACCESS' IN 108 AMBULANCE SERVICES AT GVK EMRI, INDIA

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ABSTRACT

Introduction: Emergency care providers are responsible for the management and transportation of critically ill or injured patients. Vascular access is often needed in emergency care for patients with haemodynamically unstable condition who often require immediate interventions such as Intravenous (IV) cannulation for various medications and/or, in need of IV fluids or both. **Objectives:** To describe the IV cannulation training processes /protocols in ambulance based pre hospital care. To study on the role of IV cannulation in trauma cases reported to 108 GVK EMRI, India. **Methods:** This study was conducted in the pre hospital setting in GVK EMRI, India. A descriptive research design was adopted to explain the training and pre hospital care processes of IV cannulation. A retrospective study methodology was used to share the trauma study findings related to IV cannulation and IV fluids. **Results:** In total, 2643 number of trauma patients were enrolled during the study period in 2016 in 6 operating states of 108 GVK EMRI. State wise distribution of trauma sample 20% Assam, 18% Gujarat, 20% Himachal Pradesh, 25% Karnataka, 8% Meghalaya and 9% Telangana. Out of 2643 cases, IV was placed in 735; among these IV Fluids given in 542 patients. **Conclusion:** Based on this study, setting up IV access is a commonly followed procedure in the pre hospital setting. One out of every fourth victim was cannulated by Emergency Medical Technician (EMT) of GVK EMRI.

KEYWORDS: Intravenous (IV) Cannulation, Trauma Emergencies, Training Process, Protocols, Pre hospital setting.

INTRODUCTION

Emergency care providers are responsible for the management and transportation of critically ill or injured patients. These patients often require immediate interventions such as Intravenous (IV) cannulation. IV cannulation by Emergency Medical Technician (EMT) is a key intervention which enables administration of fluids and drugs in the prehospital setting. IV cannulation is a procedure of introducing a canula in to a vein to obtain an IV access. Like any other medical procedure, gaining an IV access takes time and has risks as well. Vascular access is often needed in emergency medicine for patient's haemodynamically unstable condition and in need of IV fluids, various medications, or both.[2]

There are multiple situations that require the delivery of medications to patients in the pre hospital setting. Fortunately, there are many routes for drug and fluid administration that we can use, including the IV, intraosseous (IO), IM, rectal, and nasal routes. Which route(s) are used depends on many factors, including the patient's individual needs and complaints, the type and degree of injury or disease, the hemodynamic state, any specific allergies or other contraindications, as well as the medication(s) that one wishes to administer. Peripheral Intravenous access (IV) purpose of procedure is to establish secure parenteral access using a peripheral vein for patients needing fluid resuscitation or intravenous medication. Peripheral Intravenous access (IV) purpose of procedure is to establish secure parenteral access using a peripheral vein for patients needing fluid resuscitation or intravenous medication.[2]

Paramedics are trained to consider various factors in deciding whether to place an IV cannula, including chief complaint, past medical history, age, vital signs, and time and distance to hospital.[3] IV cannulation can provide necessary and clinically important vascular access, inappropriate use may cause unnecessary pain and distress and, in some cases, put patients at risk for phlebitis, catheter-related obstruction and infection.[4] Research shows that cannulation can add considerably to ambulance on scene times but postponing cannulation may make it much more difficult at a later stage. Currently, standard procedures state that the predominant means (excluding intra osseous access) involves setting up the entire IV line comprising the selected catheter and the administration set, plus the selected IV fluid bag.

GVK Emergency Management and Research Institute (GVK EMRI) is the pioneer and professional organization providing integrated emergency response services (Medical, Police and Fire) in Public-Private-Partnership (PPP) framework in India. GVK EMRI is a registered not-for-profit organization. 108 GVK EMRI ambulance service has been providing pre-

hospital services by in-house trained EMTs in 14 states and 2 union territories across India and in Sri Lanka.[5] Objectives of this study are to describe the use of intravenous (IV) cannulation in emergency care and its contribution to reducing avoidable death and disability. It also highlights the IV cannulation training processes /protocols in ambulance based pre-hospital care. In addition, it also shares the usage rates of IV cannulation in trauma and medical emergencies in 108 GVK EMRI, India ambulances.

MATERIALS AND METHODS

This study adopted a descriptive research design for explaining the training and pre hospital care processes of IV cannulation and a retrospective study method was adapted to measure the establishment of IV access in selected chief complaint of trauma cases of 108 ambulances for the year 2016. This study was conducted based on near real time data collection of patients who were treated and transported by 108 ambulance EMT's in 6 operating states of 108 GVK EMRI India.

Training: GVK EMRI in collaboration with Stanford Emergency Medicine International (SEMI), USA has been attempting to provide world-class expertise in basic and advanced EMT courses. EMT-Basic course consists of 450 hours training in triaging, basic airway, ventilation, circulation and stabilization skills. Skill practices including airway management, IV cannulation techniques and administration of fluids, assessment of vitals (pulse, respiration, blood pressure, oxygen saturation, temperature, random blood glucose, pupils) patient assessment, BLS, spinal motion restriction devices, pharmacology and normal delivery.[6] Majority of basic EMTs are also trained in Global Certification Programs (Basic Life Support (BLS) by American Heart Association (AHA), International Trauma Life Support (ITLS) by American College of Emergency Physicians (ACEP), Basic Life Support in Obstetrics (BLSO) by American Academy of Family Physicians (AAFP). EMT-Basic course has 8 hours of training on IV cannulation techniques and administration of fluids, duration of theory is 2 hours and practicals are 6 hours. In these 8 hours, EMT learn about indications, contraindications, complications and procedure of IV cannulation. IV cannulation procedure including assembling the equipment, choosing an IV solution, preparing an administration set, choosing an IV site, choosing an IV catheter, inserting the IV catheter, securing the line and documentation. Specifications of medical equipments for ERS/Patient transport service ambulances under National Health Mission (NHM) Ministry of Health &

Family Welfare, Government of India and type of ambulances, under first aid box included IV cannula and IV fluid.

The training was designed to address the following outcomes.

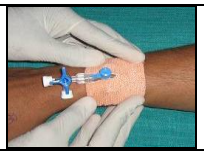
Indications: To deliver IV fluids; to administrating IV medications; to obtain blood samples.

Complications: Complications of gaining IV may include infiltration, hematoma, an air embolism, phlebitis, extra vascular drug administration, and intra-arterial injection.[7]

Procedure: In GVK EMRI EMS system, EMT follows the standardized protocol to access the IV cannulation, which starts from assembling the equipment and ends with securing the IV line and documentation as shown in (Table 1).

Table 1: Standard Training Procedure for Intravenous (IV) Access – GVK EMRI.

Step – 1: Assembling the equipment: To avoid delays and IV site contamination, gather and prepare all the equipments before attempt to start an IV. 1. Sterile gloves, 2. Tourniquet, 3. Spirit Swab, 4. Syringe, 5. Securing Tapes, 6. Saline for flush, 7. Three way Connector, 8. Administration set (IV Set), 9. IV Fluid.	
Step – 2: Choosing an IV solution: When choosing the most appropriate IV solution, EMT identifies the need of the patient under the virtual guidance of Emergency Response Center Physician (ERCP).	
Step – 3: Preparing an administration set: EMT checks for the integrity of package, clarity of the fluid and expiry date. Prepare to spike the bottle with the administration set.	
Step – 4: Choosing an IV site: Important to select the most appropriate vein for IV catheter insertion. In 108 ambulances EMT chooses a vein that has a firm, round appearance or is springy when palpated.	
Step – 5: Choosing an IV catheter: Catheter selection depends on purpose of the IV, the age of the patient, and the location for the IV.	
Step – 6: Inserting an IV catheter: EMT holds the cannula under aseptic precautions; inserts the canula at the angle of 45 degree; looks for the flashback of blood in the hub to confirm penetration; advances the cannula in to the vein at the angle of 15 degree; pulls the stylet (needle) back, and connects the three-way connector.	

Step – 7: Securing the line: Secure the cannula with securing tapes.	

The EMTs use different sizes of cannulas for adult, child and infant victims as shown in (Table 2). The EMTs will choose the appropriate size of cannula depending on the patient condition. EMT chooses a large visible vein with a straight path which does not cross a joint. Generally the veins on the forearm or the dorsum of hand are preferred. In many elderly patients, veins stand out well beneath the paper thin epidermis. These veins are suitable for cannulation but are often very difficult to use because of their fragile walls, which are liable to tear while inserting the needle. At GVK EMRI as in most EMS systems, EMTs are encouraged to gain access through IV cannulation only after the patient is shifted in to the ambulance.

Table 2: Typical IV Cannula Sizes.

S. No	Size of the Cannula	Colour code	Age group	Condition and Intention	Flow rate (ml / min)
1	14 G	Orange	Adult	Volume replacement in case of shock	270 ml/min
2	16 G	Grey			172 ml/min
3	18 G	Green	Adult	Volume infusion in bleeding	76 ml/min
4	20 G	Pink	Adults/Children /Elderly	Volume infusion / Medication administration	54 ml/min
5	22 G	Blue	Children/Elderly/ Infants		31 ml/min
6	24 G	Yellow	Infants / New Born		14 ml/min

In GVK EMRI EMT's practice the IV skills by using the task trainers such as IV training arms in simulation based education as shown in (Fig. 1). IV training arms are utilized for training and practice for IV insertion, intramuscular injections, and intradermal injections. Simulation provides a means for training in a less threatening environment in which students are not exposing patients to unnecessary pain and suffering.[7]

Fig. 1: IV Cannulation skill practice by using task trainers.

Intravenous (IV) Access Protocol: GVK EMRI and Stanford Emergency Medicine International (SEMI) USA designed and developed standardized pre-hospital emergency care protocol manual for EMTs in a simple and in brief, such that EMT can easily memorize the protocol and implement on the patient to save the lives[9] as shown in (Fig. 2).

- IV (intravenous) catheter/cannula may be inserted into peripheral veins
- IVs may be used to administer fluids or medications
- Use a safety needle (if available) when inserting IV catheters/cannulas
- Avoid more than 3 attempts at vascular access per patient unless absolutely necessary
- Wide open: The drip regulator is left in the open position
  - Use caution in the elderly, children or patients with cardiovascular disease
  - Reassess lung sounds frequently to monitor for fluid overload
- TKO (To Keep Open)/ KVO (Keep Vein Open): A rate of 25-30 ml/hr
  - Default rate, unless otherwise indicated

Procedure

1. **Choose size**
   - Use 18 gauge catheters/cannulas for routine IV access
   - Use large bore catheters/cannulas (14-18G) for large fluid volumes or unstable patients
   - Use age-appropriate catheter/cannula size for pediatric patients
2. **Choose number**
   - Place 2 IVs if at risk for significant volume loss, hypotension, or instability
3. **Choose site location**
   - Avoid extremity with injury, cellulitis/infection, fistula or prior breast operation
   - Place large bore IVs in proximal location (e.g., antecubital fossa)
4. **Choose fluid or drug to administer**
   - Fluid challenge for adult patient (NS 500 mL), for pediatric patient (NS 20 mL/kg)
   - Ensure medication can be given intravenously prior to administration
5. **Document**
   - Gauge, site, number of attempts, fluid infused, time and rate

Fig. 2: Intravenous (IV) Access Protocol - GVK EMRI.

Rapid intravascular access is a prerequisite component of emergency care and resuscitation. Peripheral intravenous (IV) access is the first-choice for most of the medical or trauma patients, but may be delayed in emergency conditions because of various difficulties.

Intraosseous (IO) access is useful when vascular access is difficult or likely to lead to delayed management in emergency situations. Failure to gain intravenous access in a trauma, burns, shock or resuscitation setting ILCOR, 2010: "Delivery of drugs via an endotracheal tube is no longer recommended – if IV access cannot be achieved, drugs should be given by the "IO route".

Role of Supply Chain Management (SCM): GVK EMRI is operated through PPP mode (Public Private Partnership), the purchase department in the organization also follows public procurement procedures. Tender process will be initiated for the purchase of all the items, including IV equipment. Based on the tender outcome, Purchase Order will be issued to the successful bidder, to supply the items in stipulated time to the destination site. Stores department will receive the material in full quantity and confirm the Procurement department to process the payment. Procure to Pay process cycle is facilitated by the SCM department in GVK EMRI organization.

Logistics and Distribution System in GVK EMRI: On monthly basis, stock indent request is received from the field to stores, based on the request Stock-Keeping Units (SKU) are dispatched from stores to the field through third party logistics. Lead time taken by third party logistics to deliver the items is 3 to 4 days. 15 days of stock maintained as safety stock in the stores to meet the Emergency situation as shown in (Fig. 3).

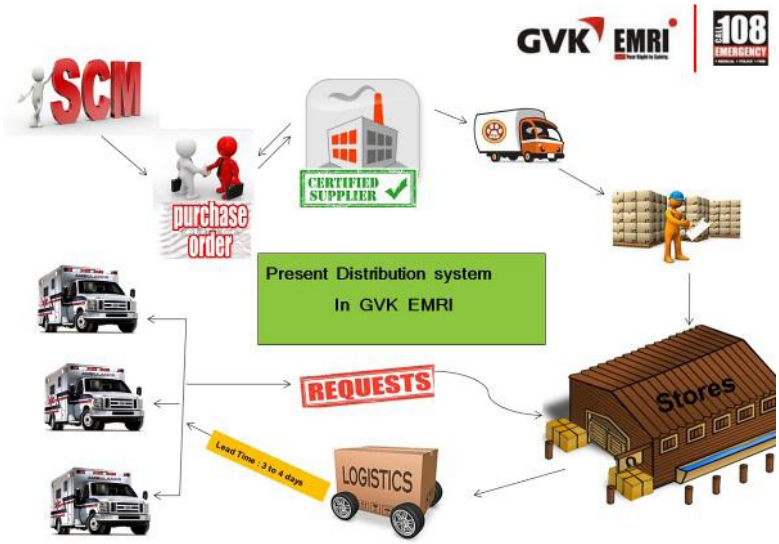


Fig. 3: Distribution system in GVK EMRI.

RESULTS

GVK EMRI conducted a prospective study of patients calling 108 for Chief Complaint of **"*Trauma*"** in 2016 in six GVK EMRI operating states in India. At initial enrolment, trained research assistants used a standardized questionnaire to collect data in near real time through the phone from the EMTs caring for patients. EMTs performance in pre hospital setting on IV placement and IV Fluids given in 542 (74%) of the trauma patients.

In total, an inclusion sample number of 2643 Trauma patients were enrolled during the study period of 3 months from November 2015 to January 2016. State wise distribution of cases and percent were shown in (Fig. 4).

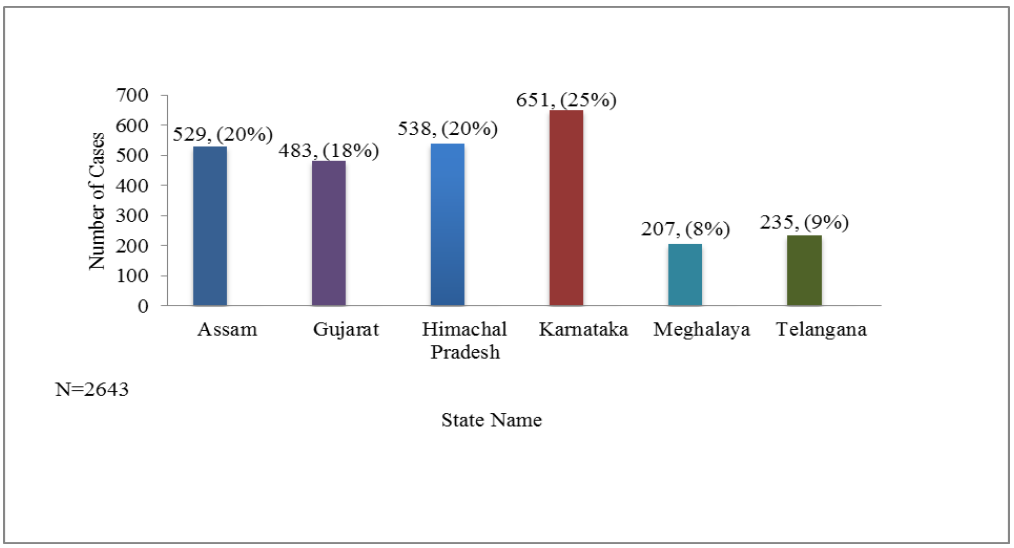


Fig. 4: Distribution of Trauma sample in 6 operating states of GVK EMRI.

State wise distribution of IV placed and IV fluid given cases were shown in (Fig. 5). Out of IV placed in 735, among these IV Fluids given in 542 (74%) of the trauma patients.

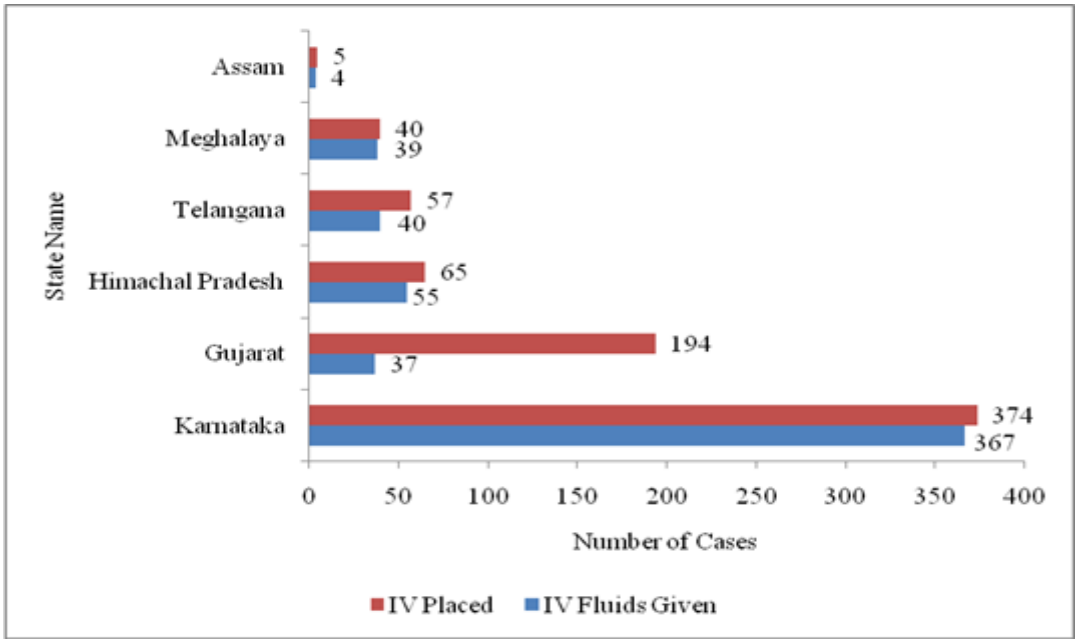


Fig. 5: State wise distribution of IV placed Vs. IV fluid given cases.

DISCUSSION

From the above study, we observed that 28 percent of patients received IV cannulation amongst Trauma victims and out of this, 74 percent patients received IV Fluids by following GVK EMRI standardized protocol. The percent of patients, who received IV fluids, is high in view of trauma associated blood loss. In GVK EMRI, 108 ambulances EMTs transport many emergency patients, who require pre hospital medical interventions. Every basic EMT is given 2 hours theory and 6 hours practical training on IV cannulation. Protocol manual being used, highlights the steps and indications of IV Cannulation. EMT's are having clinical rotations include 10 day's hospital and 10 day's ambulance. In these clinical rotations, they practice the IV cannulation skills on patients in real time under the supervision of instructor. EMT uses the 'logbook' in clinical rotations to document the quality and quantity (ideally 25 times) of IV cannulation skills practice.

Healthcare Sector Skill Council (HSSC) also specifies that in **EMT Basic model curriculum,** under the section Unique Equipment Required which covers IV related training on All Size, IV Cannula 16, 18, 20, 22, 24; IV Fluid NS, RL, D25%.[10] In GVK EMRI ambulances also having all sizes of IV canula and choice of IV solution is usually limited to two isotonic crystalloids, Normal Saline (NS) and Ringer's Lactate (RL) solution. 25% Dextrose (D25) is often reserved for administrating medication.

EMTs follow the IV cannulation standardized protocol when placing an IV cannula to the patients by using different sizes of cannulas for adult, child and infant patients. The EMTs will choose the appropriate size of cannula depending on the patient condition. Emergency Response Centre Physician (ERCP) is available round-the-clock at GVK EMRI state level Emergency Response Center (ERC) to support the EMTs on medical oversight. EMT documents the case details and pre hospital care information in the Prehospital Care Record (PCR).Thus, trained EMT in the 108 ambulances provides evidence based pre hospital care under the guidance of ERCP on giving IV fluids.

CONCLUSION

Setting up IV access is a commonly performed pre hospital procedure. Based on this study, one out of every fourth Trauma victim was cannulated by Emergency Medical Technician of GVK EMRI in the pre hospital setting.

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