1. Gap Analysis
2. Why do ES Gap Analysis
3. Goals of this document
4. Sectors :

* Health Care Organization
* Investment Banking Organization

Health Care Organization – Trauma Resuscitation Service

Trauma resuscitation is a very important service provided by many healthcare organizations. In this report, we will be explaining what trauma resuscitation means, how the current workflow of trauma resuscitation is in major healthcare organizations and how technology can be used to make it more efficient.

Trauma resuscitation process begins right from where the EMS (Emergency Medical Services) picks up the patient from the injury/accident site and takes him/her to the trauma room in the hospital. Throughout this process where the patient is transferred from the injury site to the trauma room and during the treatment of the patient in the trauma room, there is a lot of information handling, data transfer and communication happening between the EMS crew members and the trauma team as well as between the trauma team members itself. A lot of these actions happen so quickly, that there is a very little time to document important information for future reference, retrieve reliable information and also results in a lot of communication gaps. Thus, there is a lot of room for improvement in the current workflow. We will discuss the points where IT applications could be used for information handling and transfer and how it changes the work flow via GAP Analysis.

Proposing IT solutions to support teamwork in trauma resuscitation requires a better understanding of the how the trauma team works, their information needs and information seeking behavior. We will be focusing on proposing a new workflow to support information handover as well as information needs of the trauma team.

1. *Overview of Current Workflow*

Start

EMS picks up the patient and notifies the hospital

Trauma Team Prepares

Patient Handover at the hospital and information update

ATLS

Information Acquisition, exchange and archiving

Complete

Treatment Plan and Reporting

The EMS crew gets a notification about a victim/patient to be picked up. The EMS crew departs towards the site and notifies the hospital about an incoming patient arrival via *phone/pager.* Once the EMS crew reaches the accident site, it updates the trauma team with patient information. The information transferred at this time is restricted to the *sex, name, approximate weight, and approximate age* of the victim*.*

Upon learning about a pending patient arrival, the trauma team members assemble in the shock trauma bay. The trauma team typically consists of 8-10 members comprising of an attending surgeon, an orthopedic, a pharmacist, nurses, a respiratory therapist and an x-ray technician. There is always an assigned team leader in the trauma group to lead the medication. The point to be noted however is that the members of the trauma team are not specialized trauma team professionals but are general doctors and physicians who have been called from their regular duties for an emergency. As a result, they have little or no time to plan for proper medication, gather sufficient information or lookup the patient history (which in most of the cases is not available in trauma cases). So the trauma team relies on the EMS crew for certain critical information like the pulse rate, blood pressure, neurological status of the patient while on the transit. Many of the initial patient treatment plans is based on the information from the injury site.

*However this information transfer from the injury scene to the trauma team does not follow a specific protocol/standard and is a mixture of handwritten notes, mental recollection and verbal reports. Thus the information transfer lacks continuity and structure resulting in communication failure and missing information.*

As soon as the patient arrives at the trauma bay, the hospital staff prepares the patient and takes him/her to the trauma room while one of the nurses gets the briefing from the EMS crew member. Even this information transfer comprises of verbal communication and handwritten notes. Sometimes, due to lack of synchronization and due to the rush, there are two EMS crew members updating two different trauma team members with patient information. This may result in information collision, confusion and also some miscommunication. The EMS crew members do not get any special training in conveying critical patient information and most of the information transfer is based on how they can recollect. In addition, the trauma team members often immediately start with the patient assessment and treatment and pay little or no attention to the EMS briefings. This results in repetitive briefings about the same information by the nurse to different team members generating a lot of redundancy and time wastage in such a critical environment.

The trauma team follows a well defined protocol known as *ATLS* (Advanced Trauma Life Support) for trauma resuscitations around the world. The protocol consists of four phases –

1. Evaluation of physiological systems : establishing and maintaining airway
2. Adequate ventilation : breathing
3. Perfusion : Circulation
4. Neurological Status : Disability

The results and records pertaining to these four phases are noted down by the nurse periodically and dictated to the physicians/surgeons on request. Due to multiple people in the trauma room, this information might get missed easily and also there is a possibility of confusion of timely information.

Trauma room is thus a very stressful, noisy and dynamic environment where the patient information is not readily available and flows in a continuous manner from sources inside and outside the hospital. Also, this information is retrieved in a need basis resulting in improper data storage and redundancy in information transfer. Unlike other settings such as ICU where a complete history about the patient is available, trauma treatment requires the staff to act upon the details available in a much shorter period of time.

There is a requirement for a system that stores, retrieves information throughout the medication and also maintains uniformity.

1. SWOT analysis

|  |  |
| --- | --- |
| Strengths   * Established protocol for initial treatment plan. * Reliable notification by the EMS crew about the patient arrival. * Experienced and well composed trauma team. | Weaknesses   * Failure to transfer information reliably during handover by EMS crew. * Absence of a standard protocol for information transfer by the EMS crew. * Absence of a system to store critical information on the go. * Unreliable methods of note taking and verbal communication |
| Opportunities   * Use of IT tools to support teamwork in a trauma room. * Use of a mobile application for storing and transferring information by the EMS crew. * Use of an ES system for information retrieval and storage for the trauma room. | Threats   * Miscommunication resulting in wrong treatment plan. * Absence of timely information resulting in delayed treatment. * Communication gap between the EMS crew and the trauma team. |

1. Major problems faced in current workflow- Limitations to the application of IT in this field

As seen from the above SWOT analysis, the major concerns with the above workflow is the way information is transferred and retrieved due to the absence of an established IT tool for the same.

EMS crew members do not have any tools or a standard method for reporting information from the injury site to the trauma team. This information transfer is purely based on memory recollection, verbal communication and note taking on papers which is highly unreliable.

During the patient handover by the EMS crew, the information handover also takes place. Due to the time critical scenario, this information transfer is mostly verbal communication by the EMS crew member where a nurse notes down the information on a paper which is later presented to the entire trauma team. The problem with this is that, the EMS crew member might miss out certain information due to improper recording. Also the nurse has to present the same copy of the record to all the members or she has to dictate information which again has to be noted down.

The second major problem is the way the trauma team members communicate with each other in the dynamic environment. Most of the communication is verbal, which to a lot of extent cannot be changed and is the quickest way.

1. Solutions and Changes

* Mobile Application for the EMS Crew to store and transfer information reliably

The EMS crew members should be equipped with a tablet which has a customized application for the health care organization. This application should be designed to have the following features:

1. Injury Site Patient Information form
2. On-Transit Recording form
3. Receipt notifications
4. Tracking the nearest hospitals
5. Additional Contact Information of the hospitals
6. Blood Bank Notification
7. Patient Handover Form
8. *Injury Site Patient Information* refers to the immediate information that the EMS crew gets about the injury site and the patient. The application should have template forms that could be filled in by the EMS crew members easily rather than typing the entire thing. The form could contain some of these fields –
9. Injury Site Location
10. Patient Name
11. Patient Age
12. Patient Sex
13. Injury Description
14. Estimated time of injury
15. Estimated time to handover

Once this information has been filled and saved, the form could be shared by the EMS crew member with the corresponding trauma team staff. This would eliminate communications via phone/mobile/text and also result in easy documentation. The hospital staff could also respond back to the EMS crew with a receipt and other required information. The application should have the ability to design customized templates for forms so that different EMS crews can design different forms according to their usage.

1. *On Transit Recording*

This is another feature that the application should have to record the patient information on transit when the EMS crew is taking the patient to the hospital. Once the EMS crew has picked up the patient, they go through their routine emergency check up to determine the pulse rate, blood pressure, respiratory levels and loss of blood. This is very critical information that needs to be stored and sent reliably to the health care team. Most of the initial planning of the trauma team happens on the basis of this information. Instead of recording this information on paper and transferring it via verbal communication, this application could be used to fill in the data and sent via the wireless network on the go. On Transit form can have some of these fields–

1. Pulse Rate
2. Blood Pressure
3. Respiratory status
4. Bleeding Status
5. Patient Blood Type
6. Consciousness
7. Neurological Status
8. Recording time
9. *Receipt Notifications*

Receipt notifications are the notifications that are used to convey the sender that the receiver has received the message. This is a very important feature that the application should have. The application should be smart enough to re-send the forms if it does not receive the notification within 5 minutes after it is send. The application should also notify the sender after 3-4 failures. This is because, the workflow is very time sensitive and critical and the EMS crew members cannot afford to send the same information again and again on their own. This will avoid the possible scenarios where a phone conversation breaks due to signal loss, or improper communication due to noise in the signal resulting in saying the information again. Once the EMS crew member has sent the information, he can be assured the application will send the data reliably and correctly.

1. Tracking the nearest hospitals

This is may be used as an added feature for the application to track the nearest hospitals from the injury site. Usually, the EMS crew is well equipped with information regarding the hospitals, but this feature could be used in dire circumstances.

1. Additional Contact Information of the Hospitals

The application should be like a messenger service providing sharing functionalities. Once the information for all major hospitals is added, the application should allow the users to share the forms with click of a button. The application should also have the facility to send a text message, voice message to the desired recipient. This would help the EMS crew to contact the hospital staff more personally.

1. *Blood Bank Notification*

This is yet another important feature that the application could provide. Based on the blood type of the patient, the hospitals have to usually arrange for the blood from their own blood bank or contact other banks for the same. This may take up some time, due to chained communication. The application could notify the approaching hospitals as well as all the nearby blood banks about the blood type of the patient. The blood banks can reply back to this notification to the hospital based on their availability. It would serve as a very handy tool for the hospitals to know the availability of blood in their own bank as well as other banks quickly thus saving some crucial time.

Once the required information has been saved, the EMS crew can transfer the information to the hospital during the handover. The hospital staff should have the same application running on their side to retrieve the information. The application can also have an electronic sign off provision to indicate that the handover has been completed. Thus using this application, the information chaos in recording, noting and transferring the information can be avoided.

* **Application to assist teamwork in the trauma room**

Based on the current workflow and the discussion so far, it is very important to understand the problems faced in the trauma room and the technical difficulties of implementing an IT tool for assistance. Trauma room is a very noisy and dynamic environment where communication is a critical thing. If we have an ERP system to store the information and retrieve it on time, then this could avoid a lot of miscommunications and redundancy in information transfer.

Usually all the trauma teams have a nurse who keeps on recording notes throughout the treatment. The nurse could instead put in the information in an ERP system in a separate module which could be linked to the other modules within the hospital. This could help us in retrieving historical data about the patient if present, reliable storing of information, easy documentation, and avoid redundant information transfer since the information is available to everyone from the system. A lot of major hospitals already have an ERP system for the organization, but these systems lack a specialized module for the trauma bay. So implementing a module in the system for the trauma team would be the best IT solution for this purpose.

The trauma module could be linked to other modules such as the pharmacy module, address book. The pharmacy module could suggest the available medicines depending upon the patient injury and illness. The address book could be used as a patient repository to retrieve historical information about the patient and also check the availability of doctors. The information once stored could be displayed in a screen in the hospital room from where everyone could read and access it. This would avoid the repeated queries that are made to the recording nurse and also reduce some confusion.

The new module could also be linked with the inventory module which basically stores the information regarding all the medical equipments currently in use. This would help the staff keep a track of the medical equipments being used in the trauma center, helping the staff to track the status of it and also availability.

1. Adaptation

Now that the changes to be made in the workflow are known, it is very important to facilitate a smooth transition from the current workflow to the proposed workflow. Some of the measures that could be followed for the same are:

* EMS Training - The EMS crew should be provided formal training for the use of the application in numerous simulated trauma events. This would help them to get used to the system and also identify possible hindrances /bugs in their workflow. The EMS team should be trained for data reporting, information transfer, handover information with respect to the new application.
* Trauma Team – There should be designated nurse in every trauma team who is well equipped with the enterprise system. This would avoid unnecessary waste of time due to the information retrieval during the patient handover since the information has already been sent to the system. The trauma team members should be trained to retrieve the information from the system directly rather than sending queries for the same. Since the system maintains uniformity, this would avoid wrong information being sent from one member to the other due to miscommunication.

1. Financial cost estimate

The cost of the changeover is not significant compared to its future usage and benefits. With the outburst of apps on iOS and android platform, a new application can easily be developed for the trauma team purpose.

The approximate overall cost of this system can be summarized as follows:

Capital Expenditure –

* App Development Cost : ~20,000 $ (for both the iphone and android platforms)

ERP module development cost: depends upon the vendor

* Hardware Cost : An ipad/EMS crew + a PC with a ERP module at the trauma bay ~1500$

Operational Expenditure

* Network Expenditure: 3G services for the EMS crew tablet ~50$/month
* Maintenance: Application maintenance fee ~ 50$/month

ERP module vendor will provide the maintenance and bug fixes