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Titled

EVALUATION OF TRAUMA REGISTRY IN GOVERNMENT HEALTH FACILITIES IN TAMIL NADU, INDIA. 2024-25:

A MIXED-.METHOD STUDY

Submitted by

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Final Project Report

Evaluation of Trauma Registry in Government Health Facilities in Tamil Nadu, India 2024-2025:

A mixed-method study

Submitted to

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Summary

Road traffic injuries are the leading cause of death among individuals aged 10–49 globally, with Tamil Nadu accounting for 13.5% of fatalities due to road traffic accidents in India. Recognizing the importance of timely intervention during the "golden hour," the Tamil Nadu Accident and Emergency Care Initiative (TAEI) introduced an IT-based Trauma Registry. This registry integrates pre-hospital, in-hospital, and post-hospital care systems, tracking patients from the scene to follow-up rehabilitation. Since its pilot phase in 2019–2020, the registry has expanded to 111 institutions. This study evaluates the registry's infrastructure, resource planning, and utilization, aiming to identify strengths and propose solutions to optimize its role in emergency preparedness and clinical outcomes.

We conducted a mixed-method study from September 2024 to March 2025 to evaluate the rollout of the Trauma Registry program in Tamil Nadu, India. Twelve TAEI centers were selected using stratified random sampling based on facility level (Level 1, Level 2, and Level 3). Ambulance (N=54) and hospital staff (N=50) involved in data entry were interviewed. Case sheets from Emergency Departments in July 2024 were sampled randomly. A total of 264 case sheets (22 per facility) were analyzed, with the sample size calculated using OpenEpi. Analysis done using software Stata v.17 and the qualitative analysis followed transcription, coding and thematic development from the interviews. Ethical approval for the study was obtained from the institutional Human Ethics Committee of ICMR-NIE

All the twelve facilities were equipped with data entry devices and dedicated staff. However, utilisation of devices for data entry was lower in forensic (43%, 3/7) and rehabilitation (50%, 3/6). Pre-arrival patient intimation displayed in 9 facilities. Formal training for dedicated staff was limited, with only 2% (1/50) of Hospital staff and 40% (21/54) for ambulance staff trained. Out of 342 case sheets reviewed for correctness, 110 (32%) were not entered into Trauma Registry.We observed variations in the vitals recorded in the registry when compared to the case sheet. The variables Heart Rate (147, 63%) and Blood Pressure (113, 49%) the values entered in registry were not matching with the case sheets. Blood transfusion details were not entered in the registry for 78% (139). By in-depth interviews and field observations revealed that the portal's primary use was for retrieving patient details and preparing census reports, while its broader utility remains largely unexplored

The findings highlight the transformative impact of the Tamil Nadu Trauma Registry in healthcare systems. From paper-based systems, this IT-enabled platform has streamlined pre-hospital, in-hospital, and post-hospital care, improving data retrieval, coordination, and decision-making. Key features, such as real-time pre-arrival notifications and integration of the 108 ambulance service and various departments, have enhanced emergency preparedness and early intervention.

However, challenges such as inadequate training, underutilization of specific modules, and a complex user interface limit its full potential. Addressing these gaps involves simplifying data entry processes, scaling up to rehabilitation modules, and providing the user guidelines. The registry serves as a model for leveraging digital platforms to revolutionize health systems, providing a scalable solution for improving trauma care and outcomes

Evaluation of rollout of Trauma Registry in Government health facilities in Tamil Nadu, India, 2024-25; a mixed-method study

Introduction

Globally road traffic injuries are the 7th leading cause of mortality among the general population and the most common cause of mortality among people aged between 10 and 49 years. (1)

Around one lakh fifty thousand deaths are reported annually due to accidents in India, and more than 60% are aged between 18 and 45. Tamil Nadu contributes 13.5% to this mortality due to road traffic accidents.(2)

Multiple vehicles, road users, and road infrastructure risk factors exist for road traffic accidents. Reducing mortality due to accidents requires a multidisciplinary approach centred on reducing these risk factors and timely managing accident victims. Proper first aid given in the first hour of road traffic injury, called as golden hour, is critical in increasing the chance of survival. Having a good road traffic injury surveillance system can have a track of causes and risk factors for mortality due to road traffic injuries. Capturing the series of events in the journey of a patient undergoing road traffic injury with proper timestamps is crucial in identifying lacunae in timely case management of cases.(3,4)

Tamil Nadu Accident and Emergency Care Initiative (TAEI) launched its IT based Trauma Registry with the aim of integrating the pre-hospital, in-hospital and rehabilitation care components. The system was developed to capture the patient clinical profile, treatment and outcome of all trauma victims coming into contact with the Government health facilities from the moment the individual is picked up by 108 Ambulance service till their follow-up for rehabilitative care. Moreover, it connects key stakeholders like police department and integrates IRAD (Integrated Road Traffic Accident Database), as well as the post-mortem details when necessary, reflects a robust step towards improving emergency and trauma care Tamil Nadu.

The optimal functioning of the Registry requires collaboration, cooperation and coordination between various departments and stakeholders and training of staff involved (5)

It also requires constant monitoring and evaluation to assess the completeness of the rollout and validity of the information entered into the registry. However, as noted, there has not been a formal evaluation of the registry since its inception. With this background, we are proposing this study to describe and evaluate the functioning of the TAEI Trauma Registry.

Objectives

- To describe the intended & in-practice functioning of TAEI Trauma Registry portal in Tamil Nadu, India
- To evaluate the TAEI Trauma Registry portal in Tamil Nadu with respect to its completeness & correctness
- To explore the challenges in implementation of trauma registry portal in Tamil Nadu

Methods

Study Design: We conducted a single-phase convergent mixed methodological study-design to evaluate the role out of Trauma Registry program in state of Tamil Nadu.

Study Setting: There were total 111 intuitions with functional Trauma Registry in Tamil Nadu, India and we conducted the study in 12 selected TAEI (Tamil Nadu Accident and Emergency Care Initiative) care centres

Study Period: September 2024 to March 2025

Methods for Objective – 1

Study design: Qualitative

a. Document review – Government orders released during the formation and further establishment of Trauma Registry, Tamil Nadu.
b. Stakeholder discussions with state consultants of the Trauma Registry Program aim to explore the program's concept, the formation, objectives and its utility from the perspective planners.

Study participants

Document Review: The documents reviewed were; G.O. 03.12.2020 | G.O. 21.10.2021 | G.O. 30.09.2022 | G.O. 25.08.2022 | G.O. 22.11.2022 | G.O. 14.06.2022 | G.O. 15.06.2023 | G.O. 26.07.2023 | G.O. 27.09.2023 | G.O. 14.10.2024

Stakeholder discussion: In-depth interview of stakeholders at various level involved in the functioning trauma registry, including state level nodal, facility level nodal officers, emergency medical officers and data entry staffs.

Sampling Technique and Sample Size

Document review: We retrieved and reviewed all accessible and publically available documents related to Trauma Registry.

Stakeholder discussion: We conducted in depth interview of stakeholders involved in the functioning of Trauma Registry. Sampling was based on maximum variation. Sample size we followed the principle of data saturation

Data collection instrument and Data Collection

Document Review: A comprehensive document review was conducted. All retrievable documents (online or offline) related to the Trauma Registry's initiation, functioning, monitoring, supervision, and evaluation were identified. Investigators performed a thorough review of all these documents.

Stakeholder Discussion: A systematic qualitative enquiry was conducted using in-depth interviews of individuals engaged with various aspects of the Trauma Registry. A comprehensive, in-depth interview guide was prepared to facilitate this process. The Key informant interviews were given unique number to ensure the privacy and confidentiality.

Analysis

The investigator generated and compiled transcripts of key informant interview using notes and audio recordings. The investigator familiarised themselves with the transcripts by reading them multiple times. A primary set of codes was generated from the transcripts. The codes were finalised, and the codebook was created following detailed discussions among investigators. Similar codes were combined into categories and themes, which were subsequently described. Similarly process repeated to was done to generate categories and themes based on document reviews also.

Methods for Objective – 2

Study design

a. A Quantitative – Cross sectional design is used to assess correctness of the data entry. We have conducted a Clinical record review and compared the information entered in Trauma Registry Portal
b. To assess completeness of data we conducted Registry data analysis

a. Assess the Correctness of data entered in Trauma Registry

The correctness of data entered in trauma registry was verified by comparing paper based emergency case records with the corresponding entries in the Trauma Registry portal.

Sampling Technique

Health Facility was selected by stratified simple random sampling. From each level (level 1, level 2 and level 3) we selected 4 TAEI centres by simple random sampling. From each selected facility we retrieved case sheet by simple random sampling among the patients admitted in Emergency Department in the centre in the month of July 2024.

Sample Size: Sample size was estimated as 264 (22 case sheets per facility) based on the following assumptions. Expected data completeness rate of 50%, an absolute error of 10%, a design effect of 2 and estimated non-availability rate of 20% using OpenEpi (www.openepi.com).

Data collection tools and Mode of data collection:

To assess the correctness of the data entry to the trauma registry portal, we selected 22 case sheets from each selected health facilities. These case sheets were of individuals who visited the emergency room in the month of July 2024. We used the patient name, age, date of entry, and presenting complaint from the line list for identify the cases in the portal. The data collection tool included a correctness checklist that could compare if the information entered in registry matching with the case records collected from the medical records department. There were total of 13 variables, 7 were from triage nurse module

and others from EMO2 module. The data collection tool prepared in ODK, each variable given four responses.

Operational Definition of responses in correctness checklist:

Matching - Information entered in the registry matching with the case sheet information
Not matching - Information in the registry does not match with case sheet information
Not recorded in case sheet – Information not recorded in case sheet, but entered in registry
Not recorded in registry – Information recorded in case sheet, But not in Trauma registry portal.

The key aspects examined included:

Initially, we selected 15 variables from different modules of Trauma Registry to check for correctness of data entry. Among that seven variables were from triage nurse module, five from EMO2 module, one from emergency surgery module and one from the ICU module. All variables, except blood transfusion, were mandatory variables of Trauma Registry.

The variables from triage nurse module included all vital signs of patients upon arrival: GCS (Glasgow coma scale), BP (Blood Pressure), HR (Heart Rate), SpO_2 (Peripheral Oxygen Saturation) RR (Respiratory Rate), and Pupil reaction.

The GCS in trauma registry recorded as a total value (maximum 15) which is automatically calculated from the GCS eye, GCS verbal and GCS motor with each had maximum score of five. While in case sheets, consciousness of the patient was often noted "patient oriented/disoriented, conscious/unconscious" or the total or component score of GCS out of 15.

The Heart Rate (HR), Blood Pressure, Respiratory rate, and SpO_2 were recorded as numerical values in both the Trauma Registry portal and in case sheets. Regarding pupil size and reaction, the trauma registry recorded variables such as includes pupil size (right), pupil reaction to light (right), pupil size (left) and pupil reaction to light (left), Among these, pupil size (right) and Pupil reaction to light (right) were mandatory in the Trauma Registry.

The EMO2 module included five variables: The recent history of alcohol consumption, Drug use, procedure e-FAST, blood transfusion and requirement for specialist opinion.

The alcohol consumption and drug use, as recorded in case sheets, were compared with Trauma Registry entries, with responses marked as "yes" or "no" in the registry.

The e-FAST procedure was captured in the trauma registry portal as "yes" or "no", and in case sheets with the details of procedure.

The blood transfusion, was a non-mandatory variable in trauma registry portal, was recorded as "no" if not required and "yes" if need.

The specialist opinion in trauma registry was marked as "yes/no" while in the case sheets, it was identified through the doctors name and designation recorded in case sheets.

Initially, 'surgery date and time' were considered for correctness checks in emergency surgery module. However, most health facilities had not started entering data in this module, making it impossible to capture responses. Instead we examined the "surgery

required" variable in the EM02 module to understand data accuracy related to emergency surgeries. Later the ED disposition variable also included as it is a mandatory variable for all cases arriving at emergency department. Responses were recorded as red, yellow, green, or black in the portal.

Data Analysis:

As part of case record review, 30 case sheets were selected from each of the TAEI canters for the month of July 2024. The responses were analysed by comparing the information recorded in the case sheets with the data entered in the portal. Descriptive data analysis was conducted using the statistical software STATA v.17

b. Assess the Completeness of data entered in registry

All the recorded data in trauma registry portal retrieved from the state authority from 2021 to 2024.

Selected data: The registry data entered during the first six months and last six months of project period

Operational Definition:

Complete data: Proportion of patients for whom a variable is completed, out of the total number of patients eligible for the variable to be completed

Analysis: The registry data in first six (September 2021 to February 2022) months and last six months (February 2024 to July 2024) were analysed using statistical software STATA v. 17. The missing data entries in each stage of pre-hospital, hospital, and follow-up & rehabilitation stages were calculated. Also, the complete data and incomplete data entries were tabulated across different modules.

Methods for Objective – 3

Study design - Mixed method (Qualitative and quantitative) to explore the challenges in implementation of Trauma Registry portal.

1. Quantitative method
   a. Health facility checklist
   b. Data entry staff interview

Study participants

Health facility checklist: Government Health facility with functional Trauma Registry in Tamil Nadu were selected to find the equipment availability, pre-arrival information, human resource for data entry, and budgets related information.

Data entry staff interview: The 108 emergency service is staffed by Emergency Medical Technicians (EMTs). Addition to patient care, EMT staff were also responsible for entering data into the 108 application.

Each medical college (Level 1 and Level 2) was allotted one Emergency Department (ED) Secretary and trauma registry assistants (TAs) to enter data into the Trauma Registry. The

Level 3 facilities with one trauma assistant for the purpose of data entry. In addition to dedicated staff, data entry personnel responsible in each department handle the different modules of the trauma registry portal. Annexure……

i. The emergency medical officer in charge
ii. Data Entry Operator
iii. 108 Ambulance Staff
iv. Staff nurse
v. Other technical staffs involved in data entry

Sampling procedure and Sample size:

a. Health facility checklist

Stratified Simple random sampling used to select the health facilities for the study. In the first stage, the health facilities with functional Trauma registry program in Tamil Nadu were stratified into level 1 level 2 and level 3. By using the list of TAEI centres at each zone will be sub stratified into TAEI centres. From each stratum, health facilities for the study selected using simple random sampling.

b. Data entry staff interview

Ambulance staff who visited the health facility during day of health facility visit and involved in data entry to trauma registry were selected for the interview.

Hospital staff who was identified as entering data into trauma registry by nodal officer at facility or ED secretary or the head Emergency department and were available at the day of visit.

Data collection tools and mode of data collection

a. Health facility check-list

The health facility checklist was designed to assess the availability of equipment, the human resources engaged in data entry, pre- arrival information, the standard operating procedures (SOPs) or guidelines concerning the Trauma Registry at the facility, as well as budget –related aspects. A health facility checklist was developed using the Open Data Kit (ODK) platform, with data collected through observations at facility and discussions with the respective nodal officers at each facility.

Separate semi-structured questionnaires were developed for ambulance staff and hospital staff. These included questions on the training provided, feedback mechanisms, and challenges related to the portal, network and devices. Open-ended questions were also included to identify additional challenges and activities.

The permissions for communicating with ambulance staff were provided by the EMT coordinator of the facility. To ensure confidentiality, each participant was assigned a unique ID within the facilities. Both the checklist and the questionnaires, created using ODK, were securely stored on the ICMR server.

The key aspects examined included:

Pre arrival intimation: it refers to the process where Emergency Medical Technicians (EMTs) provide advance notification to the Emergency Department about the incoming critical cases, which is integrated with 108 application and trauma registry portal.

The equipment availability: The equipment provided under the trauma registry program included desktops, laptops, tablets and printers. We recorded the numbers of sanctioned, available and functional equipment in the facility and verified the number of desktops currently used for data entry in the hospital.

Human resources: To understand the work load and human resource allocation, we asked the current vacancies of the dedicated staff responsible for data entry.

Budget: The specific budget allocation as equipment, human resource and other expenditures were examined to understand the budget related challenges

b. Ambulance staff interview

A semi-structured questionnaire were prepared includes the questions on socio-demographic characters of the staff, the details of training, SOPs and feedback mechanism about the data entered in 108 application. Also, the challenges faced related to portal, network and device. Additionally questionnaire includes some open ended questions to capture the other challenges faced by the staff.

c. Hospital staff interview

We used ODK platform to capture the responses of the participants. The staff asked questions on socio-demographic details, training details, SOPs provided to them, challenges on data entry and the feedbacks.

Data Analysis:

Questionnaires and observation checklists were integrated into the ODK (Open Data Kit) application. The collected data were shared and stored in ICMR - NIE server. Data analysis was conducted using STATA v.17.

Qualitative variables were summarised as proportions or percentages, and quantitative variables were summarised as mean (standard deviation) or median (interquartile range) depending on the normality of the data. Certain quantitative variables were recoded and presented as proportions and percentages during analysis.

2. Qualitative method
    I. Key informant Interview with stakeholders to understand the facilitators and barriers of functioning of Trauma Registry.
    II. Field observations of all selected TAEI facilities

Study participants

All the selected TAEI centres were observed and the key findings were recorded in field notes in filed notes. For the key informant interview includes the nodal officers, medical officers, data entry staffs, Residents, Staff nurses and other technical staffs involved in data entry in Trauma portal.

Sampling procedure and Sample size

For the key informant interview, at least one representation ensured from state level nodal officers, facility level nodal officers, Medical officers, Data entry staffs, 108 staff nurse and other technical staffs related to trauma registry project. Sampling was based on maximum variation. Sample size we followed the principle of data saturation.

Health facilities were selected using stratified simple random sampling. All the selected facilities visited and made facility field notes.

Data collection tools and mode of data collection

A systematic qualitative enquiry was conducted using in-depth interviews of individuals engaged with various aspects of the trauma registry. A comprehensive, in-depth interview guide was prepared to facilitate the interviews. The Key informant interviews were assigned unique numbers to ensure the privacy and confidentiality.

Observations were made regarding the arrangement of TAEI wards, the distribution of equipment, pre-arrival intimation, patient flow processes, timing and methods of data entry and the overall work environment. These observations helped identify facilitators and challenges related to trauma registry data entry. Field notes and images collected from each facility were documented for further analysis.

Analysis

The investigator generated and compiled transcripts of key informant interview using notes and audio recordings. The investigator familiarised themselves with the transcripts by reading them multiple times. A primary set of codes was generated from the transcripts. The codes were finalised, and the codebook was created following detailed discussions among investigators.

The remaining transcripts were then coded based on the finalised codebook. Similar codes were combined into categories and themes, which were subsequently described. Final tables arising from the analysis were shared with stakeholders for their feedback and approval to ensure data processing accuracy and validity. Findings from the study were reported using the Consolidated Criteria for Reporting Qualitative Research (COREQ) guidelines.

Quality Assurance & Quality control

The questionnaires were pilot tested in real-world settings at TAEI centres and modified based on the feedback received. The data collectors were trained by Principle investigator. The data were analysed at regular intervals to identify and address any inconsistencies or errors.

Human Participant Protection

All necessary permissions were obtained from the concerned departments and facilities. Consent was secured from the study participants after the study was explained in an understandable language, both for participation and for audio recording of the interview.

Personal identifiers were made accessible only to data collectors and were de-identified at the analysis stage, with data being presented only in a summarised form. Data collectors were trained to administer the questionnaire with utmost empathy. Study findings and insights were communicated to the concerned TAEI centres, directories and the government of Tamil Nadu.

RESULTS

Objective 1

Description of the Trauma Registry program - Qualitative

1. Formation of Trauma Registry program

The Trauma Registry initiative began as a pilot program during 2019-2020 at Vellore Medical College and Ambur General Hospital. As a second year activity (2020-2021) an IT based Trauma registry was established across 26 trauma care centres of medical colleges in Tamil Nadu. During the year 2021- 2022, the registry was expanded in 11 new medical college hospitals. Since to achieve the year four target (2022- 2023), established the Trauma Registry in four government district headquarters. Currently, the program encompasses 111 institutions, including 37 medical colleges and reminder comprising District Head Quarters, Taluk and General hospitals. [G.O.03.12.2020|G.O 21.10.2021|26.07.2023]

"In Vellore and Ambur GH, Vellore Medical College Hospital and Ambur GH, pilots we started."[KII-1/State nodal officer/Male]

"Jan 2, next September we established 27 Medical College Hospitals.....Then February 2022, we established 11 more Medical College Hospitals" [KII-1/State nodal officer/Male]

The list of the facilities were the Trauma Registry is currently running is given Annexure 3.1

2. Conception of the program

The need for a new digital platform was identified to address inefficiencies in the existing system. The existing paper based registries were not only time consuming but also posed challenges in retrieving the documents for future reference and research. Additionally, the existing 108 ambulance services operated independently, highlighting the need for linking these services to a common trauma system to ensure coordination in pre-hospital, in-hospital and post-hospital levels of care. The new system was designed to track a patient from the incident scene through the entire care process. By consolidating the independently managed earlier systems into a unified platform, the program aimed to maintain the continuum of patient flow as well as the quality of data collected [G.O.03.12.2020|G.O.21.10.2021|26.07.2023|G.O.14.10.2024]

"*Ambulance service was differently maintained and this (Registry) was differently maintained.... the main thing was there was no connection between what was happening in the ambulance."* [KII-1/State nodal officer/Male]

"Trauma registry will connect the ambulance system as well as the TAEI centre system." .....patient goes in or whether it is death or the follow-up." [KII-1/State nodal officer/Male]

The IT enabled trauma registry program, was conceived by incorporating functioning trauma registry models from the private sector hospitals in India, the All India Institute of Medical Sciences, Delhi (AIIMS), and various foreign institutes.

3. Vision and Goals of the program

The perceived objectives of the program was to store and retrieve the data efficiently, and to track the patients from the scene to different care points. From the response of state level officers, we could understand that the program was conceived as an initiative to digitize the data so that the burden of entering as well as retrieving would be easy. The continuum of care can be assured after linking the existing ambulance services and patient care at the facility could be linked. [G.O. 03.12.2020|G.O. 26.07.2023|G.O. 21.10.2021]

"*Before it was a paper-based registry, which was very difficult to maintain or moreover, we can miss it out. Papers can, the book itself can go missing and every time we cannot open the old records, we have to go back, open it and then take details, if you want to do one study.....it is very difficult. But when we are in the digitalization world, it is very easy to get whole data in one or two minutes."* [KII-1/State nodal officer/Male]

"*Otherwise, it would take nearly one day to get all the data."* [KII-1/State nodal officer/Male]

"We can have an idea of the continuum, where the patient went, what happened and everything." [KII-1/State nodal officer/Male]

4. Functioning of the Trauma Registry at facilities

One of the key benefits of linking the existing ambulance services to the trauma registry was the real-time communication between the ambulance staff to the nearest health facilities. This pre-arrival information served as a trigger for the health facility staff, enabling them to promptly set up the triage and prepare to receive the patient effectively. The data captured by the emergency medical technicians (EMT) automatically captured in the transit care summary of the trauma registry portal, so that the dedicated staff at facilities can follow-up and collect the details for other modules of the registry.

"When the, mainly in case of emergency cases, it will help when the ambulance will give the pre-arrival intimation, it will give an idea in the emergency that so and so patient is coming, in the emergency people have to be ready." [KII-1/State nodal officer/Male]

"It has a monitor where it will give a red blink" [KII-1/State nodal officer/Male]

After receiving the patient, the trained nurse takes initiative, beginning with a check of the patient's vital signs. The initial priority is to stabilize the patient, and from the triage point, the care pathway is determined based on the type and severity of the emergency. Regardless of the emergency type, including medical cases, the patient's history is collected. Trauma cases are assessed by EMO2, typically a surgeon stationed in the emergency department. The following modules were filled according to the suggestions of the medical officer.

There are 14 modules in the trauma registry, with each module has separate login ID.

The detailed module list of Trauma Registry given Annexure .....

"So, as soon as the case comes to the emergency department, triage nurse will capture all the details of the patients at present vitals" [KII-1/State nodal officer/Male]

“……., so further investigation is done by the nurse. Once the nurse captures, automatically the case will be reflected into EMO-1 protocol. We have 14 modules, so each module we have a separate login and ID……So, once the nurse enters, EMO-1 will follow-up the case history. [KII-1/State nodal officer/Male]

5. Future plan

The future plans for the Trauma Registry program in Tamil Nadu include its continued implementation and expansion across tertiary and secondary care hospitals, aiming to enhance trauma care comprehensively. There is a focus on monitoring the program’s growth and scalability to ensure it evolves effectively over time. Additionally, potential enhancements to the system are being explored, such as incorporating functionalities like ambulance movement tracking to further improve emergency response and coordination. These developments underline a commitment to advancing trauma care systems in the region.

"In future… ambulance moving response, moving time, tracking time, if we bring it in the application, that will be useful." [KII-1/State nodal officer/Male]

Although the objective was to fully digitalise the data, this goal has been partially compromised in some facilities. Staff members often record certain information in paper based registries first, which is then manually entered into the trauma registry portal. This dual process highlights a gap in achieving seamless digitalisation across all centres. Efforts to address this issue will be critical in ensuring the program’s efficiency and accuracy moving forward.

“But the whole idea remains the same intact till now. That is one objective is the complete digitalization, it has been completely followed……. In a dual system, first the nurses’ start writing it in a paper or a book and then they go enter” [KII-1/State nodal officer/Male]

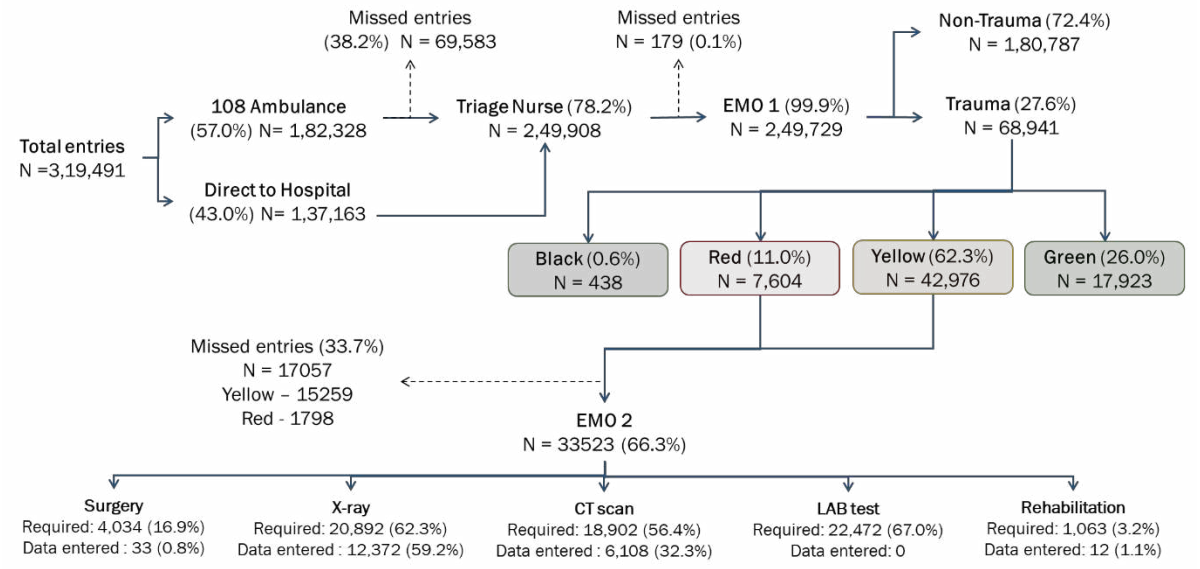
“In many of the hospitals, they have reduced the nominal registry. They have reduced manual entries and started to enter directly in the Trauma Register” [KII-1/State nodal officer/Male]

Objective 2

Correctness and completeness of data entered in Trauma Registry portal

a. Completeness of Trauma Registry

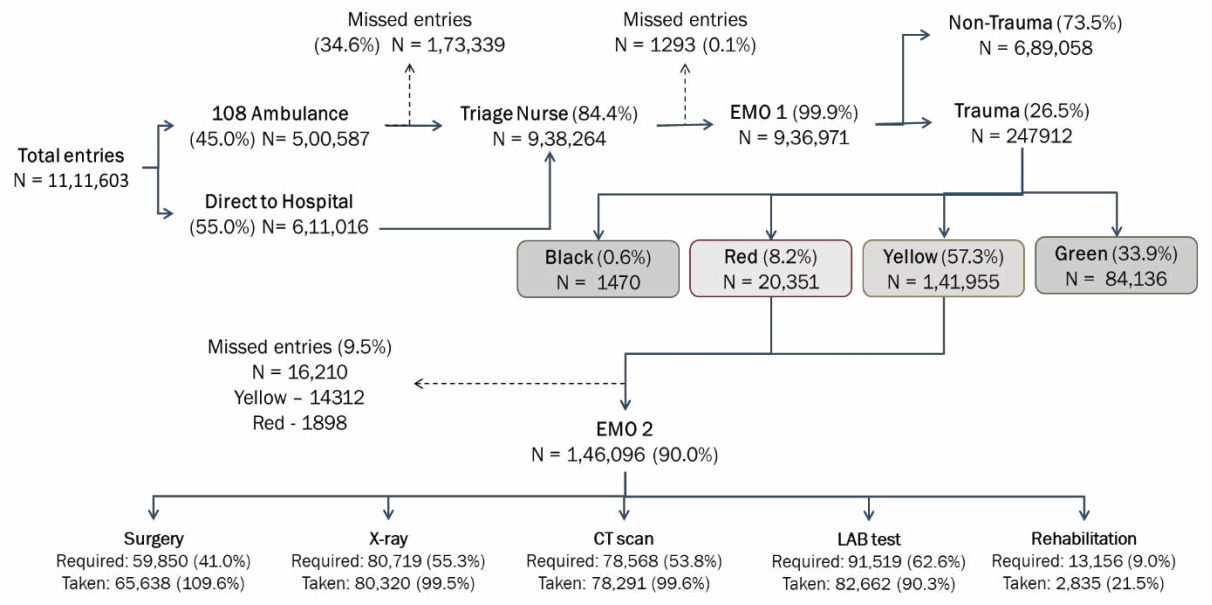
Flowchart for the period of first six month data – September 2021 – February 2022



A total of 3,19,491 cases were reported at emergency department during the initial six months of Trauma Registry, Of these cases, 57% (n=182,328) arrived via 108 ambulance service. Among those transported by the 108 service, 38% (n=69,583) of the cases were not entered into the Trauma Registry. Nearly all cases entered in the triage nurse module also proceeded to the next module, EMO1. Only critical trauma cases (red and yellow cases) are eligible to be entered in to the EMO2 module. However, of the 50,580 cases eligible for the EMO2 module, details for 33.7% (n=17057) of cases were not entered in the module.

Around 80% (n=18974) of the cases entered in the EMO2 module required specialist opinion. Remarkably, 105.4% case details were entered in the specialist module. Only 0.8% of the surgery-required cases were recorded in the in the surgery module of portal. Among the 20892 X-ray required cases, only 36.9% (n=12372) were entered in the X-ray module. Similarly, for CT-required cases in the EMO2 module, only 18.2% (n=6108) were recorded in the CT module. No entries were made in the laboratory module during this period. Additionally, only a few entries (0.1%) were made in the rehabilitation module.

Flowchart for the period of last six month data – February 2024 – July 2024



Between February and July 2024, a total of 11,11,603 cases were reported at the emergency department. Of these, 45% (n=5,00,587) were transported to facilities via 108 ambulance service. Among the cases transported by the 108 ambulance, 34.6% (n=1,73,339) were not entered into the Trauma Registry. Nearly all cases documented in the triage nurse module advanced to the next module, EMO1. Out of 1,62,306 cases eligible for the EMO2 module, 9.5% (n=16,210) were not entered in registry.

Around 110% of case details entered in surgery module for eligible surgery cases in EMO2 module. Almost all X-ray and CT required cases in the EMO2 module were directed to their respective modules in trauma portal. Additionally, 90% of the laboratory required cases entered into the Laboratory module. However, only 21% of eligible cases were recorded in the rehabilitation module. When comparing the first six months of data to the last six months, the total number of cases increased. Additionally, the percentage of missing entries decreased cross all modules, including EMO2, Surgery, Laboratory and CT scan modules.

Nevertheless, the rehabilitation module entries remained consistently low in both sets of data. Number of cases increased on comparing the first six month data with the last six month data.

Table 3.1 Completeness of each variable filled in each module period of February – July 2024

	108 (N=18)	Triage Nurse (N=61)	EMO-1 (N=14)	EMO-2 (N=108)
% Filled ‡	n (%)	n (%)	n (%)	n (%)
<20%	0 (0)	7 (16)	6 (43)	*44 (41)
20-39%	0 (0)	26 (43)	1 (7)	24 (23)
40-59%	0 (0)	2 (3)	0 (0)	1 (1)
60-79%	18 (100)	2 (3)	1 (7)	0 (0)
≥80%	0 (0)	31 (51)	5 (35)	39 (36)

‡ % filled is calculated as the number of entries recorded under the variable divided by the total number of people registered who are eligible for entry into the variable

*Outcome at 2 hour, 4 hour, 8 hour, 24 hour, 48 hour

During the period of February to July 2024, there were 5,00,587 eligible individuals whose data the has to be entered into the Pre-hospitalisation module (108 module). In this module each of the variables were filled for 60-79% of these eligible individuals. Similarly there were 9,38,264 cases entered in the triage nurse module. Among the variables in this module, 7(16%) were filled for less than 20% of the eligible cases, while 51% (31/61) variables were filled for more than 80% of eligible cases. In the EM01 module, out of 9,36,976 entries, 6 variables (43%) were filled for less than 20% of eligible cases, whereas 5 out of 14 variables (35%) were completed for more than 80% of eligible cases. In the EM02 module, with 1,46,096 eligible case entries, 44 variables (41%) were completed for less than 20% of eligible cases. Additionally, 24 variables (34%) were filled within a range of 20-39%, while 39 variables (36%) were completed for 80% or more of eligible cases.

b. Correctness of data entry to the Trauma Registry

The total number of case sheets used for correctness check was 342, of which 110 case sheets (32%) were not entered in Trauma registry portal.

Table 3.2 Correctness of data entry into Triage nurse module

Variable	Information in the registry does not match with case sheet		Information in registry match with case sheet		Not recorded in case sheet, but entered in registry		Recorded in case sheet, But not in registry	
	n	%	n	%	n	%	n	%
GCS (N=232)	36	16	116	50	80	34	0	0
BP	113	49	95	41	24	10	0	0
HR	147	63	59	25	26	11	0	0
SpO_2	39	17	160	69	33	14	0	0
RR	44	19	28	12	160	69	0	0
Pupil size	11	5	38	16	183	79	0	0
ED disposition (N=156)‡	0	0	85	54	71	46	0	0

‡ The variable later

Vitals signs of patients on arrival were available in the registry for all the case sheet considered for review. However, we observed variations in the vitals recorded in the registry when compared to the case sheet.

The variables such as Respiratory Rate (160, 69%) and Pupil size (183, 79%) were not available in most of the case sheets. GCS, Blood Pressure, HR, SpO_2 were available in the trauma registry portal in the majority of cases reviewed, Except for BP and HR, for the other variable, only less than 5 to 19% of case sheets varied. But in HR (147, 63%) and BP (113, 49%) the values were not matching for majority of the case sheets.

Table 3.3 Correctness of data entry into EMO2 module

Variable	Information in the registry does not match with case sheet		Information in registry match with case sheet		Not recorded in case sheet, but entered in registry		Recorded in case sheet, But not in registry	
	n	%	n	%	n	%	n	%
Alcohol (N=178)	11	6	31	17	136	76	0	0
Drug	2	1	25	14	151	85	0	0
e-fast	7	4	168	94	3	2	0	0
Specialist opinion	26	11	152	85	0	0	0	0
Blood transfusion*	5	3	32	18	2	1	139	78
Surgery required (N=57)	11	19	25	44	21	37	0	0

*non mandatory variable. All others mandatory

Among reviewed record 178 were eligible to go for EMO 2 module. Among them alcohol and drug consumption status were not recorded in the case sheets for majority of the cases. Status on whether the individual had undergone e-fast procedure and or required of specialist consultation were marked correctly in majority of reviewed records. But blood transfusion details were not entered in the registry for 78% (139) reviewed cases and whether the person required emergency surgery (yes or no) requirement status was correctly marked for 44% of reviewed cases sheets (25/57, 44%).

Objective 3

Challenges in implementation of Trauma Registry portal - Quantitative

1. Health Facility Checklist

Table 3.4 Availability of equipment and funding for functioning trauma registry in the TAEI centres

Health facility Characteristics	Categories	No. of Facilities	%
Internet access		12	100
24 hour stability of internet	Stable	8	67
	Unstable	4	33
Availability of TV		12	100
Wall mounted TV		12	100
Pre-arrival information displayed in TV during the visit		9	75
User Manual/SOP available		2	17
Specific budget for Trauma Registry present		12	100
Availability of Printer		11	92
Specifications of printer	Printer only	4	17
	Printer and scanner	7	8

*SOP – Standard Operating Procedure

All the facilities had internet access to enter data into the Trauma Registry, and the majority of the facilities reported (67%, 8/12) stable internet connectivity.

All the health facilities had wall mounted TVs. However on the day of visit Pre-Arrival Intimation about the patients arriving in 108 ambulance service was displayed in three fourth of the facilities (n=9). Additionally, 92% (n=11) of the facilities had provided with printer. Only 2 out of 12 facilities had a user manual/SOP available for data entry into trauma registry portal. Every facility had an allocated budget for the functioning of Trauma Registry.

Table 3.5 Availability of desktops for data entry to the Trauma registry

Facility name	No. of desktops Sanctioned	No. of desktops available		No. of desktops functional		No. of desktops using for data entry	
	N	n1	%	n2	%	n3	%
Level 1 (N=4)	48	48	100	44	92	34	71
Level 2 (N=4)	48	46	96	41	89	29	63
Level 3 (N=4)	4	4	100	4	100	4	100
Total	100	98	98	89	91	67	68

We visited 12 health care facilities where the trauma registry currently functioning. All the facilities provided with desktops, laptops and tablets for entering data into the trauma

registry portal. The total number of desktop allotted across all the 12 facilities was 100. Among the available desktops, around 90 percent (91%, n=89) were functional, and most of them (68%, 68/98) were being used for data entry work. A few facilities were using other desktops within the facility for data entry purposes that were not provided under the Trauma Registry.

The total number of laptops allotted to facilities were 12. Only seven laptops were available and all were functional. However, only one of these laptops was used for data entry. Additionally, a total of 24 tablets were allotted across all facilities, with 22 were available. Among these available tablets, only five were being used for data entry purposes.

Table 3.6 Distribution of available desktops within different departments in the selected TAEI centres for Trauma Registry data entry

Department	No. of desktops Available	
	n	%
Emergency*	46	47
Radiology (CT/X-Ray)	12	12
OT/Surgery	8	8
Laboratory	8	8
Forensic Medicine (FM)	7	7
Medical Records Department (MRD)	7	7
Physical Medicine and Rehabilitation (PMR)	6	6
Intensive Care Unit (ICU)	4	4
Total	98	100

*Emergency department, EMO desk, office were included

The majority of the dedicated devices were provided to the emergency department (47%, 46/98), followed by radiology (12%, 12/98), laboratory (8%, 8/98) and surgery (8%, 8/98).

Table 3.7 Distribution and use of desktops in different departments in the TAEI centres for trauma registry data entry

Department	No. of desktops available	No. of desktops functional		No. of desktops using for data entry	
	N	n1	%	n2	%
Emergency*	46	44	96	38	83
Radiology (CT/X-Ray)	12	11	92	8	67
Laboratory	8	6	75	5	63
OT/Surgery	8	8	100	6	75
Forensic Medicine (FM)	7	6	86	3	43
Medical Records Department (MRD)	7	6	86	3	43
Physical Medicine and Rehabilitation (PMR)	6	5	83	3	50
Intensive Care Unit (ICU)	4	3	75	1	25
Total	98	89	91	67	68

Among the available desktops at the emergency department, all of them were functional and 83% of them currently being used for trauma registry data entry purposes. However, the use of available for desktop for data entry into Trauma Registry portal was 43% and 50% in the Forensic Medicine and Rehabilitation departments respectively.

Table 3.8 Availability of Human resources for data entry to Trauma Registry in selected TAEI centres (N=50)

Trauma Level	ED secretary		Trauma Assistant		Other data entry staff*
	Sanctioned	Available	Sanctioned	Available	
Level 1 (N=4)	4	4	8	7	6
Level 2 (n=4)	4	1	8	8	6
Level 3 (N=4)	0	0	4	4	0
Total	**8**	**5**	**20**	**19**	**3**

*NK-48 staff and data entry operators recruited in contract basis

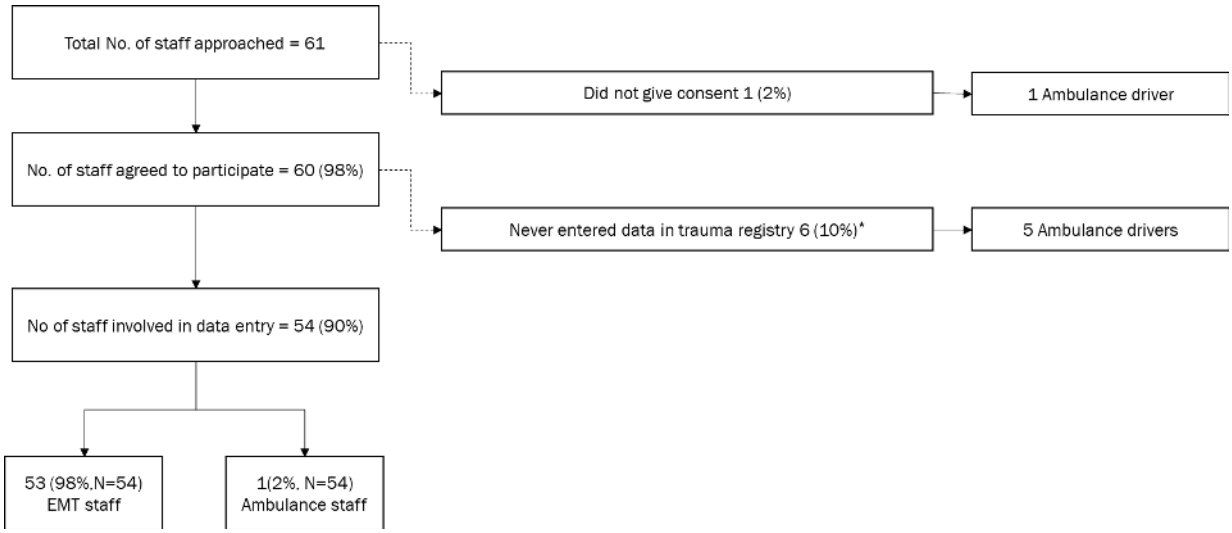
All the level 1 and level 2 facilities were allotted with 1 ED secretary per facility. In visited total 8 level 1 and level 2 facilities total 5 facilities had ED Secretary on the day of visit(n=8), with 5 available. Among these, four were currently entering data into trauma registry. Similarly two trauma assistant were sanctioned for each level 1 and level 2 facilities. In the visited facilities 7/8 facilities had all the sanctioned post filled. In the level three facility there is only one sanctioned post for one trauma assistant. It was filled in all the facilities.

Additionally, some facilities used NK-48 staff and other data entry operators on a contract basis for trauma registry data entry work.

Interview with ambulance staff

2. Ambulance Staff

Participant enrolment flow chart of Ambulance Staff



*The other staff in the ambulance (EMT) doing the data entry

We approached 61, 108 ambulance staffs (Ambulance driver and EMT staff) for the study. Among them 1 person (2%) did not give consent for the interview. Among the 60 staffs who responded, 53 (88%) were EMT (Emergency Medical Technician) staffs and 7 (12%) were ambulance drivers. All the EMT staffs and one ambulance driver reported they were entering data into the 108 Trauma Registry application. We have only considered these 54 members for further analysis.

Table 3.9 socio-demographic characterises of 108 Ambulance Staff (N=54)

Socio-demographic Characteristics	Categories	n	%
Age Group	18 – 30	24	44
	31 – 43	28	52
	44 – 56	2	4
Median age (IQR*)	32 (29,38)		
Gender	Male	40	74
	Female	14	26
Designation	Ambulance driver	1	2
	EMT Staff	53	98

*IQR – Inter Quartile Range

Median (IQR) age of the respondents were 32 (29, 38) and most of them were male (74%, n=40).

Table 3.10 Availability of equipment, and other logistics for the data entry to trauma registry application for ambulance staff (N=54)

Variable	Categories	n	%
Dedicated mobile used for data entry		54	100
Training received	Yes, within 1 year	21	39
	Never	33	61
Name of the institute provided training (N= 21)	EMLC EMRI Chennai	13	62
	District coordinator	4	19
	Others (DMS HQ, ALS training)	3	14
User Manual/SOP‡ present		26	48
Time of performance of data entry	From the spot of picking the patient	16	30
	In the ambulance during the transit	35	65
	After reaching the hospital	3	6

*Any audio, video or printed material which guide the users on the process of data entry to the trauma registry portal

‡SOP Standard Operating Procedure

All the staffs were provided with dedicated devices (mobile) for data entry. Most of the staff (65%, n=16) were entering the data into the 108 trauma registry application from the ambulance while transporting the patient to the hospital. However, only 40% (n=21) reported that they received formal training on data entry, All of them mentioned they received the training within the past one year. These reported training sessions were part of the routine training activity of the 108 ambulance team.

Table 3.11 Challenges faced during of data entry work of Trauma Registry by the ambulance staff (N=54)

Variable	Categories	n	%
Challenges for data entry	Network	29	52
	Portal	24	44
	Device	6	11
Network/connectivity related difficulties (N = 29)	Slow network connectivity	24	83
	Non availability of network in remote areas	19	66
	Issue related to new network package	2	7
Frequency of connectivity issues (N=29)	very often (more than once a day)	2	7
	sometimes (one or two times a week)	11	39
	Rarely (once a month or even less frequent)	16	57
Difficulties while using Trauma portal (N=24)	Issues with new updates in application	11	44
	Technical issues on saving entered data	9	36
	Portal not loading or login issue	6	24
	Other technical issues	5	20
Challenges faced with dedicated devices (N=6)	Low battery capacity	3	50
	Temporary glitches	2	33
	Low Storage space	1	17
How challenging the data entry	Very challenging	7	13
	Manageable	40	74
	not a challenge	7	13
Do they feel this as a useful activity	Yes	49	91
Received feedback on data entered to the portal	Yes	11	20

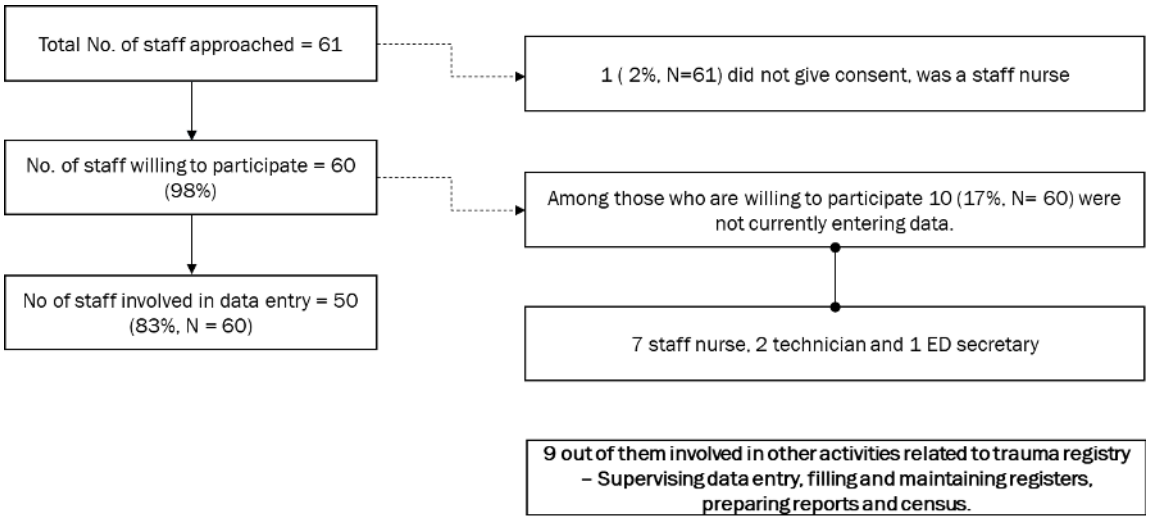
On enquiring about the challenges faced during data entry, 29 (52%) reported that they faced network related difficulties, 24 (86%) had issues with trauma registry portal, and 6

(19%) reported device related issues. Most commonly reported issue with the network were the slow network speed (83%, 24/29) and (66%, 19/29) with lack of network coverage in the, remote areas. Those who reported network related difficulties, more than half of them said that (54%, N=29) these challenges were not very frequent. The common portal related difficulties reported by staffs were issues with loading (25%, 6/24) followed by trouble in saving the entered data (17%, 4/24). A few staff had issues with their dedicated devices (11%, n=6). Most of the respondents (74%, n=40) replied the data entry works were manageable along with their other responsibilities.

Majority of the staff (91%, n=49) perceived the data entry work is a useful activity. Around half (48%, 26/54) of the staff informed that they had Demo Videos about the data entry. Only 20% (n=11) got Feedbacks on the quality of data entry. Majority (76%, n=41) of the EMT staff does not recommend having another staff dedicated for data entry in the ambulance.

3. Health facility staff

Health facility staff - – participant enrolment flow chart



From the 12 facilities visited, we approached 61 hospital staff, among them 60 (98%) agreed to participate in the study. Among those who agreed to participate, 50 respondents (83%) were entering data in trauma registry.

Table 3.12 Socio-demographic characteristics of the interviewed Health Facility Staff (N= 50)

Variable	Categories	n	%
Age Group	18-30	27	54
	31-43	20	40
	44-56	3	6
Median (IQR*)		31 (25,35)	

Gender	Male	16	32
	Female	34	68
Designation	Trauma Assistant	18	36
	Technician	15	30
	NK 48 staff	6	12
	Junior Resident/House surgeon/student	5	10
	ED Secretary	4	8
	Medical Officer	1	2
	Staff Nurse	1	2

*Inter Quartile Range

Median (IQR) age of the respondents were 31 (25, 35) years and majority of them were females (68%, n=34). The participants included, trauma assistants (36%, n=18), technicians in various departments (30%, n=15), NK48 (Nammai Kakkum-48) staffs (12%, n=6), Students/House Surgeons/Junior Residents (10%, n=5), ED secretary (8%, n=4) Staff nurses (2%, n=1) and Medical officer (2%, n=1).

Table 3.13 **Availability of equipment, training and SOP for the hospital staff for data entry (N=50)**

Variable	Categories	n	%
Dedicated device		50	100
Device used for data entry	Desktop/laptop	49	98
	Tablet	1	2
Formal Training received	yes, within 1 year	1	2
	yes, > 1 year back	5	10
	never	44	88
Name of the institute provided training recently (N=1)	MMC	1	
*SOP/Guide present		2	4
Feedback on quality and correctness of data received		8	16

*Standard Operating Procedure

All the respondents were provided with dedicated devices for data entry in the Trauma registry. Most of the staffs (98%, n= 49) used desktop computers for data entry. Most of the staff (88%, n=44) did not receive any formal training. One staff (2%) informed that he received a one day formal training within past one year, conducted by MMC. However, most of the respondents (84%, n=42) received informal training from seniors or other faculty members at their facility. There was no SOP/manuals, (either in softcopy or hard copy format) available with the majority of the hospital staffs, (96%, n=48). Most of the staff (84%, n=42) did not received any feedbacks about the quality of data entered in the portal.

Table 3.14 **Challenges and Feedbacks of data entry work of Trauma Registry (N=50)**

Variable	Categories	n	%
Challenges for data entry	Network	32	64
	Portal	32	64
	Device	4	8
Network/connectivity related difficulties (N = 32)	Internet is very slow	23	72
	Interrupted internet connectivity	16	50
Frequency of connectivity issues (N= 32)	very often (more than once a day)	3	9
	sometimes (one or two times a week)	8	25
	rarely (once a month or even less frequent)	21	66
Difficulties while using Trauma portal (N=32)	Portal not loading	20	63
	Technical issues on saving	18	56
	Portal log in issue	7	22
	Technical Issues with portal updates	7	22
	Getting logged out in between	3	9
Challenges faced with dedicated devices (N=4)	Software related issue	3	75
	Printer not available	1	25
How challenging the data entry	Very challenging	9	18
	Manageable	32	64
	not a challenge	9	18
Offline data entry suggested		34	68
Whether they are suggesting need of assigning dedicated data entry operator for TR data entry (N= 28-Other staff)		16	57

Other activities of ED secretary and TAs (N= 22)	Preparing census/reports	8	36
	IKT duties	7	32
	Patient care	5	23
	Supervisory duties	3	14
	equipment purchase/ other financial responsibilities	2	9
	conducting training	1	5

Nearly half of the staffs (32, 64%) reported that they were facing issues with the portal and internet.

Most frequently reported issue were related to the speed of internet connectivity (72%, 23/32), followed by interruption in the network connectivity (50%, 6/32). However, majority of the staffs (66%, 21/32) reported these issues occurred in a frequency of once in a month or less. Around 50 percent of the staff (n =32) reported portal or server related issues. Most common technical problems were related to loading of the portal page (63%, 20/32) and followed by troubles in saving data (56%, 18/32).

A very few staff (8%, 4/50) raised device related issues, and most of them had (75%, 3/4) software related problem. Of the 22 dedicated trauma registry staff (ED Secretary, Trauma Assistant) we interviewed, 90% (n=20) mentioned that they were involved in other hospital activity, apart from data entry into trauma registry. These activities primarily included preparing various hospital reports (36%, 8/22) followed IKT (Innuyir Kappom Thittam) duties (32%, 7/22) and patient care (23% 5/22).

On enquiring other hospital staffs who were also involved in data entry to the trauma registry portal, most of them (57%, 16/28) informed the data entry work was manageable along with the routine hospital work. However, (57%, 16/28) informed that having more dedicated data entry operators will be helpful for the activity. Also majority of the staff(68%, n=34) given an opinion that having a feasibility to enter the data offline and later uploading on would be a more use friendly option.

Challenges and facilitators – Qualitative

1. Human resource

1.1 Insufficient Human Resource

There are dedicated staff assigned for Trauma Registry data entry called Trauma Assistants (TA) with nursing qualifications. All the level 1 and level 2 facilities allotted with two staffs for data entry at the emergency department. Additionally, the medical colleges have assigned ED secretaries with supervisory roles to coordinate the trauma registry program due to high case load in these institutions. Considering the heavy work load in level 1 facilities, the allocated staff is inadequate, and the existing staff find it difficult to manage the work load in the stipulated time frame. Though the level 3 facilities, which

are the District Head Quarters and Taluk hospitals were allotted with one trauma assistant. But the discussion with the staff revealed their difficulty in completing the data entry work in the given 24 hour time frame. Furthermore, facilities with vacant posts for dedicated staff face additional challenges. Hence overall there is a need for increasing the staff strength across all levels of Trauma Registry for efficient functioning of Trauma Registry.

"So, in our institution, manpower is very little.....And, we need to run a trauma registry for 24 hours, giving only two trauma registry assistants. We have to pull some other staff members from the general pool to the trauma registry." (KII16/Nodal officer/Male)

"Mainly, here, in our Medical College, we don't have an ED secretary post. It is still vacant. It has not been fulfilled for 3 years. In other colleges they have filled the post." (KII19/Trauma Assistant/Female)

"For 100 cases, we can only enter 50 cases. We can only fill 50 cases the next day. The manpower is less. In the night, we are also looking at IKT works. There is no one allotted for IKT yet. Even if there is one person, they will look at their work. We will look at our work.. Since we are looking at both, it will be difficult cover all cases." (KII13/Trauma Assistant/Female)*

1.2 Need for effective training for dedicated staff

Interview with the staff has revealed that they did not get any formal training to undertake their trauma registry work. They informed that their senior staff gave ad hoc instructions during their course of work, as how to go about performing their duties. It was also revealed that some training sessions were conducted during the time of portal updates through online mode. The staff acknowledged it was useful in performing their work. This emphasizes the need for training to effectively and efficiently perform their job roles.

"They only got the informal training from the seniors or whoever worked before. So, for three years she has been working, but she didn't get any training program." (KII14/Medical Officer/Male)

"We didn't get any training particularly for TRA (Trauma Registry) in these 3 years. We didn't attend any training." (KII19/Trauma Assistant/Female)

"Initial training was provided on joining. Additional training was conducted during a portal update, which was a video conference organized by TNHSRP. Updates on Post-Mortem modules and portal entry were explained by state level officer. No further or recent training has been deemed necessary." (KII11/ED secretary/male)

1.3 Work Burden – Multitasking role of Data entry staff

Trauma registry staff handle multiple responsibilities beyond portal entry, especially much of their time has been devoted in trauma care activities. Due to their multi-tasking role the timely entries in trauma registry has been affected. The dedicated staff reported that due to high patient load and agitated attenders they had to step into patient care activities, IKT works (Innuyir Kappom Thittam), other report writing and census works and eventually they couldn't complete the data entries with completeness.

“There were two IKT staffs. One staff left for a reason. We will take care of the case in the night.” (KII13/Trauma Assistant/Female)

“Yes, we do (other works). Sometimes, when they are busy, we have to go and help (patient care)” (KII19 /Trauma Assistant/Female)

“Other than this portal entry, we look at reports. We send daily reports, weekly reports. We prepare monthly reports. We also send power points for death audit. We also look at NK48. We look at claim work, need more, etc.” (KII19/Trauma Assistant/Female)

2. Infrastructure / Workplace

2.1 IT Set up

All the level 1 facilities were provided with 12 desktops, one laptop, tablets and one printer. The other secondary care facilities were provided equipment according to the patient load and the modules available. So, the respondent felt that there was enough hardware set up to run the registry.

Many reported issues with the functioning of the portal. Delay in response time, server issues and frequent errors while entering data are some of the challenges faced by the team while dealing with the trauma registry. These issues in the software infrastructure greatly affect the functioning of the workflow in the program. Any wrong entries made through 108 mobile application could not be edited later. This concern was raised by the staff to make an edit option available in the app, so as to correct any wrong entries.

“Lack of proper IT infrastructure: tablets for data entry are not supplied. Poor software design lacking flexibility and ease of use.” (KII6/Medical Officer/Male)

“I think it's good to do everything with the same ID (Login ID). Every module has a username and password. They have given 12 modules. It is a little difficult to log in and log out with each module.” (KII9/Female/Trauma Assistant)

“Yes, we can't log in. Server is the problem, network problem. The website doesn't open, we have to enter the data the next day.” (KII20/Trauma Assistant/Female)

2.2 Work environment

The fast-paced nature of the emergency department makes data entry challenging for the staff. Additionally, the behaviour of bystanders adds to their stress. They also face mistreatment from other staff members due to their designation and job responsibilities. In some instances, staff nurses dominate the data entry process. Respondents expressed that having a uniform could help them gain recognition and respect among their colleagues. Moreover, they noted that other staff members and patient attendants often perceive trauma registry staff as wasting time on data entry instead of contributing to patient care. This perception creates a barrier, preventing them from performing real-time data entry effectively.

“Overburdened medical officers due to increased patient load. Emergency department environment is fast-paced, making documentation difficult.” (KII6/Medical Officer/Male)

“Everyone has problems with the trauma registry. They say, “You shouldn't sit in the system as soon as you come. You should do the cleaning work (Wound cleaning). They make us to do cleaning work” (KII18/Taruma Assistant/Female)

“But no one knows that we are here as TRA (Trauma Registry). They think that, We come, We come in un-uniform, We sit in a system, We go. They don’t know how much work we have. They are thinking like that. We come and do some work in the system. This is how they think. But they don’t know our work.”(KII19/Female/Trauma Assistant)

2.3 No dedicated space

In few facilities, it was felt that lack of sufficient work place dedicated for trauma registry activity negatively affected their work. Staff found it difficult to efficiently and timely complete the data entry work. And place where there are dedicated space for trauma registry work, staff of those centres conveyed their comfort towards that.

“Data entry happens without a clearly defined dedicated workspace.” (KII11/ED secretary/Male)

“The data entry nurse or TA cannot see the patient details at the reception or they cannot get the correct values or there is no place to compare. So, they are asking for vitals and mode of arrival, some information like they are entering just randomly because they don't have a place on the register.” (KII16/Nodal officer/Male)

2.4 Resource Sharing:

In some of the facilities the respondents conveyed that the resources like desktop allotted to trauma registry has been re-appropriated to other departments. This resource constraint greatly affected the quality and timely completion of their work. Hence they felt this needs an immediate intervention from the concerned authority.

“One is here. All are here. One is down there. And one is in this room. The laptop is also there. NK48 is using it. The other one is used by them. The tablet is there. It is given to the staff. But because it is used by them, they use it more.” (KII4/Medical Officer/male)

3. Governance and finance

3.1 Monitoring mechanism

There is no evaluation or supervision of data entered by trauma clerks, and no death audits or monitoring at Taluk hospital levels. Similar responses were received by other centers that no systematic monitoring exists. The review work is being conducted on ad hoc basis depending upon necessities. Lack of systematic monitoring mechanism poses a great challenge in successful implementation of this trauma registry. Data is monitored through a 24-hour dashboard, with night duty staff updating a group at midnight. If entries are incomplete, reasons such as server issues are documented, and delayed cases are entered once the system is restored (KII21/ED secretary/Female).

“No evaluation or supervision of data entered by trauma clerks. Lack of death audits or monitoring at Taluk hospital levels.” (KII6/Medical Officer/Male)

"We have a group. Our sirs are there. Everyone in that group will be there. They take a photo of the dashboard and put it in the group like a screenshot. We know how many cases have come. These many cases we have filled and we will follow it. If it's not full, they ask why. Sometimes, if there is a server problem, they mention it in the group. Data entry staff will do that and follow it up." (KII21/ED secretary/Female).

3.2 Feedback mechanism

Monthly review meetings with stakeholders are conducted to address issues, but there is no systematic follow-up with software developers to resolve them. If there are doubts, staff can call for assistance, and support is provided directly. Thus this lack of feedback mechanism is yet another lacuna in this trauma registry that needs immediate intervention.

"Monthly review meetings with stakeholders to address issues are in place. No systematic follow-up with software developers to resolve issues." (KII6/Medical Officer/Male)

"If there is any doubt, we can call them. They will come directly to the vehicle and clear any doubt." (KII12/EMT/Male and female)

3.3 Budget

Despite significant government funding, it remains highly inadequate, especially with increasing patient intake. With the increased patient flow the respondent felt that there should be improvement in infrastructure and human resource so as to efficiently discharge the registry functions. Hence this warrants an increased fund outlay for the trauma registry based on the growing need.

"We are in a growing college, more number of admissions, day to day, we are having more number of admissions. So, the funds should be raised, as a general fund should be raised." (KII16/Nodal officer/Male)

4. Service / Functioning

4.1 Role clarity/ SOP

The absence of standard operating procedures (SOPs) for referral criteria results in unclear trauma registry roles. Despite that in some centres due to the efforts of the head of the centre, data entry and medical roles are well-defined. Senior staff take on additional coordination responsibilities due to the limited knowledge of non-medical personnel. Though overall the work is well delegated still the need for a detailed SOP is felt. Having a detailed SOP will systematize the entire process and will reduce the dependency on individuals.

"Lack of standard operating procedures for referral criteria. Inconsistent data collection and unclear roles in trauma registry usage." (KII6/Medical Officer/Male)

“EMO handles resuscitation, and CMO manages admissions. Triage nurses segregate patients into red, yellow, or green zones. Role clarity exists for data entry and medical staff responsibilities.” (KII11/ED secretary/Male)

“Since we are old staff, we have to coordinate and arrange everything. Non-medical guys don't know much, so we have to adjust” (KII19/Female/Trauma Assistant)

4.2 Co-ordination

There is poor coordination between peripheral hospitals and tertiary centers during referrals this is one great challenge in the success of Trauma registry. Internally there is also lack of coordination among different departments involved in trauma registry implementation. The respondents strongly felt that if there exist better coordination among various departments and coordination among all trauma registry staff would greatly motivate them to work better. Also the respondents demanded a district coordinator to monitor all the trauma registry staff in a district.

Poor coordination between peripheral hospitals and tertiary centers during referrals. Lack of interaction between departments in trauma registry implementation. (KII6/Medical Officer/Male)

Coordination occurs between CMO, duty doctors, CRRI, allied health students, AECT, physician assistants, and other staff. Support is provided during night shifts or absences. (KII11/ED secretary/Male)

“If we have a district coordinator to coordinate, it will be correct”(KII19/Female/Trauma Assistant)

4.3 Dual registry work

Most of the staff have said that both digital and physical records are maintained, causing duplication of work. Medical officers manually document cases before entering them online, making the process time-consuming. This completely defeats the purpose of trauma registry. Also this greatly reduces the efficiency of the staff due to dual entry. The staff emphasized that online trauma registry portal alone be used in all cases to improve the system.

“Duplication of work with both digital and physical records being maintained.” (KII6/Medical Officer/Male)

“Manual entries in registers (MLC and non-MLC) are maintained alongside online registry entries.” (KII11/ED secretary/Male)

“Now the trauma registry project used to be paper-based. They have to collect details, kind of registers and all. Now it's coming, it's working like an online platform. Mainly time-consuming now.” (KII14/CMO/Male)

4.4 Usefulness and benefit of trauma registry

Most of the staff has agreed that this trauma registry project is very useful for the government and public as it can store all the data of the patients. It helps in managing

patient flow and admissions. Because of Pre-Arrival Intimation, the staff are well prepared before the patient arrives. Government is collecting all the data from the hospital and it helps to improve the infrastructure of the hospital. The census will be useful for public health purpose. This result shows a good attitude of the staff towards the trauma registry system and its usefulness. Hence the government may focus on eliminating the challenges that pose as a threat to the system and focus to improve the positives in the system.

We are getting pre-arrival intimation online. So, we are well prepared before the patient arrives. We are cutting short the time delay and making early procedures." (KII14/CMO/Male)

"Trauma Registry, as of today, we can have some data for institutions. How many cases are there in an average day? How many trauma cases are there? What is the percentage of trauma cases? Or RTI case? What is the admission rate? We can prioritize our funds to the need for trauma patients. Government is collecting a lot of data. They are taking each and every bit of data. It helps us a lot to improve the infrastructure of this hospital. It transforms the quality of healthcare which is being served to the patient." (KII16/Nodal officer/Male)

"I think it will be useful to the hospital, to the patients and to the public. I think it will be very useful for the treatment. If there is any verification for an MLC (Medico-legal case) case, it will be very useful. Yes, it will be very useful." (KII17/ Trauma Assistant/Female)

Discussion

The Trauma Registry program was a commendable initiative aimed at designing a unified platform to enhance the care across pre-hospital, hospital and post- hospital levels of care. A new digital platform was identified as essential to address inefficiencies in the existing system. The paper based registries were time consuming and posed difficulties in retrieving documents for future reference or research. Additionally, the existing 108 ambulance services operated independently, highlighting the need for linking these services to a common trauma system to ensure effective communication across various levels of patient care.

The trauma registry serves as an essential tool for quality improvement in trauma care, providing an internal quality control mechanism to benchmark hospital performance against national or international standards. It enables the comparison of individual institutions or healthcare regions within the state or country, helping identify areas for improvement. At the administrative level, the registry aids in planning resource allocation by estimating the needs for materials and human resources. It also provides a comprehensive description of trauma victims and the care they receive, with surveillance capabilities extending to specific areas such as occupational trauma. Furthermore, the registry evaluates the impact of pre- hospital care on patient outcomes, ensuring insights into the effectiveness of emergency response systems. Post- discharge, the registry identifies survivors of major trauma who require ongoing care, whether institutional (long term hospital care, rehabilitation) or ambulatory (physiotherapy, psychotherapy), thereby supporting follow-up care focussed on quality of life.

The data entry into the Registry portal showed significant improvement over time, with a noticeable difference when comparing the first and last six months. The registry scaled up each year, increasing the number of facilities and, consequently, the total number entries. The proportion of missing entries decreased in the last six months compared to the first. While data entries in modules like surgery, X-ray, and laboratory improved substantially, the rehabilitation module continued to have relatively low entries. This limit the utility of using the trauma registry data for assessing the effectiveness of rehabilitation care received by the patients.

The trauma registry has significant potential for diverse applications, yet it is currently being utilized sub-optimally. Although the portal is primarily used to retrieve patient case details and prepare census reports at the facility level, its broader utility remains largely unexplored. To address this gap, a systematic protocol for assessing the quality of care should be developed and implemented at both institutional and state levels. Training Nodal officers to effectively apply this protocol is crucial for ensuring consistency and efficiency. Integrating the protocol into routine review meetings will further institutionalise its use. As a comprehensive source of clinical data, the trauma registry could be utilised to evaluate facility performance based on the timeliness of care and interventions provided to patients, the procedures performed, and the follow-up and rehabilitation efforts. Furthermore, it can be crucial for generating reports on caseloads and disease-specific trends at each facility. With modifications to the existing program, the registry has the potential to support all these applications effectively.

Challenges

A significant proportion of the variables entered into the trauma registry were not documented in the case sheets, highlighting a gap in the data collection process. While the trauma registry was initially designed to be maintained by doctors and staff nurses, in practice, data entry in most facilities is carried out by Trauma Assistants, Emergency Department Secretaries, or other technical or data entry staff. This deviation from the original plan emphasizes the need for a more structured and consistent approach to ensure the accuracy and reliability of the registry. To enhance the efficiency of the trauma registry, it is crucial to reconsider the total number of variables and focus on limiting them to the most essential ones, prioritizing their importance from clinical and public health perspectives.

There is a noticeable lack of clarity in the job descriptions of Emergency Department (ED) Secretaries and Trauma Assistant staff, coupled with an absence of adequate training sessions for these roles. No comprehensive manuals currently exist to guide the data entry process into the trauma registry portal, which poses challenges to maintaining consistency and accuracy. To address these issues, it is essential to conduct induction training as well as periodic refresher sessions for all staff involved in data entry, focusing on a detailed question-by-question guide and clearly defined roles and responsibilities. Furthermore, comprehensive audio, video, or printed materials should be developed and distributed to facilitate self-learning for data collectors. Recently, a video guide on data entry to the trauma registry portal was created specifically for ambulance staff, marking a positive step toward improving the overall system.

One of the key challenges faced in the trauma registry system is the duplication of work due to the presence of multiple offline registers maintained at facilities, along with the portal. To address this, it is recommended to identify all the reports required for routine monitoring and evaluation of emergency care facilities across the state. The necessary variables for generating these reports should be incorporated into the trauma registry portal, along with a provision to automatically generate the reports directly from the portal. Additionally, training nodal officers at emergency care facilities to effectively utilize the portal for report generation will enhance efficiency and reduce redundant efforts.

The follow-up and rehabilitation modules have seen minimal data entries, primarily due to lack of coordination between departments at the facilities. Enhancing the linkage between rehabilitation care and trauma management is crucial for ensuring continuity of care and better outcomes for patients. Efforts should focus on improving data entry processes within the PMR (Physical Medicine and Rehabilitation) departments to maintain accurate and comprehensive records.

Conclusion and recommendation

Recommendations on process of data entry

The data entry into the Trauma Registry portal improved over-time. Also the missing entries in the last six months compared to first six months of Trauma Registry implementation.

- ✓ We need to reconsider the number of total limit and Mandatory variables to be included in the Trauma Registry bases on it's importance from clinical and public health perspective
- ✓ Draft a detailed manual on the roles and responsibilities people involved in data entry (Who, what, when)
- ✓ Enable provision for ED Secretary and Trauma Assistant to complete data entry of one individual from a single login page
- ✓ Establish a periodic evaluation mechanism
- ✓ Identify all the reports that need to be generated for routine monitoring/evaluation of emergency care facilities in the state
- ✓ Add the variables required for generating these routine reports into the trauma registry portal
- ✓ Include provision to automatically generate these reports from the portal
- ✓ Train nodal officers of emergency care facilities to generate these reports from the portal

Recommendations on use of Trauma Registry

- ✓ Develop a systematic protocol for quality of care assessment at the institute level and at the state level
- ✓ Train Nodal officers to use the protocol
- ✓ Include this as a part of routine review meeting
- ✓ Release period news-letter/report based on the data (± with an action component)
- ✓ Improve linkage of rehabilitation care with trauma
- ✓ Improve data entry at the PMR departments
- ✓ Add unique ID to retrieve patient information
- ✓ Improve entry of clinical outcome data of all individual
- ✓ Deidentified patient line list of patient data can be made available for the research
- ✓ Call for operational research proposal using trauma registry data

Recommendations on training of data collectors

- ✓ Conduct induction training and periodic refresher training to all staff included in the data entry with focus of Question by Question guide also their Roles and Responsibility
- ✓ Develop and distribute a comprehensive audio/video/printed material to guide (self-learning) the data collectors in data entry process

Recommendations related to portal

- ✓ Generate a common ID in portal and mention it in the case sheet of the individual to track individual case entries
- ✓ Develop a Question by Question guide with detailed description of what is indented to collected with each questions and options in it
- ✓ Develop a detailed data dictionary linking each question in the trauma registry portal with appropriate variables in the data base
- ✓ Add appropriate data validations based on logical sequence of question and type and range what each variables are intended to collect

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Annexure 1: TAEI facility list

	Name of TAEI Centre	District	TYPE	Levels
1	Govt, Chengalpattu Medical College Hospital	Chengalpattu	MCH	I
2	Govt, Thoothukudi Medical College Hospital	Thoothukudi	MCH	II
3	Govt, Dharmapuri Medical College Hospital	Dharmapuri	MCH	I
4	Govt, Rajaji Hospital,Madurai	Madurai	MCH	I
5	Govt, Pudukottai Medical College Hospital	Pudukottai	MCH	II
6	Govt, Thanjavur Medical College Hospital	Thanjavur	MCH	I
7	Govt, Mohan Kumaramangalam MC Hospital,Salem	Salem	MCH	I
8	Govt, Kanyakumari Medical College Hospital	Kanyakumari	MCH	II
9	Govt, Tirunelveli Medical College Hospital	Tirunelveli	MCH	I
10	Govt, Vellore Medical College Hospital	Vellore	MCH	I
11	Govt, Mahatma Gandhi Memorial Hospital	Trichy	MCH	I
12	Govt, Villupuram Medical College Hospital	Villupuram	MCH	I
13	Govt, Kilpauk Medical College Hospital	Chennai	MCH	I
14	Govt, Karur Medical College Hospital	Karur	MCH	II
15	Govt, Sivaganga Medical College Hospital	Sivaganga	MCH	II
16	Govt, Coimbatore Medical College Hospital	Coimbatore	MCH	I
17	Govt, Omandurar Medical College Hospital	Chennai	MCH	II
18	Govt, Royapettah Hospital, Chennai-04	Chennai	GH	II
19	Govt, Thiruvarur Medical College Hospital	Thiruvarur	MCH	II
20	Govt, Rajiv Gandhi Govt General Hospital	Chennai	MCH	I
21	Govt, Stanley Medical College Hospital	Chennai	MCH	I
22	Govt, Theni Medical College Hospital	Theni	MCH	II
23	Govt, Institute of Child Health and Hospital for Children	Chennai	GH	II
24	Govt, Esi Coimbatore MCH	Coimbatore	MCH	II
25	Govt, IRT Perundurai Medical College	Erode	MCH	II
26	Govt, Rajah muthiah Medical college	Cuddalore	MCH	II

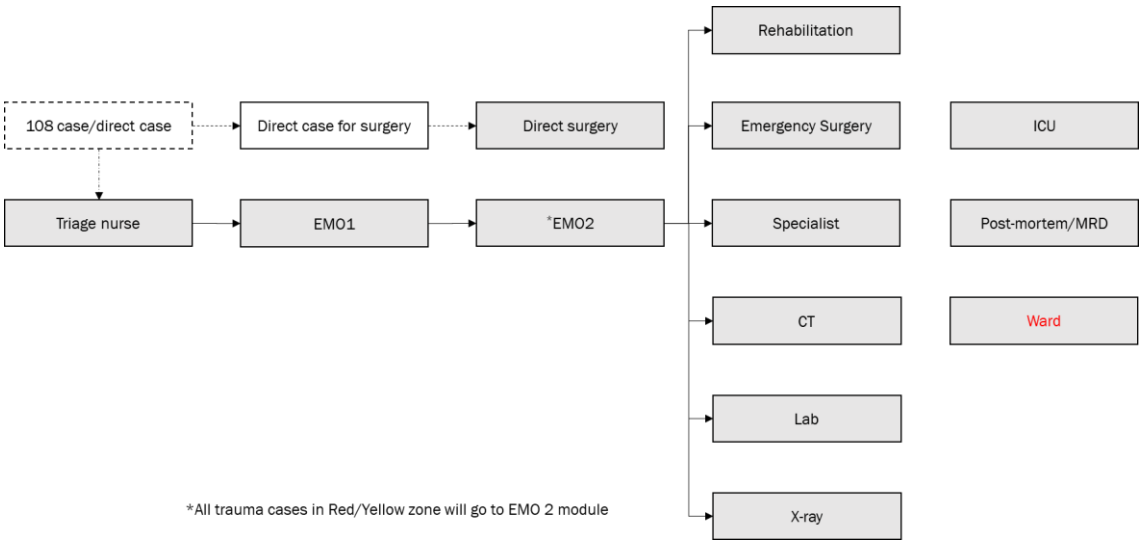
27	Govt, Thiruvannamalai Medical College Hospital	Thiruvannamalai	MCH	II
28	Govt, Dindigul Medical College Hospital	Dindigul	MCH	II
29	Govt, Ramanathapuram Medical College Hospital	Ramanathapuram	MCH	II
30	Govt, Uthagamandalam Medical College Hospital	Ooty	MCH	II
31	Govt, Virudhunagar Medical College Hospital	Virudhunagar	MCH	II
32	Govt, Tiruppur Medical College Hospital	Tiruppur	MCH	II
33	Govt, Nagapattinam Medical College Hospital	Nagapattinam	MCH	II
34	Govt, Thiruvallur Medical College Hospital	Thiruvallur	MCH	II
35	Govt, Namakkal Medical College Hospital	Namakkal	MCH	II
36	Govt, Krishnagiri Medical College Hospital	Krishnagiri	MCH	II
37	Govt, Kallakurichi Medical College Hospital	Kallakurichi	MCH	II
38	Govt, Ariyalur Medical College Hospital	Ariyalur	MCH	II
39	Govt, District Headquarters Hospital, Kumbakonam,	Thanjavur	DHQH	III
40	Govt, Hospital Harur	Dharmapuri	TK	III
41	Govt, Taluk Hospital, Tambaram	Chengalpattu	DHQH	III
42	Govt, District Headquarters Hospital, Mettur Dam	Salem	DHQH	III
43	Govt, Taluk Hospital, Rajapalayam	Virudhunagar	DHQH	III
44	Govt, District Headquarters Hospital, Cheyyar,	Thiruvannamalai	DHQH	III
45	Govt, Taluk Hospital, Melur	Madurai	TK	III
46	Govt, District Headquarters Hospital, Kancheepuram	Kancheepuram	DHQH	II
47	Govt, District Headquarters Hospital, Pennagaram	Dharmapuri	DHQH	III
48	Govt, District Headquarters Hospital, Pollachi	Coimbatore	DHQH	III
49	Govt, Ambur Taluk Hospital	Tirupattur	TK	III
50	Govt, District Headquarters Hospital, Walajapet	Ranipet	DHQH	III
51	Govt,Taluk Hospital, Palani	Dindigul	DHQH	III
52	Govt, District Headquarters Hospital, Erode	Erode	DHQH	II

53	Govt, District Headquarters Hospital, Tenkasi	Tenkasi	DHQH	III
54	Govt, Jayamkondan Taluk Hospital	Ariyalur	DHQH	III
55	Govt,Thuraiyur Taluk Hospital	Trichy	TK	III
56	Govt, District Headquarters Hospital, Kovilpatti	Thoothukudi	DHQH	III
57	Govt, Aruppukottai Hospital	Virudhunagar	DHQH	III
58	Govt, District Headquarters Hospital, Periyakulam	Theni	DHQH	III
59	Govt, District Headquarters Hospital, Usilampatti	Madurai	DHQH	III
60	Govt, District Headquarters Hospital, Perambalur	Perambalur	DHQH	II
61	Govt, Taluk Hospital, Kulithalai, Karur district	Karur	DHQH	III
62	Govt, District Headquarters Hospital, Cuddalore	Cuddalore	DHQH	II
63	Govt, Taluk Hospital, Omalur, Salem district	Salem	TK	III
64	Govt, Taluk Hospital, Ulundurpet	Kallakurici	TK	III
65	Govt, Thirupattur Hospital	Thirupattur	DHQH	III
66	Govt, District Headquarters Hospital, Padmanabapuram	Kanyakumari	DHQH	III
67	Govt, Hospital Hosur	Krishnagiri	DHQH	III
68	Govt, District Headquarters Hospital, Karaikudi	Sivagangai	DHQH	III
69	Govt, District Headquarters Hospital, Manapparai	Trichy	DHQH	III
70	Govt, Tindivanam Hospital	Villupuram	DHQH	III
71	Govt, Taluk Hospital, Aranthangi	Pudukottai	DHQH	III
72	Govt, District Headquarters Hospital, Mannargudi	Tiruvarur	DHQH	III
73	Govt, Kodaikanal Taluk Hospital	Dindigul	TK	III
74	Govt, Mayiladuthurai Taluk Hospital	Mayiladuthurai	DHQH	III
75	Govt,Taluk Hospital, Attur	Salem	TK	III
76	Govt, Hospital Viralimalai	Pudukottai	TK	III
77	Govt, Taluk Hospital, Tiruttani	Thiruvallur	DHQH	III
78	Govt, Taluk hospital, Ponneri	Thiruvallur	TK	III

79	Govt, Taluk hospital, Sriperumbudur	Kancheepuram	TK	III
80	Govt, Taluk hospital, Mettupalayam	Coimbatore	TK	III
81	Govt, Taluk hospital, Bhavani	Erode	TK	III
82	Govt, Hospital, Vetharanyam	Nagapattinam	DHQH	III
83	Govt, Hospital, Pattukottai	Thanjavur	TK	III
84	Govt, Hospital, Vazhappadi	Salem	TK	III
85	Govt, Taluk hospital, Sangagiri	Salem	TK	III
86	Govt, Pheriperal Hospital Periyar Nagar	Chennai	TK	III
87	Govt, Thirupathur Hospital	Sivagangai	TK	III
88	Govt, Sattur Hospital	Virudhunagar	TK	III
89	Govt, Taluk Hosptal Virdhuchalam	Cuddalore	TK	III
90	Govt, Taluk Hospital Palacode	Dharmapuri	TK	III
91	Govt, Uthamapalayam Hospital	Theni	TK	III
92	Govt, Thirumaiyam Hospital	Pudukottai	TK	III
93	Govt, Vandhavasi Hospital	Tiruvannamalai	TK	III
94	Govt, Taluk Hospital Chengam	Tiruvannamalai	TK	III
95	Govt Omandurar Multispeciality Hospital	Chennai	MCH	II
96	Kalaignar Centenary Super Speciality Hospital KCSSH	Chennai	GH	II
97	Govt, Taluk Hospital Pappireddipatti	Dharmapuri	TK	III
98	Govt, Taluk Hospital Oddanchatiram	Dindugul	TK	III
99	Govt, Taluk Hospital Wallajabad	Kancheepuram	TK	III
100	Govt, Taluk Hospital Sirkazi	Mayiladuthurai	TK	III
101	Govt, Taluk Hospital Kothagiri	Nilgiri	TK	III
102	Govt, Taluk Hospital Parampakudi	Pudukottai	TK	III
103	Govt, Taluk Hospital Keeranur	Pudukottai	TK	III
104	Govt, Taluk Hospital Cumbum	Theni	TK	III
105	Govt, Taluk Hospital Polur	Thiruvanamalai	TK	III
106	Govt, Taluk Hospital Dharapuram	Tiruppur	TK	III
107	Govt, Taluk Hospital Palladam	Tiruppur	TK	III
108	Govt, Taluk Hospital Nazretpet	Tiruvallur	TK	III
109	Govt, Taluk Hospital Gudiyatham	Vellore	TK	III

110	Govt, Taluk Hospital Marakanam	Villupuram	TK	III
111	Govt, Taluk Hospita MUSIRI	Trichy	TK	III

Annexure 2: Trauma Registry Modules



Annexure 3

Person responsible for data entry in each module

S. No	Module name	Person Responsible
1.	Transit Care	EMT
2.	Triage Nurse	Triage Nurse
3.	EMO1	EMO1
4.	EMO2	EMO2
5.	Pain Management	EMO2
6.	Lab	Lab Technician
7.	X-Ray	Radiographer
8.	CT	CT Technician
9.	Specialty	Specialist
10.	Emergency Surgery	Operation Theatre Nurse
11.	ICU	Staff nurse
12.	MRD	MRD
13.	Rehabilitation	Rehab Therapist
14.	Forensic Module	Forensic Department/ PM Nodal officer

TAEI Trauma Registry Evaluation Ambulance Staff Interview			
Qn No.	Question	Options	
1.	Zone	1. North 2. South 3. East 4. West	
2.	Health Facility	1. Mohan Kumaramangalam MC Hospital, Salem 2. Rajiv Gandhi General Hospital, Chennai 3. Mahatma Gandhi Memorial Hospital, Trichy 4. Rajaji Hospital, Madurai 5. Karur Medical College Hospital, Karur 6. Thiruvannamalai Medical College 7. Ariyalur Medical College Hospital 8. Ramanathapuram Medical College Hospital 9. District Headquarters Hospital, Pollachi 10. Mayiladuthurai Taluk Hospital 11. Aruppukottai Hospital 12. Taluk hospital, Ponneri	IF NORTH – Rajiv Gandhi General Hospital,Chennai, Thiruvannamalai Medical College, Taluk Hospital Ponneri IF SOUTH – Rajaji Hospital Madurai, Ramanathapuram Medical College Hospital, Aruppukottai Hospital,Virudhanagar IF EAST- Mahatma Gandhi Memorial Hospital Trichy, Ariyalur Medical College Hospital, Mayiladudhurai Taluk Hospital, IF WEST-Mohan Kumaramangalam MC Hospital Salem, Karur Medical College Hospital, District Headquarters Pollachi,Coimbatore
3.	Level of trauma care facility	1. Level 1 2. Level 2 3. Level 3	If answer to Qn2 1 – 4 – Level 1

			5 – 8 – Level 2 9 – 12 – Level 3
4.	Respondent ID		
5.	Name of the Respondent		
6.	Designation	1. 108 Ambulance Driver 2. 108 EMT Staff	
7.	Participant agreed to participate & Consent form obtained	0. No 1. Yes	If No - Close
8.	Gender	1. Male 2. Female 3. Others	
9.	Age in completed years		18 ≤Age< 65
10.	Contact number		
11.	Have you ever entered data into the trauma registry portal when receiving patients? (Mark "Yes" if the staff ever performed data entry to the portal)	0. No 1. Yes	If "No" go to question 13 IF "No" for question 13 also close form If "Yes" for question 13 go to question 14 and close
12.	If Yes, Are you currently entering data into the trauma registry portal? (If the person is currently involved in the activity of data entry into the trauma registry portal as part of their day to day activity mark "Yes")	0. No 1. Yes	If No go to Question 12, else go to 15
13.	If No, What is the reason for not entering data to the portal	1. Other staff in the ambulance is doing 2. Don't Know about the portal	Multiple choice

		3. Not getting time to upload 4. Do not have device for data entry 5. Network issue 6. Don't think it is important 7. Others (specify)	
14.	Do you currently have any responsibility related to trauma registry portal other than data entry?	0. No 1. Yes	Qn 10 and Qn 13 – No → Close Qn 10 No and Qn 13 – Yes → Go to Qn 14 then close
15.	What is your current responsibility related to the trauma registry portal		Open ended
16.	When do you usually perform the data entry	1. From the spot of picking the patient 2. In the ambulance during the transit 3. After reaching the hospital	
17.	Have you ever received any formal training regarding the Trauma Registry and its data entry? (Mark "Yes" if they have attended any formal training sessions or program specific to entry of data into the trauma registry portal. Informal training given by supervisors or seniors onjob will be considered as No)	0. No 1. Yes	If No skip to 20
18.	Did you received any training regarding trauma registry in last year?	0. No 1. Yes	

Details about the most recent training			
19.	Which institute organised the training program? (Mention the name of the institute or department that conducted the training program)		
20.	How many days of training that you received?		0< Number <7
21.	Have you ever received any informal training given by Medical officers or supervisors or any seniors on data entry to the trauma registry portal? (By informal training we means any orientation sessions by the Medical Officer or any seniors or Supervisors and not as a organised workshop or training program)	0. No 1. Yes	
22.	Do you have a hard or soft copy of the protocol/SOP/Guide of Trauma Registry data entry protocols with you? (Mark "Yes" if you can observe a soft or hard copy of any document that give step by step guide or frequently asked question guide on data entry to the trauma registry portal)	0. No 1. Yes	
23.	Do you have a dedicated device for carrying out the	0. No 1. Yes	IF 'No' hide question 29

	data entry to the Trauma Registry? (Mark "Yes" if you are able to observe a functioning tablet PC or Mobile phone provided by the Trauma Registry team for data entry to the poral)		
24.	Which device is used for **entering data** into the trauma registry portal?	1. Desktop/Laptop 2. Mobile Phone/Tablet 3. Others (Specify)	
25.	Have you faced any technical difficulties while using the Trauma Registry portal? (This captures glitches and problems from the portal, which does not include problems due to the device and network and connectivity issues)	0. No 0. Yes	If "No" skip to 26
26.	If yes, please list out the specific difficulties you encountered while using the Trauma Registry portal.	1. Portal not loading/opening 2. Not able to log in 3. Getting logged out in between 4. Data not getting saved/Need to enter repeatedly 5. Other (Specify all)	Multiple options
27.	Have you faced any network or connectivity issues while using the TR in past 2 months	0. No 1. Yes	If "No" skip to 29
28.	Mention the network or connectivity issues that you have faced while using the portal in the past 2 months	1. Network not available at the field 2. Not providing provision to purchase data plan 3. Network is very slow 4. No sim port in the device provided 5. Others (specify all)	Multiple options
29.	How often you are facing such network or	1. All the time 2. Very often (more than once a day)	

	connectivity related issues?	3. Some times (one or two times a week) 4. Rarely (once a month or even less frequent)	
30.	Have you encountered any challenges or difficulties while using the dedicated devices provided by the Trauma Registry team for data entry to the Trauma Registry? (If the staff mentions any complaints related to the device, excluding network issues mark "Yes". If they mention any complaints related to the network issue or technical issue with the portal alone then mark "No")	0. No 1. Yes	If "No" skip 31
31.	What are the other common challenges faced during the data entry (Clues: Login from multiple IDs, Case load, Complexity of design, Lots of information, Lack of training)		Capture all information shared by the PERSON
32.	How challenging it is for you managing the data entry task in addition to your existing responsibilities?	1. Very Challenging 2. Manageable 3. Not a challenge	
33.	Do you think the portal will be more user-friendly if the data can be entered offline	0.No 1. Yes	

	and it can be uploaded to the server together whenever the network connection resumes?		
34.	Have you received any feedbacks related to the information that you have entered in to the Trauma Registry Portal? (If the person has received some feedbacks of appreciation or feedback to improve completeness or correctness data entry to the portal mark "Yes". Appreciation or feedback to improve related to the usual patient transport and care will be marked as "No"	0. No 1. Yes	
35.	Do you think this is this is a useful activity?	0. No 1. Yes	
36.	Do you believe that assigning a dedicated data entry operator will enhance the efficiency and effectiveness of the work?	0. No 1. Yes	

Annexure 4:

4.A

TAEI Trauma Registry Evaluation Hospital Staff Interview			
Qn No.	Question	Options	
37.	Zone	5. North 6. South 7. East 8. West	
38.	Health Facility	13. Mohan Kumaramangalam MC Hospital, Salem 14. Rajiv Gandhi General Hospital, Chennai 15. Mahatma Gandhi Memorial Hospital, Trichy 16. Rajaji Hospital, Madurai 17. Karur Medical College Hospital, Karur 18. Thiruvannamalai Medical College 19. Ariyalur Medical College Hospital 20. Ramanathapuram Medical College Hospital 21. District Headquarters Hospital, Pollachi 22. Mayiladuthurai Taluk Hospital 23. Aruppukottai Hospital 24. Taluk hospital, Ponneri	IF NORTH – Rajiv Gandhi General Hospital,Chennai, Thiruvannamalai Medical College, Taluk Hospital Ponneri IF SOUTH – Rajaji Hospital Madurai, Ramanathapuram Medical College Hospital, Aruppukottai Hospital,Virudhanagar IF EAST- Mahatma Gandhi Memorial Hospital Trichy, Ariyalur Medical College Hospital, Mayiladudhurai Taluk Hospital, IF WEST- Mohan Kumaramangalam MC Hospital Salem, Karur Medical College Hospital,District Headquarters Pollachi, Coimbatore
39.	Level of trauma care facility	4. Level 1 5. Level 2 6. Level 3	If answer to Qn2 1 – 4 – Level 1 5 – 8 – Level 2 9 – 12 – Level 3
40.	Respondent ID		
41.	Name of the Respondent		
42.	Designation	3. ED Secretary 4. Trauma Assistant 5. NK 48 staff	

		6. Staff Nurse 7. Medical Officer 8. Junior Resident 9. Senior Resident 10. House Surgeon 11. Technician 12. Others (Specify)	
43.	Participant agreed to participate & Consent form obtained	2. No 3. Yes	If No - Close
44.	Gender	4. Male 5. Female 6. Others	
45.	Age in completed years		18 ≤Age< 65
46.	Contact number		
47.	Have you ever entered data into the trauma registry portal when receiving patients? (Mark "Yes" if the staff is performing data entry to the portal)	2. No 3. Yes	If "No" go to question 12 IF "No" for question 12 also close form If "Yes" for question 12 go to question 14 and close
48.	If Yes, Are you currently entering data into the trauma registry portal? (If the person is currently involved in the activity of data entry into the trauma registry portal as part of their day to day activity mark "Yes")	2. No 3. Yes	If No, go to Question number 12 If Yes, go to Question number 14
49.	Do you currently have any other responsibility related to trauma registry portal?	2. No 3. Yes	Qn 10 and Qn 12 – No → Close Qn 10 No and Qn 12 – Yes → Go to Qn 14 then close
50.	What is your current responsibility related to the trauma registry portal		Open ended
51.	Have you ever received any formal training regarding the Trauma	0. No 1. Yes	If No skip to 18

	Registry and its data entry? (Mark "Yes" if they have attended any formal training sessions or program specific to entry of data into the trauma registry portal. Informal training given by supervisors or seniors on job will be considered as No)		
52.	Did you received any training regarding trauma registry in last year?	2. No 3. Yes	If No skip to 18
Details about the most recent training			
53.	Which institute organised the training program? (Mention the name of the institute or department that conducted the training program)	1. MMC 2. Others (Specify)	
54.	How many days of training that you received?		>0 number <7
55.	Have you received any informal/on the job training given by Medical officers or supervisors on data entry to the trauma registry portal? (By informal training we means any orientation sessions by the Medical Officer or any seniors or Supervisors and not as a organised workshop or training program)	2. No 3. Yes	
56.	Do you have a hard or soft copy of the protocol/SOP/Guide of Trauma Registry data entry protocols with you? (Mark "Yes" if you can observe a soft or hard	2. No 3. Yes	

	copy of any document that give step by step guide or frequently asked question guide on data entry to the trauma registry portal)		
57.	Do you have a dedicated device for carrying out the data entry to the Trauma Registry? (Mark "Yes" if you are able to observe a functioning tablet PC or Mobile phone provided by the Trauma Registry team for data entry to the poral)	2. No 3. Yes	If NO hide question 27
58.	Which device is used for entering data into the trauma registry portal?	4. Desktop/Laptop 5. Mobile Phone/Tablet 6. Others (Specify)	
59.	Have you faced any technical difficulties while using the Trauma Registry portal? (This captures glitches and problems from the portal, which does not include problems due to the device and network and connectivity issues)	1. No 2. Yes	If "No" skip to 24
60.	If yes, please list out the specific difficulties you encountered while using the Trauma Registry portal.	6. Portal not loading/opening 7. Not able to log in 8. Getting logged out in between 9. Data not getting saved/Need to enter repeatedly 10. Other (Specify all)	Multiple options
61.	Have you faced any network or connectivity issues while using the TR in past 2 months	2. No 3. Yes	If "No" skip to 27
62.	Mention the internet connectivity issues that you have faced while using the portal in the past 2 months	6. Internet not available 7. Internet is very slow 8. Interrupted internet connectivity 9. Others (specify all)	Multiple options
63.	How often you are facing such internet	5. All the time 6. Very often (more than once a day)	

	connectivity related issues?	7. Sometimes (one or two times a week) 8. Rarely (once a month or even less frequent)	
64.	Have you encountered any challenges or difficulties while using the dedicated devices provided by the Trauma Registry team for data entry to the Trauma Registry? (If the staff mentions any complaints related to the device, excluding network issues mark "Yes". If they mention any complaints related to the network issue or technical issue with the portal alone then mark "No")	2. No 3. Yes	If "No" skip to 29
65.	What are the other common challenges faced during the data entry (Clues: Login from multiple IDs, Case load, Complexity of design, Lots of information, Lack of training)		Capture all information shared by the PERSON
66.	How challenging it is for you managing the data entry task in addition to your existing responsibilities?	4. Very Challenging 5. Manageable 6. Not a challenge	Questions 29 and 30 will open only if the answer for Question 5 is not 1 or 2
67.	Do you believe that assigning a dedicated data entry operator will enhance the efficiency and effectiveness of the work?	2. No 3. Yes	
68.	Do you think the portal will be more user-friendly if the data can be entered offline and it can be uploaded to the server together whenever the network connection resumes?	0.No 1. Yes	

69.	Have you received any feedbacks related to the information that you have entered in to the Trauma Registry Portal? (If the person has received some feedbacks of appreciation or feedback to improve completeness or correctness data entry to the portal mark "Yes". Appreciation or feedback to improve related to the usual patient transport and care will be marked as "No")	2. No 3. Yes	
70.	Are you involved in any other activities apart from data entry into trauma registry portal?	0. No 1. Yes	33,34 and 35 Question will open if the answer for Question 5 is 1 or 2
71.	If yes, what are they?		Skip this question if question 33 is No
72.	How challenging it is for you the data entry task?	1. Very Challenging 2. Manageable 3. Not a challenge	Open question number 36 and 37 if answered Very Challenging
73.	What are the challenges?		
74.	How these challenges can be addressed?		

4.B

TAEI Trauma Registry Evaluation Health Facility Checklist			
Qn.No	Question	Options	
1.	Zone	9. North 10. South 11. East 12. West	
2.	Health Facility	25. Mohan Kumaramangalam MC Hospital, Salem 26. Rajiv Gandhi General Hospital, Chennai 27. Mahatma Gandhi Memorial Hospital, Trichy 28. Rajaji Hospital, Madurai 29. Karur Medical College Hospital, Karur 30. Thiruvannamalai Medical College 31. Ariyalur Medical College Hospital 32. Ramanathapuram Medical College Hospital 33. District Headquarters Hospital, Pollachi 34. Mayiladuthurai Taluk Hospital 35. Aruppukottai Hospital 36. Taluk hospital, Ponneri	IF NORTH – Rajiv Gandhi General Hospital,Chennai, Thiruvannamalai Medical College, Taluk Hospital Ponneri IF SOUTH – Rajaji Hospital Madurai, Ramanathapuram Medical College Hospital, Aruppukottai Hospital,Virudhanagar IF EAST- Mahatma Gandhi Memorial Hospital Trichy, Ariyalur Medical College Hospital, Mayiladudhurai Taluk Hospital, IF WEST-Mohan Kumaramangalam MC Hospital Salem, Karur Medical College Hospital, District Headquarters Pollachi,Coimbatore
3.	Level of trauma care facility	7. Level 1 8. Level 2 9. Level 3	If answer to Qn2 1 – 4 – Level 1 5 – 8 – Level 2 9 – 12 – Level 3
4.	Is data entry to trauma registry portal is happening in this institute	0. No 1. Yes	If no Go to Qn No.5 If yes Go to Qn No.6
5.	If no, What is the reason for not conducting data entry to the portal		Open Ended

6.	Does the facility provide devices like desktops/laptops to enter data in the trauma registry portal?	0. No 1. Yes	(If No skip to Qn.8)

7. If yes,

	Availability at	7A. Numbers allotted/Budgeted/sanctioned (If not available, mark "0")	7B.Numbers available (If not available, mark "0") (Skip if 7A = 0) Restrict number <=20	7C.Numbers in functional state (As on day of visit) (Skip if 7B = 0) Restrict number <=20	7D. If functional how many of them using for trauma registry data entry purpose (Skip if 7C = 0) Restrict number <=20	7E. Is Entry to Trauma Registry Portal Happening by any other means (Options 0.No 1.Yes) If yes specify number
1.	Emergency Department					
2.	Radio-Imaging Room					
3.	ICU					
4.	Laboratory					
5.	MRD					
6.	Rehabilitation Centre					
7.	Emergency OT					
8.	Forensic Department					

8.	Does the facility has dedicated ED Secretary/Trauma Assistant/NK -48 staff for data entry to the trauma registry?	0. No 1. Yes	(If No skip to Qn.9)

9. If yes,

	Availability	9.A. Total number of posts sanctioned	9.B. Total number of posts filled	9.C. Trained in data entry to Trauma Registry Portal	9.D. For how many months the post were remaining vacant	Is he involved in Data entry to Trauma Registry
1.	ED Secretary					0. No 1. Yes
2.	Trauma Assistant					0. No 1. Yes
3.	NK 48 Staff					0. No 1. Yes

10.	Does the facility have internet access?	0. No 1. Yes	
11.	How stable is the internet connectivity in your facility?	1. Very Stable 2. Stable but speed inadequate 3. Unstable	
12.	Is there any back – up options for the internet services if the network is down?	0. No 1. Yes	
13.	Do have a TV in your facility?	0. No 1. Yes	If NO then hide q 14, 15,16 and 17
14.	Does the Tv is in good working condition	0. No 1. Yes	
15.	Does Tv is wall - mounted?	0. No 1. Yes	
16.	What is the size of the display?	1. 33 inch 2. Less than 33 inch 3. >33 inch	
17.	Is the pre-hospital patient notification is displayed on the hospital's TV?	0. No 1. Yes	

<table>
<tr><td>18.</td><td>Does the facility have printer?</td><td>0. No
1. Yes, Wifi Scanner cum Printer
2. Yes, Scanner cum printer – no wifi connectivity
3. Yes, Wifi printer – no scanner
4. Yes, only printer</td><td></td></tr>
<tr><td>19.</td><td>Does the facility have SOPs for data entry available</td><td>0. No
1. Yes, Softcopy
2. Yes, Hardcopy
3. Yes, Both Hard & Soft copy</td><td></td></tr>
<tr><td>20.</td><td>Is there any specific budget for functioning of Trauma Registry in the facility</td><td>0. No
1. Yes</td><td>If No skip to 22</td></tr>
<tr><td>21.</td><td colspan="3">If Yes give the budget details for the financial year 2023-23
<table><tr><td></td><td>Head</td><td>Sanctioned</td><td>Utilised</td></tr><tr><td>1.</td><td>Human Resource</td><td></td><td></td></tr><tr><td>2.</td><td>Equipment</td><td></td><td></td></tr><tr><td>3.</td><td>Other</td><td></td><td></td></tr></table></td></tr>
<tr><td>22.</td><td>Do you have any challenges in spending the budget</td><td>0. No
1. Yes</td><td>If yes go to Qn 23</td></tr>
<tr><td>23.</td><td>What are the challenges?</td><td></td><td></td></tr>
<tr><td>24.</td><td>Does the facility provide devices like tablets to enter data in the trauma registry portal?</td><td>0 No
1 Yes</td><td>(If No end questionnaire)</td></tr>
<tr><td>25.</td><td colspan="3">If Yes,
<table><tr><td></td><td>Availability at</td><td>25A. Numbers allotted/Budgeted/sanctioned</td><td>25B.Numbers available</td><td>25C.Numbers in functional state (As on day of visit)</td><td>25D. If functional how many of them using for trauma registry data entry purpose</td><td>25E. Is Entry to Trauma Registry Portal Happening by any other means</td></tr><tr><td>9.</td><td>Emergency Department</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>10.</td><td>Radio-Imaging Room</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>11.</td><td>ICU</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>12.</td><td>Laboratory</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>13.</td><td>MRD</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>14.</td><td>Rehabilitation Centre</td><td></td><td></td><td></td><td></td><td></td></tr></table></td></tr>
</table>

	15.	Emergency OT						
	16.	Forensic Department						

4.C

4.D

TAEI Trauma Registry Evaluation Correctness of Data Entry		
Qn.No	Question	Answer (All Options **0.Wrong 1.Correct 2.Information entered in registry but not available in case sheet 3. Information not entered in registry**)
1.	Total GCS	
2.	BP	
3.	HR	
4.	SpO2	
5.	Respiratory Rate (RR)	
6.	Pupil size & reaction	
7.	Alcohol consumption	
8.	Drug abuse	
9.	EFAST (done Y/N)	
10.	Blood transfusion in ED (done Y/N)	
11.	Specialist Opinion Required	
12.	Date & Time of surgery	
13.	Date & Time of admission in ICU	
14.	ED Disposition	