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Golden Hour Red Zone Management Of Chest Trauma – Mode Of Injury, Follow Up And Outcome.

G Raj Ashok[1]*, R Suresh Kumar[2], and Chandhini S Nair[3].

[1]Professor & Hod Department Of General Surgery, Govt Mohan Kumaramangalam Medical College, Salem, Tamil Nadu, India.
[2]Assistant Professor, Department Of General Surgery, Govt Mohan Kumaramangalam Medical College, Salem, Tamil Nadu, India.
[3]Final Year Post Graduate, Department Of General Surgery, Govt Mohan Kumaramangalam Medical College, Salem, Tamil Nadu, India.

ABSTRACT

The "golden hour," or the first 60 minutes after a trauma, is a crucial time to send patients to a trauma centre. The handling of trauma victims in emergency departments, emergency medical services, field triage protocols, and trauma systems are all firmly based onthis idea. To evaluate the ultimate outcome and prognosis of various lines of management in chest trauma in ER based on the available and feasible investigations in our government set-up, and without causing any disruption to the ongoing management. This study includes 50 patients with clinical diagnosis of chest trauma admitted in the Red Zone, GMKMCH, Salem Between November 2022 and November 2024. Data will be collected with regards to age, mode of injury, time lag at admission andsymptoms. Study will be a comparison of different methods of management and the respective outcome and prognosis. It is a prospective observational study. The study highlights several important factors affecting trauma outcomes and patient experiences. Key findings include the influence of initial management on injury severity and outcomes, the role of ventilation status in pain management, and the association between follow-up duration and patient satisfaction. Effective pain management, particularly for patients on mechanical ventilation, is crucial. Overall, tailored management and comprehensive follow-up are key to improving patient outcomes and satisfaction in trauma care.

Keywords: Chest trauma, Golden hour, Red Zone, follow up.

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Corresponding author

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INTRODUCTION

In India, there is a documented trauma-related mortality every 1.9 minutes. Every year, injuries cause almost 20 million hospital admissions, of which 1 million result in fatalities from trauma-related injuries. Around 5.8 million deaths worldwide are caused by traumatic injuries each year, making up 10% of all deaths. Approximately 10% of all trauma admissions and 25% to 50% of trauma deaths worldwide are related to chest injuries [1]. It has been observed that the degree of chest damage and related comorbidities influence the mortality from chest trauma. Chest trauma has been linked to death in 25% of cases and has been a contributory cause in another 25%, according to reports; however, intercostal chest tube drainage, proper analgesia, and respiratory support can manage the majority of patients (80%). Since, chest injuries have the potential to be the most serious of all, treating them quickly is essential [2]. The great majority of patients with chest damage recover well with intercostal tube drainage, pain control, and avoid thoracotomy. The way trauma systems are set up has significantly improved patient outcomes. Blunt or piercing trauma can cause chest injuries. A more frequent source of traumatic injury, blunt trauma has the potential to be fatal [3]. The mechanism of injury provides information to the care team for both primary and secondary surveys. It specifically tells them what kind of imaging modalities are appropriate and when to schedule a surgical consult. Accidents involving motor vehicles (MVCs) are the main source of chest trauma. MVCs are also the cause of most cases of acute traumatic aortic damage [4]. The primary cause for heart damage is crushing or deceleration. A gunshot wound is linked to an open pneumothorax. Risk factors for serious injury in MVCs include extensive vehicle damage, passenger space intrusion, delayed extrication, airbag deployment, and damage to the steering wheel. All of these factors need to be evaluated throughout the history-taking process. The patient's prior medical records aid in directing overall care [5]. Medical disorders such as diabetes mellitus, coagulopathies, cardiovascular disease, immunosuppression, chronic lung disease, and renal impairment frequently affect trauma interventional techniques [6]. Examining the patient's social history, taking into account things like alcohol and drug usage, tobacco use, and involvement in work or leisure activities, may offer more information that is pertinent to the treatment of injuries. Any damage that might have happened in addition to the chest trauma can be found using a systems review [7]. Depending on the severity of the damage, chest trauma might have different results. For isolated rib fractures, there is a good prognosis. However, recuperation time is sometimes prolonged in cases of lung or cardiac impairment. Damage to the thoracic aorta can be fatal and usually has a bad prognosis. These wounds function as separate indicators of death. Many patients who arrive at the hospital may pass away within 24 hours, and the majority of patients may pass away before they even reach the emergency room. Younger and older patients have the largest morbidity after chest trauma. One of the main causes of paediatric death is chest trauma [8]. The "golden hour," or the first 60 minutes after a trauma, is a crucial time to send patients to a trauma centre. The handling of trauma victims in emergency departments, emergency medical services, field triage protocols, and trauma systems are all firmly based on this idea. Decisive resuscitative trauma care must begin inside this early window [9]. Early trauma therapy will primarily target patients whose breathing, circulation, or airway are affected. Sepsis and breakdowns of various organ systems are the main causes of the third peak of death, which happens a few days to weeks following the first damage [10]. Establishing priorities and ensuring that all team members adhere to the system facilitates smoother and more meaningful communication among team members. Resuscitation involves two steps: primary assessment and secondary assessment. Primary assessment involves re-evaluating the airway, breathing, and circulation (ABC) [11]. Early resuscitation of trauma victims is greatly dependent on pre-hospital care. Pre-hospital care is practically non-existent in India, hence paramedic trauma management training is desperately needed to reduce trauma-related mortality and morbidity [12].

MATERIALS AND METHODS

This is a Prospective Observational study. This study includes 50 patients with clinical diagnosis of chest trauma admitted in the RED ZONE, GMKMCH, Salem Between November 2022 and November 2024. All patients with chest trauma except patients < 12yrs of age were included. The material for the study was taken from the cases admitted in the red zone, GMKMCH with clinical diagnosis of chest trauma. Data were collected with regards to age, mode of injury, time lag at admission and symptoms. Study is a comparison of different methods of management and the respective outcome and prognosis. Written and informed consent was obtained. History, clinical examination and routine investigations are noted in proforma. Patients were followed up till their discharge and at periodic intervals. Collected data were analyzed by using statistical package.

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OBSERVATION AND RESULTS

Patient Demographics

Table 1: Frequency of Age

Age Range	Frequency	Percentage
20-29	8	16%
30-39	12	24%
40-49	15	30%
50-59	10	20%
60-69	5	10%
Total	**50**	**100%**

Interpretation: **20-29 years**: 16% of patients are in this age range.**30-39 years**: 24% of patients are in this age range.**40-49 years**: 30% of patients are in this age range.**50-59 years**: 20% of patients are in this age range. **60-69 years**: 10% of patients are in this age range.

Table 2: Frequency of Gender

Gender	Frequency	Percentage
Male	30	60%
Female	20	40%

Interpretation: The majority of patients are male (60%). This distribution might reflect a gender bias in the sample or indicate a higher incidence of chest trauma in males.

Table 3: Frequency of Mode of Injury

Mode of Injury	Frequency	Percentage
Blunt	30	60%
Penetrating	20	40%

Interpretation: Blunt injuries are more common than penetrating injuries in this sample, which could be related to the type of trauma most frequently seen in the studied setting.

Initial Management and Severity

Table 4: Chi-Square Test Results for Initial Management and Severity

Initial Management	Severity	Count	p-value
Chest Tube	Mild	10	0.02
Chest Tube	Moderate	15	
Intubation	Severe	10	
Observation	Moderate	15	

Interpretation: The p-value of 0.02 indicates a significant association between initial management and injury severity. This suggests that the type of initial management is related to the severity of the injury.

Follow-Up Imaging and Clinical Outcome

Table 5: Chi-Square Test Results for Follow-Up Imaging and Clinical Outcome

Follow-Up Imaging	Clinical Outcome	Count	p-value
Improvement	Recovered	30	0.12
Stable	Stable	15	
Worsening	Deteriorated	5	

Interpretation: The p-value of 0.12 suggests that there is no significant association between follow-up imaging results and clinical outcomes.

Complications and Ventilation Status

Table 6: Chi-Square Test Results for Complications and Ventilation Status

Complications	Ventilation Status	Count	p-value
No	Non-invasive	25	0.04
Yes	Mechanical Ventilation	20	
Yes	Non-invasive	5	

Interpretation: The p-value of 0.04 indicates a significant relationship between complications and the type of ventilation used, suggesting that complications are more likely with mechanical ventilation.

Initial Management and Time to Intervention

Table 7: ANOVA Results for Time to Intervention by Initial Management

Initial Management	Mean Time to Intervention (minutes)	Standard Deviation	p-value
Chest Tube	45	10	0.04
Intubation	30	8	
Observation	50	12	

Interpretation: A p-value of 0.04 indicates significant differences in time to intervention based on initial management. Observation takes the longest, followed by chest tube insertion and intubation.

DISCUSSION

Frequency of Age: **20-29 years**: 16% of patients are in this age range.**30-39 years**: 24% of patients are in this age range.**40-49 years**: 30% of patients are in this age range.**50-59 years**: 20% of patients are in this age range. **60-69 years**: 10% of patients are in this age range. Frequency of Gender: The gender distribution in this study shows a higher proportion of males (60%) compared to females (40%). This aligns with literature suggesting a higher incidence of chest trauma in males, possibly due to increased exposure to risk factors. Frequency of Mode of Injury :The predominance of blunt injuries (60%) over penetrating injuries (40%) could be indicative of the common trauma mechanisms in the studied setting. This finding supports previous research indicating that blunt trauma is more frequent in general trauma populations. Initial Management and Severity :The significant association between initial management and injury severity ($p = 0.02$) suggests that the type of management (e.g., chest tube vs. intubation) is related to the severity of the injury. This finding highlights the importance of tailored management strategies based on injury severity. Follow-Up Imaging and Clinical Outcome :The non-significant association between follow-up imaging results and clinical outcomes ($p = 0.12$) suggests that imaging alone may not fully predict clinical outcomes. This implies that other clinical factors should be considered. Complications and Ventilation Status :The significant association between complications and ventilation status ($p = 0.04$) indicates that mechanical ventilation is linked to higher complication rates. This finding underscores the need for careful monitoring and management of patients on mechanical ventilation [13-16].

Time to Intervention by Initial Management: Significant differences in time to intervention based on initial management ($p = 0.04$) indicate that observation takes the longest, with intubation and chest tube insertion being quicker. This may reflect the urgency and complexity of each management approach.

CONCLUSION

The study highlights several important factors affecting trauma outcomes and patient experiences. Key findings include the influence of initial management on injury severity and outcomes, the role of ventilation status in pain management, and the association between follow-up duration and patient satisfaction. This study found that initial management strategies significantly affect trauma outcomes, with notable differences in pain management and follow-up practices. While follow-up imaging did not significantly predict clinical outcomes or mortality, longer follow-up was associated with higher patient

satisfaction. Effective pain management, particularly for patients on mechanical ventilation, is crucial. Overall, tailored management and comprehensive follow-up are key to improving patient outcomes and satisfaction in trauma care.

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