



Role of Trauma Blood Panel and Its Relation to the Disposition of Major Trauma Patients in a Tertiary Hospital

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Abstract

Introduction: Emergency and trauma departments have been managing accident cases and providing care for trauma patients as a fundamental service. Over time, emergency trauma care has evolved into a specialized area of interest and subspecialty within many healthcare sectors. The primary goal is to enhance the care system for trauma patients to achieve higher standards and outcomes. **Method:** One initiative to improve trauma care is the development of a trauma panel of blood. This panel is intended to assist in determining patient outcomes and guiding treatment decisions, whether conservative or operative. **Results:** For patients treated conservatively, having comprehensive information from the trauma blood panel could facilitate the transition from critical care units to general wards, ensuring appropriate and timely care adjustments. **Discussion:** The introduction of a trauma panel of blood is expected to streamline clinical decision-making in trauma care. This tool can influence treatment pathways and patient management strategies, potentially improving overall patient outcomes. **Conclusion:** Implementing a trauma panel of blood aims to enhance the quality of trauma care by providing critical information that supports informed and timely clinical decisions, ultimately leading to better patient outcomes and more efficient use of healthcare resources.

Keywords: Disposition; Emergency Medicine; Pathology; Trauma

Introduction

Trauma has consistently been one of the major contributors to mortality in Malaysia. In 2022, transport accidents ranked as the 5th principal cause of death in the country, accounting for 1.9%. The significance of trauma in causing mortality is particularly evident in the population aged 0-14, where transport accidents stood as the leading cause of death, surpassing even COVID-19 infections - the top contributor to deaths in all other age groups in Malaysia (Statistics on Causes of Death, Malaysia, 2022). Consequently, the establishment of trauma suites in Emergency Departments in public hospitals across Malaysia has garnered considerable interest lately.

One element that plays a pivotal role in ensuring the success of a trauma suite is the trauma blood panel. The trauma blood panel includes a variety of hematological and biochemical investigations such as blood typing (Group, Screen and Hold or Group and Crossmatch), blood gas analysis (including serum lactate), full blood count, renal profile, coagulation profile, creatine kinase, troponin, and fibrinogen. Currently, in the damage control resuscitation (DCR) suite of the emergency department at Selayang Hospital, the trauma blood panel is similar to that recommended by Trauma Life Support Malaysia, with the inclusion of liver function tests and cardiac enzymes. These investigations serve as primary adjuncts in the assessment and management of trauma patients. Careful evaluation of the patients' clinical, imaging, and laboratory parameters may provide clues to patient outcomes, which

may then help in planning for the management and disposition of the trauma patient (Nelson & David, 2012).

Methodology

This study included all patients presenting to the damage control resuscitation (DCR) suite of the emergency department at Selayang Hospital from the 1st of March to the 15th of June 2023. Major trauma patients were identified early by the prehospital trauma care team based on the Revised Trauma Score and were subsequently triaged to the DCR suite with prior notification to the Tier 1 Trauma Team in the emergency department. This was done in accordance with the Malaysian Trauma Chain of Survival, with early activation of the trauma chain improving patients' chances of survival (Spahn *et al.*, 2019). One patient was excluded due to the inability to trace the patient's final disposition.

The article initially examines the percentage of major trauma patients who had their blood samples sent as a trauma blood panel and those who did not have their blood sent via a trauma blood panel. Subsequently, all patients who had the trauma blood panel sent were analyzed to determine whether they underwent operative or non-operative intervention.

The patients who had their trauma blood panels sent were also studied regarding their disposition to critical care wards, normal wards, or discharge from the emergency department.

This simple percentage analysis will help guide the emergency team on the compliance with trauma blood panels in major trauma patients, determine if a trauma blood panel can assist in treating patients more conservatively and avoiding surgery, and also assess if sending trauma blood panels for those treated conservatively allows patients to be admitted to normal wards rather than critical care units.

Results

Throughout the duration of the study, the DCR suite at Selayang Hospital served a total of 78 patients. Out of these 78 patients, 67 had a full trauma blood panel sent, accounting that 85.9% of all patients admitted to the DCR suite. Eleven patients did not have a trauma blood panel sent from the DCR suite, comprising 14.1% of the total as described in Table 1.

Table 1: Distribution of Trauma Blood Panels for Patients in the DCR Suite During the Study Period

Total Patients	Trauma Blood Panel Sent	Trauma Blood Panel Not Sent
78	67 (85.8%)	11 (14.1%)

Out of 67 patients, 11 (16.4%) were treated surgically and sent directly to the operating theater from the emergency department. The remaining 84.6% of major trauma patients were either managed with non-surgical treatments or their resuscitative efforts were unsuccessful (Table 2).

Table 2: Distribution of Patients with Trauma Blood Panels by Operative and Non-Operative Treatments

Total Patients with Trauma Blood Panel	Surgical Treatment	Non-Surgical Treatment
67	11 (16.4%)	56 (84.6%)

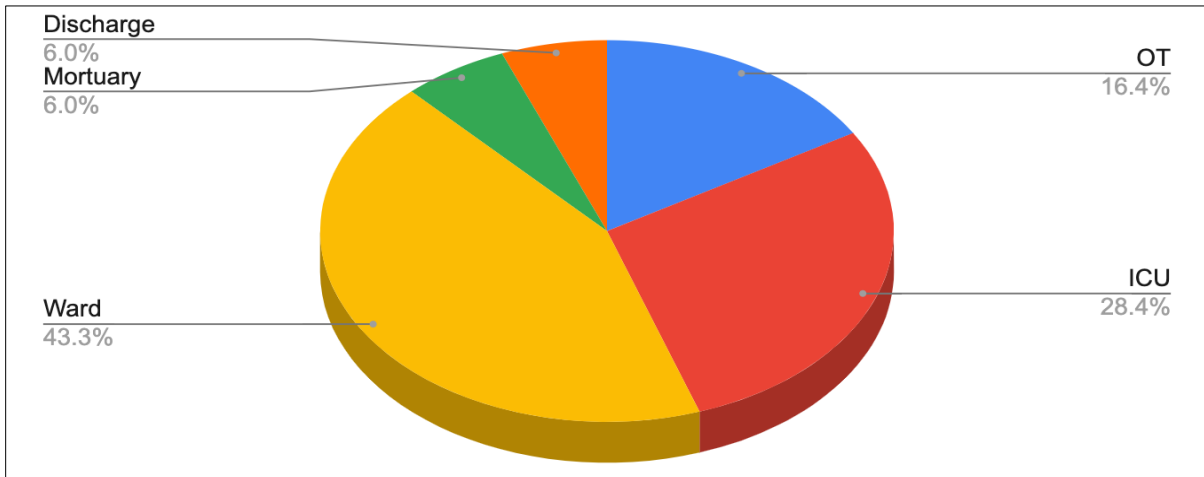


Figure 1: Patient Disposition in the DCR Suite with Trauma Blood Panels at Hospital Selayang (March 1, 2023 - June 15, 2023)

Figure 1 represents the outcomes of patients treated during this period. The data shows that 6% of patients were discharged, while another 6% succumbed to their injuries. A significant portion, 43.3%, were admitted to the general ward, 28.4% required intensive care in the ICU, and 16.4% were taken to the operating theatre for surgical interventions. This distribution underscores the diverse range of patient outcomes, with many requiring extensive medical care.

Table 3: Post-Resuscitation Outcomes and Patient Disposition

Patients with Trauma Blood Panel	Patients Admitted to Critical Care	Admitted to Ward	Discharged
67	19 (28.4%)	29 (43.3%)	4 (6%)

Out of all major trauma patients with a trauma blood panel sent, 19 patients were admitted to a critical care setting, accounting for 28.4% of the cohort studied. Twenty-nine patients were managed conservatively in wards, constituting the majority of the cohort (43.3%). Four patients were discharged from the emergency department after review by the respective primary teams, while another four were sent to the mortuary after unsuccessful resuscitative efforts, each accounting for 6% of the total studied population (Table 3).

Discussion

The majority of all major trauma patients had a full trauma blood panel sent, while 14.1% of the studied cohort did not. This may be attributed to Selayang Hospital's role as a tertiary hospital receiving referrals from its surrounding cluster hospitals. Most referred cases arrive with a full set of blood investigations available for review upon the patient's arrival (Schneider *et al.*, 2023). Typically, blood investigations available from cluster hospitals may include a full blood count, renal profile, liver function test, coagulation profile, cardiac enzymes, and blood gases. Nevertheless, transferred trauma patients still undergo blood sampling at Selayang Hospital, primarily for point-of-care tests (full blood count and blood gas analysis) and blood typing (Castro *et al.*, 2024). Point-of-care testing guides emergency healthcare providers in continuous resuscitation efforts to stabilize transferred trauma patients, while blood typing ensures compatible blood products are available for transfusion if needed, whether in the emergency department or the operating theatre (Stojek *et al.*, 2023).

The trauma blood panel may provide insights into the severity of injuries sustained by major trauma patients and their related prognoses and outcomes. Studies on post-traumatic renal failure support this notion. A retrospective review of trauma registry information from Los Angeles County-University of Southern California Medical Center from 1998 to 2005 by Brown *et al.* found that post-traumatic renal failure occurred in 1% of trauma patients studied. Among the patients who developed post-traumatic renal failure, 20% required dialysis while 38% eventually succumbed to illness (Brown *et al.*, 2008). The

study also identified laparotomy as an independent risk factor for the need for dialysis, with patients developing elevated creatinine levels later during the course of illness more likely to require dialysis. Another study by Yuan *et al.* concluded that mortality rates were proportionally related to the severity of acute kidney injury sustained after road traffic injuries (Yuan *et al.*, 2009).

Furthermore, the trauma blood panel may help identify hidden injuries in trauma patients, including myocardial contusions or hepatic injuries. Myocardial contusions are challenging to diagnose clinically, as the gold standard appears to be autopsy (Taggart *et al.*, 2021). However, Mori *et al.* (2001) provided insight into the role of elevated troponin I levels between 0.4 and 1 ng/ml in detecting myocardial microlesions, which is more sensitive than transthoracic echocardiography. Collins *et al.* (2011) further support this by recommending that a normal troponin level 4 to 6 hours post-injury excludes clinically significant blunt myocardial injury, regardless of the electrocardiogram findings upon admission. Meanwhile, another study has shown that an aspartate aminotransferase or alanine aminotransferase level above 130 units corresponds to significant hepatic injury.

With the advent of thromboelastography (TEG), in addition to the conventional coagulation profile and fibrinogen levels, emergency physicians are now better able to provide hemostatic resuscitation to major trauma patients through targeted transfusion protocols, compared to the standard massive transfusion protocol. TEG helps determine clotting deficiencies present in major trauma patients and guides the transfusion of blood components required to correct coagulopathy (Srinivasa, Gilbertson & Bhavani-Shankar, 2001). It may be prudent to include such an investigation in centers with sufficient resources, as it may directly affect mortality in trauma patients. As advocated by the American College of Surgeons, patients who do not immediately require massive transfusions should ideally receive platelets, cryoprecipitate, and fresh-frozen plasma guided by coagulation studies, fibrinogen levels, and balanced resuscitation principles (Henry, 2018). Such a recommendation is further supported by a study by Tapia *et al.* (2013), which shows lower mortality in penetrating trauma patients receiving 10 units or more of packed red blood cells in the TEG-directed resuscitation group (33.3%) versus the massive transfusion protocol group (54.1%). With the successful implementation of targeted transfusion protocols, the ideal outcome would be one in which major trauma patients achieve hemostasis with blood product transfusions and possibly avoid operative management.

Conclusion

Of all major trauma patients admitted to the damage control suite of the emergency department at Hospital Selayang, 85.9% had a full trauma blood panel sent. Among the 67 patients with a blood trauma panel sent, 11 patients were treated operatively in the operating theatre (16.4%), while the majority (71.7%) of patients were treated conservatively, either in critical care settings or in wards. With the array of tools available to physicians in the emergency department, including the trauma blood panel, extended focused assessment with sonography in trauma, and whole-body computer tomography imaging, we are better equipped to assess the extent of traumatic injuries, identify concealed injuries, and predict the outcome of major trauma patients. By optimizing trauma critical care in the emergency department, there is hope that most patients can be managed conservatively and avoid unnecessary surgery unless indicated otherwise.

Conflict of Interest

The authors declare that they have no competing interests.

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