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Original Article

Orthopaedic Surgical Prioritization in the Polytrauma Patient - A Retrospective Analysis

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ABSTRACT

Background: *The study aims to evaluate orthopaedic surgical prioritisation patterns and clinical outcomes in polytrauma patients managed at tertiary care centers.* ***Methods & Materials:*** *This retrospective observational study was conducted at Gazi Medical College and Hospital (GMCH) and Khulna Medical College and Hospital (KMCH), Bangladesh, from January 2022 to December 2023, involving 50 polytrauma patients aged ≥18 years with at least one orthopedic fracture requiring surgical or conservative management. Data were extracted from electronic medical records using a structured sheet. Variables included demographics, injury mechanism, Injury Severity Score (ISS), Glasgow Coma Scale (GCS), surgical details, ICU stay, timing of surgery, rationale for prioritization, and in-hospital outcomes. Early surgery was defined as intervention within 24 hours. Data were analyzed using SPSS version 26.0 with descriptive statistical methods.* ***Result:*** *Among the 50 polytrauma patients analyzed, the majority were males (76.0%) aged 21–40 years (50.0%), with a mean age of 33.6±12.4 years. ICU admission was needed in 36.0% of cases, with a mean ICU stay of 4.2±2.3 days. Road traffic accidents were the predominant cause of injury (70.0%), and 34.0% had severe injuries (ISS 16–24). Most patients (68.0%) had mild GCS scores (13–15). Femur and tibia/fibula fractures were most common (24.0% each), and 70.0% of fractures were closed. Delayed surgery (≥24 hrs) occurred in 60.0% of cases, with ORIF as the most frequent procedure (40.0%). Favorable outcomes included 84.0% ambulatory at discharge and 4.0% mortality.* ***Conclusion:*** *This study concludes that tailored orthopedic surgical prioritization based on patient stability, injury severity, and fracture complexity can improve outcomes in polytrauma cases, achieving high ambulation rates with minimal complications. Multidisciplinary strategies in tertiary care settings are vital to managing lower limb injuries and optimizing patient recovery effectively.*

Keywords: *Polytrauma, Orthopedic surgery, Surgical prioritization and Trauma management*

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INTRODUCTION

Polytrauma, defined as injuries involving multiple body systems or organs, is a significant cause of mortality and morbidity worldwide, particularly in low- and middle-income countries like Bangladesh, where road traffic accidents and occupational injuries are increasingly prevalent. [1,2] Orthopaedic injuries are among the most common sequelae of polytrauma, with fractures of long bones, pelvic injuries, and spinal trauma representing a significant burden on trauma care systems. [3,4] The complexity of managing multiple fractures amidst concurrent life-threatening conditions necessitates a systematic prioritization of surgical interventions. In the context of polytrauma, the concept of the "damage control orthopaedics" (DCO) paradigm has been widely adopted, emphasizing early temporary stabilization of fractures in critically injured patients, followed by definitive fixation once physiological stability is achieved. [5,6] This approach contrasts with "early total care" (ETC), which advocates definitive fracture fixation within 24 hours regardless of injury severity. The choice between these strategies depends on several factors, including injury severity score (ISS), Glasgow Coma Scale (GCS), hemodynamic status, and associated systemic injuries.[7] Emerging evidence suggests that inappropriate timing of orthopaedic procedures may exacerbate systemic inflammatory responses, thereby worsening patient outcomes. [8] In Bangladesh, the prioritization of orthopaedic surgery in polytrauma cases is further complicated by limited intensive care resources, delayed patient presentation, and inconsistent trauma protocols. [9] The scarcity of standardized clinical pathways often leaves the decision-making process to individual clinician judgment, which may vary widely depending on experience and institutional capacity. Moreover, polytrauma patients frequently require coordination among multidisciplinary teams, including trauma surgeons, orthopaedic specialists, intensivists, and radiologists, which

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poses logistical and organizational challenges. [10] Previous studies have identified that road traffic accidents (RTAs) remain the predominant mechanism of injury in polytrauma patients in South Asia, including Bangladesh, accounting for over 60% of admissions to tertiary trauma centres.[11] The subsequent orthopaedic injuries often include femur fractures, tibia/fibula fractures, pelvic disruptions, and upper limb fractures, many of which require urgent or staged interventions. [12,13] The prioritization of surgical repair for these injuries must account for factors such as open versus closed fracture status, fracture complexity, vascular compromise, and the need for concurrent abdominal, thoracic, or neurological interventions.[14] Despite the global advances in trauma care, the literature from low-resource settings like Bangladesh remains scarce regarding how surgical prioritization decisions are made in polytrauma scenarios, particularly within orthopaedic units. The study aims to evaluate orthopaedic surgical prioritisation patterns and clinical outcomes in polytrauma patients managed at a tertiary care center.

METHODOLOGY & MATERIALS

This retrospective observational study was conducted to analyze the surgical prioritization and outcomes in polytrauma patients with orthopaedic injuries admitted to a tertiary care hospital in Bangladesh. The study was conducted at the Department of Orthopaedic Surgery of Gazi Medical College and Hospital (GMCH) and Khulna Medical College and Hospital (KMCH), Khulna, Bangladesh. Patient data were collected from the hospital's electronic medical record system for cases admitted between January 2022 to December 2023. A total of 50 polytrauma patients aged 18 years and above who sustained multiple injuries, including at least one orthopaedic fracture requiring surgical intervention, were included in the study.

Inclusion Criteria

- Patients with polytrauma.
- Presence of at least one radiologically confirmed orthopaedic fracture.
- Underwent surgical intervention or conservative orthopaedic management during hospitalization.
- Admitted directly from the Emergency Department or transferred from ICU to orthopaedics.

Exclusion Criteria

- Isolated single-limb fractures without other systemic injuries.
- Patients who died before surgical decision-making.
- Incomplete medical records or loss of follow-up during hospitalization.

Data Collection

Data were collected using a structured data extraction sheet to retrieve relevant patient records systematically. Key variables included demographic information such as age and sex; injury characteristics including the mechanism of injury (e.g., road traffic accident, fall, assault), Injury Severity Score (ISS) [15], Glasgow Coma Scale (GCS) [16], and the anatomical site of orthopaedic injury. Hospital-related parameters comprised ICU admission status, length of hospital stay, and timing of surgical intervention. Surgical details encompassed the type of procedure performed (e.g., open reduction and internal fixation, external fixation) and the rationale for surgical prioritization, which was based on factors such as hemodynamic stability, fracture complexity, and life-threatening injuries. Outcomes assessed included postoperative complications such as surgical site infections, deep vein thrombosis or pulmonary embolism, and hardware failure, as well as functional status at discharge and in-hospital mortality.

Operational Definitions

In this study, early surgery refers to any surgical intervention conducted within the first 24 hours following hospital admission, while delayed surgery is defined as surgical procedures performed 24 hours or more after admission. Functional status at discharge is assessed based on the patient's ambulation ability, which is classified as either ambulatory (with or without assistance) or non-ambulatory. The severity of trauma is evaluated using the Injury Severity Score (ISS) and categorized into four levels: mild (ISS <16), moderate (ISS 16–24), severe (ISS 25–40), and profound (ISS >40).

Data Analysis

All collected data were entered, cleaned, and analyzed using IBM SPSS Statistics for Windows, version 26.0. Descriptive statistics were employed to summarize the study variables. Categorical variables were presented as frequencies and percentages, while continuous variables were reported using means and standard deviations (SD) for normally distributed data.

RESULTS

Table-I one shows the demographic and clinical parameters of the study patients, where most patients were aged between 21-40 years (50.0%), with a mean age of 33.6±12.4 years, and most were male (76.0%). ICU admission was required in 36.0% of cases, with an average ICU stay of 4.2±2.3 days. Table II indicates that road traffic accidents were the most common mechanism of injury (70.0%), and 34.0% had severe (ISS 16-24) injuries. Most patients presented with mild GCS scores (13-15) at 68.0%. Table-III highlights that the femur and tibia/fibula were the most frequently injured sites (24.0% each), and 70.0% of fractures were closed. Lower limb fractures dominated (62.0%). Regarding surgical management (Table IV), 60.0% of patients underwent delayed surgeries (≥24 hrs), with open reduction and internal fixation (ORIF) being the most common procedure (40.0%). Hemodynamic stability (36.0%) was the leading factor influencing surgical prioritization. Finally, Table V shows that most patients (84.0%) were ambulatory at discharge, with low complication rates of surgical site infections in 12.0%, DVT/PE in 6.0%, and a mortality rate of 4.0%.

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Table – I: Demographic and Clinical Parameters of the study patients (*n*=50)

Variable	Frequency (n)	Percentage (%)
Age		
<20	10	20.00
21–40	25	50.00
>40	15	30.00
Mean±SD	33.6 ± 12.4	
Sex		
Male	38	76.00
Female	12	24.00
Length of hospital stay (days)	Mean±SD = 12.1 ± 5.6	
ICU admission	18	36.00
ICU stay duration (days)	Mean±SD = 4.2 ± 2.3	

Table – II: Injury Characteristics of the study patients (*n*=50)

Variable	Frequency (n)	Percentage (%)
Mechanism of Injury		
Road Traffic Accident (RTA)	35	70.00
Fall from height	10	20.00
Assault	3	6.00
Others	2	4.00
Injury Severity Score (ISS)		
Mild (1-8)	6	12.00
Moderate (9-15)	18	36.00
Severe (16-24)	17	34.00
Profound (>24)	9	18.00
Glasgow Coma Scale (GCS)		
Mild (13-15)	34	68.00
Moderate (9-12)	10	20.00
Severe (≤8)	6	12.00

Table – III: Injury Pattern and Type of the study patients (*n*=50)

Variable	Frequency (n)	Percentage (%)
Injury Site		
Clavicle	6	12.00
Humerus	5	10.00
Radius/Ulna	8	16.00
Pelvis	7	14.00
Femur	12	24.00
Tibia/Fibula	12	24.00
Type of Fracture		
Closed fracture	35	70.00
Open fracture	15	30.00
Region		
Upper limb fractures	19	38.00
Lower limb fractures	31	62.00

Table – IV: Management and Surgical Prioritization

Variable	Frequency (n)	Percentage (%)
Timing of First Surgery		
Early (<24 hrs)	20	40.00
Delayed (≥24 hrs)	30	60.00
Type of Procedure		
External fixation	12	24.00
ORIF	20	40.00
Spinal stabilization	5	10.00
Debridement	7	14.00
Conservative	6	12.00
Rationale for Prioritization		
Hemodynamic stability	18	36.00
Fracture complexity	14	28.00
Life-threatening injuries	10	20.00
Resource/ICU availability	8	16.00

Table – V: Outcome of the study patients (*n*=50)

Outcome	Frequency (n)	Percentage (%)
Postoperative Complications		
Surgical site infection	6	12.00
DVT/Pulmonary embolism	3	6.00
Hardware failure	2	4.00
Functional Status at Discharge		
Ambulatory with/without aid	42	84.00
Non-ambulatory	6	12.00
Mortality	2	4.00

DISCUSSION

This retrospective study provides valuable insight into the patterns of orthopedic surgical prioritization and its impact on clinical outcomes among polytrauma patients managed in tertiary care settings. The findings underscore the complexities of clinical decision-making in a trauma setting, particularly in balancing the urgency of surgical intervention with hemodynamic stability, injury severity, and available resources. The demographic profile of patients showed a predominance of young adults, with 50% between the ages of 21 and 40 years, and a male majority (76%). This is consistent with global trauma trends where young males are disproportionately affected due to high-risk behaviors and occupational exposure. [1] The predominant mechanism of injury was road traffic accidents (70%), affirming WHO reports that RTAs remain a leading cause of trauma-related morbidity and mortality in low- and middle-income countries. [17] Injury severity was considerable, with over half the patients presenting with moderate to severe Injury Severity Scores (ISS 9-24), and 18% classified as having profound injuries (ISS >24). Additionally, 36% required ICU admission, with an average ICU stay of 4.2 days, suggesting a significant burden on critical care resources. These findings are comparable to studies by Kasotakis et al. [18] emphasising the importance of resource availability and early critical care interventions in trauma patient outcomes. A notable finding is the distribution of orthopedic injuries. Lower limb fractures were more prevalent (62%) than upper limb fractures, with

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femur and tibia/fibula injuries accounting for nearly half of all fractures. This reflects the high-energy nature of polytrauma, particularly in road traffic accidents, where axial loading and blunt trauma are common mechanisms. [19] The high proportion of closed fractures (70%) suggests that, despite the severity of trauma, prompt initial management may have helped prevent open injuries in many cases. Surgical prioritization patterns revealed that only 40% of patients underwent early surgical intervention (<24 hours), while the majority (60%) experienced delayed surgery. Although early definitive fixation reduces complications and hospital stay in stable patients, delayed fixation may be necessary in unstable or severely injured patients, aligning with the principles of damage control orthopedics.[20] The most common procedures performed were open reduction and internal fixation (ORIF) at 40%, followed by external fixation (24%). The selection of procedure types suggests a tailored approach, considering the patient's physiologic status and fracture complexity. The rationale for prioritization further supports this individualized approach hemodynamic stability (36%) and fracture complexity (28%) were leading factors. Interestingly, life-threatening injuries and ICU/resource availability also influenced surgical timing, indicating that systemic and logistical considerations play an essential role in trauma care decision-making. [21] Such multifactorial decision frameworks are supported by contemporary literature, emphasising the need for multidisciplinary coordination in trauma centers. [22] Outcomes in this study were generally favorable. Most (84%) patients were ambulatory at discharge, reflecting successful orthopedic and rehabilitative management. The postoperative complication rate was relatively low, with surgical site infections at 12%, DVT/PE at 6%, and hardware failure at 4%. These rates are in line with other studies on polytrauma patients. [23] The mortality rate of 4% is commendably low given the severity of injuries, highlighting the efficacy of surgical prioritization and critical care in improving survival.

Limitations of the study: Being a retrospective analysis, it is inherently subject to selection bias and relies on the accuracy and completeness of medical records. The relatively small sample size (N=50) from a single or limited number of tertiary care centers may limit the generalizability of the findings to broader populations. Additionally, the study did not assess long-term functional outcomes or quality of life post-discharge, which are crucial in evaluating the true success of surgical prioritization strategies. Variability in clinician judgment and resource availability across centers may also have influenced management decisions and outcomes.

CONCLUSION AND RECOMMENDATIONS

This retrospective analysis highlights that effective orthopedic surgical prioritization in polytrauma patients guided by hemodynamic stability, injury severity, and fracture complexity can lead to favorable clinical outcomes, including high postoperative ambulation and low complication and mortality rates. The predominance of lower limb fractures, the frequent need for ICU care, and the reliance on both early and delayed surgical strategies reflect the multifactorial decision-making essential in trauma management. Tailored, multidisciplinary approaches within tertiary care settings are crucial in optimizing recovery and minimizing morbidity in this complex patient population.

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