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Validation of the adapted clavien dindo in trauma (ACDiT) scale to grade management related complications at a level I trauma center

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ABSTRACT

Objective: Complications during trauma management are the main factor responsible for the overall increase in treatment cost. There are very few grading systems to measure the burden of complications in trauma patients. A prospective study was conducted using the Adapted Clavien Dindo in Trauma (ACDiT) scale, with the primary aim of validating it at our center. As a secondary aim, it was also wanted to measure the mortality burden among our admitted patients.

Material and Methods: The study was conducted at a dedicated trauma center. All patients with acute injuries, who were admitted, were included. An initial treatment plan was made within 24 hours of admission. Any deviation from this was recorded and graded according to the ACDiT. The grading was correlated with hospital-free days and ICU-free days within 30 days.

Results: A total of 505 patients were included in this study, with a mean age of 31 years. The most common mechanism of injury was road traffic injury, with a median ISS and NISS of 13 and 14, respectively. Two hundred and forty-eight out of 505 patients had some grade of complication as determined by the ACDiT scale. Hospital-free days (13.5 vs. 25; p< 0.001) were significantly lower in patients with complications than those without complications, and so were ICU-free days (29 vs. 30; p< 0.001). Significant differences were also observed when comparing mean hospital free and ICU free days across various ACDiT grades. Overall mortality of the population was 8.3 %, the majority of whom were hypotensive on arrival and required ICU care.

Conclusion: We successfully validated the ACDiT scale at our center. We recommend using this scale to objectively measure in-hospital complications and improve trauma management quality. ACDiT scale should be one of the data points in any trauma database/registry.

Keywords: Morbidity, trauma, quality improvement, outcome assessment

INTRODUCTION

Trauma is a complex entity involving multiple systems, which affect the injured person's anatomy and physiology. According to the trauma registry established by the Australia India Trauma Systems Collaboration (AITSC) Project, in-hospital trauma mortality rate in urban trauma centers of India is 12.4% (1).

There is increasing evidence that trauma care involves a substantial financial burden, both on the patient and the government/insurance companies. As per a study done at a Level I trauma center in India in 2011, the mean cost of trauma care per admission was around USD 1900 (2). The severity of injury, length of stay in the intensive care unit (ICU) and hospital, surgical interventions, and transfusion requirements are significant drivers of the total costs incurred (3). Complications occurring during management tend to increase all these parameters, thus analyzing them would help us to better the quality and bring down the cost of treatment.

Even if we strictly adhere to the best practices and patient safety guidelines, trauma management complications cannot be avoided (4). Though non-mortality complications are far more common than mortality, the latter is the only parameter measured and used as a quality indicator. A grading system to measure morbidity would help us compare our outcomes with other centers and improve our quality of care.

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Several attempts have been made since the 1990s to classify surgical complications. Surgical Complication Outcome (SCOUT) score, Clavien Dindo grading system, Memorial Sloan Kettering (MSKCC) severity grading system, and the Accordion severity classification of postoperative complications are a notable few (5-8). None of them, except the Clavien Dindo grading system, have gained widespread acceptance, but that too only in elective surgeries.

Naumann et al., in their multicentric study, have described a novel "adapted Clavien-Dindo in trauma (ACDiT) scale" which encompasses all aspects of trauma management, especially non-operative treatment (9). We found that this scale is the only grading system explicitly designed for this purpose. Though few studies have validated this scale, all of them have been conducted in high-income countries (HICs). Validation of the ACDiT in low- and middle-income countries (LMICs), which lack similar organized trauma systems like the HICs, would help in determining whether it can be used for trauma quality improvement and trauma outcomes research on a global level.

A prospective study was performed using the ACDiT scale (Table 1) with the primary aim of grading the complications at our center. We thus examined this grading system's validity in an LMIC. Measurement of the mortality burden among our patients was a secondary aim.

MATERIAL and METHODS

Study Design

A prospective single-center observational study was undertaken over 12 months (January 2018 to December 2018).

Place of Study

The study was conducted at a level I trauma center of an LMIC in the division of trauma surgery & critical care.

Inclusion Criteria

All adult (age≥18 years) patients with acute injuries admitted under the Division of Trauma Surgery and Critical Care were included in the study.

Exclusion Criteria

Patients with any kind of known malignancy (including treatment completed/undergoing treatment) or any known co-morbidities were excluded from the study. Referred patients treated for more than 24 hours in other health care facilities and pregnant/lactating women were also excluded.

Methodology

Our trauma center has an annual emergency department (ED) footfall of about 75.000 injured patients. All these patients are triaged and resuscitated as per standard advanced trauma life support (ATLS) protocols. Most of them are discharged after primary treatment, and around ten percent are admitted.

Admission primarily occurs under any of the three departments, trauma surgery & critical care, orthopedics and neurosurgery. Patients admitted under trauma surgery & critical care are generally acutely injured patients involving one or more systems, isolated thoracic and abdominal injuries, extremity, vascular, and extensive soft tissue injuries. The average annual admission in this department is around 1300.

Table 1. The adapted clavien dindo in trauma (ACDiT) scale (adopted from Naumann et al.) (9)

Grades	Complications
I	Any deviation from the clinical course expected during the initial management plan without the need for pharmacological treatment or surgical, endoscopic and radiological interventions. The allowed therapeutic regimens include antiemetics, antipyretics, analgesics, diuretics, electrolytes, and physiotherapy. This grade also includes wound infections that were opened at the bedside.
II	Complications that require pharmacological treatment with drugs other than those allowed for Grade I complications. Unexpected blood product transfusions after hemostasis were deemed to be achieved*, and total parenteral nutrition (unless specified as part of original management) are also included.
III	Complications that require unplanned surgical, endoscopic or radiological interventions**. a. without general anesthesia b. with general anesthesia
IV	Life-threatening complications that require unplanned readmission or extension of stay in the critical care unit (including high dependency) beyond what was initially expected. This includes new organ failure other than the primarily injured organ. a. single organ dysfunction b. multi-organ dysfunction
V	Death a. No active treatment or escalation (patient kept comfortable) b. Actively treated patient

*Blood transfusions used for initial resuscitation are not included; **Relook surgeries as part of damage control are not considered as unplanned.

Every patient's clinical and epidemiological data were recorded in a preformed data set by a dedicated floor nurse and later transferred to an electronic database. When documenting the mechanism of injuries, fall from height, industrial and agricultural accidents were clubbed together as accidental/unintentional injuries. Hypotensive on arrival has been defined as an initial systolic blood pressure <90 mmHg.

Upon admission, the seriousness of injuries [based on the Injury Severity Score (ISS), New Injury Severity Score (NISS), Revised Trauma Score (RTS), Glasgow Coma Scale (GCS)] and the primary survey findings determine where the patient is transferred from the emergency department. they are either shifted to the operation room (OR) or the ward or ICU/high dependency unit (HDU).

The trauma surgery consultant in charge examined these patients to formulate a complete plan of treatment. It included: any upfront damage control procedure, expected surgeries, planned radiological interventions, and non-operative management. The so decided "initial treatment plan" was written down and attached to the patient's treatment file within 24 hours of admission. Patients were followed up daily (by the resident and the consultant in charge), and clinical parameters were recorded on preformed datasets until the time of patient discharge or death.

Any deviation from the initial treatment plan was prospectively recorded and graded according to the ACDiT. The resident in charge did it after a discussion with the consultant in charge. These recorded deviations were reviewed at the time of the patient's death/discharge, or at 30 days, whichever was earlier. If there were multiple grades of complications, only the highest grade was considered for final analysis. Patients, who were initially planned for non-operative management but ended up getting operated on, were considered to have a complication. Supplementary Table 1 depicts a few case-based examples of the complications to which this grading system was applied.

Hospital-free days and ICU-free days within 30 days were calculated for all patients for correlation with the ACDiT grades.

This study was approved by the institutional ethics committee (All India Institute of Medical Sciences, New Delhi, India) with the reference number IECPG-458/29.11.2017 with effect from 29.11.2017.

Data Analysis

Data was analyzed using SPSS version 21, IBM Inc., and STATA 14. Descriptive statistics such as median and interquartile range were calculated. Chi-square test was used for frequency analysis. The level of statistical significance was set at a p-value less than 0.05. Normality was determined by rule of thumb and was found to be not normally distributed in all grades. Jonckheere-Terpstra test was used to compare hospital free days and ICU free days across the ACDiT grades, and Tukey's HSD was used for pairwise comparison.

RESULTS

During the study period, 73.245 patients visited the ED, out of whom a total of 1207 patients were admitted under trauma surgery & critical care. Out of this, 87 patients did not fit the age criteria (≥18 years), and 453 were referred cases having undergone treatment elsewhere for >24 hours. A total of 99 patients were excluded for having known co-morbidities (Hypertension, COPD, chronic kidney disease, and hypothyroidism). Sixteen patients were either pregnant or lactating, and another 47 patients had known malignancies. After excluding all these patients, we recruited a total of 505 patients for our study.

Of the patients, 49.1% (248 of 505) had some complications and were assigned an ACDiT grade, as depicted in Table 2. As per the study protocol, the rest of the patients (257/505) did not have any complications. When looking at individual grades, Grade I (15.6%) and Grade II (9.3%) constituted the maximum, followed by Grade III (8.2%) and IV (7.7%). Demographic characteristics of the total patient population are summarized in Table 3. Mean age was 31 years with a male preponderance of 88 percent. Median ISS, NISS and GCS were 13, 14 and 15 respectively with a mean RTS of 7.52. The most common mechanism of injury was road traffic injury (63%), followed by accidental/unintentional injuries (including falls) (15%). Blunt assault (8%) was more common than penetrating assault (6%). Median time gap between the injury and arrival at the ED was six hours.

Complications: Table 4 depicts the comparison among patients having or not having complications. ISS, NISS, and Revised Trauma Score were found to be less severe in patients without any complications. A total of 159 (31.5%) patients were hypotensive on arrival and a vast majority of them had complications (124 out of 159). Patients who presented to the ED with a heart rate of more than 100/minutes were also prone to complications.

Management strategy: Of the total of 505 patients, 230 (45.54%) were initially planned for non-operative management. Table 5 depicts the differences in demographic characteristics and outcomes among patients in which the Initial management plan was operative or non-operative.

Comparison between the ACDiT grade and outcomes: Median hospital stay for the entire study population was eight (5-13) days. Among the patients requiring ICU care, median ICU stay was 9 (2.25-15) days. Hospital-free days (13.5 vs. 25; $p< 0.001$) were significantly lower in patients with complications than those without complications, and so were ICU-free days (29 vs. 30; $p< 0.001$). A strong association was also observed between an increase in the grade of ACDiT and a decrease in the hospital-free and ICU-free days.

Supplementary Table 1. Examples of some cases, their complications, the interventions done and the subsequent ACDiT grades assigned

Age/Sex	Mechanism	ISS	Injuries	Management	Complication	Intervention	Grade
45/M	RTI (Pedestrian hit by 4-wheeler)	25	Multiple rib fractures, Pneumothorax, Splenic injury in hemorrhagic shock	ICD, Operative management with splenectomy	Superficial skin infection	Opening of skin sutures and dressing	I
39/M	Blunt assault with rods and sticks	13	Bilateral rib fractures	Non operative management	Missed injury-fracture of distal phalanx of thumb	Required splinting of the finger when injury was detected just before discharge	I
29/F	Multiple penetrating assault to abdomen (Stab injury)	9	Multiple small bowel perforations, mesenteric injury with bleeding	Damage control surgery followed by mesh laparostomy	Enteroatmospheric fistula	Required unplanned TPN	II
46/M	RTI (2-wheeler rider hit by 4-wheeler)	9	Blunt trauma abdomen with pneumoperitoneum due to small bowel perforation	Operative management and repair of bowel perforation	Postoperatively developed urinary tract infection	Treated with urine culture-based antibiotics	II
59/M	RTI (2-wheeler rider hit by 4-wheeler)	13	Hemothorax, multiple bilateral rib fractures multiple transverse process fractures	Bilateral ICD, Non operative management	Iatrogenic pneumothorax during removal of ICD	Reinsertion under LA	IIIa
34/M	Railway associated injury	16	Crush injury left lower limb, without involvement of knee joint	Below knee amputation with primary closure of stump	Wound infection with sepsis	Revision amputation (above knee amputation) under RA	IIIa
44/M	RTI (Pedestrian run over by 4-wheeler)	25	Hemodynamically stable pelvic fractures, no bowel injury on initial CT	Non operative management	Delayed sigmoid colon gangrene	Exploratory laparotomy under GA	IIIb
25/F	RTI (Passenger in an autorickshaw which overturned)	25	Subarachnoid hemorrhage; subdural hemorrhage, multiple rib and spinal fractures; pulmonary contusion	Non operative management	Sepsis	Extended stay in ICU	IVa
35/F	Gunshot injury chest	25	Penetrating injury to lungs with massive hemothorax	Thoracotomy with non-anatomical lung resection	Multiorgan failure	Prolonged ICU stay for 21 days, followed by recovery and discharge	IVb
44/M	Penetrating assault to head, face, chest (Gunshot injury)	50	Severe head injury, facial injury	Non operative management (Palliative)	Patient became brain dead	Palliative management till physiological death	Va
24/M	RTI (Pedestrian hit by 4-wheeler)	34	Subdural hematoma, blunt thoracic injury, liver injury	Decompressive craniectomy, ICD for hemopneumothorax	Patient had a sudden cardiac death in postoperative ICU	Active management till death	Vb

RTI: Road traffic injury, ICD: Intercostal chest drain, TPN: Total parenteral nutrition, LA: Local anesthesia, RA: Regional anesthesia, GA: General anesthesia.

Table 2. Distribution of the patients according to the adapted Clavien Dindo in trauma (ACDiT) scale				
Total number of patients (n)	505			
No complications, n (%)	257 (50.9)			
ACDiT complications, n (%)	Grade I	79 (15.6)		
	Grade II	47 (9.3)		
	Grade III	41(8.1)	A	31 (6.1)
			B	10 (2)
	Grade IV	39 (7.7)	A	33 (6.5)
			B	6 (1.2)
	Grade V	42 (8.3)	A	3 (0.6)
			B	39 (7.7)

Significant differences were observed in mean Hospital free days and ICU free days between various ACDiT grades when compared using the Jonckheere-Terpstra test ($p< 0.001$), i.e., the mean number of hospital-free days and ICU-free days were found to be more among subjects with a lower grade of ACDiT complications (Figures 1A and 1B).

Mortality: Of the 505 patients, 8.3% (42 of 505) died and were categorized as Grade V complications. Among these 42 mortalities, 35 were hypotensive on arrival, 40 needed ICU care, and 29 patients required upfront surgery.

DISCUSSION

Our study depicts the association of ACDiT grades of complications with the total stay in the hospital or the ICU for a trauma patient. It thus proves the applicability of this scale in an LMIC to measure the complications occurring during trauma management.

Epidemiological parameters in the present study are in concordance with similar studies done in LMICs. Among these studies, mean age has been found around 30 years, with 80-90 % of males being injured. The severity of the injuries (as depicted by the mean ISS, NISS, and RTS) is also comparable (10-12). This trend among LMICs is, however, different from HICs, as evident from US-based studies (mean age 43.3 years, male 62.6%) (13)

In our study, when considering the injury mechanism, road traffic injuries (RTIs) were the majority, contributing 64.2% of the total, which is similar to other LMICs (11,12). Accidental/unintentional injuries (15.2% of total) were mostly due to falls from height, a common injury mechanism in our country (10). However, in the US, falls constitute a more significant proportion (36.9%), mostly due to the elderly population more prone to falls related to age or co-morbidities (13).

In trauma, be it blunt or penetrating, severe hemorrhage is associated with increased mortality risk, more extended hospital stays, and higher costs (14). The majority of hypotensive patients on arrival (bleeding being the most common cause) ended up with a higher ACDiT grade of complication. Again, there were 42 mortalities, out of which 35 (83.3%) were hypotensive on arrival on presentation.

Patients with a heart rate >100/minute at presentation to the ED had more complications. The literature states that in patients who present after moderate to severe trauma, the lowest mortality is observed when admission heart rate (AHR) is between 70 and 89 (15). Similarly, the complication rate was much more in patients presenting to the ED with acidosis on initial ABG. We already know that persistent acidosis is a cause of mortality in trauma (15). pH, initial lactate, lactate clearance, and base deficit are excellent indicators of shock and resuscitation, as well as predictors of complications and mortality (16). In a study from California involving a group of severely injured trauma patients, the degree of metabolic acidosis at the time of admission has identified those patients with the highest probability of developing acute lung injury (17).

In 2017, Naumann et al. first proposed a novel grading system for complications during trauma management (9). Compared to this multicentric ambispective index study by Naumann et al., ours was a prospective single center-based study. When considering the individual grades of complications, it was observed that our study had a higher number of Grade I complications (16% vs. 4%) and fewer Grade V complications (8% vs. 13%) than the index study. It can be explained by the fact that our study population consisted of fewer ICU admitted patients. In the index study, those patients who had complications had shorter hospital-free and ICU-free days than patients who did not have complications, (11 vs. 18 days; $p= 0.006$) and (10 vs. 28; $p< 0.001$) respectively. Similar was the distribution of hospital-free days (13.5 vs. 25; $p< 0.001$) and ICU-free days (29 vs. 30; $p< 0.001$), with versus without complications, in our study. In both studies, increasing ACDiT grades were strongly associated with decreasing hospital free days and ICU-free days (Figures 1A and 1B).

Table 3. Demographic characteristics, ED presentation and outcomes of the entire patient population

Patient characteristics		**All patients (n= 505)**
Age, (Mean, SD)		31.09 (14.78)
Male, n (%)		447 (88.5)
Trauma scores	ISS (Median, IQR)	13 (9-22)
	NISS (Median, IQR)	14 (9-24)
	RTS (Mean, SD)	7.52 (0.93)
	GCS (Median, IQR)	15 (15-15)
Mechanism of injury, n (%)	Road traffic injury	318 (62.9)
	Blunt assault	40 (7.9)
	Accidental/Unintentional	77 (15.2)
	Penetrating assault low velocity	15 (3)
	Penetrating assault high velocity	13 (2.6)
	Intentional self harm	6 (1.2)
	Railway associated injury	27 (5.3)
	Unknown	9 (1.8)
Injury presentation interval (Median, IQR) (hr)		6 (3-8)
ED Intubation, n (%)		67 (13.3)
Initial Heart rate >100, n (%)		167 (33.1)
Acidosis on initial ABG (Median, IQR)		267 (52.9)
Hypotensive on arrival, n (%)		159 (31.5)
Head injury, n (%)		53 (10.5)
System involved, n (%)	Abdomen	65 (12.9)
	Thorax	73 (14.5)
	Extremity and Pelvis	123 (24.4)
	Head and Neck	24 (4.8)
	Maxillofacial	15 (3)
	Soft Tissue Injury	5 (1)
	Polytrauma	200 (39.6)
Outcomes	Hospital stay (Median, IQR)	8 (5-13)
	Hospital free days (Median, IQR)	21 (11-25)
	ICU stay (Median, IQR)	0 (0-2)
	ICU free days (Median, IQR)	30 (26-30)
	Mortality (n, %)	42 (8.3%)

ED: Emergency department, SD: Standard deviation, ISS: Injury Severity Score, NISS: New Injury Severity Score, RTS: Revised Trauma Score, GCS: Glasgow Coma Scale, IQR: Interquartile range, ICU: Intensive care unit.

The development of hospital course complications was more common among patients admitted to the ICU than among patients hospitalized without ICU admission, similar to another study on ICU complications after trauma (18). Our ICU patients' overall complication rate was 79.87%, which was much higher than the 52.03% complication rate reported in the index study. It might be because we can admit only very sick patients to our ICU, owing to ICU bed limitations.

Our study population's overall mortality rate correlates with our trauma registry data (8.47% for the year 2018), which is more than HICs. According to a study from NHS hospitals over ten years, overall mortality was 8.3% among 248,234 patients with an ISS≥ 9 (19). Our study had 381 of 505 patients with an ISS≥ 9, and mortality among them was 10.5%. HICs like the United States, with robust trauma systems, have a significantly lower overall mortality rate (4.39% as per the ACS National Trauma Data Bank Annual Report 2016) (20).

Table 4. Comparison of patient characteristics and final outcomes among patients with or without complications

Patient characteristics		Patients without complications (n= 257)	Patients with complications (n= 248)	p
Age (Mean, SD)		29.39 (15.16)	32.85 (14.2)	0.002
Male, n (%)		228 (88.7)	219 (88.3)	0.88
Trauma Scores	ISS (Median, IQR)	9 (5-16)	17 (11-25)	<0.001
	NISS (Median, IQR)	9 (5-16)	19 (13-29)	<0.001
	RTS (Mean, SD)	7.81 (0.23)	7.22 (1.24)	<0.001
	GCS (Median, IQR)	15 (15-15)	15 (15-15)	-
Injury presentation interval (Median, IQR) (hr)		6 (3.5-8)	6 (3-9)	0.73
ED Intubation, n (%)		2 (0.7)	65 (26.2)	<0.001
Initial heart rate >100, n (%)		39 (15.18)	128 (51.61)	<0.001
Acidosis on initial ABG (Median, IQR)		117 (45.52)	150 (60.48)	0.001
Hypotensive on arrival, n (%)		35 (13.62)	124 (50)	<0.001
Mechanism of injury, (n)	Road traffic injury	154	164	0.15
	Blunt assault	23	17	0.38
	Accidental/Unintentional	52	25	0.002
	Penetrating assault low velocity	11	4	0.08
	Penetrating assault high velocity	4	9	0.14
	Intentional self-harm	6	0	0.015
	Railway associated injury	5	22	0.001
	Unknown	2	7	0.08
System involved, (n)	Abdomen	34	31	0.81
	Thorax	45	28	0.04
	Extremity and pelvis	69	54	0.18
	Head and neck	9	15	0.18
	Maxillofacial	12	3	0.02
	Soft tissue injury	2	3	0.62
	Polytrauma	86	114	0.004
Outcomes	Hospital stay (Median, IQR)	5 (4-8)	12 (8-20)	<0.001
	Hospital free days (Median, IQR)	25 (23-26)	13.5 (0-20)	<0.001
	ICU stay (Median, IQR)	0	0.5 (0-9.5)	<0.001
	ICU free days (Median, IQR)	30 (30-30)	29 (9-30)	<0.001
	Mortality, n(%)	0	42 (16.9%)	-

ED: Emergency department, SD: Standard deviation, ISS: Injury Severity Score, NISS: New Injury Severity Score, RTS: Revised Trauma Score, GCS: Glasgow Coma Scale, IQR: Interquartile range, ICU: Intensive care unit.

Before the advent of the ACDiT scale, mortality was the only outcome variable used to access the treatment care quality and compare among different centers. However, there is a considerable burden of morbidity or non-mortality complications, which gets hidden and is never quantified. Although it does not explicitly list the individual complications, this scale is the best available tool to initially screen a trauma center's performance and highlight it at audit meetings. Along with quality control, this scale would help us determine whether a new intervention effectively improves the system, measured by the grades of complications occurring before and after such an intervention. It can also be used across different trauma centers (both in LMICs and HICs) to compare the quality of care, thereby motivating, and aiding in trauma research.

Table 5. Patient characteristics and length of stay according to the plan of management (Non operative management vs operative)

Patient characteristics		Non operative management (n= 230)	Surgery (n= 275)	p
Age (Mean, SD)		33.06 (17.53)	29.45 (11.81)	0.06
Male, n (%)		198 (86.1)	249 (90.5)	0.89
Trauma scores	ISS (Median, IQR)	14 (9-22)	13 (5-21)	0.02
	NISS (Median, IQR)	16 (9-25)	13 (6-24)	0.03
	RTS (Mean, SD)	7.64 (0.69)	7.42 (1.08)	<0.001
	GCS (Median, IQR)	15 (15-15)	15 (15-15)	-
Complications present, n (%)		104 (45.2)	144 (52.4%)	0.11
Outcomes	Hospital stay (Median, IQR)	7 (5-12)	8 (5-14)	0.45
	Hospital free days (Median, IQR)	23 (15-25)	20 (7-24)	0.007
	ICU stay (Median, IQR)	0 (0-0)	0 (0-3)	0.003
	ICU free days (Median, IQR)	30 (30-30)	30 (24-30)	0.002
	Mortality, n (%)	13 (5.6%)	29 (10.5%)	0.04

SD: Standard deviation, ISS: Injury Severity Score, NISS: New Injury Severity Score, RTS: Revised Trauma Score, GCS: Glasgow Coma Scale, IQR: Interquartile range, ICU: Intensive care unit.

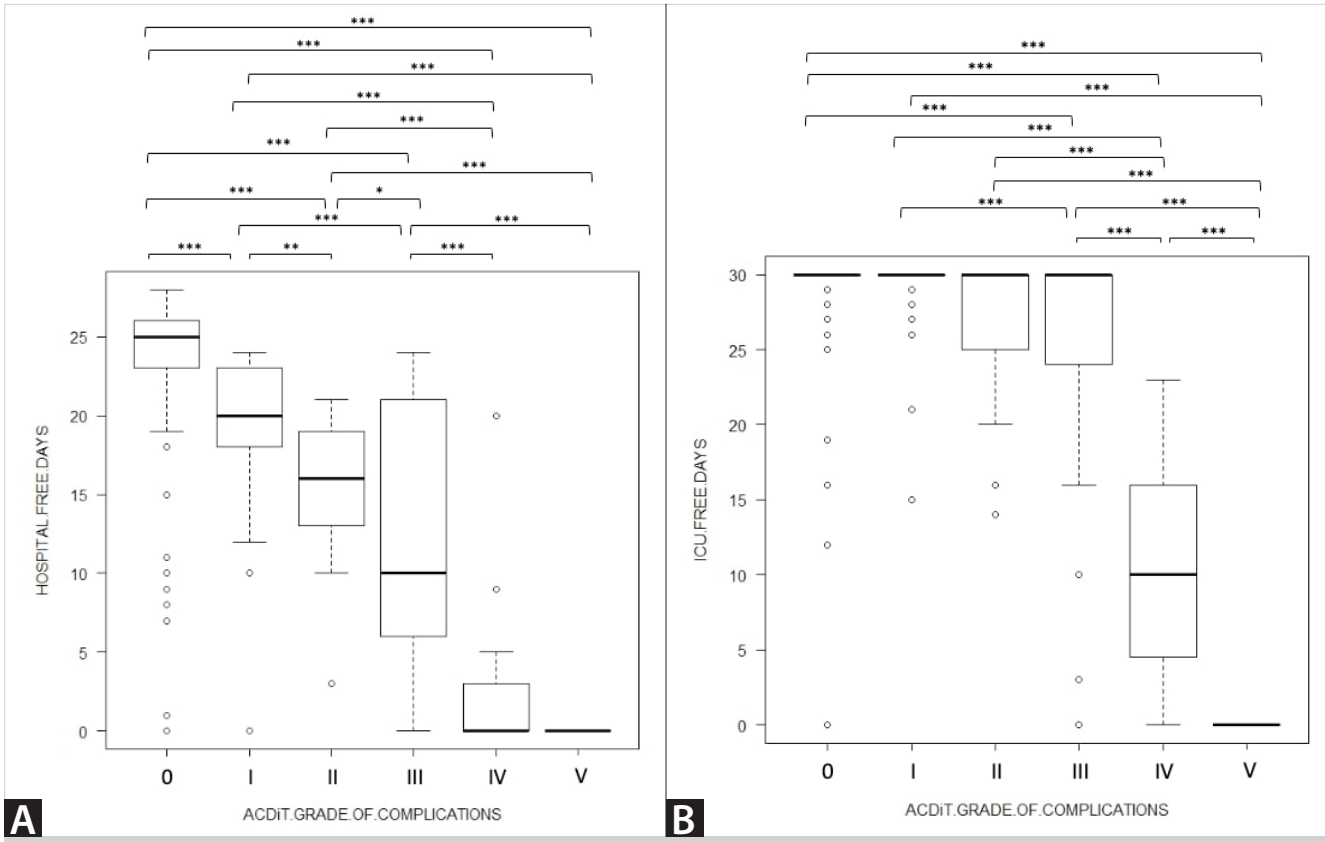

Figure 1. Comparison of Hospital free days **(A)** and ICU free days **(B)** across ACDiT grades (Horizontal bars represent median values; upper and lower boundaries of boxes represent the 25th to 75th percentiles (i.e., IQR); whiskers represent 10th to 90th percentiles; circles represent outliers). Statistical significance using Tukey's multiple comparison of means is illustrated using *p< 0.05, **p< 0.01, ***p< 0.001.

There are, however, certain limitations in our study. First, the ACDiT considers only the highest grade of complication, leading to underestimation of overall postoperative/post-trauma morbidity. Besides, the comparison of patients with more than one complication is difficult. The authors propose incorporating total hospital stay and ICU stay into the ACDiT grading criteria to overcome these limitations. Second, grade V complication in ACDiT means death, which ideally should not be a part of a grading system designed for non-mortality complications. Another limitation of our study is that missed injuries, which were diagnosed 24 hours after admission and needed to be separately treated, were considered as complications. Finally, undetected co-morbidities may have acted as confounding factors. The authors propose the use of co-morbidity indices to overcome this.

CONCLUSION

We propose that the ACDiT scale is valid in LMICs and can be included as part of the in-hospital trauma database/registry in HICs as well as LMICs. In this way, morbidity can be analyzed and compared across different trauma care systems. Alternative methods for grading complications do not accommodate non-operative management as a treatment option, which is nowadays a mainstay in trauma.

Ethics Committee Approval: This study was approved by All India Institute of Medical Sciences Ethics Committee for Post Graduate Research (Ref. no: IECPG-458/29.11.2017, Date: 05.12.2017).

Peer-review: Externally peer-reviewed.

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ORİJİNAL ÇALIŞMA-ÖZET
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Travmada Uyarlanmış Clavien Dindo (ACDiT) sınıflamasının 1. seviye bir travma merkezinde tedavi komplikasyonlarının derecelendirmesindeki geçerliliği

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ÖZET

Giriş ve Amaç: Travma yönetimi sırasındaki komplikasyonlar, tedavi maliyetindeki genel artıştan sorumlu ana faktördür. Travma hastalarında komplikasyon yükünü ölçmek için çok az derecelendirme sistemi vardır. Uyarlanmış Clavien Dindo in Trauma (ACDiT) sınıflaması kullanılarak ve bunun geçerliliğini merkezimizde araştırma amacıyla ileriye dönük bir çalışma yürütüldü. İkinci amaç ise yatışı yapılan hastalarımızfa mortalite yükünü ölçmekti.

Gereç ve Yöntem: Çalışma özel bir travma merkezinde yapıldı. Akut yaralanma ile başvuran tüm hastalar çalışmaya dahil edildi. Yatışı müteakip 24 saat içinde bir "ilk tedavi planı" yapıldı. Bundan her türlü sapma kaydedildi ve ACDiT'e göre derecelendirildi. Derecelendirme, 30 gün içinde hastanesiz ve yoğun bakım ünitesiz günlerle ilişkilendirildi.

Bulgular: Bu çalışmaya ortalama yaşı 31 olan toplam 505 hasta dahil edildi. En yaygın yaralanma mekanizması, medyan ISS ve NISS sırasıyla 13 ve 14 olan karayolu trafik kazasıydı. Beş yüz beş hastanın 248'inde ACDiT skalası tarafından belirlenen komplikasyonlar vardı. Hastanesiz günler (13,5'e karşı 25; p< 0,001), aynı YBÜ'süz günler gibi (29'a karşı 30; p< 0,001) komplikasyonları olan hastalarda komplikasyonu olmayanlara göre anlamlı olarak daha düşüktü. Çeşitli ACDiT dereceleri arasında ortalama hastanesiz ve yoğun bakımsız günleri karşılaştırırken de anlamlı farklılıklar gözlendi. Genel mortalite %8,3 idi; bunların çoğunluğu varışta hipotansifti ve yoğun bakım ünitesine ihtiyaç duymuştu.

Sonuç: ACDiT sınıflamasını merkezimizde başarıyla doğruladık. Hastane içi komplikasyonları objektif olarak ölçmek ve travma yönetimi kalitesini iyileştirmek için bu sınıflamayı kullanmanızı öneririz. ACDiT sınıflaması, herhangi bir travma veritabanı/kaydında veri noktalarından biri olmalıdır.

Anahtar Kelimeler: Morbidite, travma, kalite iyileştirme, sonuç değerlendirmesi

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