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An adapted Clavien-Dindo scoring system in trauma as a clinically meaningful non-mortality endpoint

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Level of Evidence

Prognostic, Level IV

Author contribution

The original study design and development was undertaken by DNN, NP, KP, IMS and MJM. International collaboration and study development was further discussed and implemented by DNN, LEV, BAC, JBH and MJM. DNN was the facilitator for communication regarding the scoring adaptations. The final version of the adapted Clavien-Dindo for trauma tool was agreed by all authors. Data collection was undertaken by NP, DNN, AB, ET (Birmingham, UK), IMS and KS (Glasgow, UK), and LEV (Houston, TX). The Public and Patient Involvement exercise was designed and implemented by AB and DNN. Data were analysed by DNN, and critically appraised and interpreted by MJM, HRD, CEW, BAC and JBH. The draft manuscript was written by DNN, and was reviewed and edited by LEV, AB, ET, KP, MJM, IMS, CEW and JBH. All authors have seen and approved the final version of the manuscript.

Conflicts of interest

All authors declare that they have no conflict of interest. Although some authors are affiliated to the UK Defence Medical Services, their opinions are their own, and do not necessarily represent those of the UK Defence Medical Services.

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Abstract

Background—There is no consensus on reporting non-mortality trauma complications in a graded manner. The Clavien-Dindo scale of complications was originally for elective surgery, and requires adaptation to provide meaningful data for trauma patients. In particular the original score does not account for those treated without surgery. We report an adapted Clavien-Dindo in trauma (ACDiT) scale and apply it to patients managed operatively and non-operatively.

Methods—A combined prospective and retrospective international multi-center observational study was undertaken to apply the ACDiT scale to 484 trauma patients at 3 university teaching hospitals (Birmingham, England (n=303); Houston, Texas (n=113); and Glasgow, Scotland (n=68)). These included both intensive care (ICU) and non-ICU managed patients. The Clavien-Dindo scoring system was adapted for trauma patients based on consensus amongst an international collaboration of trauma specialists at these sites. Data included whether initial patients were managed operatively or non-operatively. Complication grades were compared to hospital-free and ICU-free days as other outcome measures of patient morbidity.

Results—217/484 (44.8%) patients experienced complications, of whom 61/217 (28.1%) died (Grade V). The remainder consisted of grades I (n=20), II (n=60), III (n=24) and IV (n=52). There was a strong association between higher ACDiT grade category and lower number of hospital-free and ICU-free days ($p<0.01$). Eighty-eight patients with complications did not require surgery, validating the score's usefulness in patients managed non-operatively.

Conclusions—The ACDiT scale can be used to grade the severity of post-trauma complications in patients managed both operatively and non-operatively. It provides clinically meaningful data for morbidity and mortality meetings and other quality improvement exercises.

Keywords

Trauma; complications; morbidity; quality improvement

BACKGROUND

Complications following trauma are common, but there is no standardized method of reporting these endpoints other than simply listing the individual pathologies or percentage of patients who have suffered with these. A recent large randomized controlled trial reported 23 pre-specified complications, but with no stratification for severity or clinical prognosis¹. Performance improvement and patient safety (PIPS) guidance from the American College of Surgeons Committee on Trauma directs that mortality, number of complications and length of stay are recommended as useful trauma outcomes, again with no grading scale for complications². Although strict adherence to best practice according to PIPS guidance may improve mortality at trauma centers³, these may be considered crude primary endpoints for trauma research. Such a binary system of complication classification (present or not) is especially unsuitable when attempting to assess the efficacy of new management strategies that do not necessarily improve survival but might reduce complication burden. In order to assess patient outcomes in such scenarios, a more precise way to compare non-mortality complication frequency and severity is warranted.

The validated Clavien-Dindo scoring system⁴ has been used for over 25 years to record post-operative complications following elective surgery. It offers an appealing and straightforward solution for reporting complication burden for trauma patients. It is both clinically relevant and patient-centered. Some investigators have used the Clavien-Dindo scoring system to classify complications following emergency surgery; these investigators found that some further modification of the scoring system is required to reflect organ dysfunction present at admission⁵. Only 9 (2%) of these patients had suffered trauma, and so generalization of their technique to the trauma population may be unwarranted. Although clinicians may be able to score a patient's post-trauma complication using the Clavien-Dindo scale by interpreting the scoring system in a manner that replaces the term 'elective surgery' with 'trauma management', such an approach has not yet been standardized, tested on a large scale, or recorded in the literature.

If a complications scale is to be meaningful it ought to take into consideration the impact to the patient in terms of subjective morbidity. No investigators have compared the transitive scale of the Clavien-Dindo scoring system to the subjective opinions of severity to a group of patients or trauma survivors. Our international multi-center collaboration of trauma specialists has reached an agreed adaptation of the Clavien-Dindo scale so that it is useable for the assessment of post-trauma complications. The aims of the current study are to describe the adapted Clavien-Dindo in trauma (ACDiT) scoring system, to report its performance in different countries and levels of care, and to confirm that such a scale is patient-centered according to the subjective opinions of trauma patients and their relatives.

METHODS

Study design

A combined prospective and retrospective observational study was undertaken to confirm the utility of the trauma-specific adaptations to the Clavien-Dindo scoring system, and compare to other endpoints. The study was conducted in four stages over 12 months:

- i. The adaptations were agreed by consensus amongst an international collaboration of trauma specialists.
- ii. A pilot phase was undertaken, where the ACDiT scoring system was applied prospectively to intensive care trauma admissions at two UK-based university teaching hospitals (Birmingham and Glasgow, UK).
- iii. A further phase, employing retrospective data, was undertaken to increase the breadth of patients (both more severely and less severely injured). The ACDiT scoring system was retrospectively applied to both a population of trauma patients with hemorrhagic shock that had extensive and detailed data collected on outcomes (the patients from Houston, Texas) and to a further group of ICU and ward (non-ICU) based trauma patients in Birmingham, UK. Combining these population with the pilot study data resulted in a heterogeneous population of injured patients (see Table 1; All Patients) in which to evaluate the effectiveness and efficacy of the ACDiT scoring system.
- iv. A consultation was undertaken with a community group of previous major trauma patients and their relatives (an established Patient and Public Involvement (PPI) group in order to confirm the order of severity was in keeping with their views.

Adaptation of the Clavien-Dindo scale for trauma patients

A facilitator (D.N.N.) invited a panel of experts from three international major trauma centers (Birmingham and Glasgow, UK, and Houston, Texas) to collaborate in an exercise to modify the Clavien-Dindo scale for utilization in trauma. Communication was undertaken by both face-to-face and electronic means. The first draft of modifications was made by one group (Birmingham), and communicated to the entire panel. All panel members were invited to consider cases from their own experience to which the score may apply, and to contribute comments to the facilitator that would improve the scoring system, whilst attempting to stay as close as possible to its original structure and philosophy. Contributions were collated by the facilitator at regular intervals, and all members were allowed to change or revise earlier statements. This process was repeated in a feedback loop similar to that communication structure of the Delphi technique⁶, except that panel members were not anonymous. The final version was agreed upon by all panel members and the details of the adaptations are illustrated in Supplementary Digital Content Figure 1.

The original Clavien-Dindo classification system was intended for use in elective surgery and does not include a category for expected death or patients managed non-operatively. A trauma system must take into account patients who, due to the nature of their injuries, are not expected to survive. One important modification agreed by the panel was that Grade V complications (death) in the ACDiT scoring system be divided into (a) patients managed palliatively due to futility of treatment, and (b) death following treatment with therapeutic intent. The suffix [P] is added to a grade if it is associated with a permanent disability (such as a peripheral nerve injury with associated permanent functional loss, or amputation of a limb).

The term “initial management plan” is intended to indicate the written treatment plan decided by the most senior clinician after all of the primary diagnostic tests have been performed. The time at which “hemostasis was achieved” was when it was considered that there was definitive cessation of bleeding by whichever means required (for example, surgical or radiological), and no further blood product transfusions were planned.

Patient selection

Trauma patients were selected from three university teaching hospitals in which the expert panel members were employed. These included the University Hospitals Birmingham NHS Foundation Trust (Birmingham, UK); the Queen Elizabeth University Hospital (Glasgow, UK); and patients from the Houston cohort of the PROPPR study¹ (Center for Translational Injury Research, Division of Acute Care Surgery, Department of Surgery, Medical School, University of Texas Health Science Center at Houston, Houston, TX).

The pilot phase was undertaken at the Birmingham and Glasgow sites from November 2015 – April 2016, by selecting and scoring patients prospectively. Patients were eligible for inclusion if they required ICU admission following trauma. Subsequently, the ACDiT scoring system was applied to the Houston group of patients in the PROPPR study, who by nature of the trial had extensive and well documented outcomes recorded (2013), and to a 12-month cohort of trauma patients at the Birmingham site (1st January 2015 – 31st December 2015). These Birmingham patients were identified as eligible for inclusion if their details were included in the Major Trauma Service (MTS) electronic records. Patients are usually only included on these records if they have sustained polytrauma that requires 2 or more specialist services during their treatment (for example general and orthopedic surgeons). A flow diagram for the selection of patients is illustrated in Figure 1.

No patient identifiable details were recorded. Institutional board approval was gained at each institution prior to data collection. For the purposes of the study, “intensive care” was considered to include both level 3 (Intensive) and Level 2 (High Dependency) care. A simplified flowchart for score assignment is illustrated in Figure 2.

Data collection

Data collection was achieved by examining electronic patient records and hospital notes. Recorded details included patient demographics (age, gender), mechanism of injury, and injury severity score (ISS), and initial management strategy (surgery, interventional radiology, conservative management or selective non-operative management (SNOM)). Charlson Comorbidity Index (CCI) was calculated and used as an indicator of pre-morbid status. Hospital-free and ICU-free days were recorded in order to compare ACDiT grades to other well-established endpoints of patient morbidity. Both were defined as days outside of hospital or ICU within 30 days.

Patient and Public Involvement (PPI) consultation

Volunteers from an established PPI group at the National Institute for Health Research Surgical Reconstruction and Microbiology Research Centre, UK, were invited to a focus group in order to determine whether their subjective opinions about severity of

complications were matched to those of the ACDiT scale. There were 12 survivors of trauma and their relatives who participated. Eleven hypothetical trauma scenarios of varying severity were presented to the group by two facilitators (D.N.N. and A.B.) in a randomly assigned order (Supplementary Digital Content Table 1). The PPI group was asked by to consider the impact of presented cases and determine a hierarchy of complication severity (i.e. they numbered each complication from 1 (“worst”) to 11 (“best”). Cases were considered first individually, then as part of a group interaction. During the group discussion, the facilitators allowed the group to place the scenario cards on a board with “worst” on the top and “best” underneath. As each scenario was added to the board, the group decided where it would be placed based on a transitive scale. Disagreements between participants were resolved by discussion and voting until a final order was agreed by majority. None of the group were aware of the existence of a trauma complications severity scale and were therefore considered to be blinded to the ACDiT scale.

Data analysis

Non-normally distributed data are presented as median and interquartile range (IQR). Categorical data are presented as N, %. Paired data are compared using the Mann-Whitney *U*-test for continuous data, and two-tailed Chi-squared analysis with Yates correction for continuity for categorical data. Multiple groups of continuous data are compared using a Kruskal-Wallis test, with multiple pairwise comparisons performed using Dunn’s multiple comparisons test. For the PPI exercise, correlation between the group rankings of severity and associated ACDiT grades was tested using Spearman nonparametric correlation. A *p*-value of <0.05 was considered significant.

RESULTS

There were 484 patients included in the study (Figure 1). An ACDiT score was assigned to 44.8% (217/484). The remaining patients were not considered to have suffered a complication following their in-hospital management for trauma (i.e. Grade 0).

Patient characteristics

The median age for all patients was 41 (IQR 27 – 58); 77.1% (373/484) were male. The median ISS was 25 (IQR 16 – 34), and there was a wide distribution of mild, moderate and severe injuries. The most common mechanism of injury was road traffic collision (RTC). There were 76 (15.7%) patients with penetrating injuries and 408 (84.3%) with blunt injuries. Patient characteristics for patients are summarized in Table 1 according to trauma-related complication status, and in Table 2 according to whether they required a stay in ICU. Patients who had a trauma-related complication had higher median ISS when compared to those without (30 vs 21; $p<0.001$). In terms of mechanism of injury, the group with complications had a higher proportion of RTCs (62.7% vs 49.8%; $p<0.05$) but lower proportion of stab wounds (3.7% vs 11.2%; $p<0.001$). Patients in the ICU group had a higher median ISS (26) than those in the non-ICU group (15); $p<0.001$. The ICU group had a higher proportion of patients wounded by gunshot than the non-ICU group (8.9% vs 1.1%; $p<0.05$), whereas the non-ICU group had a higher proportion of blunt assault than the ICU group (10% vs 1.8%; $p<0.001$). The median Charlson Comorbidity Index was 0 (IQR 0 – 0;

range 0 – 5), indicating that this trauma cohort was relatively free of serious comorbidities on arrival in hospital.

Management strategy

Of the 217 patients with complications, the primary management following their traumatic injuries was surgery for 129 (59.14%). Thirteen of the patients who had surgery also had interventional radiology as part of their initial management. The remaining 88 patients that did not have surgery were managed conservatively (n=67), palliatively (n=14), or by interventional radiology (n=7). These 88 patients represent a group that would otherwise not be able to be scored according to the original Clavien-Dindo scoring system. In order to illustrate the utility of the ACDiT scoring system for real-world scenarios for which the original Clavien-Dindo scoring system could not be applied, some cases are summarized in Supplementary Digital Content Table 2. The need for intervention after an initial decision to manage only by SNOM or interventional radiology was considered as complications for the purposes of this study.

Complications according to the adapted Clavien-Dindo for trauma

Of the 217 patients who were considered to have suffered a complication, 28.1% (61/217) died, including 25 patients who were managed palliatively, and 36 who died despite treatment with therapeutic intent. The remainder consisted of grade I (n=20), grade II (n=60), grade III (n=24) and grade IV (n=52) complications as graded by the ACDiT (illustrated in Figure 1). Patients in the ICU group were more likely to have a Grade II complication (14.5% vs 3.3%; $p<0.001$). When types of trauma were compared, there was no significant difference in ACDiT complications between blunt (187 (45.8%)) and penetrating (n=30 (39.5%)) trauma; $p=0.369$. Complications and patient characteristics are compared between the retrospective and prospective cohorts in Supplementary Digital Content Table 3.

Comparison between ACDiT grade and other endpoints

Patients with trauma-related complications had significantly fewer hospital-free days (11 vs 18 days; $p=0.006$) and fewer ICU-free days (10 vs 28; $p<0.001$) than those without complications. There was a strong association between increasing ACDiT grade category and lower number of both hospital-free days (Figure 3a) and ICU-free days (Figure 3b).

Patient and Public Involvement group

When the hypothetical scenarios were ranked according to severity by the PPI group, these correlated well with the transitivity of the ACDiT scale ($r = -0.9748$; $p<0.0001$) (Figure 4). This indicates an agreement in the hierarchy of the complications severity between a group of patients and their relatives and their grading by the ACDiT scale.

DISCUSSION

The Clavien-Dindo complication scoring system has been adapted to allow application to trauma patients who have been managed both surgically and non-operatively. It has been successfully applied to 484 trauma patients, including patients in ICU and non-ICU wards.

We propose that the adapted Clavien-Dindo in trauma (ACDiT) scoring system is a useful trauma endpoint that is non-binary, clinically meaningful and patient-centered as it was associated with hospital-free and ICU-free days. It could potentially be applied to trauma research participants as a medium-term non-mortality endpoint. It may also be applied to clinical practice in regular trauma morbidity and mortality (M&M) meetings, as well as clinical governance exercises and assessments of best practices and patient safety. Interventional research intended to reduce morbidity is a valid alternative to mortality-reduction alone. The ACDiT scoring system provides a standardized tool to facilitate this.

Other methods for grading complications do not accommodate the active decision of watchful waiting nor the potential consequences that may result from this. The original Clavien-Dindo classification system was only applicable to patients who have had elective surgery. Trauma is not always managed operatively, since management of head and solid organ injury by SNOM or interventional radiology rather than surgery is commonplace⁷⁻⁹. A method of determining the subsequent morbidity of both surgical and non-surgical strategies together has not previously been proposed, but can be graded according to our adaptations. The ACDiT scoring system enables clinicians to stratify post-trauma complications for patients in the whole spectrum of trauma management, including those who have had damage control surgery as well as those who have had SNOM or interventional radiology by considering the term “*clinical management of trauma*” rather than elective general surgery.

Some investigators have reported Clavien-Dindo complication scores following trauma¹⁰⁻¹² but without an explanation regarding how any modifications were made or whether there were any issues with translating the scoring system from elective surgery to emergency trauma management. Furthermore, they do not cite any source or justification for their utilization of Clavien-Dindo. Other investigators have made specific adaptations to the Clavien-Dindo scoring system for other purposes than elective general surgery^{13, 14}. Without adequate explanation of the rationale or detailed methodology, there is a risk of trauma clinicians interpreting or adapting the scoring system in different ways, and inconsistently according to their own internal processes, or missing patients that were managed non-operatively. Such variation may limit the utility in comparison over time or between institutions or trauma networks. Here we present a detailed explanation of how this well-known complications grading system has been adapted for trauma in order to encourage greater uniformity in reporting of data, and to include all trauma patients whether or not they are managed operatively. These classifications have been clearly laid out in a simple to use flow diagram (Figure 2). We have also discovered through detailed consultation with community members who are previous major trauma survivors and relatives that they are in agreement about the order of severity listed in the scale.

One of the biggest differences between the ACDiT scoring system and the original Clavien-Dindo tool for elective surgery is the frequency of complications expected to occur in the respective patient groups. Elective surgery is normally performed on patients who are optimized for anesthesia and surgery, and not normally performed for patients with severe physiological compromise or those who are at high risk of death within 48 hours. Conversely trauma surgery is characterized by urgency, rapidly changing physiology, and

often in the context of injuries that pose an immediate and significant threat to life. Heroic measures are often taken to seize any chance for survival even against unfavorable odds. It is of no surprise therefore that complications should be more frequent, of higher severity, and affected by the state of the patient at presentation. In our study the most severely injured patients with hemorrhagic shock (within the retrospective cohort) had significantly higher ISS, different patterns of injury, and different distribution of ACDiT scores than the prospective cohort (Supplementary Digital Content Table 3). Meaningful comparison of ACDiT scores between centers or within a center should be made in the context of injury burden.

The ACDiT scoring is just one part of analyzing complications, unanticipated clinical courses, or undesirable outcomes. The designation of post-trauma complications is not to be used as a mechanism for attributing blame or systemic shortfalls. Rather, it can be used as an objective tool to measure patient-centered performance year-by-year, and ensure that trauma systems are paying attention to meaningful outcomes beyond simple mortality. We recommend that a separate but parallel discussion regarding systemic improvements in practice accompany any meeting (such as M&M) that utilizes the ACDiT scoring system.

Limitations

Further adaptation of the ACDiT score may be required. Although tested on a diverse international population (including a wide range of severity of injuries), there is a large heterogeneity in trauma patients and there may be some instances that still require interpretation. Patients were scored after discussion between clinicians about individual cases. Since scores were not blinded between individuals, inter-user reliability testing could not be performed. However, this was considered to be the methodology most translatable to how the scoring system would be used during M&M discussions and clinical evaluation exercises. Further inter-user reliability testing between individuals, or between groups of individuals, may be required for greater assurance of reliability.

This study was undertaken in developed countries within specialized trauma units. Further evaluation in other scenarios may be warranted. Although a non-mortality endpoint is appealing for those who wish to improve practice for the lives of survivors, it has not been validated over longer periods of time and it is unknown whether the ACDiT scoring system corresponds well to subsequent patient quality of life, or special populations; a worthy research question for follow up studies. The current study may be at risk of selection bias due to missed patients during patient identification, limiting the representativeness of the sample. This may be more likely in the retrospective cohort of patients, where incomplete electronic records may cause patients to be inadvertently excluded. There are no patients in the current study with isolated low severity injuries (such as a single fractured bone). Nevertheless, a relatively wide range of injury severities are presented, in order to illustrate the applicability of the ACDiT in the diverse field of trauma.

Both the original Clavien-Dindo scoring system and ACDiT are defined by the treatment required. In the trauma context, treatment itself may depend on other co-morbidities or injuries. This may lead to differences in level of complication between clinicians for the same pathology but different resources or decision-making. For example a clinician may

elect for re-admission to ICU following a pulmonary embolus, whereas another may choose ward based therapy depending on their clinical judgment. Careful analysis of complications on a case by case basis would be an important task during M&M discussions that utilize the ACDiT scoring system.

The adapted Clavien-Dindo for trauma scale can be used to grade the severity of post-trauma complications in patients managed both operatively and non-operatively. It can be utilized as a patient-centered non-mortality endpoint for research purposes, as well as a clinically meaningful measure for reporting at morbidity and mortality meetings or other exercises in quality improvement.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Figure 1.
 Flow diagram for patient selection and scoring according to the adapted Clavien-Dindo in trauma scoring system

Figure 2.
Simplified flowchart for assigning scores for the adapted Clavien-Dindo in trauma (ACDiT) scale

Figure 3. Relationship between ACDiT grade and other morbidity endpoints

A. hospital-free days and B. ICU-free days.

Horizontal bars represent median values; upper and lower boundaries of boxes represent the 25th to 75th percentiles (i.e. interquartile range); whiskers represent 10th – 90th percentiles.

Statistical significance using Dunn's multiple comparisons test is illustrated using * $p < 0.05$;

** $p < 0.005$; *** $p < 0.001$; and **** $p < 0.0001$.

Figure 4.

Correlation between ACDiT grade for clinical scenarios and the ranking of severity agreed by the Patient and Public Involvement group

Table 1

Study patient characteristics and length of stay according to trauma-related complication status

Patient characteristic	All patients (n=484)	ACDiT complication (n=217)	No ACDiT complication (n=267)	p-value
Age, median (IQR)	41 (27 – 58)	43 (27 – 60)	41 (27 – 56)	0.308
Male, n (%)	373 (77.1)	164 (75.6)	209 (78.3)	0.552
ISS, median (IQR)	25 (16 – 34)	30 (21 – 41)	21 (13 – 29)	<0.001 ^{**}
Mechanism of injury, n (%)				0.0014 [*]
RTC	269 (55.6)	136 (62.7)	133 (49.8)	
Fall	112 (23.1)	43 (19.8)	69 (25.8)	
Assault (stabbing)	38 (7.9)	8 (3.7)	30 (11.2)	
GSW	36 (7.4)	21 (9.7)	15 (5.6)	
Assault (blunt)	16 (3.3)	3 (1.4)	13 (4.9)	
Crush	2 (0.4)	0 (0)	2 (0.7)	
Blast	1 (0.2)	0 (0)	1 (0.4)	
Railway incident	1 (0.2)	1 (0.5)	0 (0)	
Unknown/found	9 (1.9)	5 (2.3)	4 (1.5)	
Other endpoints, median (IQR)				
Hospital-free days	16 (4 – 23)	11 (0 – 23)	18 (9 – 23)	0.006 ^{**}
ICU-free days	25 (7 – 29)	10 (0 – 25)	28 (23 – 30)	<0.001 ^{**}
Died	61	61	0	NA ^{***}

IQR: interquartile range; ICU: intensive care unit; ISS: injury severity score; RTC: road traffic collision; GSW: gunshot wound

^{*} Significant according to Chi-squared test^{**} Significant according to Mann-Whitney *U* test^{***} All patients who died were in the ACDiT complication group

Table 2

Study patient characteristics and ACDiT grades according to whether they required an inpatient stay in the Intensive Care Unit

Patient characteristic	All patients (n=484)	ICU patients (n=394)	Non-ICU patients (n=90)	p-value
Age, median (IQR)	41 (27 – 58)	42 (27 – 59)	40 (26 – 53)	0.326
Male, n (%)	373 (77.1)	299 (75.9)	74 (82.2)	0.250
ISS, median (IQR)	25 (16 – 34)	26 (18 – 36)	15 (9 – 22)	<0.001 **
Mechanism of injury, n (%)				0.0010 *
RTC	269 (55.6)	223 (55.6)	46 (51.1)	
Fall	112 (23.1)	86 (21.8)	26 (28.9)	
Assault (stabbing)	38 (7.9)	30 (7.6)	8 (8.9)	
GSW	36 (7.4)	35 (8.9)	1 (1.1)	
Assault (blunt)	16 (3.3)	7 (1.8)	9 (10.0)	
Crush	2 (0.4)	2 (0.5)	0 (0)	
Blast	1 (0.2)	1 (0.3)	0 (0)	
Railway incident	1 (0.2)	1 (0.3)	0 (0)	
Unknown/found	9 (1.9)	9 (2.3)	0 (0)	
ACDiT complication grade, n (%)				<0.001 *
Grade 0 (none)	267 (55.2)	189 (48.0)	78 (86.7)	
Grade I	20 (4.1)	19 (4.8)	1 (1.1)	
Grade II	60 (12.4)	57 (14.5)	3 (3.3)	
Grade III	24 (5.0)	23 (5.8)	1 (1.1)	
Grade IV	52 (10.7)	52 (13.2)	0 (0) ***	
Grade V (died)	61 (12.6)	54 (13.7)	7 (7.8)	

IQR: interquartile range; ICU: intensive care unit; ISS: injury severity score; RTC: road traffic collision; GSW: gunshot wound; ACDiT: adapted Clavien-Dindo in trauma

* Significant according to Chi-squared test

** Significant according to Mann-Whitney *U* test

*** All patients with a Grade IV complication must have had a stay in ICU