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ANALYSIS OF THE ACCURACY OF THE EXISTING KABCO INJURY SCALE

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INTRODUCTION

The police in North Carolina and many other states rate traffic crash injury on a five point scale known as KABCO which consists of categories designated fatal (K), serious (A), moderate (B), minor (C), and none (O). In making these ratings, officers are supposed to rely on the definitions provided in the National Safety Council Manual on Classification of Motor Vehicle Traffic Accidents - 1976 (1). These injury ratings comprise one of the key variables in the statewide traffic crash data base compiled in virtually every USA state.

Over the years, extensive analyses have been made of such motor vehicle crash data sets. A main advantage of such data bases is the large sample size. In N.C. annual data include about 250,000 crash-involved vehicles and their occupants. The very large number of cases provides an opportunity to examine quite low probability events and determine such things as the relative likelihood of a serious injury when seat belts are used or not.

A disadvantage of this type of data lies in the data quality that may reasonably be expected of an officer completing a form at the crash scene. Because of these limits and because injury is the crucial dependent variable in many studies, the behavior of the KABCO injury scale is of interest to determine the process by which officers report injury, and to learn how officers' ratings compare with those of medical professionals. The results of this research may enable researchers to consider methods to reduce discrepancies. Additionally, if the judgment of the law enforcement officer at the scene of the crash is consistent with that of physicians, data provided by these officers might be utilized as triage tools to facilitate rapid transport of seriously injured patients to designated trauma hospitals.

ELEMENTS OF THE STUDY

The purpose of this study is to examine several aspects of the use of the KABCO injury rating scale. Specific objectives in this report are:

1. Describe factors present in the process by which investigating police officers arrive at judgments regarding severity of injury.

2. Examine the injury rating system for possible bias in reporting according to age or sex.

3. Compare the police officers' estimate of injury with those of physicians following the completion of a medical evaluation.

4. Relate KABCO injury scores to other common injury severity indices.

5. Determine some of the prevailing characteristics of cases in which officer and physician ratings of injury differ markedly.

By understanding the strength and weakness of the scale, clues may be derived as to how to improve injury data within the framework of information police can reasonably be expected to provide, or to define the necessity to tap into other existing scales which may better portray injury and may be linked to police crash reports.

RESULTS

The results are presented in the form of several small, independent studies.

Current KABCO Rating Procedures

The first study involved an attempt to understand when and on what basis officers actually make the injury rating. Do they make the injury judgment at the crash scene in the presence of the victims, or have the victims usually been transported to the hospital by the time the officer arrives? To what extent is the investigating officer's judgment dependent upon information obtained from medical personnel?

To acquire data on these matters, arrangements were made with a rural district of the NC State Highway Patrol (SHP) to obtain supplementary information for some crashes. SHP Officers filled out a brief supplemental form on 45 crash- involved persons -- approximately ten cases each with "o", "c", "b", and "a" injuries respectively (plus a single fatal crash that occurred in the district during that time).

The SHP reported that 33 (73%) of the 45 crash-involved persons were still at the scene when the officer arrived while the remaining 12 (27%) had been removed from the scene. Table 1 shows the breakdown by police injury rating. For "C" injuries (minor) and no injuries, the persons were still at the scene in more than 80% of the instances. In the case of "A" or "B" injuries, the persons were at the scene in 67% and 56% of the cases respectively. Thus, in the majority of instances, the officer had the opportunity to observe the crash victim at the scene and make a rating of injury severity then and there.

Table 1. Injury category related to whether victim was still at the scene when the officer arrived.

Injury Category	Victim at Crash Scene	
	No	Yes
K	0 0%	1 100%
A	3 33%	6 67%
B	5 45%	6 55%
C	2 14%	12 86%
No Injury	2 20%	8 80%
Total	12 27%	33 73%

Officers were asked to report the most important means by which they decided on the injury rating to be applied. The categories to be ranked were:

interview with the victim
appearance of the victim
degree of damage to the vehicle
discussion with ambulance attendants
discussion with hospital emergency room staff

Table 2 shows the number of instances in which a given category was rated as most important, broken down by rated injury category.

Table 2. Related injury severity as related to factor of greatest importance in making the injury rating.

	Factor of Greatest Importance in Injury Rating				
Injury Category	Discuss with Victim	Appearance of victim	Vehicle Damage	Discuss with EMS Staff	Discuss with ED Staff
A	0	7	0	1	1
B	0	9	0	1	1
C	8	2	0	1	1
No Injury	4	6	0	0	0

In only 6 of the 42 cases (14%) did the officer report that principal reliance was placed on an external source of information to arrive at the injury rating. This was reported despite the fact that officers usually find it necessary to visit the Emergency Department (ED) to complete their investigation. In the great majority of cases the officer indicated that the injury rating was based either on information from the victim, or appearance of the victim. Not surprisingly, in the minor (and no) injury cases, discussion with the victim was the most important factor in determining injury severities.

As shown in Table 1, there were twelve instances in which the victim had already been removed from the scene by the time the officer arrived. Presumably in those cases the officer had to get information from other sources. In 6 of those 12 instances, the officer placed most important reliance on the EMS or ED staff as the source of the information. These six cases account for all the instances in which the police officer depended upon EMS or ED staff to assign injury severity. Among the larger number of cases when the victim was still at the scene, main reliance was placed on the appearance of the victim or upon direct contact with the victim.

We were also interested in whether the officers had any impression that the presence of alcohol in the victim might somehow influence his judgment. Officers were asked whether they thought the presence of alcohol in the victim would in any way influence their rating of injury. Many officers did not respond to the question (20 out of 45); but when they did respond, they indicated their belief that the presence of alcohol in the victim did not influence their injury rating (24 out of 25 so responded).

It is not surprising that officers do not think their ratings are influenced by the alcohol status of the victims. After all, they are expected to be objective and doubtless, they believe they are. The real question is whether their ratings are, in fact, so influenced. If so, then the next step is what can be done to overcome the fact, or, otherwise how the fact can be handled.

EXAMINATION OF NORTH CAROLINA DATA FOR POSSIBLE INJURY REPORTING BIAS

There was interest in determining whether characteristics of North Carolina crashes are consistent with the hypothesis that police officers more often select the "C" injury (minor) category instead of the "0" (no injury) category for females as compared to males.

The anecdotal impression is that sometimes police officers (mostly male) will assign a "C" injury to a female victim whereas under the same circumstances they would assign a "0" injury category in the case of a male.

There is no unambiguous way to examine this matter, because if there is a sex difference of this sort, it is not possible completely to rule out the possibility that the observed difference indicates a true injury difference. Since females and males are usually of a different size and musculature, it is perhaps possible that one sex rather than the other may tend to escape injury more often.

A process was undertaken to define a data subset and then to compare reported injuries to males and females within that data set. The intention was to define the data set in such a way that the male-female comparison would be made under as nearly similar crash situations as possible.

Accordingly, all North Carolina crashes that occurred during 1985-89 were scanned. This included records of about 1.5 million persons in crashes. In order to define a subset of crashes that were as similar as feasible, it was decided to select only (1) right front occupants, (2) who were unbelted, (3) riding in passenger cars, (4) in the intermediate size category, (5) confined to model years 1980-85, (6) involved in car versus car crashes, (7) of know degree of vehicle deformation.

Within that framework, ten age groups were defined:

- < 6 years old
- 6-10 years old
- ll-16 years old
- 16-30 years old
- 3l-40 years old
- 41-50 years old
- 51-60 years old
- 61-70 years old
- 71-80 years old
- > 80 years old

Within each age group, crashes were displayed according to level of severity using the seven point TAD vehicle deformation rating scale. This vehicle information scale consists of pairs of photographs depicting front or side views of vehicles damaged at varying levels of severity. The officer judges the case car in comparison to this referenced set (1). A comparison was made, within each TAD level, and each age group, of the percent of males vs females that were categorized as uninjured by the police officer. With ten age groups, and seven levels of TAD, it was theoretically possible that 70 comparisons of male vs female could have been accomplished. However, considering missing data and ties, 5l comparisons were possible.

In 35 of the 51 comparisons, a larger percentage of males were rated as not injured than females. In16 categories females were more often assigned as uninjured than males. Under a null hypothesis, each outcome would be expected equally -- 25.5 outcomes each. This deviation, a split of 35 vs 16, yields a chi-square whose p value is less than .01. Thus, it appears that, for whatever reasons, police officers somewhat more often assign males to the uninjured category than females.

It is also interesting to consider the direction of outcome as a function of occupant age. For the age groups below16, there were eight categories in which males were more often rated as uninjured and eight in which females were more often rated as uninjured. Among passengers 61 years old or older, in seven instances males were more often assigned as uninjured and in five instances, the females. However, in the middle range (i.e, 16-60), in 20 categories, males were more often assigned uninjured and in only three were females so assigned. Thus, it appears that the tendency to assign more males as uninjured is most prominent in the middle age range whereas among the youngest and among the eldest age groups, the tendency is less likely.

It is not possible to say with certainty that these differences in injury reporting are the result of an officer reporting bias. The outcome of the analysis is consistent with what would have occurred if such a reporting bias were present. The alternate explanation is that for some reason males, especially in the 16-60 age range, truly do escape injury more often than females under similar crash circumstances.

Comparison of Police and Physician Judgements of Injury Severity

Many of the results and conclusions from previous studies from this Center, which are based on North Carolina Division of Motor Vehicle crash reports, are dependent on law enforcement officers' judgment regarding the severity of injuries sustained in the motor vehicle crashes.

However, there have not been systematic comparisons of the police officers' judgment to those of physicians who have the benefit of a detailed history of the event, physical exam, laboratory, x-rays and period of observation. Therefore, we compared the judgment of the law enforcement officer with the results of a medical evaluation at a Level 1 Trauma Center.

Methods

This was a retrospective analysis utilizing North Carolina Division of Motor Vehicle crash reports and hospital records from victims of motor vehicle crashes presenting to the North Carolina Memorial Hospital Emergency Department over a 21-month period. In a previous study, we obtained the Division of Motor Vehicle's crash reports describing crashes which resulted in a patient visit to the Emergency Department. The original study (2) included 1509 consecutive patients presenting from April 1986 through December 1987. Included were all non-admitted patients over 18 years of age and all patients over 16 years old who were seriously enough injured to require admission. For each of these patients, an abstract was completed exerpting: data on the pre-hospital care rendered to the patient by rescue squads, the results of an Emergency Department evaluation, including a physician's judgment of alcohol use, level of impairment, the usual history, physical, laboratory and the results of x-rays. For those patients requiring admission, details of the hospital course were also extracted to include types and numbers of procedures, operations, length and stay in hospital, and complications as well as final diagnoses and condition at discharge.

For inclusion in this study, a sample was derived by taking the first 880 records consecutively. The abstract of all the care provided to the patient in the pre-hospital, emergency department, and in-patient hospital setting was examined, and a physician participating in this research assigned a KABCO rating to each case using the same criterion (as described above) as that used by the police officer in filling out the crash report form. The injury rating was done in a blinded fashion without foreknowledge of the police officers' judgment. Somewhat arbitrarily, we assigned an "A" rating to any patient requiring hospital admission, even if only for observation overnight. Similarly, any significant extremity fracture requiring casting was given an "A" score. Large lacerations, significant abrasions, or contusions were given a "B" score. The "C" rating was assigned to patients with complaints of pain in whom the evaluation failed to uncover a functionally significant injury. After deriving the KABCO scores from the abstract of the medical record in this fashion, a previously linked copy of the North Carolina Division of Motor Vehicles (DMV) crash file was searched for the corresponding injury values assigned by the investigating officer. When differences between physician assessment and officer judgment were discovered, the abstract of medical record and DMV crash report were examined more thoroughly in an attempt to discover reasons for the discrepancies. In situations where the law enforcement officer reported that the motor vehicle crash victim was seriously injured, but the medical doctor, after a thorough evaluation, found the patient less compromised, reasons for the discrepancies might be attributed to reasons such as the following:

1. The victim appeared more seriously injured because obvious but superficial injuries caused significant bleeding, or seemed for other physical reasons to be at high risk for injury (e.g., pregnancy).

2. The victim had an altered mental status which in retrospect, might be attributable to alcohol intoxication.

3. The victim had readily reversible injuries such as minor concussion, which improved rapidly in the interval between evaluation at the crash scene and examination at the hospital.

4. The vehicle sustained major damage, or there were other crash circumstances which might cause one to suspect serious injuries.

5. There were deaths or severe injuries among other victims of the crash.

We also considered discrepancies of the opposite sort -- circumstances wherein the law enforcement officer rated the patient as not seriously injured, but the hospital staff would discover more serious problems or admit the victim to the hospital. The following represents our "prospective" assignment of potential reasons for such discrepancies.

1. The crash victim suffered occult injuries such as internal hemorrhage or non-displaced fractures that would be difficult to ascertain at the scene.

2. The crash circumstance did not appear likely to have produced serious injuries (e.g., little vehicle damage).

3. The physician apparently admitted the crash victim for precautionary reasons such as pregnancy and no incapacitating injuries were diagnosed.

4. The patient, although apparently not seriously injured, was admitted primarily because of premorbid conditions such as old age or debilitating disease.

5. The patient was judged alcohol-impaired and was subsequently found to be injured as well.

6. Socio-economic factors such as language barriers may have biased the initial impression.

Sometimes differences of one rank were clearly a matter of borderline cases where the difference was not substantive, but a matter of arbitrary judgement. For example, minor lacerations which did not require suturing (B or C?); admissions of the elderly to rule out myocardial contusion and found to have only minor chest wall injuries (A or B?). Finally, in some examples, no apparent explanation could be defined after analysis of both the medical record abstract and the crash report. These differences we attributed simply to an undefined rater disagreement.

Results

Of the sample of 880 crash reports examined, 796 (90%) had complete crash and medical data. When the officer's injury rating was compared with the physician's,

49 percent of cases demonstrated rating agreement between the investigating officer and the physician's assessment in the emergency department. In 402 (51%) there was a discrepancy, and in 93 of those cases (12%), there was disagreement of two or more categories.

As shown on Table 3, agreement was highest at the extremes of the injury scale. There was agreement in the majority of cases in the seriously injured "A" category. In the "C" category (minor injury), there was also good agreement. When the investigating officer called the injuries minor, physicians agreed 78% of the time. Where disagreement occurred, there is a tendency for the law enforcement officer to rate the injury as more serious than did the physician, rather than to rate it as less serious than did the physician (219 vs 183). The least agreement was observed in the "B" (moderate injury) category. Injuries given a "B" rating by the police were likely to be called a "C" injury or no injury by the physician staff after a more thorough evaluation. All cases in which there was a discrepancy of two or more scale categories were examined for a likely cause of this difference.

Table 4 categorizes reasons for the differences which existed. In cases where the officer overrated the degree of injury, the most likely reason for the officer assigning a higher injury score seemed to be circumstances in which the patient appeared badly injured because of multiple abrasions or lacerations, and in circumstances where the vehicle TAD score was 5 or greater. In significant numbers of cases, there was no ready explanation.

In circumstances where the law enforcement officer underrated the degree of the motor vehicle crash victim injury, the most frequently assigned explanation for this discrepancy was a failure to recognize occult definition injury. Often these circumstances would be nearly impossible for a first responder to recognize (e.g., occult internal hemorrhage, non-displaced fracture).

Similar reasons were found among a further sample of 103 cases in which officer and medical personnel ratings differed by only one category (Table 5). Overrating by the law enforcement officer was, again, usually attributable to readily apparent bleeding from minor lacerations, contusions or abrasions. A high TAD score may have influenced the officer into assigning a higher injury rating. The third most common reason was again inexplicable rater "error", but there were also a substantial number who appeared to have reversible injuries such as short term loss of consciousness.

In circumstances where the law enforcement officer underrated the injury by a single category, the most frequent cause by far was the failure to recognize occult fractures. The next most common cause probably represents caution on the part of the medical staff (more than a certain diagnosis of significant injury). In similar cases, the difference between raters seemed insignificant and did not represent an error in judgment at all.

Table 3: Police vs. physician assessment of injury using KABCO rating scale.

Frequency Percent Row Pct Col Pct	Police Officer's Judgment					
	K	A	B	C	None	Total
K	14	2	0	0	0	16
	87.50	12.50	0.00	0.00	0.00	
	82.35	0.77	0.00	0.00	0.00	
A	3	133	45	20	5	206
	1.46	64.56	21.84	9.71	2.43	
	17.65	51.35	22.61	8.85	5.26	
B	0	61	68	24	5	158
	0.00	38.61	43.04	15.19	3.16	
	0.00	23.55	34.17	10.62	5.26	
C	0	63	84	176	82	405
	0.00	15.56	20.74	43.46	20.25	
	0.00	24.32	42.21	77.88	86.32	
None	0	0	2	6	3	11
	0.00	0.00	18.18	54.55	27.27	
	0.00	0.00	1.01	2.65	3.16	
Total	17	259	199	226	95	796

Frequency Missing = 84

Table 4: Discrepancy in injury scoring: physician vs. police. All cases in which differences of 2 or more were found in rating scale.

	Frequency	Percent
Possible Reasons for Police to Over-rate Injury		
Superficial injury with obvious bleeding	34	26.4
Alcohol induced stupor	9	7.0
Reversible injuries	4	3.1
High vehicle damage	21	16.3
Possible reasons for police to underrate injury		
Occult injuries	14	10.9
Little vehicle damage	4	3.1
Precautionary admiss. (physician "error")	5	3.9
Premorbid conditions	3	2.3
Alcohol impaired & injured	2	1.6
Socioeconomic bias	3	2.3
No evident reason for difference		
Rater error	25	19.4
Motorcyclist	5	3.9

Table 5: Discrepancies in injury scoring: physician vs. police. All cases in which differences of 1 were found in rating scale.

	Frequency	Percent
Possible Reasons for Police to Over-rate Injury		
Superficial injury but obvious bleeding	22	21.4
Alcohol induced stupor	6	5.8
Reversible injuries	3	2.9
High vehicle damage	7	6.8
Death or injury in others	1	1.0
Possible reasons for police to underrate injury		
Occult injuries	20	19.4
Precautionary admission. (physician "error")	7	6.8
Alcohol impaired/but, injured	3	2.9
No evident reason for difference		
Rater error	13	12.6
Inconsequential (small) difference	21	20.4

Certain subset populations stand out as likely to be systematically "misjudged". In our sample, there were five motorcycle crash victims, all of whom sustained multiple abrasions. All were discharged from the Emergency Department within hours of their initial evaluation, yet were judged by police officers to be seriously injured. Similarly, there were three pregnant women in the sample. None of them sustained serious injuries, but each was considered an "A" injury by the investigating law enforcement officer. This probably represents a prudent and cautious approach by police.

Conclusion

Overall, there is substantial correlation between officer judgment and the physician assignment of KABCO ratings using the data available from a thorough medical evaluation. It is apparent, however, that multiple superficial injuries that are not incapacitating may lead the law enforcement officer to overestimate the severity of injuries. Severe vehicle damage may also skew police judgment. A relatively small incidence of underrating because of missed occult injuries is also evident from the analysis.

Alcohol involvement, although perhaps contributing to errors in judgment in either direction, is more likely to be associated with erroneously high KABCO score than with a serious injury being falsely attributed to alcohol alone.

A Statistical Comparison of KABCO and Several Other Injury Severity Scales

The Abbreviated Injury Scale (AIS) is a multidimensional scale also designed to discriminate among injuries ranging in severity from no injury to unsurvivable injuries. Several different injuries (to different body regions) are each rated on a seven point severity scale. Two one-dimensional scales derived from the AIS are the MAIS which is the AIS severity rating for the most severe injury, and the ISS (injury severity score) which is the sum of squares of the severity ratings of as many as three different injuries (3).

Two trauma scales are also examined, the trauma score, and the Glasgow coma scale. These scales are used by EMS and hospital personnel and seem to discriminate among quite serious or life-threatening injuries.

Two-way contingency tables of KABCO vs each of the other scales are presented as Tables 6-10. With the exception of MAIS, some grouping of scale values was necessary for each of the other scales. This was done in such a way as to have a reasonable sample size in each (grouped) category.

Below each table three measures of association are given. Each of these measures is based on an estimate of the probability that if two observations are chosen at random and if observation one is rated as more severe on one scale, it will also be rated as more severe on the other scale. The measures differ with respect to the way that tied observations are treated and certain adjustments for table size. In

particular, γ ignores ties, τ_b contains corrections for ties, and τ_c contains corrections for ties and adjustments for table size.

The relationship between KABCO and each of the three trauma scores are quite similar with $\gamma \approx .80$, $\tau_b \approx .34$, $\tau_c \approx .20$. The relationship between KABCO and ISS and KABCO and MAIS are also similar with $\gamma \approx .75$, $\tau_b \approx .50$, $\tau_c \approx .40$. Thus, with respect to τ_b and τ_c the ISS and MAIS are shown to be more strongly associated with KABCO than are the trauma scales, while the trauma scales have slightly higher values of γ.

Perhaps more informative are the distributions of frequencies within the tables themselves. For example, Table 8 shows that virtually, all of the variation of the TS_ED is concentrated within the A-level of the KABCO scale. In fact, over 95% of the B, C, and 0-level KABCO injuries are classified as 16, (normal) on the TS_ED, and even more than 73% of the A-level injuries are classified as 16. Thus, the TS_ED seems only to begin to discriminate the severity of the "worst" 25% of the A-level classification. This pattern is typical of the KABCO by trauma scale tables.

By contrast, Table 6 shows much more variation in the ISS at the B and C-levels of the KABCO scale, and the A-level KABCO injuries are almost equally distributed across the four ISS categories.

CONCLUSION

This series of small studies reviewed the efficacy of police injury ratings using the KABCO injury rating procedure. This rating procedure is used by police in most states to characterize the severity of traffic injuries. Because such data bases are used for research, as in North Carolina, the accuracy of values assigned according to the KABCO scale will govern the validity of many research studies.

It is shown herein that the scale is applied with reasonable skill by police officers, though the scale, like any other, is not wholly without problems. It is seen, for example, that police officers generally assign values similar to those given by physicians. When the same cases are rated by police officers and by physicians, there is most often agreement within a range of one category. That is, if the physician were to select a category (based on relatively extensive medical knowledge of the case), the police officer would usually pick that same category or an adjacent category, even though the officer often made the rating on his view of the victim at the crash scene before any medical analysis had taken place. Further, indications are that the great majority of the NC SHP ratings are made at the scene of the crash (based on experience at one SHP district office).

Table 6: A comparison of police KABCO injury ratings with Injury Severity Scores (ISS) made by physicians at a Level I Trauma Center.

Frequency Percent Row Pct Col Pct	ISS 0-3	4-8	09-15	16+OVER	Total
K	0 0.00 0.00 0.00	1 0.08 3.33 0.40	0 0.00 0.00 0.00	29 2.26 96.67 19.21	30 2.34
A	126 9.82 28.64 16.76	104 8.11 23.64 41.94	93 7.25 21.14 70.45	117 9.12 26.59 77.48	440 34.29
B	201 15.67 61.66 26.73	92 7.17 28.22 37.10	30 2.34 9.20 22.73	3 0.23 0.92 1.99	326 25.41
C	300 23.38 85.23 39.89	42 3.27 11.93 16.94	8 0.62 2.27 6.06	2 0.16 0.57 1.32	352 27.44
O	125 9.74 92.59 16.62	9 0.70 6.67 3.63	1 0.08 0.74 0.76	0 0.00 0.00 0.00	135 10.52
Total	752 58.61	248 19.33	132 10.29	151 11.77	1283 100.00

Frequency Missing = 217

γ = .755

τ_b = .517

τ_c = .455

Table 7: A comparison of police KABCO injury ratings with Maximum Injury Severity Score (MAIS).

Frequency / Percent / Row Pct / Col Pct	MAIS 0	1	2	3	4	5	6	Total
K	0	0	1	0	0	25	4	30
	0.00	0.00	0.08	0.00	0.00	1.96	0.31	2.35
	0.00	0.00	3.33	0.00	0.00	83.33	13.33	
	0.00	0.00	0.35	0.00	0.00	50.00	100.00	
A	0	126	131	117	37	24	0	435
	0.00	9.86	10.25	9.15	2.90	1.88	0.00	34.04
	0.00	28.97	30.11	26.90	8.51	5.52	0.00	
	0.00	17.28	46.13	78.00	94.87	48.00	0.00	
B	4	196	101	24	1	0	0	326
	0.31	15.34	7.90	1.88	0.08	0.00	0.00	25.51
	1.23	60.12	30.98	7.36	0.31	0.00	0.00	
	18.18	26.89	35.56	16.00	2.56	0.00	0.00	
C	13	287	42	8	1	1	0	352
	1.02	22.46	3.29	0.63	0.08	0.08	0.00	27.54
	3.69	81.53	11.93	2.27	0.28	0.28	0.00	
	59.09	39.37	14.79	5.33	2.56	2.00	0.00	
O	5	120	9	1	0	0	0	135
	0.39	9.39	0.70	0.08	0.00	0.00	0.00	10.56
	3.70	88.89	6.67	0.74	0.00	0.00	0.00	
	22.73	16.46	3.17	0.67	0.00	0.00	0.00	
Total	22	729	284	150	39	50	4	1278
	1.72	57.04	22.22	11.74	3.05	3.91	0.31	100.00

Frequency Missing = 222

γ = .755

τ_b = .517

τ_c = .455

Table 8: A comparison of KABCO rating with Total ED Trauma Score.

Frequency Percent Row Pct Col Pct	TS-ER (Total ED Trauma Score)				
	00-11	12-14	15	16	Total
K	27 2.14 96.43 58.70	0 0.00 0.00 0.00	0 0.00 0.00 0.00	1 0.08 3.57 0.09	28 2.22
A	19 1.51 4.46 41.30	42 3.33 9.86 100.00	52 4.12 12.21 64.20	313 24.82 73.47 28.66	426 33.78
B	0 0.00 0.00 0.00	0 0.00 0.00 0.00	11 0.87 3.40 13.58	313 24.82 96.60 28.66	324 25.69
C	0 0.00 0.00 0.00	0 0.00 0.00 0.00	17 1.35 4.89 20.99	331 26.25 95.11 30.31	348 27.60
O	0 0.00 0.00 0.00	0 0.00 0.00 0.00	1 0.08 0.74 1.23	134 10.63 99.26 12.27	135 10.71
Total	46 3.65	42 3.33	81 6.42	1092 86.60	1261 100.00

Frequency Missing = 239

γ = .791

τ_b = .342

τ_c = .192

Table 9. Comparison of KABCO and Glascow Coma Scale (ED) - Total.

Frequency Percent Row Pct Col Pct	Glascow Coma Scale (ED) - Total				
	03-07	08-13	14	15	Total
K	26 2.05 92.86 66.67	1 0.08 3.57 2.50	0 0.00 0.00 0.00	1 0.08 3.57 0.09	28 2.21
A	13 1.02 3.02 33.33	35 2.76 8.14 87.50	53 4.18 12.33 62.35	329 25.93 76.51 29.77	430 33.88
B	0 0.00 0.00 0.00	2 0.16 0.62 5.00	23 1.81 7.08 27.06	300 23.64 92.31 27.15	325 25.61
C	0 0.00 0.00 0.00	1 0.08 0.28 2.50	8 0.63 2.28 9.41	342 26.95 97.44 30.95	351 27.66
O	0 0.00 0.00 0.00	1 0.08 0.74 2.50	1 0.08 0.74 1.18	133 10.48 98.52 12.04	135 10.64
Total	39 3.07	40 3.15	85 6.70	1105 87.08	1269 100.00

Frequency Missing = 231

γ = .772

τ_b = .329

τ_c = .182

Table 10: A comparison of KABCO and Trauma Score (ED) - Total.

Frequency Percent Row Pct Col Pct	Trauma Score (ED) - Tota				Total
	00-06	07-09	10	11	
K	25 1.97 86.21 65.79	3 0.24 10.34 7.69	0 0.00 0.00 0.00	1 0.08 3.45 0.09	29 2.29
A	13 1.02 3.01 34.21	36 2.84 8.33 92.31	56 4.41 12.96 69.14	327 25.77 75.69 29.43	432 34.04
B	0 0.00 0.00 0.00	0 0.00 0.00 0.00	10 0.79 3.09 12.35	314 24.74 96.91 28.26	324 25.53
C	0 0.00 0.00 0.00	0 0.00 0.00 0.00	15 1.18 4.30 18.52	334 26.32 95.70 30.06	349 27.50
O	0 0.00 0.00 0.00	0 0.00 0.00 0.00	0 0.00 0.00 0.00	135 10.64 100.00 12.15	135 10.64
Total	38 2.99	39 3.07	81 6.38	1111 87.55	1269 100.00

Frequency Missing = 231

γ = .810

τ_b = .339

τ_c = .184

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