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ORIGINAL RESEARCH

A Comparison of the Kampala Trauma Score with the Revised Trauma Score in a Cohort of Colombian Trauma Patients

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ABSTRACT

Introduction: To date, no trauma scoring system has emerged as the gold standard for use in developing countries, where limited resources for data collection are a major issue. The purpose of this study is to compare the relatively recently developed and simply calculated KTS (Kampala Trauma Score) with the more widely used RTS (Revised Trauma Score) within a cohort of Colombian trauma patients.

Materials and methods: Data on over 2,200 patients was derived from a newly developed trauma registry in Colombia. A statistical analysis was done using SPSS software, and included simple linear and logistical regression as appropriate.

Results: Both the KTS and RTS were statistically significant in terms of their ability to predict death and length of stay in hospital with the KTS being a better predictor of both. The simplest model predicting death used only the neurologic component of the KTS. However, none of these three scores explained a very large amount of the variation in the dataset.

Conclusion: Although statistically significant, neither the KTS nor the RTS performed well at predicting death or length of hospital stay. However, the simpler KTS did perform somewhat better than the slightly more complex RTS. Using the extremely simple neurologic component of the KTS on its own proved to be the best predictor of length of hospital stay, and also outperformed the RTS in regards to death prediction. It is clear from this study that the optimal injury scoring system for use in under resourced environments remains allusive with further research warranted.

Keywords: Kampala Trauma Score (KTS), Revised Trauma Score (RTS).

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RESUMEN

Introducción: Hasta la fecha, ningún sistema de puntuación de trauma se ha convertido en como el estándar de oro para su uso en países en desarrollo, donde recursos limitados para la recopilación de datos son un problema importante. El propósito de este estudio es comparar el relativamente poco desarrollado y simplemente calculado KTS (Kampala Trauma Score) con el más ampliamente utilizado RTS (Revised Trauma Score) en una cohorte de pacientes colombianos con trauma.

Materiales y métodos: Los datos sobre más de 2.200 pacientes se derivó de un registro de trauma reciente desarrollo en Colombia. El análisis estadístico se realizó utilizando el software SPSS, e incluyó regresión lineal simple y logístico, según corresponda.

Resultados: Los KTS y RTS fueron estadísticamente significativas en cuanto a su capacidad para predecir la muerte y la duración de la estancia en el hospital, con el KTS un mejor predictor de ambos. El modelo más sencillo predecir la muerte utilizarse únicamente el componente neurológico del KTS. Sin embargo, ninguno de estas tres puntuaciones explica una muy gran cantidad de la variación en el conjunto de datos.

Conclusión: Aunque estadísticamente significativas, ni el KTS ni el RTS son muy bien en la predicción de muerte o la duración de estadía en el hospital. Sin embargo, el KTS más simples se realizó poco mejor que el ligeramente más complejo RTS. Utilización del componente neurológico extremadamente simple de los KTS en su propia demostrado para ser el mejor predictor de la duración de la estancia hospitalaria, y también superó el RTS a la predicción de la muerte. Es evidente de este estudio que el óptimo sistema sigue siendo alusivo con más investigación justificada.

Palabras claves: Kampala Trauma Score (KTS), Revised Trauma Score (RTS).

INTRODUCTION

Injuries account for approximately 10% of all deaths worldwide and at least 12% of the world's burden of disease.[1-4] Trauma is increasingly becoming recognized as a major public health problem in the developing world.[5-14] Globally, over 5 million people died from injuries in 2002, with more than 90% occurring in low and middle income countries.[4,14,15] From the year 2000 until the year 2020, road traffic deaths are projected to increase by 83% in low and middle income countries.[16,17] In order to combat this rise, there has been increasing interest in implementing trauma systems within developing countries.[1,12,15,16] Trauma registries are recognized as an important part of the implementation of trauma systems, which in turn have led to decreases in death and disability from injuries within high-income countries.[16,18-22] Trauma registries specially designed for use in developing countries are equally important. The data which they collect can serve as the basis for injury reduction strategies, public health policy, the development of trauma systems and ultimately can lead to improved patient care and outcomes.[1,23]

In order to document improvement in patient outcomes following interventions, or in order to document differences in resource needs and patient outcomes between hospital sites, there must be standardized scoring systems in use in

order to classify injury severity. [24-26] These scoring systems also serve as important tools in triage, research and in the prediction of patient outcomes following the initial trauma itself.[26] Therefore, along with the evolution of trauma systems and trauma registries has been the evolution of trauma scoring systems. A number of different scoring systems have been proposed as a way of standardizing injury severity, which include but are not limited to a severity characterization of trauma (ASCOT), the revised trauma score (RTS), the injury severity score (ISS), the new injury severity score (NISS), and the trauma and injury severity score (TRISS).[5,24,26]

To date, no scoring system has emerged as the gold standard for use in high-income countries, much less a perfect score that works in developing countries, where limited resources for data collection are an issue.[5,16,24,26] In a recent attempt to solve this problem, a newer scoring system, the Kampala Trauma Score (KTS), was developed in Uganda for use in developing countries.[5,6,12]

In brief, the KTS is a simplified composite of the RTS and the ISS and closely resembles the TRISS.[5,12] The KTS is shown in Table 1. Possible scores range from 5 to 16, and like the RTS, a decreasing value of the KTS corresponds to a more severe injury.[5,12] Severe injury has been described as a KTS <11, moderate injury 11 to 13, and mild injury 14 to 16.[6] The KTS has been shown to be valid and reliable for use in both adults and children.[12]

The objective of this article is to compare the KTS against the more often used RTS in a large population of trauma patients in a minimally resourced environment.

Table 1: Kampala trauma score

Age (years)		
≤5	1	
6-55	2	
>55	1	a. _____
Number of serious injuries		
None	3	
One	2	
Two or more	1	b. _____
Systolic blood pressure		
>89	4	
50-89	3	
1-49	2	
Undetectable	1	c. _____
Respiratory rate (breaths/min)		
10-29	3	
≥30	2	
≤9	1	d. _____
Neurological status (AVPU system)		
Alert	4	
Responds to verbal stimuli	3	
Responds to painful stimuli	2	
Unresponsive	1	e. _____
KTS total: a + b + c + d + e = f		f. _____

MATERIALS AND METHODS

A new trauma registry intended for minimally resourced environments was recently developed and trialed at the main public hospital in Neiva, Colombia. Specific details of the trauma registry and its development will be published elsewhere. During the first year of registry implementation, data was collected on a total of 2,220 patients who presented to the emergency department suffering from some form of trauma. Neiva is a city of about 350,000 inhabitants in southern Colombia. The hospital has approximately 500 beds, including 22 intensive care unit (ICU) beds, and is associated with the local university. Data collected within the trauma registry ranges from basic patient demographics, to time and date of injury, length of time prior to arrival in hospital, mechanism and type of injuries sustained, interventions and outcomes. In addition to this information, an RTS and a KTS is collected on each patient. The data used in the current study was collected on trauma patients presenting to the hospital over a one year period ending in February 2009.

Data analysis was performed using SPSS version 17.0 software. Simple linear regression was used for predicting continuous variables and logistic regression was used for categorical variables. A p-value of 0.05 was considered significant. The dependent variables, death and length of stay, were constant throughout the modeling. We used multiple independent variables (all the data points which make up the KTS and RTS scores) in order to try and come up with a simpler predictive tool.

RESULTS

During the first year of the trauma registries implementation, RTS and KTS scores were collected on 2,220 trauma patients.

Regression analysis was used to identify factors that predicted length of stay in hospital. Both the KTS and RTS were statistically significant. However, they explained only a small amount of the variation in the dataset at 10.7 and 1.8% respectively.

Logistic regression analysis was used to identify factors that predicted death. Both the KTS and RTS were statistically significant. However, they explained only a small amount of the variation in the dataset at 10.8 and 9.3% respectively.

When all other factors were analyzed, the simplest model predicting death used only the KTS neurologic injury score, explaining 10.9% of the variation in the data (OR –2.6, $p < 0.001$).

The KTS neurologic injury score was also a significant predictor of length of stay, explaining 3.5% of the variation in the data. Although, this is less that the KTS total score is still higher than the RTS total score.

DISCUSSION

To date, studies looking at the KTS as a predictive tool have been fairly limited. To our knowledge, this was the first prospective study of this size to examine the KTS as a predictive tool.

The first study done to validate the KTS was performed on 545 adults and 191 children in Uganda.[12] In that study, the KTS was shown to be highly predictive of the composite of the two variables 'need for admission or death', using areas under the ROC (receiver operator curve). Unfortunately, the authors did not look at the two variables separately, which makes direct comparison to our study impossible, in regards to death prediction. We have no way of controlling for the variable admission thresholds among different hospitals.

In a second such study from Uganda, the KTS was applied retrospectively to a cohort of prospectively accrued urban trauma patients and then compared with the RTS, ISS and TRISS.[5] As pointed out by the authors of that study, cohorts with a large number of 'easy' cases or very serious or 'obvious' cases dilute the power of a prognostic instrument, and therefore comparing instruments is statistically more difficult and less accurate. Therefore, the cohort they examined excluded patients who would not be considered major trauma (ISS < 16) or the most obviously severely injured patients, ISS = 75 (injuries incompatible with life).

The authors of that study found that when using logistic regression models and areas under the ROC curve, the RTS in fact proved to be a more robust predictor of death at 2 weeks in comparison to the KTS. However, these differences were marginal (areas under the ROC curves were 87% for the RTS and 84% for the KTS) with statistical significance only reached for an improved specificity (67% *vs* 47%; $p < 0.001$), at a fixed sensitivity of 90%.[5] In addition, the KTS predicted hospitalization at 2 weeks more accurately. The authors concluded that the KTS statistically performs comparably to the RTS and ISS alone as well as to the TRISS, but has the added advantage of utility. They feel that the KTS therefore has potential as a triage tool in resource-poor and similar health care settings.

One of the main difficulties in comparing this study to our own in Colombia is that we did not select out patients with an ISS between 16 and 75, while the authors of the Ugandan study did. The two other points worthy of note are that the Ugandan study included only 150 patients (ours included 2,220) and that the KTS scores in Uganda were calculated retrospectively (ours were collected prospectively).

The authors of this Uganda study also rightly pointed out that the RTS was developed from a statistical regression model which was used to predict survival only.[5] Therefore, the fact that its predictive ability could not be transferred to other outcome measures, such as length of hospital stay does not necessarily indicate a weakness.

A third study looking at the KTS was also undertaken in Uganda.[27] One objective of this combined retrospective and prospective study was to assess the KTS as an injury severity filter. The results are based on a retrospective review of 873 trauma patients admitted between October 1996 and September 1997 and a 7 months prospective study of 432 trauma patients beginning in December 1997. The authors of that study concluded that the KTS was found to be a reliable severity filter for injured patients. They showed that a KTS score of 14 or less was found to increase the patient's likelihood of death by at least three times.

SUMMARY

Our prospective study of 2,220 trauma patients in Colombia is not able to paint as positive a picture of the KTS as a tool for prediction of death or length of hospital stay as some of the earlier studies have. While both are statistically significant, neither the KTS nor the RTS performed well at predicting death or length of hospital stay. However, the simpler KTS did perform somewhat better than the slightly more complex RTS. Using the extremely simple neurologic component of the KTS on its own proved to be the best predictor of death, and also outperformed the RTS in regards to prediction of length of hospital stay. It is clear from this study that the optimal injury scoring system for use in under resourced environments remains allusive with further research warranted. While the more complex scoring systems, such as the ISS and TRISS are widely used and are of some use in research and quality improvement, they are likely too cumbersome for use in severely under resourced environments, particularly as predictive tools. Even the simplified KTS may not be of significant practical use. Perhaps a prospective study looking at an even simpler model, such as the AVPU neurological status, would of benefit for predicting death and hospital stay in a severely under resourced environment.

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