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EVALUATION OF TRAUMA CARE APPLYING TRISS METHODOLOGY IN A CARIBBEAN DEVELOPING COUNTRY

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□ **Abstract**—There have been conflicting reports regarding the applicability of Trauma Injury Severity Score (TRISS) methodology to evaluate trauma care in a developing country setting. The objective of this study was to apply TRISS methodology to evaluate trauma care in the public hospitals of a Caribbean developing country. A prospective, observational study was conducted in the three major general hospitals in Trinidad. Major trauma patients were included. Demographic data, waiting time in the Emergency Department, and nature of injury (blunt or penetrating) were noted. Revised Trauma Score, Injury Severity Score, and Glasgow Coma Scale were applied to all patients on admission. Hospital outcomes were noted. Predicted outcomes were calculated for adult patients using TRISS methodology. M, Z statistics and receiver operating characteristic (ROC) curve analysis were done. There were 326 trauma patients studied, of whom 279 adults were evaluated by the TRISS methodology. Men were more frequently involved in trauma than women; there was more blunt trauma than penetrating trauma. The M statistic was 0.98 and the overall Z statistic was 5.81. The ROC curve analysis showed TRISS to be a fair discriminator in the study case-mix with an area under the curve of 0.82 (95% confidence interval 0.69–0.96). There is a considerable disparity between predicted and observed outcomes when trauma patients are evaluated by the TRISS methodology in a developing country setting. © 2009 Published by Elsevier Inc.

□ **Keywords**—trauma scoring; trauma care; developing country

INTRODUCTION

Deaths due to a traumatic injury have been steadily increasing in many countries all over the world. The Centers for Disease Control (CDC) of the United States of America reported in 2002 that trauma was the leading cause of death for the 15–24-year-old age group in the population (1). Ten million Americans were estimated to be disabled by trauma during that year—400,000 of them permanently—and there were over 150,000 fatalities. The United Kingdom reported similar findings. Traumatic injuries kill 40 people per day or 14,500 per year (2). Furthermore, over 7 million attend Accident and Emergency (A&E) Departments for treatment annually, and 620,000 patients are admitted to hospitals after injury (2).

The financial impact of trauma on a nation's economy is also devastating. In 1985, The Medical Commission on Accident Prevention in England estimated that road traffic accidents alone would cost the British economy 2.8 billion dollars (2). The cost of caring for victims in 1987 exceeded 64 billion dollars of the total personal health care spending in the USA (1).

In recent years, Trinidad and Tobago have experienced a surge in crime. There was an increase of serious criminal and violent acts, such as murder and manslaughter (excluding traffic accidents) (3). Trauma-related deaths and injuries increased by 10.3% from 1998 through 2002. The risk of deaths due to motor vehicle accidents increased from 5.9 per 1000 accidents in 1998 to 11.2 in 2003 (3). It is imperative, therefore, that Trinidad and Tobago be equipped with adequate infrastructure and resources in the public hospitals to appropriately manage the increasing influx of patients.

Major trauma causes both morbidity and mortality. To assess the severity of a patient's injuries, scoring systems are widely used internationally. In the 1980s, the Trauma Injury Severity Score (TRISS) was developed to predict patient outcomes after trauma using physiological and anatomical criteria. It combined the earlier developed Revised Trauma Score (RTS) and the Injury Severity score (ISS) (4,5). TRISS methodology was proposed to assess the degree of injury, calculate the chances of a patient's survival (for identification of cases for peer review), and compare the death rates to survival rates of patient populations in different hospitals (6). Despite further advancements in trauma care and identification of numerous limitations of TRISS, this methodology continues to be the most commonly used tool for monitoring trauma outcomes and assessing trauma unit performance (7,8).

With this background, this study attempted to evaluate trauma care applying the TRISS methodology in the major public hospitals of Trinidad. There have been studies from the Caribbean reporting the improvisation of trauma care after Advanced Trauma Life Support (ATLS) training courses to the personnel who care for trauma victims (9–13). To our knowledge, there is no published report applying the TRISS methodology to evaluate trauma care in the Caribbean.

MATERIALS AND METHODS

Study Setting

Trinidad and Tobago comprise a twin-island nation of the Caribbean that is English-speaking, with a population of 1.3 million. In 2003, the per capita gross national income was US\$7260, thus making Trinidad and Tobago one of the richest countries in the West Indies (3). In the same year, the Government allocated US\$210 million toward the health sector; the per capita expenditure being US\$1754 (3). There are three major public hospitals in Trinidad: Eric Williams Medical Sciences Complex, San Fernando General Hospital, and Port of Spain General Hospital, offering tertiary care services and affiliated

with the University of the West Indies. All three institutions are tertiary care teaching hospitals offering training to both undergraduate medical students and postgraduate residents. Eric Williams Medical Sciences Complex is a 300-bed hospital offering care predominantly to pediatric patients and has the only pediatric intensive care unit (ICU) in the country. Port of Spain General Hospital and San Fernando General Hospital are 600-bed hospitals offering services to mostly adult patients.

There is an Emergency Health Service (EHS) run by the South West Regional Health Authority of Trinidad and Tobago. The prehospital care personnel are trained in the ATLS program and are updated at the required time intervals. The EHS has an emergency telephone number (911) available for the common public and has its own networking communication. In addition, there are many privately run ambulance services that use mobile telephones for communication. Severely injured patients in Tobago are usually airlifted to Trinidad for ICU care.

Design

The study was designed as a prospective observational cohort study. Approval of the University Ethics Committee was obtained before the study. There were no interventions required by the study per se; data from case notes were recorded and there were no direct interactions between the patients and the researchers. No patient identifiers were recorded and each patient was codified to maintain confidentiality. Due to this observational design, the Ethics Committee waived the requirement for individual informed patient consent as well as approval for Human Subjects research.

Additionally, the Regional Health Authorities of the respective hospitals approved data collection. All trauma patients who received care in the three hospitals during the 8-week period from June through July 2006 were studied. Major trauma patients who were admitted to the hospital were included. Minor trauma patients who were discharged from the A&E Department after treatment were excluded.

A sample size of 322 was determined based on the prevalence of major trauma in Trinidad for the year 1999, which was reported to be 30% (14).

The sample size equation was used to arrive at the figure:

$$\frac{t^2 (p) (1 - p)}{\alpha^2}$$

Where, "p" (prevalence) = 0.3, t = 1.96, and α = 0.05 (significance level)

$$\frac{(1.96)^2 (0.3) (1 - 0.3)}{(0.05)^2} = 322.7$$

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