Incidence of Shock in Patients Treated in an Emergency Department after Sustaining a Road Traffic Injury

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Abstract: Road traffic injuries in Thailand are the major cause of death and disabilities in young adults. The presence of shock plays an important role in clinical outcomes. This cross-sectional study aimed to determine the incidence of shock and to identify factors predicting the presence of shock on discharge from the emergency department in patients sustaining moderate to serious road traffic injuries in Thailand. Five hundred and three patients (N=503), who scored at least 16 on the Injury Severity Score on admission to an emergency department were recruited. Population and contextual variables were collected from patients' medical records and patients and triage nurses' interviews. Two standardized tools were used to measure the severity of injury and the presence of shock. Data analyses included descriptive statistics, univariate analysis and multivariate logistical regression.

Results indicated that the majority of patients were males, wearing no safety devices and had consumed alcohol prior to driving their motorcycle. The incidence of shock on discharge from the emergency department to the operating room, intensive care unit or general ward was 35%. Transport time, injury severity, shock on arrival and time spent in the emergency department all made significant contributions to whether patients were in shock on discharge from the emergency department. Our findings suggest that emergency nurses should perform routine ongoing calculation of Modified Shock Index scores for monitoring the moderately to severely injured. Further studies examining the superiority of the Modified Shock Index over cardiorespiratory parameters alone could provide evidence to consider the inclusion of this Index into best practice guidelines.

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Introduction

Consistent with global figures, road traffic injury (RTI) in Thailand is the major cause of premature death and disability among young adults. According to the reported road traffic fatalities in Thailand by

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WHO 2018, there were 21,745 cases and 32.7/100,000 deaths from RTI, compared to a rate of 12.4/100,000 deaths in the Americas.[1,2] Most Thai fatalities involve motorcycles, the most commonly registered vehicle in Thailand (74.4%). Compulsory helmet use was enacted in 1996 but the legislation did not specify a helmet quality standard. Lack of reinforcement about the use of a helmet, alcohol consumption, improper use of a helmet and low-quality helmets have all contributed to the limited success in decreasing motorcycle-related deaths and serious life-threatening injuries.[3-4]

The consequences of an RTI can have pervasive and life-altering impacts on patients and their families, as well as financial and human resource implications for the health care delivery system. Accordingly, the National Institute for Emergency Medicine in Thailand was established in 2008 to create and deliver a comprehensive care system for patients with emergency care needs, such as post-RTI. The care system was structured to include care from first responders, pre-hospital care, care on arrival at an emergency department (ED) and emergency surgical and/or ICU intervention. Currently in Thailand the care system involves a range of people, including volunteers from foundations such as Poh Teck Tung and ambulance personnel providing pre-hospital care, multidisciplinary ED staff and surgical/ICU staff. Volunteer pre-hospital care providers are all registered members of faith-based foundations and are trained in first aid, cardiopulmonary resuscitation (CPR) and safe patient handling and transfer, although there is no standardized training program across all foundations. When a bystander calls the national emergency number the dispatcher calls one of the foundations who sends a volunteer to the scene. This first responder decides if an ambulance is necessary and calls for one if required. They do not have direct contact with ED staff. Ambulance personnel includes emergency nurses and some paramedics. For consistency across EDs in Thailand, the Canadian Triage and Acuity Scale (CTAS) is used and this has been shown to be an effective triage system for ED care in a recent metanalysis,[5].

In addition to reducing the time from the RTI to hospital care, a desired outcome of trauma care is a reduction in preventable deaths in patients with RTIs due to shock (typically due to hypovolemia). Consistent with framing the study using Anderson's Behavioral Model of Health Service Use, factors related to the care system and those related to patient characteristics have been shown in other countries and regions to influence this type of preventable death.[6-9] It is essential that ongoing efforts to improve ED patient outcomes are based on country-specific evidence of modifiable factors that influence health outcomes after an RTI.

Review of the literature and Conceptual framework

In much of the published literature regarding pre-hospital care, for those that have sustained a serious RTI it is recommended that immediate on-scene assessment be provided by first responders trained in field emergency care [usually paramedics and emergency medical technicians (EMT)] who are in contact with ED staff and can provide symptom management with timely transportation to highly-equipped hospitals. On-scene advanced life support (including cardiopulmonary resuscitation) provided by health professionals with advanced training has been shown to improve outcomes.[10-11] Literature regarding non-professional first responders is sparse.[11,12] A longer time providing on-scene care and transport are associated with poorer outcomes.[10,13] On arrival to an ED, severity of injury, type of triage system (nurse-or physician-led)[14] and years of triage nurses' experience have been shown to affect triage accuracy, increasing the likelihood of appropriate treatment and improved patient outcomes.[15-17] The majority of patients sustaining a serious RTI experience blunt force trauma, long bone fracture and hemorrhage, which can be life-threatening due to blood loss and hypovolemic shock.[6] Trauma care guidelines emphasize the importance of accurate assessment and rapid intervention for hypovolemic shock to prevent premature death in patients with multiple injuries.[6,8,18] Although the 2004 WHO guidelines for essential trauma care suggest that assessment for shock only requires collecting heart rate (HR) and blood pressure (BP), as well as visual assessment of circulation, the Shock Index and the later adapted version, the Modified Shock Index (MSI) have been used extensively to increase accuracy in identifying shock from HR and BP data.[19] The MSI is calculated by using patients' HR divided by mean arterial pressure (MAP) (MSI = HR/MAP).[8] In terms of the MSI, a low or high score indicates hemodynamic instability in injured patients.[20] Patients with MSI scores of < 0.7 or >1.3 are defined as experiencing shock. This range of values was determined by setting the threshold values at a heart rate of 120 beats per minute and a systolic blood pressure (BP) at less than 90 and calculating the largest possible odds ratio (OR) for higher mortality rates.[20] Comparisons between the SI and MSI have yielded equivocal results; however, the populations involved, and the details of the research method differed across studies.[21-24] For the aims of this study, the term shock will be defined as MSI scores of < 0.7 or >1.3. Individual patient characteristics that have been shown to increase the risk of experiencing a serious RTI include age and sex, use of alcohol, use of personal safety equipment, type of vehicle and position in vehicle (driver or passenger).[25]

Relevant components of the updated Anderson Behavioral Model (BM) of Health Service Use were used to frame this study.[26] Although the original intent of the BM was to investigate predisposing, enabling and need factors as they relate to health care utilization, the model has been used extensively to examine both individual and contextual factors that impact how and why patients access health care for a variety of health conditions.[27] We applied the BM model to examine how both contextual (operationally defined here as the characteristics of the care system from pre-hospital care to ED discharge) and individual factors (related to a population of those who had experienced a RTI) can influence a specific health outcome after RTI (defined here as the incidence of shock).

The objectives of the study

The first objective of this study was to determine the incidence of shock at the time of discharge from an ED in patients who had suffered a moderate or serious RTI [Injury Severity Score (ISS score) >16]. The second was to examine the impact of pre-hospital- and ED-related variables and individual patient-related variables on the incidence of shock on discharge from ED care.

Methods

Design: A cross-sectional study was used.

Setting and Sample

The study was conducted in 12 tertiary care hospitals (of which 7 were designated as Level 1 trauma centers) in Bangkok and neighboring provinces. The sample size comprised of 503 patients with RTI who were transported to an ED for trauma care. Inclusion criteria included those aged 18 years and older and with an Injury Severity Score (ISS) ≥16[28,29] (score typically associated with requiring care from a Level 1 Trauma Center). The sample size estimation was calculated by using Schlessman's equation.[30] The Schlessman's equation is an equation for logistic regression. Level of significance was set at $\alpha = 0.05$ with 80% on power of test. It was calculated that a sample size of 520 was required.

Ethical Considerations: Research ethics approval was obtained from the Siriraj Institutional Review Board (IRB), Faculty of Medicine Siriraj Hospital, Mahidol University (No.IRB-SI120/2016) and the IRBs of the 11 participating hospitals. After providing detailed information about the study, including the right to withdraw at any time, safeguards related to anonymity and participation did not affect care in the ED, eligible and willing participants or their relatives signed consent.

Tools: Participant demographic data, details of the road traffic incident and the resultant injury and

ED data were collected to provide clinical information as well as contextual information as proposed by Anderson's model. The following tools were employed. A template sheet was developed specifically for the study to collect data from triage nurses and included age, gender, years of work in ED, educational level and training experience related to trauma nursing and triage. Another template was developed specifically to collect data from patients and/or their relatives and extract data from the patient's ED record. The sheet collected information on the following: (a) patient demographics; (b) details of the road traffic incident (cause of injury, information of vehicle type, status of the injured, safety devices used and consumption of alcohol before the accident); (c) details of pre-hospital care; (type of first responder on-scene, on-scene care, transport time from the injury scene to the hospital); (d) admission to ED (wait time, triage nurse experience). Both tools were reviewed by five experts in emergency medicine for content items and clinical relevance.

ED care-related parameters included initial and ongoing assessments of pulse, respiratory rate (RR), diastolic blood pressure (DBP), systolic blood pressure (SBP), pupillary reaction to light, mobility, oxygen saturation and level of consciousness.[31,32] The cardiovascular parameters were used to calculate admission and discharge MSI scores. Although other standardized tools were used by the involved EDs, the Injury Severity Score (ISS) was the most consistently used across all sites. Thus, the ISS was used in this study to classify the severity of injury according to the regions of body that sustained injuries. ISS scores range from 1 to 75, with a score ≥ 16 indicative of moderate to severe injury.[33] Time in the ED and the details of where each patient went on discharge from the ED were also obtained from the ED record. **Table 1** summarizes the operational definitions, the source of data and how each variable was measured for each of the included contextual and individual factors, as well as the specific health outcome.

Data Collection: Of the 566 patients or family members that the researcher approached in the ED, 503 agreed to participate. If the patient was unable to provide informed consent, consent was obtained from relatives if available. Data were also collected from 157 ED nurses who were responsible for triage.

Data Analysis: Descriptive statistics were tabulated [frequency (percentages and n)] for all the variables of interest. Univariate analyses were completed for each variable to examine if the variable (or the various categories within categorical variables) had a significant ($p \leq 0.05$ with a 95% confidence interval) impact on the likelihood of being in shock on discharge from the ED. Variables that were significantly associated with shock on discharge in the univariate analyses or have been shown to be associated with shock in previous studies was further analyzed using multivariate logistical regression modeling.

Results

Among the 503 patients who received care in one of the twelve EDs, the majority were male motorcycle drivers with ages ranging from 18 to 88 years (average age close to 35 years of age). Almost half of the patients (48.9%) did not have compulsory motor vehicle insurance, despite it being mandatory. The majority (89.1%) were not wearing any protective safety devices (motorbike helmet or car seatbelt) and more than one third had consumed alcohol before driving. All suffered blunt force injuries.

Eighty-five percent of patients were connected to the emergency care system by the national emergency telephone number. Although bystanders were often first on scene, foundation volunteers provided most of the initial care. More than half of patients (58%) arrived at an ED within 1 hour of the RTI; however, transit time from the scene to an ED was longer than an hour for a significant proportion of patients, as treatment was often initiated on scene. Wait times were relatively short with only a small percentage of patients waiting more than 10 minutes before assessment and treatment was initiated. The major body regions of injury were head (72%) and extremities (61%). More than a half (59.2%) had ISS scores between 25 and 49, which is indicative of a severe injury (**Table 1**). **Table 2** highlights the distribution of patients who were in shock on discharge based on their shock/no shock status on ED admission and their admission ISS scores. No patient was discharged home, most were discharged from the ED to a general ward in the hospital or less commonly to the ICU or immediate surgery (**Table 3**). A total of 17 individuals were deceased on arrival at an ED and another 109 patients died after discharge from an ED.

Table 1 Frequency of variables regarding contextual environment, population and health outcomes (n=503)

Variables	How defined; source of data	How measured/ categorized	Frequency % (N)
1. CONTEXTUAL ENVIRONMENT			
a. Pre-hospital			
Type of responder (categorical)	On-scene care providers; interview & ED[1] record	Bystander	6 (30)
		Volunteer[2]	71 (357)
		Ambulance-based HCP[3]	23 (116)
On-scene care (dichotomous)	Requiring CPR or not; ED record	CPR[4] provided	1.6 (8)
		no CPR provided	98.4 (495)
Time from scene to ED (categorical)	Time from leaving scene to arrival at an ED; ED record	< 60 min[5]	57.7 (290)
		≥ 60 min	42.3 (213)
b. ED care			
Wait time (categorical)	Time from triage to initiation of treatment; ED record	Immediate care	84.1 (423)
		1-10 min	10.7 (54)
		≥ 11 min	5.2 (26)
Years of triage experience collected in relation to each participant. (categorical)	Triage experience of nurse who provided triage; interview	1-5 yrs[6]	37 (186)
		6-10 yrs	27.6 (139)
		11-20 yrs	30.4 (153)
		≥ 21 yrs	5 (25)
Severity of Injury (categorical)	As rated by ED staff on admission using the ISS[7]; ED record	16-24	196 (39)
		25-49	293 (58.3)
		≥ 50	14 (2.8)
Total time in ED (categorical)	From arrival to discharge in mins; ED record	≤ 60 min	6.2 (31)
		6-120 min	36.4 (183)
		121-180 min	24.3 (122)
		181-240 min	12.3 (62)
		241-300 min	7.8 (39)
		≥ 301 min	13.1 (66)
2. POPULATION CHARACTERISTICS			
Age (continuous)	Interview & ED record	In yrs[8]	Mean=34.7 (SD[9] 16.4)
Sex (dichotomous)	Male or female; ED record	Male	422 (83.9)
		Female	81 (16.1)
RTI[10] details			
Type of vehicle (categorical)	Type involved in the RTI; Interview & ED record	Motorcycle	79.3 (399)
		Personal car or truck	7.6 (38)
		Other type of vehicle or pedestrian	13 (66)
		Pedestrian	8.9 (45)

Table 1 Frequency of variables regarding contextual environment, population and health outcomes (n=503) (Cont.)

Variables	How defined; source of data	How measured/ categorized	Frequency % (N)
Participant position in vehicle (categorical)	Where the participant was at the time of the RTI; Interview & ED record	Driver Passenger Pedestrian	78.5 (395) 12.5 (63) 8.9 (45)
Shock on admission; dichotomous	MSI[11] score (< 0.7 or >1.3); calculated by research team	Yes No	38.6 (176) 61.4 (309)
Safety devices employed (dichotomous)	Helmets for motorcycles or bicycles, seat belts for cars/ trucks; Interview & ED record	Yes No	10.9 (55) 89.1 (448)
Use of alcohol (dichotomous)	Prior to or at time of RTI; Interview & ED record	Yes No	37.2 (187) 62.8 (316)
3. HEALTH OUTCOME			
Shock at discharge from ED; dichotomous		Yes No	35 (176) 65 (327)

Legend: 1=emergency department; 2=volunteer from a foundation; 3=health care professional; 4=cardiopulmonary resuscitation; 5=kilometers; 6=minutes; 7= Injury Severity Score; 8= years; 9=standard deviation; 10=road traffic injury; 11=Modified Shock Index

Table 2 Frequencies of shock on discharge and ISS scores by shock status1 on ED arrival (n=503)

	Shock on ED arrival 38.6% (194/503)	No shock on ED arrival 61.4% (309/503)
Shock on discharge from ED[2]	55.7% (108)	22.0% (68)
No shock on discharge from ED	44.3% (86)	78.0% (241)
ISS scores		
16-24	31.4% (61)	43.7% (135)
25-49	63.4% (123)	55% (170)
≥ 50	5.2% (10)	1.3% (4)

Legend: 1= shock or no shock according to MIS value; 2=emergency department

Table 3 Patient destinations from ED and deaths by destination (n = 503)

Destination	Total n =503 % (n)	Deaths after discharge from ED % (n)
Operating room for surgery	30.6 (159)	0
Transfer to ICU	20.2 (105)	59 (62/105)
Transfer to general ward	46 (239)	19.7 (47/239)

Univariate analysis of all the variables of interest revealed four variables that were significantly associated with shock on discharge from the ED (**Table 4**). Those that took longer to be transported to an ED, arrived in shock, spent from 3 to 5 hours in the ED and had an ISS score between 25 and 49 were more likely to have MSI scores indicative of shock in discharge from the ED. Interestingly, the type of responder and what care was provided at the scene, and many of the population demographics and triage experience were not significantly related to shock on discharge. Three variables (spending 2-3 hours, or more than 5 hours, in the ED and those with ISS scores greater than 49) showed a trend towards significance. **Table 5** highlights the results of multivariate logistical regression analyses. The same four variables that were significant in the univariate analyses remained so in the regression model, reinforcing the importance of timing in transporting patients to an ED, the presence of shock on admission to the ED, the severity of the injuries and the total time spent in the ED to the incidence of shock on discharge. However, the three variables that showed a trend towards significance when analyzed on their own became insignificant when put in the regression model with all the other variables.

Table 4 Results of the univariate analyses: Variables that were significantly associated with shock on discharge (n = 503)

Variables	Pseudo R^2	Wald	Shock on Discharge		
			Odds Ratio	95% Confidence Interval	p-value
Shock on arrival (N)					
No (n=309)	.153	56.09	1	Ref.	
Yes (n=194)			.225	.152-.332	0.000*
Total time in ED					
1-60 min (n=31)			1	Ref.	
61-120 min (n=183)			.554	.258-1.192	.131
121-180 min (n=122)	.018	6.42	.492	.222-1.092	.081
181-240 min (n=62)			.354	.144-.870	.024*
241-300 min (n=39)			.368	.137-.992	.048*
≥ 301 min (n= 66)			.469	.196-1.120	.088
Total transport time to ED					
< 60 min (n= 290)	.013	4.73	1	Ref.	
≥ 60 min (n= 213)			.658	.451-.959	.030*
Severity of Injury					
ISS 16 -24 (N=196)	.023	8.38	1	Ref.	
ISS 25 -49 (N=293)			1.699	1.149-2.513	.008*
ISS > 50 (N=14)			2.630	.881-7.846	.083

Table 5 Results of the multivariate regression analysis: variables that significantly impact the incidence of shock on discharge from the ED (n = 503)

Variables	Pseudo R^2	Beta	Wald	Shock on discharge from ED		
				OR	95% CI	P-value
Constant	.093	-.858	8.010			
Shock on arrival				2.13	1.414-3.218	.000*
Total time in ED						
61-120 min				.633	.282-1.421	.267
121-180 min				.514	.221-1.193	.121
181-240 min				.341	.131-.884	.027*
241-300 min				.311	.109-.886	.029*
≥ 301 min				.472	.187-1.191	.112
Total transport time to ED				.568	.377-.854	.007*
Severity of Injury						
ISS 25-49				1.560	1.042-2.335	.031*
ISS ≥50				1.622	.499-5.273	.421

Discussion

In general, the Anderson's Behavioral Model of Health Service Use served as a useful framework for the study, highlighting the various contextual and patient characteristics that potentially influenced the outcome of interest. However, only one patient characteristic (shock on arrival to the ED) was found to be related to the incidence of shock on discharge from the ED. The remaining three significant variables were contextual in nature. It is likely that the severity of injury of all the participants in this study overshadowed any contribution that other patient characteristics may have had in previous studies. [25]

On arrival to the ED, a total of 194 patients demonstrated shock (MSI<0.7 or >1.3) and, at discharge from the ED to other hospital services, more than half of these patients remained in shock. Four factors emerged as predictors of risk for shock on discharge. Severity of injuries is well recognized as being closely associated to mortality and morbidity.[34] Only ISS scores between 25 and 49 (indicative of severe injuries) were associated with shock on discharge from the ED. Contributing to this finding is that 62.3% of patients with severe injuries (ISS score>25) had a moderate to severe traumatic brain injury with associated injuries, such as facial or chest injuries. These injuries can result in altered consciousness and respiratory system failure, leading to decreased oxygen perfusion of the vital organs, thus compounding the effects of intravascular volume depletion and hypovolemic shock.[35-37] The majority of those with scores 50 and above (9/14) were immediately transferred out of the ED, which may account for the finding of statistical non-significance for that category of ISS scores in the multivariate regression model.

Time in the ED was another predictive variable. However, this variable reflects multiple dynamic components. It would be expected that those patients that were rapidly sent to ICU or required immediate surgery upon arrival would be more likely to arrive at an ED in shock and remain in shock on discharge from the ED. However, that was not always the case. For example, of the patients who were transferred to ICU and later died from their injuries, 71% had ISS scores in the 25-29 range and 35.5% were not in shock on arrival. Access to specialized cardiopulmonary support equipment and higher staff: patient ratio may also influence decisions about ICU transfer.

Separating the time in ED into discrete time periods allowed us to remove those that were rapidly assessed and discharged and highlight that shock can remain or emerge after 3 to 5 hours of ED care. Indeed, the 101 patients (62 + 39) who spent 3 to 5 hours in the ED made up the majority of the total patient population who were in shock on discharge. This underscores the importance of ongoing assessment of hemodynamic status in the ED. Developing shock after admission can arise from many alterations in physiological perfusion-related processes.[22,24] Continuous scheduled monitoring that includes BP, mean arterial pressure, oxygen saturation and respiratory rate is routine throughout the emergency phase of trauma.[22] However, our findings suggest that using these cardiopulmonary data to calculate MSI scores on an ongoing basis may be of benefit, especially to those patients whose initial ISS scores are between 25 and 49. Transit time from the scene to an ED was also a significant factor. This finding is similar to previous studies that showed that the quicker seriously and severely injured individuals can access skilled trauma assessment and treatment, the better the health outcomes.[38]

Interestingly, three contextual factors that have been shown to affect health outcomes in previous studies were found not to make a significant contribution to shock on discharge in this study. Although Thailand does not meet the pre-hospital standards of the National Institute for Emergency Medicine in Thailand related to the training and credentials of first responders,[6] it does have a national pre-hospital trauma system. Foundation members volunteering as first responders have been in place for more than 20 years and a nation-wide emergency telephone number is in place. Foundation members and ambulance staff are directed to the nearest appropriate emergency department. Budget constraints make it unlikely that the routine use of foundation volunteers for on-scene care will be replaced or augmented with healthcare professionals. Whether CPR was provided on the scene of an accident did not affect the risk of shock at ED discharge, which differs from other studies regarding pre-hospital care in developing countries.[10,11] However, their outcomes examined mortality and morbidity, rather than the specific clinical outcome related to shock.

Perhaps there was a "ceiling effect" that under-laid the lack of significance in terms of triage experience. Even with limited experience (1 to 5 years), nurses would be more likely to accurately assess and score a more severely injured person than those that have lower ISS scores. Some hospitals in the study expressed that although they were experiencing critical ED staff shortages, they routinely assigned the more experienced nurses to triage. This may also have impacted our results.

Limitations

Many factors beyond the studied variables can affect clinical outcomes in patients who experience RTI. The multiplicity of process elements across the entire trajectory of care from on-scene care to ED care and beyond can also impact mortality and morbidity. Important confounds (both population and contextual characteristics) include medications that can directly or indirectly affect cardiovascular status, staff expertise in delivering trauma care, the availability of space to transfer patients out of the ED and the health status of individuals prior to the RTI. We considered only one clinical outcome at one time point, which limits any general statements in terms of improving overall health-related outcomes post-RTI.

Conclusions and Implications for Nursing Practice

RTIs have serious implications for the individual, their families and the health care system. In this study 25% of those that were involved in an RTI either died on transit to an ED (n=17) or after transfer to ICU or a general ward (n=109). Of those that arrived in an ED after an RTI (n=503), the incidence of shock on discharge from the ED was 35%. Transit time to an ED, the severity of their injuries, whether they were in shock on arrival and time spent in ED care all made significant contributions to whether they were in shock on discharge. Shock is a life-threatening circumstance and its presence needs to be identified quickly and accurately to establish a baseline and then monitored on an ongoing basis to identify a change in status in such a physiologically unstable population. The MSI provides such identification. Although the MSI must be calculated, the time required to calculate the score could be minimized by having the formula readily available in the trauma record or easily accessed via electronic means. Accordingly, on ED arrival emergency nurses should use the MSI as a routine component of care for those with moderately to severe injuries to identify patients' hemodynamic status. This can then be used as a baseline from which to systematically identify any changes in hemodynamic status patients throughout their stay in the ED. Our findings suggest that further study on the superiority of routine use of MSI over recording HR and BP in the ED could be advantageous and lead to its inclusion in best practice guidelines.

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อุบัติการณ์ของการเกิดภาวะช็อกในผู้บาดเจ็บจากการจราจรทางบกที่เข้ารับการรักษาในแผนกฉุกเฉิน

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บทคัดย่อ: อุบัติเหตุจากการจราจรทางบกเป็นปัญหาสำคัญในประเทศไทยที่ส่งผลต่อการเสียชีวิตก่อนวัยอันควรและพิการอย่างถาวรในบุคคลวัยผู้ใหญ่ตอนต้น การเกิดภาวะช็อกเป็นผลลัพธ์ทางคลินิกที่สำคัญสำหรับผู้ป่วยกลุ่มนี้ การวิจัยแบบตัดขวางครั้งนี้มีวัตถุประสงค์เพื่อหาอุบัติการณ์และปัจจัยทำนายการเกิดภาวะช็อกในผู้ป่วยบาดเจ็บระดับปานกลางหรือรุนแรงจากอุบัติเหตุการจราจรทางบกขณะที่ได้รับการจำหน่ายจากแผนกฉุกเฉินของโรงพยาบาล 12 แห่งในประเทศไทย กลุ่มตัวอย่างประกอบด้วย ผู้บาดเจ็บจากการจราจรทางบกจำนวน 503 คนที่มีค่าคะแนนความรุนแรงของการบาดเจ็บตั้งแต่ 16 คะแนนขึ้นไป โดยเก็บข้อมูลที่เกี่ยวข้องกับปัจจัยด้านผู้ป่วยและปัจจัยด้านบริบทจากแฟ้มประวัติของผู้บาดเจ็บ การสัมภาษณ์ผู้บาดเจ็บ ญาติและพยาบาลที่ทำหน้าที่คัดแยกผู้บาดเจ็บ ใช้เครื่องมือมาตรฐานเพื่อประเมินความรุนแรงของการบาดเจ็บและการเกิดภาวะช็อก วิเคราะห์ข้อมูลโดยใช้สถิติพรรณนาและสถิติการวิเคราะห์ถดถอยโลจิสติกแบบตัวแปรเดียวและหลายตัวแปร

ผลการศึกษาพบว่า กลุ่มตัวอย่างประกอบด้วย ผู้บาดเจ็บ ส่วนใหญ่เป็นเพศชาย ไม่สวมหมวกนิรภัย และดื่มแอลกอฮอล์ขณะขับรถจักรยานยนต์ ร้อยละ 35 ที่ยังคงมีภาวะช็อกขณะที่ได้รับการจำหน่ายออกจากแผนกฉุกเฉินจะถูกย้ายไปรับการรักษาต่อยังหอผู้ป่วยวิกฤต หรือห้องผ่าตัด ระยะเวลาในการส่งต่อจากจุดเกิดเหตุจนถึงโรงพยาบาล, ความรุนแรงของการบาดเจ็บ, ภาวะช็อกก่อนถึงแผนกฉุกเฉิน และระยะเวลาในการเข้ารับการรักษาในแผนกฉุกเฉิน มีผลต่อภาวะช็อกขณะที่ได้รับการจำหน่ายออกจากแผนกฉุกเฉินอย่างมีนัยสำคัญ จากผลการศึกษา มีข้อเสนอแนะว่า พยาบาลควรนำค่าดรรชนีภาวะช็อกไปใช้เป็นเครื่องมือเฝ้าระวังภาวะช็อกสำหรับผู้ป่วยบาดเจ็บรุนแรงระหว่างการรักษาตัวในแผนกฉุกเฉิน ในการศึกษาครั้งต่อไปควรศึกษาเปรียบเทียบคุณสมบัติของค่าดรรชนีภาวะช็อก กับระดับสัญญาณชีพที่แสดงค่าการทำงานของหัวใจและการไหลเวียนอื่น ๆ เพื่อแสดงให้เห็นถึงความตรง ความเที่ยง และความถูกต้องของค่าดรรชนีภาวะช็อกทั้งนี้เพื่อนำไปใช้เป็นแนวปฏิบัติในการเฝ้าระวังและการประเมินผู้ป่วยกลุ่มนี้อย่างมีคุณภาพ

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คำสำคัญ: คะแนนความรุนแรงของการบาดเจ็บ ดรรชนีแสดงภาวะช็อกฉบับปรับปรุง อัตราการเจ็บป่วยและอัตราการเสียชีวิต ผู้บาดเจ็บจากการจราจรทางบก ภาวะช็อก

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