A Comparison of the Acute Physiology and Chronic Health Evaluation (APACHE) II Score and The Trauma-Injury Severity Score (TRISS) for Outcome Assessment in Srinagarind Intensive Care Unit Trauma Patients

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Objective: *To assess the ability of the Acute Physiology and Chronic Health Evaluation (APACHE II) system and Trauma-Injury Severity Scoring (TRISS) system in predicting group mortality in intensive care unit (ICU) trauma patients.*
Material and Method: *The trauma patients admitted to ICU at Srinagarind Hospital between June 2008 and December 2010 were studied. For each patient, demographic data, mechanism of injury and surgical status were collected. The probability of death was calculated for each patient based on the APACHE II and TRISS equations. The ability to predict group mortality for APACHE II and TRISS was assessed by receiver operating characteristic curve analysis, two by two decision matrices and calibration curve analysis.*
Results: *One hundred and thirty-two trauma patients were admitted to the ICU. Twenty-seven (20%) patients died and hundred and five (80%) survived. There were significant differences between survivors and non-survivors in Glasgow Coma Scale, Revised Trauma Score, Injury Severity Score and APACHE II score. By receiver operating characteristic (ROC) curve analysis, the areas under the curves (± SEM) of APACHE II and TRISS were 0.89 ± 0.04 and 0.83 ± 0.04, respectively. Using two by two decision matrices with a decision criterion of 0.5, the sensitivities, specificities and percentages correctly classified were 44.4%, 98.1% and 87.1%, respectively, for APACHE II and 25.9%, 98.1% and 83.3%, respectively, for TRISS. From the calibration curves, the r^2 value was 0.99 (p = 0.0001) for APACHE II and 0.98 (p = 0.0001) for TRISS.*
Conclusion: *Both APACHE II and TRISS scores were shown to accurately predict group mortality in ICU trauma patients. APACHE II and TRISS may be utilized for quality assurance in ICU trauma patients. However, neither APACHE II nor TRISS provides sufficient confidence for prediction of outcome of individual patients.*

Keywords: *Acute physiology and chronic health evaluation (APACHE) II score, Trauma-injury severity score (TRISS), Trauma outcome assessment*

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In recent years, several trauma scoring systems have been developed and validated for use in prediction of outcome, quality assurance and research. These scoring systems include the Trauma Score, Revised Trauma Score, Injury Severity Score, Trauma-Injury Severity Score combination index (TRISS), and A Severity Characterization of Trauma (ASCOT)[1-5]. TRISS combines physiologic and anatomic components of injury with age to characterize the severity of injury. TRISS has become the most widely used and accepted scoring system for trauma outcome assessment and quality assurance[6].

The Acute Physiology and Chronic Health Evaluation (APACHE II) system has been validated in outcome prediction and quality assurance in adult intensive care unit (ICU) patients[7-9]. The APACHE II score consists of 12 physiologic variables, premorbid health, and patient age; however, it does not have a component for anatomical injury in trauma patients. Despite this limitation, APACHE II has been found to compare favorably with the Revised Trauma Score and Injury Severity Score in predicting outcome in critically injured trauma patients[10,11]. Other reports[12,13],

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however, dispute the ability of the APACHE II system in predicting outcome in ICU trauma patients.

The purpose of this investigation was to study the ability of the APACHE II system in predicting group mortality in ICU trauma patients and to compare its predictive ability with that of TRISS methodology.

Material and Method

After institutional approval, data were collected prospectively for all trauma patients admitted to the surgical ICU or neurosurgical ICU or burn unit, Srinagarind tertiary referral hospital between June 2008 and December 2010. Demographic data, mechanism of injury and surgical status were recorded for each patient. Data on admission to the emergency department were collected for calculation of the Revised Trauma Score and the Injury Severity Score. The Revised Trauma Score[4] has three components: Glasgow Coma Scale, systolic blood pressure, and respiratory rate. The most abnormal physiologic values during the emergency room period were recorded. The Revised Trauma Score is the sum of the coded value multiplied by the weight for each of the three variables (Table 1). Possible values of the Revised Trauma Score range from 0 to 7.84. It has been demonstrated that there is an inverse relationship between mortality rate and the Revised Trauma Score[2,4]. Higher Revised Trauma Score values are associated with a lower mortality rate. Injury Severity Score[3] is an index of the severity and extent of anatomical injury derived at the time of emergency room care and in the operating room. It is calculated by summing the square of each of the coded values of the three most severely injured body regions. The range of values for the Injury Severity Score is from 0 to 75. There is a direct relationship between mortality and Injury Severity Score. APACHE II[14] scores were calculated for each patient from data collected during the first 24 hrs of ICU admission. The APACHE II score consists of three parts: Acute Physiology score (12 variables, maximum 60 points), Chronic Health score (premorbid major organ dysfunction, maximum 5 points) and age score (maximum 6 points). The range of APACHE II score is from 0 to 71 points. There is a linear relationship between the hospital death rate and the APACHE II score[7,14]. Hospital outcome, defined as survival, was recorded for all patients.

Patient age, Glasgow Coma Scale score, Revised Trauma Score, Injury Severity Score and APACHE II score were analyzed for survivors compared with non-survivors by use of the Student's t-test. Probability values of < 0.05 were accepted as statistically significant. The probability of death was calculated for each patient, using the APACHE II and TRISS equations (Fig. 1 and 2)[4,14]. The accuracy of group outcome prediction by the APACHE II and TRISS methodologies were compared in three ways: a) receiver operating characteristic curves; b) two by two decision matrices and c) calibration curves with r^2 values[15].

Receiver operating characteristic curves was constructed for APACHE II and TRISS from the patients' predicted and observed hospital outcomes. A plot of true positive rate against false positive rate was made and the area under the curve was derived. The area under the curve is a measure of the overall discriminatory power of the prognostic variable with a value of 0.5 equaling random prediction, and a value of 1.0 indicating perfect discrimination. The areas under the curves of APACHE II and TRISS were compared, using the nonparametric Wilcoxon method of Hanley and McNeil[16].

Two by two decision matrices were constructed to compare the accuracy of prediction of outcome, using the two systems with decision criteria of 0.5 and 0.6 as cut-offs. At a decision criterion of 0.5, patients with a calculated probability of death > 0.5 were predicted to die, while those patients with a probability of death of ≤ 0.5 were predicted to survive. Sensitivities, specificities, percent correct classification, false positives, positive predictive values, false negatives and negative predictive values were calculated from the two by two matrices.

The observed death rates were plotted against predicted death rates stratified by 10% risk ranges in calibration curves for APACHE II and TRISS. The observed death rates for the stratified risk groups were calculated by totaling the number of deaths divided by the number of patients in that stratified risk group. Linear regression analysis was applied and an r^2 value was obtained[15]. The r^2 value represents the proportion of variation of the dependent variable (observed death rate) that is explained by the independent variable (predicted death rate). An r sup 2 of 1.0 indicates that all the plotted points lie on a straight line and that the dependent variable can be predicted from the independent variable with 100% certainty. If a predictive model fits the study data well (*i.e.*, calibrated), the observed and predicted death rates will be approximately equal across the full range of predicted risk. This fit is depicted graphically by a curve fit for the data points lying on a 45 degrees line with a slope of 1. A slope of > 1 implies that the predictive model underestimated the actual death rates, while a slope of

Ps = Probability of survival.

Four variables are used to calculate the Ps of trauma patients: a) mechanism of injury; b) age; c) Revised Trauma Score (RTS); and d) Injury Severity Score (ISS).

$Ps = 1/(1 + e^{-b})$, where e = 2.718 (base of natural logarithm), and $b = b_0 + b_1 (RTS) + b_2 (ISS) + b_3 (age)$

1. Specific set of coefficients (b_0, b_1, b_2, b_3) for penetrating and blunt trauma.

2. Age = 1 if patient's age is $\geq$55 yrs, otherwise age = 0.

3. RTS consists of three physiologic variables: a) Glasgow Coma Scale (GCS); b) systolic blood pressure (SBP); and c) respiratory rate (RR). It has a range from 0 to 7.84.

   $RTS = (GCSCV \times 0.9368) + (SBPCV \times 0.7326) + (RRCV \times 0.2908)$, where GCSCV, SBPCV, RRCV represent coded integer values ranging from 1 to 4, depending on how abnormal these physiologic variables are.

4. ISS is an index of severity and location of anatomy injury. It ranges from 0 to 75. It is calculated by summing the square of the coded value of the three most severely injured body regions.

POD (Probability of Death) = 1 – Ps

Example: A 40-yr-old patient involved in blunt trauma. ISS = 45; GCS = 9; SBP = 90 mm Hg; and RR = 36 breaths/min. The coded values for GCS, SBP, and RR are 3, 4, and 3, respectively. Age = 0, since the patient's age is <55 yrs. A coefficient for blunt trauma is used: $b_0 = -1.2470$, $b_1 = 0.9544$, $b_2 = -0.0768$, and $b_3 = -1.9052$. RTS = (Glasgow Coma Score coded value × 0.9368) + (systolic blood pressure coded value × 0.7326) + (respiratory rate coded value × 0.2908). Thus, $RTS = 3 \times 0.9368 + 4 \times 0.7326 + 3 \times 0.2908$, which is = 6.6132.

$Ps = 1/(1 + e^{-b})$, and $b = b_o + b_1(RTS) + b_2(ISS) + b_3(A)$.
Here, $b = -1.2470 + (0.9544)(6.6132) + (-0.0768)(45) + (-1.9052)(0) = -1.2470 + 6.3117 - 3.456 + 0 = 1.6087$.

$Ps = 1/(1 + 2.718^{-1.6087}) = 1/(1 + 0.2014) = 0.8332$.
Therefore, POD = 1 – Ps = 0.17 or 17%.

Fig. 1 Trauma-Injury Severity Score (TRISS) Probability of Death (POD) Equation

$POD = e^x/(1 + e^x)$; $x = -3.517 + (\text{APACHE II score} \times 0.146) + DCW + ESW$, where e is 2.718 (base of natural logarithm), POD is probability of death, DCW is diagnostic category weight, and ESW is emergency surgery weight.

Example: For a nonoperative patient with a diagnosis of head trauma, ESW = 0, DCW = –0.517, and APACHE II = 25. Thus, $x = -3.517 + (25 \times 0.146) + (-0.517) + 0$, which = –0.384. $POD = e^x/(1 + e^x) = 0.405$ or 40.5%.

Fig. 2 Acute Physiology and Chronic Health Evaluation (APACHE) II Probability of Death (POD) Equation

< 1 represents overestimation of actual death rates.

Results

A total of 132 trauma patients were admitted to the ICU over the study period. Twenty-seven (20%) patients died while 105 (80%) survived. Demographic data, surgical status and mechanism of injury are provided (Table 1, Table 2). There were significant differences in Glasgow Coma Scale, Revised Trauma Score, Injury Severity Score and APACHE II score between survivors and non-survivors (Table 3).

The receiver operating characteristic curves for APACHE II and TRISS are shown (Fig. 3). The area under the curve $\pm$ SEM were 0.89 $\pm$ 0.04 for APACHE II

Table 1. Demographics and surgical status of 470 intensive care unit (ICU) trauma patients

Gender (%)	
Male	106 (80.3)
Female	26 (19.7)
ICU (%)	
SICU	119 (90.2)
MICU	0 (0)
Burn	13 (9.8)

Table 2. Mechanism of injury

Type of Injury	Number	(%)
Non-penetrating		
Motor Vehicle Accident	86	65.1
Fall	3	2.3
Assault	5	3.8
Other*	7	5.3
Total	101	76.5
Penetrating		
Gun shot	15	11.4
Stab	16	12.1
Total	31	23.5

*Industrial, Self-inflicted, Recreational

and 0.83 $\pm$ 0.04 for TRISS. These values were not significantly different (p = 0.249). The two by two decision matrices for the two methodologies at decision criteria of 0.5 and 0.6 are shown in Table 4 and the predictive abilities for each methodology are shown in Table 5. The sensitivities, specificities, correct classification rates, false positives, positive predictive values, false negatives and negative predictive values were comparable between the two methods. For both APACHE II and TRISS, at a decision criterion of 0.5, although the correct classification rates were > 80%, the false-positive rates (predicted to die but actually survived) were less than > 25%. At a decision criterion of 0.6, the false-positive rates changed to 22.2% and 14.3%, respectively, for APACHE II and TRISS. However, the sensitivity and correct classification rates were lower compared with decision criterion of 0.5.

The calibration curves for APACHE II and TRISS are shown (Fig. 4). Both APACHE II and TRISS predicted death rates were significantly correlated to observed death rates (p = 0.0001 and 0.0001, respectively). The r^2 (0.99) from APACHE II was higher than the r^2 (0.98) from TRISS. However, neither regression line lies on the 45 degrees line. The slopes of regression lines were 0.82 (95% confidence interval 0.20 to 1.10) and 0.86 (95% confidence interval 0.38 to 2.04), respectively, for APACHE II and TRISS. Both APACHE II and TRISS predicted death rates were over estimated actual observed death rates.

Discussion

The present study population consisted of 132 ICU trauma patients; 80% were male, 20% were female. The gender distribution and proportion of nonpenetrating trauma patients are representative of the Khon Kaen trauma populations[17,18]. APACHE II and TRISS scores were found to be good predictors of group mortality by receiver operating characteristic curves, two by two decision matrices at a criterion of 0.5 and calibration curves.

TRISS methodology combines the Revised Trauma Score (a measure of the physiologic response to injury), the Injury Severity Score (describing the site and severity of injury), a classification of the type of injury (blunt or penetrating) and patient age[4,6]. It has been widely used in the assessment of trauma and in the prediction of group outcome. TRISS has been used in quality assurance programs for evaluating trauma care and in identifying unexpected deaths for review[4,6]. It assesses three physiologic variables (Glasgow Coma Scale, systolic blood pressure and respiratory rate), and does not include an evaluation of chronic health status. Nevertheless, TRISS has been found to perform well in predicting outcome in ICU trauma patients[12].

APACHE II was developed as a severity of illness scoring system for adult ICU patients in 1985. It consists of 12 physiologic variables, chronic health status, and age. The APACHE II system has since been validated in its ability to predict group outcome in ICU patients[7,19-21]. Eight studies[10-13,22-25] have assessed the abilities to predict group mortality in critically injured trauma patients utilizing APACHE II, TRISS, Injury Severity Score, or the Trauma Score. In 1993, Rutledge et al[10] used stepwise discriminate analysis to compare the APACHE II score with the Trauma Score and the Injury Severity Score as predictors of outcome in 428 critically injured trauma patients. Rutledge et al[10] found that the APACHE II score was the best predictor of hospital and ICU mortality. Limitations of this study include its retrospective design and that the actual partial r^2 values in stepwise discriminate analysis were not shown. In 1990, Rhee et al[11] prospectively assessed the APACHE II score, the Trauma Score and the Injury Severity Score as predictors of mortality in 691 helicopter transported trauma patients. Simple and

Table 3. Age, Glasgow Coma Scale (GCS) score, Revised Trauma Score (RTS), Injury Severity score (ISS) and APACHE II score (mean ± SD)

	All (n = 132)	Alive (n = 105)	Dead (n = 27)	p-value*
Age	31.34 ± 18.12	29.83 ± 17.05	37.22 ± 21.15	0.058
GCS	10.80 ± 4.39	11.72 ± 3.92	7.22 ± 4.34	< 0.001
ISS	18.61 ± 9.44	17.09 ± 9.53	24.52 ± 6.32	< 0.001
RTS	6.50 ± 1.51	6.86 ± 1.15	5.09 ± 1.91	< 0.001
APACHE II	12.36 ± 9.14	9.54 ± 6.47	23.29 ± 9.85	< 0.001

*Alive compared with dead group

Table 4. Two by two decision matrices for APACHE II and TRISS with decision criteria of 0.5 and 0.6

Actual Outcome	Predicted Outcome (Decision Criterion of 0.5)			
	APACHE II		TRISS	
	Dead	Alive	Dead	Alive
Dead	12	15	7	20
Alive	2	103	9	123
Actual Outcome	**Predicted Outcome (Decision Criterion of 0.6)**			
	APACHE II		TRISS	
	Dead	Alive	Dead	Alive
Dead	9	18	6	21
Alive	2	103	1	104

Table 5. Predictive abilities of APACHE II and TRISS at decision criteria of 0.5 and 0.6

	Decision Criterion 0.5		Decision Criterion 0.6	
	APACHE II (%)	TRISS (%)	APACHE II (%)	TRISS (%)
Sensitivity	44.4	25.9	33.4	22.2
Specificity	98.1	98.1	98.1	99.1
Correct classification	87.1	83.3	84.8	83.4
False positive	14.3	22.2	18.2	14.3
False negative	12.7	16.3	14.9	16.8
Positive predictive value	85.7	77.8	81.8	85.7
Negative predictive value	87.3	83.7	85.1	83.2

stepwise logistic regression showed that all three scoring systems significantly predicted mortality. The area under the receiver operating characteristic curve was highest (0.85) for APACHE II. Thus, Rutledge et al[10] and Rhee et al[11] concluded that APACHE II was a good predictor of mortality in ICU trauma patients and it performed better than the Trauma Score and Injury Severity Score.

In 1992, Vassar et al[12] compared the ability to predict mortality in 1,000 ICU trauma patients using APACHE II, TRISS and a new 24-hr ICU point system. The 24-hr ICU point system has three components:

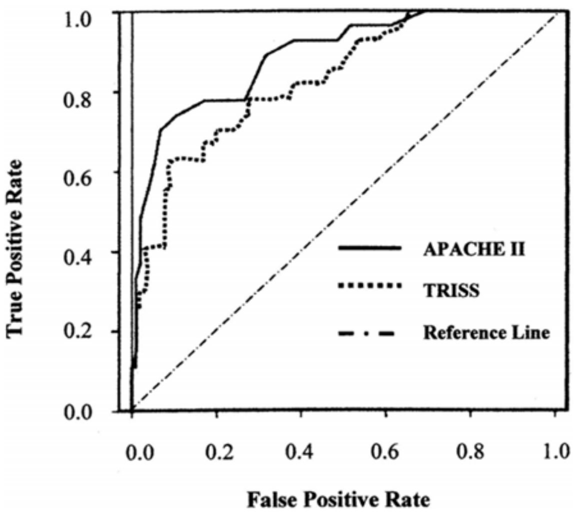

Fig. 3 Receiver operating characteristic curves for APACHE II and TRISS. Closed squares, the place at which APACHE II and TRISS points on the ROC curves coincide. The areas under the curves were 0.89 $\pm$ 0.04 and 0.83 $\pm$ 0.04 for APACHE II and TRISS, respectively

Glasgow Coma Scale, PaO_2/FIO sub 2 index and ICU fluid balance. Calibration curves showed that APACHE II underestimated mortality while TRISS over estimated mortality in patients with high predicted risk ranges. Goodness-of-fit analyses showed that both APACHE II and TRISS had poor agreement between observed and predicted outcome at various risk ranges. Vassar et al[12] concluded that the new 24-hr ICU point system gave the best predictions by calibration curve and goodness-of-fit analyses. Limitations of the present study include: a) its retrospective analysis; b) the 24-hr point system has not been validated elsewhere and c) area under the receiver operating characteristic curve is not given. In 1992, McAnena et al[13] studied 280 trauma patients who were enrolled in the hypertonic saline-dextran trial. All patients had a systolic blood pressure of < 90 mm Hg at initial assessment. Linear regression analysis showed that there was poor correlation between the APACHE II score and the Injury Severity Score and hospital length of stay. McAnena et al[13] did not assess the ability of APACHE II to predict hospital outcome. Results of the present study did not warrant the title of the article "Invalidation of APACHE II scoring system for patients with acute trauma".

The next four studies[22-25] assessing the outcome predictive abilities of scoring systems were limited by small sample sizes. All studies involved < 100 patients. Waters et al[22] found that APACHE II under estimated death rates for 47 patients with multiple trauma. Horst et al[23] studied 39 patients > 60 yrs of age with head trauma and multiple trauma. They showed that the Trauma Score, Injury Severity Score, or Acute Physiology Score did not predict survival. Rocca et al[24] found that the Acute Physiology Score, Glasgow Coma Scale, Simplified Acute Physiology Score and Therapeutic Intervention Scoring System were all weakly correlated to death rates in 70 patients with head trauma. The Glasgow Coma Scale was shown to be the best predictor of death by the receiver operating characteristic curve analysis. Lastly, Zagara et al[25] assessed the predictive ability of the APACHE II system in 76 patients with severe head injury (Glasgow Coma Scale score of $\leq$ 7). He found that APACHE II accurately predicted death at an APACHE II cutoff score of 20. The validity of the previous four studies was questionable due to the small sample sizes and limited statistical methodology.

Although there have been eight studies[10-13,22-25] which assessed the outcome predictive abilities of APACHE II and other trauma scoring systems, they have various problems and weaknesses. Limitations of these studies include: retrospective design[12-23], small sample sizes[22-25], case exclusions from final analyses[11-13,22,24], a large number of investigators collecting data[11,12] and the lack of multiple methodologies in assessing predictive ability[10,13,22-25]. In contrast, this present study is prospective in design, has a large number of patients, has an individual responsible for ICU data and a second individual for the trauma data collection and used three widely accepted statistical methodologies in assessing the predictive abilities of APACHE II and TRISS. The authors found that APACHE II and TRISS were good predictors of group mortality in ICU trauma patients by three different statistical methods.

There are several advantages of the APACHE system over TRISS in their application to ICU trauma patients. First, APACHE II consists of 12 physiologic variables while TRISS has three. It has been demonstrated that physiologic variables are the most powerful predictors of hospital outcome in ICU patients[26]. Second, the premorbid chronic health status is included in APACHE II but not TRISS. Sacco et al[27] and Milzman et al[28] concluded in independent studies that preinjury illness or organ dysfunction had a significantly adverse effect on survival of trauma patients. The inclusion of chronic health status can improve the ability to predict outcome in ICU trauma patients. However, there are several limitations to the APACHE system. First, APACHE II divides trauma

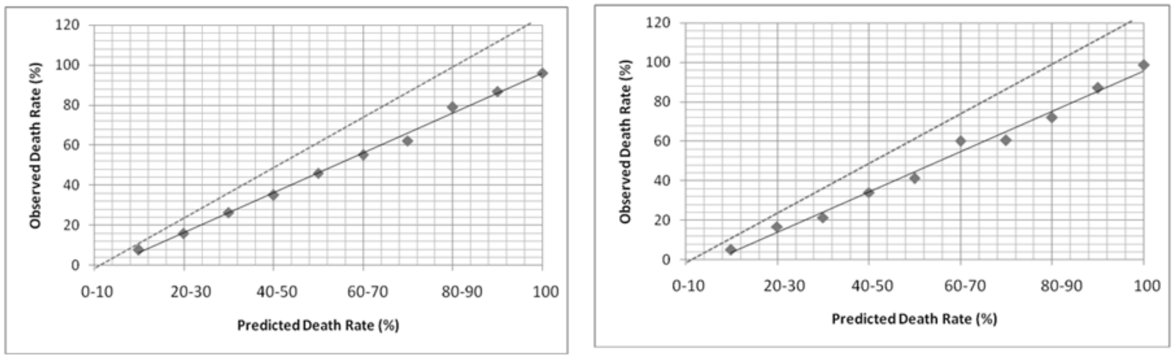

Fig. 4 Left: Calibration curve for APACHE II. The slope of the regression line is 0.82 and the r^2 value is 0.99 (p = 0.0001) Right: Calibration curve for TRISS. The slope of the regression line is 0.86 and the r^2 value is 0.98 (p = 0.0001) Open squares, observed death rates; solid line, the linear regression line representing curve fit for the data points; dotted line, a 45 degrees diagonal line with slope of 1. This line represents an ideal curve fit when the prediction is perfect

patients into those patients with head trauma or multiple trauma and into post-operative or non-operative groups. Patients with multiple system trauma in addition to head trauma are classified as having multiple trauma. The diagnostic weight is lower for multiple trauma compared with isolated head trauma. The authors found that APACHE-predicted risk of death under estimated actual risk for patients with multiple injuries in addition to head trauma. This finding is consistent with the findings of Vassar et al[29]. This deficiency in classification has been rectified in the newer APACHE III system[30,31]. APACHE II does not include an assessment of the mechanism of trauma or the specific anatomical injury. TRISS has a detailed account of the severity and location of anatomic injury. Second, APACHE II assesses the most abnormal physiologic data in the first 24 hrs of ICU care. Therefore, APACHE II scores are highly dependent on the level of care given to the trauma patient during resuscitation and the timing of ICU admission. TRISS is evaluated during the acute phase of trauma resuscitation.

The authors' results showed that both APACHE II and TRISS were good predictors of group mortality in ICU trauma patients. The authors encourage collection of APACHE data for all ICU patients. Therefore, APACHE II-predicted mortality can be utilized for quality assurance and identification of unexpected deaths and survivors in ICU trauma patients. However, neither system was found to be satisfactory in predicting individual outcome. In order to use predictive instruments to make patients' clinical decisions, The authors need to have false positives in death prediction of close to zero. Here, both systems have false-positive rates of approximate 20%. Also, calibration curves showed that both APACHE II and TRISS predicted death rates were over estimated actual observed death rates. Therefore, the role of APACHE II and TRISS should be confined to group outcome assessment and quality assurance, not individual outcome predictions.

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Potentail conflicts of interest

None.

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เปรียบเทียบผลการประเมินการรักษาโดยใช้ APACHE II และ TRISS ของผู้ป่วยอุบัติเหตุที่รับการรักษาในหอผู้ป่วยวิกฤตโรงพยาบาลศรีนครินทร์

ไชยยุทธ ธนไพศาล, พุฒิพงศ์ ศักดิ์แสน

วัตถุประสงค์: *เพื่อศึกษาความสามารถและความแม่นยำในการพยากรณ์อัตราการเสียชีวิตของผู้ป่วยอุบัติเหตุที่รับการรักษาในหอผู้ป่วยวิกฤต ระหว่างการใช้แบบประเมิน Acute Physiology and Chronic Health Evaluation system (APACHE II) และ Trauma-Injury Severity Scoring (TRISS)*

วัสดุและวิธีการ: *เป็นการวิจัยเชิงพรรณนาในผู้ป่วยอุบัติเหตุที่เข้ารับการรักษาในหอผู้ป่วยวิกฤต (ICU) โรงพยาบาลศรีนครินทร์ ตั้งแต่ 1 มิถุนายน พ.ศ. 2551 ถึง 30 สิงหาคม พ.ศ. 2553 โดยเก็บข้อมูลทั่วไปของผู้ป่วย, กลไกการบาดเจ็บ, การผ่าตัดและผลของการรักษา นำข้อมูลที่ได้มาคำนวณค่าโอกาสในการรอดชีวิตแล้วเปรียบเทียบความสามารถและความแม่นยำในการพยากรณ์อัตราการเสียชีวิตของผู้ป่วย*

ผลการศึกษา: *มีผู้ป่วยอุบัติเหตุที่เข้ารับการรักษาในหอผู้ป่วยวิกฤต จำนวน 132 ราย เสียชีวิต ร้อยละ 20 รอดชีวิต ร้อยละ 80 พบว่ามีความแตกต่างอย่างมีนัยสำคัญทางสถิติของ Glasgow Coma Scale, Revised Trauma Score, Injury Severity Score และ APACHE II score ระหว่างผู้ป่วยที่เสียชีวิตและผู้ป่วยที่รอดชีวิต แผนภูมิเปรียบเทียบความแม่นยำของการคำนวณอัตรารอดชีวิต พื้นที่ใต้กราฟของ APACHE II คือ 0.89 $\pm$ 0.04 และพื้นที่ใต้กราฟของ TRISS คือ 0.83 $\pm$ 0.04 ตามลำดับ การเปรียบเทียบค่าที่ได้จากการคำนวณและผลลัพธ์ที่เกิดขึ้นจริง พบว่าถ้าคำนวณ decision criterion ที่ 0.5 ทั้ง APACHE II และ TRISS มีซ่าขวามแม่นยำมากกว่า 80% จาก Calibration curves r^2 value ของ APACHE II มีค่า 0.99 (p = 0.0001) ส่วน TRISS r^2 value มีค่า 0.98 (p = 0.0001)*

สรุป: *ทั้ง APACHE II และ TRISS score เป็นเครื่องมือที่มีความแม่นยำในการพยากรณ์โอกาสเสียชีวิตของผู้ป่วยอุบัติเหตุที่เข้ารับการรักษาในหอผู้ป่วยวิกฤต*