# TISS 28 or SOFA: Good Predicting Factors for Admission in a Surgical Intensive Care Unit Longer than 24 Hours

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***Objectives:*** *To investigate the application of the Therapeutic Intervention Scoring System (TISS-28) and Sequential Organ Failure Assessment (SOFA) score to the surgical intensive care patients, and to find associated factors affecting length of stay (LOS).*
***Material and Method****: Prospective data; from 1st July 2004 to 31st December 2004 at Siriraj Hospital. TISS-28 and SOFA and other data were recorded within the first 24 hours of ICU admission.*
***Results:*** *Average TISS-28 and SOFA values for patients who required >24 hr ICU stay were significantly different from those who required < 24 hr ICU stay (29.7 $\pm$ 7.9 and 3.1 $\pm$ 2.8 points versus 19.4 $\pm$ 5.9 and 1.1 $\pm$ 1.9 points, respectively $p < 0.001$). The other independent predictors of LOS > 24 hrs were ventilator support; vasoactive agents administration, central venous line insertion, emergency operation, renal dysfunction, and post-operative fever.*
***Conclusion:*** *The severity scores (TISS 28 and SOFA) can sufficiently demonstrate the workload and also the good predictors of ICU length of stay.*

***Keywords:*** *Intensive care unit, Score systems, Therapeutic Intervention Scoring System, Severity of illness index*

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The Therapeutic Intervention Scoring System (TISS)[1,2] has been widely used and accepted as an instrument to measure therapeutic, diagnostic and nursing activities in intensive care. In 1996, a simplified version of TISS with only 28 items (TISS-28) was published by Reis Miranda et al[3] based on a detailed analysis of 10,000 records from the database of the Federation for Research on Intensive Care in Europe. This new TISS-28 score has already been widely used. In a recent report by Lefering, et al[4], it retrospectively showed that application of TISS-28 to adult patients admitted in a surgical Intensive Care Unit (ICU) can provide useful information of the patients. The Sequential Organ Failure Assessment score (SOFA) has also been successfully applied to critically ill patients[5-7]. The advantages of an accurate assessment of a surgical patient's risk include the opportunity to achieve a more accurate prognosis and the most appropriate treatment or intervention. If the risk of an adverse outcome is known for a group of patients, the actual outcome can be compared with the predicted outcome, and comparison can be made between groups in different surgical units for the purposes of audit or research[8].

The original APACHE II model can not precisely predict the mortality of Thai patients from a previous study[9]. The stepwise logistic regression to determine the predictors of death has found that in the presented postoperative patients from the surgical intensive care unit tended to have a higher mortality rate calculated with the original APACHE II model. Therefore, the widely used severity scoring systems may be or may be not the good predictors in Thai surgical patients. Due to this, the present study would like to investigate the predictive application of TISS-28 and SOFA to the first 24 hours on a database of adult surgical intensive care patients.

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## Material and Method

### *Patients and setting*

The surgical ICU of the Department of Anesthesiology, Faculty of Medicine, Siriraj Hospital, Mahidol University, Bangkok has fourteen beds. Postoperative patients who are eligible to get access to this unit are adult patients following all surgical services except trauma, neurosurgical, and cardiovascular procedures. Approximately half of the patients are admitted for postoperative observation and can leave the ICU within 24 h after admission.

### *Data collection*

All postoperative patients who stayed in the ICU longer than 12 hours were recruited into the present study. The documentation consisted of patients' demographic data, category of surgical service, anaesthesia techniques, indication for ICU admission, all interventions, complications and results of laboratory investigations for calculating the TISS 28 and SOFA scores. (One sentence about Glasgow Coma Scale was deleted because it was mentioned unnecessarily.) The documentation period (usually 24 h) started at 9 a.m. with the morning shift. Data collection was carried out independently of the ICU staff by members of the research team (AS and MS) and was audited by MR. As soon as inconsistencies of documentation were observed, the existing manual for data collection was updated in order to clarify definitions and to improve the identification of the sources of data in the patients' records.

### *Scores*

TISS-28 and SOFA score points were manually calculated within first 24 hours of ICU admission.

### *Statistics*

Data are presented as means and Standard Deviation (SD) where appropriate. Descriptive statistical tests (Chi-square or Fishers' exact test and student t tests) when appropriate were applied to differentiate the group of patients who could be safely discharged from the surgical ICU within 24 hours of ICU admission, the short stay group or the long stay, group who required ICU length of stay more than 24 hours. The p value < 0.05 was considered statistically significant. Stepwise logistic regression analysis was applied to evaluate all demographic data within the first 24 hours for prediction of the requirement of ICU admission longer than 24 hours in admitted patients. All variables achieving statistical significance at a 10% level in the univariate analysis were simultaneously considered in the multivariate model. The dependent variable (short ICU stay patients) was defined as success (patients were discharged safely from the ICU within the first 24 hours of ICU stay) or failure (patients remained in the ICU after 24 hours). Under appropriate conditions, coefficients of binary variables can be interpreted as natural logarithms of Odds Ratio (OR) adjusted for the linear effects of covariates with its 95% Confidence Interval (CI). Data analysis was performed with the statistical software package SPSS 11.0.

## Results

During the six-month study period, 562 admissions were recruited into the study. Five patients died in the ICU within 24 hours (0.9% of all admissions). Approximately half of the patients (317 patients, 56.4%) were discharged from the surgical ICU within the first 24 hours after ICU admission and were categorized as short ICU stay group. The basic characteristics of the patients included in the present study are shown in Table 1. Among the 562 patients documented, the sex and age were not different between the two groups. The majority of patients from the short stay group were elective (89.9%) while only 68.6% of the patients from the long stay group were elective ($p < 0.001$). The short stay group had a higher proportion of the short procedures (less than three hours). Both mean SOFA score and TISS-28 score from the short stay group and long stay group were statistically significantly different at the p value < 0.001; 1.1 $\pm$ 1.9 and 19.4 $\pm$ 5.9, and 3.1 $\pm$ 2.8 and 29.7 $\pm$ 7.9, respectively. The coincident underlying diseases did not differ significantly between the groups except renal problems, such as diabetes mellitus, hypertension, heart disease, and respiratory problems.

The proportion of surgical service in the long stay group was predominated with general surgery (54.7%), followed by orthopedic surgery (20%), head and neck procedures (9%), urologic procedures (8.2%), and obstetrics and gynecology (3.3%). The operative service differed significantly between the groups with a p value less than 0.001, details in Table 2. The anesthesia services were also significantly different between the groups, see Table 3.

The majority of patients from the short stay group required only postoperative monitoring (61.2%), while nearly half of the patients from the long stay group required both ventilation and cardiovascular support (46.1%), as shown in Table 4. The active ICU interventions, such as arterial line canulation, CVP line

**Table 1.** Demographic data. Data are shown as Mean ± SD and number (percentage)

| Factors | Short ICU stay (n = 317) | Long ICU stay (n = 245) | p value |
|---|---|---|---|
| Age | 60.7 ± 18.0 | 62.0 ± 17.4 | 0.37 |
| Female : Male | 156:161 (1:1.03) | 113:132 (1:1.2) | 0.49 |
| Elective : Emergency | 285:32 (9.1:1) | 168:77 (2.2:1) | <0.001* |
| Duration of surgery | | | |
| ≤ 3 hours | 169 (53.3) | 105 (42.9) | 0.04* |
| > 3 hours | 148 (46.7) | 140 (57.1) | |
| SOFA score | 1.1 ± 1.9 | 3.1 ± 2.8 | <0.001* |
| TISS score | 19.4 ± 5.9 | 29.7 ± 7.9 | <0.001* |
| Underlying problems | | | |
| Diabetes mellitus | 78 (24.6) | 59 (24.1) | 0.92 |
| Hypertension | 119 (37.5) | 96 (39.2) | 0.73 |
| Heart disease | 89 (28.1) | 71 (29.0) | 0.85 |
| Respiratory problems | 40 (12.6) | 35 (14.3) | 0.62 |
| Renal | 29 (9.1) | 34 (13.9) | 0.08 |
| others | 144 (45.4) | 113 (46.1) | 0.93 |

* p < 0.05 by Chi-square test and unpaired t test

**Table 2.** The operative service of each group, data are shown as number and proportion

| Operative service | Short ICU stay (n = 317) (%) | Long ICU stay (n = 245) (%) | p value |
|---|---|---|---|
| General | 85 (26.8) | 134 (54.7) | <0.001** |
| Orthopedics | 82 (25.9) | 49 (20.0) | |
| Urology | 48 (15.1) | 20 (8.2) | |
| Head and Neck | 64 (20.2) | 22 (9.0) | |
| Ob & Gyn* | 23 (7.3) | 8 (3.3) | |
| Eye | 7 (2.2) | 0 | |
| Plastic | 7 (2.2) | 10 (4.1) | |
| Other | 1 (0.3) | 2 (0.8) | |

* Obstetrics and Gynecology
** p < 0.05 by Chi-square test

**Table 3.** Anaesthesia techniques, data are shown as number and proportion

| Anaesthesia techniques | Short ICU stay (n = 317) (%) | Long ICU stay (n = 245) (%) | p value |
|---|---|---|---|
| General anaesthesia (GA) | 197 (62.1) | 188 (76.7) | 0.001*** |
| Combined GA with RA* | 73 (23.0) | 48 (19.6) | |
| Epidural anaesthesia | 11 (3.5) | 2 (0.8) | |
| Spinal anaesthesia | 26 (8.2) | 3 (1.2) | |
| CSE** | 5 (1.6) | 1 (0.4) | |
| Others | 5 (1.6) | 3 (1.2) | |

* Regional anaesthesia
** Combined spinal-epidural anaesthesia
*** p < 0.05 by Chi-square test

insertion, pulmonary artery catheter insertion, and administration of vasoactive agents, were more commonly performed in the patients from the long stay group compared to the short stay group, and all interventions achieved a statistically significant difference at the level of p value less than 0.001 (Table 4).

Table 5 shows the overall incidence of ICU complications and details of the major and minor ICU complications. The overall complications occurred in almost all of the patients from the long stay group (95.1%) compared to 78.5% in the short stay group. The major ICU complications that reached the statisti-

**Table 4.** Data for indication for admission to the surgical intensive care unit and active ICU intervention. Data are shown as number and percentage in parentheses

| | Short ICU stay (n = 317) (%) | Long ICU stay (n = 245) (%) | p value |
|---|---|---|---|
| Indication for ICU admission | | | |
| Ventilation support | 64 (20.2) | 80 (32.7) | <0.001* |
| Cardiovascular support | 30 (9.5) | 27 (11.0) | |
| Monitoring | 194 (61.2) | 24 (9.8) | |
| Ventilation and CVS support | 29 (9.1) | 113 (46.1) | |
| Others | 0 | 1 (0.4) | |
| ICU active intervention | | | |
| Arterial line cannulation | 9 (2.8) | 26 (10.6) | <0.001* |
| CVP line insertion | 18 (5.7) | 62 (25.3) | <0.001* |
| PA catheter insertion | 5 (1.6) | 28 (11.4) | <0.001* |
| Vasoactive agents used | 45 (14.2) | 138 (56.3) | <0.001* |

* $p < 0.05$ by Chi-square test

**Table 5.** Events and complications in the surgical intensive care unit. Data are shown as number and percentage in parentheses

| Events | Short ICU stay (n = 317) (%) | Long ICU stay (n = 245) (%) | p value |
|---|---|---|---|
| Overall complications | 249 (78.5) | 233 (95.1) | <0.001* |
| Major complications | | | |
| Death | 5 (1.6) | 0 | 0.07 |
| Myocardial ischemia | 0 | 12 (4.9) | <0.001* |
| Congestive heart failure | 0 | 10 (4.1) | <0.001* |
| Arrhythmias | 3 (0.9) | 8 (3.3) | 0.06 |
| ARDS | 1 (0.3) | 3 (1.2) | 0.32 |
| Septicemia | 1 (0.3) | 9 (3.7) | 0.003* |
| Shock | 3 (0.9) | 12 (4.9) | 0.006* |
| Acute renal failure | 0 | 2 (0.8) | 0.19 |
| Major bleeding | 2 (0.6) | 13 (5.3) | 0.001* |
| Reintubation | 0 | 8 (3.3) | 0.001* |
| Minor complications | | | |
| Hypotension | 16 (5.0) | 54 (22.0) | <0.001* |
| Oliguria | 65 (20.5) | 94 (38.4) | <0.001* |
| Bronchospasm | 13 (4.1) | 18 (7.3) | 0.13 |
| Electrolyte imbalance | 191 (60.3) | 187 (76.3) | <0.001* |
| Fever | 123 (38.8) | 132 (53.9) | <0.001* |

* $p < 0.05$ by Chi-square or Fisher's exact test

**Table 6.** Multivariate analysis of independent factors associated with length of stay in the surgical intensive care unit longer than 24 hours

| | Odds ratio | 95% Confidence Interval | p value |
|---|---|---|---|
| Ventilation support | 7.69 | 4.81-12.14 | <0.001* |
| Vasoactive agents used | 4.49 | 2.78-7.24 | <0.001* |
| CVP line insertion | 3.70 | 1.86-7.26 | <0.001* |
| Renal dysfunction | 2.02 | 1.02-3.98 | 0.042* |
| Emergency procedures | 2.31 | 1.30-4.11 | 0.004* |
| Postoperative fever | 1.59 | 1.02-2.47 | 0.042* |

* $p < 0.05$

cally significant difference between the groups were myocardial ischemia, congestive heart failure, septicemia, shock, major bleeding, and reintubation. The most common minor complications in the patients from the short stay group were electrolyte imbalance and postoperative fever. Furthermore, hypotension and oliguria, complications in the patients from the short stay group, differed significantly between the groups.

From the multivariate analysis, six variables remained independently associated with the ICU length of stay longer than 24 hours, namely postoperative ventilator support (OR, 7.639; 95%CI, 4.808-12.138; $p < 0.001$), vasoactive agents used (OR, 4.485; 95%CI, 2.778-7.242; $p < 0.001$), emergency procedures (OR, 2.309; 95% CI, 1.298-4.110; $p = 0.004$), preoperative renal dysfunction (OR, 2.020; 95%CI, 1.024-3.983; $p = 0.042$), CVP line insertion (OR, 3.669; 95%CI, 1.855-7.258; $p < 0.001$), and postoperative fever (OR, 1.585; 95%CI, 2.778-7.242; $p = 0.042$) (Table 6).

## Discussion

The Therapeutic Intervention Scoring System (TISS), the applied scoring system that exclusively relies on therapeutic, diagnostic and nursing activities, and the Sequential Organ Failure Assessment (SOFA) score can help differentiate the surgical patients who require either shorter (less than 24 hours) or longer ICU admission. Siriraj Hospital has not yet established a surgical high dependency unit or surgical intermediate care areas, therefore, all postoperative patients who require only close monitoring or only one organ support have to be delivered to the surgical ICU, which may have higher cost and may not need all the services. However, when the authors consider the TISS-28 score in the long ICU stay group, the mean TISS score (29.7) is comparable to the mean TISS score (28.9) in the previous report by Lefering, et al[4]. This means that the surgical workload in the long stay group is the same as the surgical ICU in Germany. Keene, et al[2] suggested that the patients with TISS score < 30 could be cared for in the HDU. Although, from the present study, the TISS 28 and SOFA scores are significantly different between the 2 groups ($29.7 \pm 7.9$ and $3.1 \pm 2.8$ points versus $19.4 \pm 5.9$ and $1.1 \pm 1.9$ points, respectively $p < 0.001$), the authors cannot state the cut off score between HDU and ICU for the presented patients because of the other factors influencing the discharge decision. Sex, age and chronic health problems of surgical patients do not have an impact on the ICU length of stay. Site of surgical procedures and emergency surgical services have affected surgical outcomes. Long stay group patients have a higher proportion of abdominal procedures, while short stay group patients were predominated with elective patients who underwent orthopaedics, head and neck procedures, urologic, and obstetrics and gynecologic patients. Therefore, this latter patient group is more appropriate for the surgical high dependency area.

Choices of anesthesia also affected the duration of ICU stay. General Anesthesia (GA) alone increased LOS compared with Regional Anesthesia (RA) alone or combined. The adequacy of pain management may be the reason. The patients with less pain can be extubated and discharged earlier. Some procedures can be done under RA alone (orthopedic and urologic).

The reasons for ICU admission can also help to classify the outcome of surgical patients requiring ICU stay. Patients who need only close postoperative monitoring are more likely to leave the surgical ICU earlier compared to those who require major organ support.

The rate of all major ICU interventions performed in surgical ICU was significantly different between the patients who required short ICU stay and long ICU stay. When the authors compared these incidences from the present study with those of anotherrecent report[4], the intervention rate appeared different. The differences may be attributed to the ICU interventions being invasive intraoperative monitoring, or deemed necessary on the later period of ICU admission, not within the 24 hour period as in the present study.

Immediate postoperative complications are more likely to occur in the long ICU stay group especially the major cardiovascular and respiratory problems. Overall incidence of major complications may appear to be low when compared to a previous report. When minor postoperative complications are considered, the incidence appears to be more common and larger than major postoperative complications. The most common event is electrolyte disturbance, which is considered very common in surgical patients. This has many causes such as malnutrition, NPO, tube drainage, and tissue injury, followed by post-operative fever, oliguria and hypotension.

In this present study, six characteristic variables, namely requirement of ventilator support, requirement of vasoactive agents, CVP line insertion, preoperative renal dysfunction, emergency surgical procedures, and postoperative fever, had excellent discrimination and were independently associated with stay. This valuable information will undoubtedly strengthen the authors to define appropriate future access to the surgical ICU, and demonstrate early warning signs to close monitor and pay more attention to the postoperative patients who may have these predictors upon their ICU admission.

In the present model of logistic regression, emergency procedures and preoperative renal dysfunction have been included as predictors for the requirement of longer ICU postoperative stay. Both predictors have long been acknowledged as predictors of poor postoperative outcomes especially in patients who underwent cardiovascular procedures[10-12]. In a recent report, impaired renal function has been confirmed as an independent prognostic factor for ICU mortality in patients with a history of acute myocardial ischemia. Surgical patients whose renal function is impaired will undoubtedly pose a major challenge in the perioperative management if a large amount of fluid resuscitation is required. Therefore, fluid management in this patient subgroup should be carefully monitored and titrated according to the fluid responsiveness[13-15].

The current trends of fast-track anaesthesia have been well accepted and practiced to limit the cost and resource utilization on the health care system. The postoperative overnight ventilator support in patients who underwent elective surgical procedures has become redundant. However, there are many reasons why surgical patients would need postoperative ventilator support including haemodynamic instability, perioperative hypothermia despite aggressive warming especially after long duration of the procedures in the cold environment of the operating theatres[12]. Therefore, patients who require postoperative mechanical ventilation mostly have higher severity scores.

The urgent placement of CVP line within the first 24 hours of the ICU admission may imply that guide for ICU fluid management is required in these patients. This is especially important when a decision between the continuation and discontinuation of rapid fluid resuscitation is necessary. If the former scenario is pursued, positive fluid balance would follow. Therefore, the chance of successful weaning from ventilator support would be difficult to achieve and the patient will require a longer period of ICU stay. CVP line can offer a safe route to the management of rapid and large volume of fluid, administration of vasoactive agents and an easy way to take blood samples. Both vasopressors and inotropic agents have been associated with the likelihood of ICU mortality[16,17].

The present study presents several limitations. First the authors collected data within the first 24 hours of ICU admission, therefore, they cannot explain more about the long term ICU outcomes and hospital outcomes following ICU management in the presented patients who required a longer ICU length of stay. Second, the observational outcome was the ability to have safe ICU discharge without complication following a short period of ICU stay. Nevertheless, after being discharged, many patients who did not do well might be readmitted and the readmission data were not collected in the present data. However, the present study paid attention to predicting factors of short ICU stay to help adjust future ICU access policy and upcoming surgical high dependency unit.

## Conclusion

In summary, this prospective study demonstrates the analysis of ICU management of surgical patients focusing on the immediate ICU outcome. The present study differentiates the patients who can be cared for in intermediate care level from those who really need ICU care by using patients' demographic data, underlying disease, perioperative events and severity scores (TISS 28 and SOFA). This will lead to further improvement of the cost-benefit of the surgical ICU.

**Appendix 1.** TISS 28[2]

| | Points |
|---|---|
| Basic Activities | |
| Standard monitoring. Hourly vital signs, regular registration and calculation of fluid balance | 5 |
| Laboratory. Biochemical and microbiological investigations | 1 |
| Single medication. Intravenously, intramuscularly, subcutaneously, and/or orally (e.g., gastric tube) | 2 |
| Multiple intravenous medication. More than one drug, single shots, or continuously | 3 |
| Routine dressing changes. Care and prevention of decubitus and daily dressing change | 1 |
| Frequent dressing changes. Frequent dressing Change (at least one time per each nursing shift) and/or extensive wound care | 1 |
| Care of drains. All (except gastric tube) | 3 |
| Ventilatory Support | |
| Mechanical ventilation. Any form of mechanical ventilation/assisted ventilation with or without positive end-expiratory pressure, with or without muscle relaxants; spontaneous breathing with positive end-expiratory pressure | 5 |
| Supplementary ventilatory support Breathing spontaneously through endotracheal tube without positive end-expiratory pressure; supplementary oxygen by any method, except if mechanical ventilation parameters apply | 2 |
| Care of artificial airways. Endotracheal tube or tracheostoma | 1 |
| Treatment for improving lung function. Thorax physiotherapy, incentive spirometry, inhalation therapy, intratracheal suctioning | 1 |
| Cardiovascular Support | |
| Single vasoactive medication. Any vasoactive drug | 3 |
| Multiple vasoactive medication. More than one vasoactive drug, disregard type and doses | 4 |
| Intravenous replacement of large fluid losses. Fluid administration > 3 L/m2/day, disregard type of fluid administered | 4 |
| Peripheral arterial catheter | 5 |
| Left atrium monitoring. Pulmonary artery flotation catheter with or without cardiac output measurement | 8 |
| Central venous line | 2 |
| Cardiopulmonsary resuscitation after arrest; in the past 24 hrs (single precordial percussion not included) | 3 |
| Renal Support | |
| Hemofiltration techniques. Dialytic techniques | 3 |
| Quantitative urine output measurement (e.g., by urinary catheter a demeure) | 2 |
| Active diuresis (e.g., furosemide > 0.5 mg/kg/day for overload) | 3 |
| Neurologic Support | |
| Measurement of intracranial pressure | 4 |
| Metabolic Support | |
| Treatment of complicated metabolic acidosis/alkalosis | 4 |
| Intravenous hyperalimentation | 3 |
| Enteral feeding. Through gastric tube or other gastrointestinal route (e.g., jejunostomy) | 2 |
| Specific Interventions | |
| Single specific intervention in the intensive care unit. Naso- or oratracheal intubation, introduction of pacemaker, cardioversion, endoscopies, emergency surgery in the past 24 hrs, gastric lavage. Routine interventions without direct consequences to the clinical condition of the patient, such as radiographs, echography, electrocardiogram, dressings, or introduction of venous or arterial catheters, are not included | 3 |
| Multiple specific interventions in the intensive care unit. More than one, as described above | 5 |
| Specific interventions outside the intensive care unit. Surgery or diagnostic procedures | 5 |

Criteria of exclusion are applied in four conditions: “Multiple intravenous medication” excluded “single medication”; “mechanical Ventilation” excludes “supplementary ventilatory support”; multiple vasoactive mediacation” excludes “single vasoactive medication”; “multiple specific interventions in the intensive care unit” excludes “single specific interventions in the intensive care unit”

**Appendix 2.** SOFA (The Sequential Organ Failure Assessment score)[5]

| System | Score | | | | | Parameter |
|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | |
| Respiration | > 400 | $\leq$ 400 | $\leq$ 300 | $\leq$ 200 with Respiratory support | $\leq$ 100 with Respiratory support | $PsO_2/FiO_2$ (mmHg) |
| Coagulation | > 150 | $\leq$ 150 | $\leq$ 100 | $\leq$ 50 | $\leq$ 20 | Platelet (x $10^3/mm^3$) |
| Liver | < 1.2 | 1.2-1.9 | 2.0-5.9 | 6.0-11.9 | > 12.0 | Bilirubin (mg/dl) |
| CVS | No Hypotension | MAP < 70 mmHg | Dopamine $\leq$ 5 or Dobutamin (any dose)* | Dopamine > 5 or Adr $\leq$ 0.1 or Noradr $\leq$ 0.1* | Dopamind >15 or Adr > 0.1 or Noradr > 0.1* | Hypotension |
| CNS | 15 | 13-14 | 10-12 | 6-9 | < 6 | Glassgow Coma Scale |
| Renal | < 1.2 | 1.2-1.9 | 2.0-3.4 | 3.5-4.9 or < 500 ml/day | > 5.0 or < 200 ml/day | Creatinine or urine output |
| | | | | | | Total SOFA score |

Adr = Adrenaline, Noradr = Noradrenaline
* Adenergic agents administered for at least 1 hours (dose given are in μg/kg/min)

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## *TISS 28 หรือ SOFA: ตัวบ่งชี้ของการอยู่ในไอซียูหลังการผ่าตัดนานกว่า 24 ชั่วโมง*

***มานี รักษาเกียรติศักดิ์, ปฏิภาณ ตุ่มทอง, พุฑฒิพรรณี วรกิจโภคาทร, อลิสา เสียงลิ่วลือ, มณเฑียร สัญจรดี***

***วัตถุประสงค์****: ศึกษาการนำ Therapeutic Intervention Scoring System (TISS 28) และ Sequential Organ failure Assessment (SOFA) มาใช้ในผู้ป่วยหนักหลังการผ่าตัดและหาปัจจัยเสี่ยงที่ทำให้ผู้ป่วยต้องอยู่ไอซียูนานกว่า 24 ชั่วโมง*
***วัสดุและวิธีการ****: เก็บข้อมูลในหออภิบาลศัลยกรรม โรงพยาบาลศิริราช ระหว่าง วันที่ 1 กรกฎาคม พ.ศ. 2547-วันที่ 31 ธันวาคม พ.ศ. 2547*
***ผลการศึกษา****: ค่าเฉลี่ยคะแนน TISS 28 และ SOFA มีความแตกต่างกันในผู้ป่วยที่อยู่ไอซียูนานกว่า 24 ชั่วโมง กับกลุ่มที่อยู่สั้นกว่า (TISS28 = 29.7 ± 7.8 เปรียบเทียบกับ 19.4 ± 5.9, SOFA 3.1 ± 2.8 เปรียบเทียบกับ 1.1 ± 1.9) ปัจจัยอื่นที่มีผลต่อการอยู่ไอซียูนานกว่า 24 ชั่วโมง คือ ใช้เครื่องช่วยหายใจ, ยาที่มีผลต่อความดันเลือด, ใส่สาย central vein, ผ่าตัดฉุกเฉิน, โรคไต และมีไข้หลังผ่าตัด*
***สรุป****: คะแนน TISS 28 และ SOFA สามารถบอกภาระงาน, ความรุนแรงของโรค และการอยู่ไอซียูนานกว่า 24 ชั่วโมง*

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