Systematic Review of the Application of Trauma Score (KTS) as an Alternative Trauma Scoring in EDs

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ABSTRACT
Background
Traumatic scoring is an integrated components of triage prehospital to predict the possibility of serious injuries or deaths. This scoring can help medics to decide appropriate facility treating the patient specifically. There are many scoring systems to find out severity levels of injuries developed both internationally and nationally in Indonesia. The scoring system uses must be adjusted to the needs of hospital in providing quick and accurate results. The purpose of this study is to find out the effective level of the application to provide accurate and quick results.
Method
This systematic review with data taken from literatures gained by surfing the internet online: Science direct, Pro-quest, and Google scholar. Data collection is done by determining appropriate and needed variables for this study from some journals. The Inclusion criteria is original research in 2009-2018, Adul participant $\geq$ 15 year and other trauma scoring as comparison study
Results
Some trauma scorings: AIS, ISS, AP, NISS, TS, RTS, and TRISS are having high accuracy. However, KTS has significant accuracy and is easy to use in developing regions with limited sources.
Conclusion
KTS is a simpler trauma scoring system with its superiorities, such as quicker and more effective in providing predictive assessment of deaths and traumatic severity.
Keywords
Trauma Scorings; KTS

BACKGROUND
Trauma is a main problem faced by modern livings. Globally, there are more than 5 million death people due to injuries in 2000. occurring 90% in lower and medium economic earning countries. From 2000 until 2020. the number of mortalities caused by traffic accident is projected into 83% in developing countries. It is expected to be 5.8 million people dying and 78 million to have disability due to trauma. To suppress and reduce this number, some experts have applied trauma scoring system in developing countries (Clarkson, 2012)

Trauma scoring system is used as integrated components of triage prehospital to predict the possibilities of serious injuries or deaths. This system can help medics to decide what facility

is appropriate to treat the patients specifically. This system also can be used as accurate decision making clinical instrument, a consideration for medics, and an instrument to inform the family about trauma severity suffered by patient from the beginning (Jennings, 2012). There are some scoring systems to check severity levels developed both nationally, Indonesia, and internationally. The needs to improve treatment quality has caused researchers to develop an accurate instrument to predict injuries and is applicable to serve health care based on needs (Tohira H, 2012).

Accurate traumatic scoring system use helps to decide traumatic management application. The system translates accurately into two situations: treatment of traumatic patient can be used before the arrival of patient and to decide whether transfer to trauma center is needed or not. The system can be used to take clinical decision in ICU (Tirtayasa & Phillipi, 2013). Present days, there are many scoring systems developed and applied based on needs, facilities, and the quality of medics. According to Orhon R *et al* (2014), scoring is basd on *anatomical* and *physiologic.* Anatomical consists of *the abbreviated injury scale* (AIS), *injury severity score* (ISS), *New Injury severity Score* (NISS), meanwhile *Physiological scoring System* consists of GCS, *Revised Trauma Score* (RTS), *Combined Scoring System* and *trauma score-injury severity score* (TRISS).

According to Weeks. SR., *et al* (2015), the scoring has been used to predict mortality especially focusing on anatomical trauma. One of methods firstly used is *Abbreviated Injury Scale* (AIS). AIS has comprehensive assessment to describe injury and to measure traumatic severity, but it cannot measure all individual traumatic severity. Since that time, many scoring methods have been proposed to support AIS. In the effort to describe all severity from traumas, some scorings are presented: ISS, NISS, and TRISS. Other hindrance from AIS uses is training time needed to cope and to assure internal and external validation of the application. There is a report of mistake in two locations and main trauma severity. Besides that, AIS has complex calculation hindrances. Based on those facts, the researchers from Uganda develop much simpler system using Kampala Trauma Score (KTS) to evaluate based on physiology than anatomical factors.

METHODS

The data of this research is taken from literature gained from online journal in the internet by surfing the online libraries: Science direct, Pro-quest, and Google Scholar. Then it is gained some studies related to KTS. From some journals read by the researcher is grouped into prisma chart then 13 journals as reference to compose this research are gained. From those 13, 7 journals are taken to be investigated according to the titles to study. Meanwhile, those unmatched titles of the journal are eliminated. The range of publication year of the taken journals is 10 years, from 2009 until 2018. It is to keep the up to date matters of the research. The purpose is to find out the effectiveness of the application. The data is collected by determining needed and appropriate variables in literature study from some journals.

RESULTS

Literature review uses retrospective analysis done in some international hospitals. The number of samples investigated varies. In utilizing the literature, the researcher uses some articles and international journals as access to develop the research. Journal and article are selected by using Prisma Chart. From some journals gained, effectiveness of traumatic scoring system predicts deaths and severity levels in limited source region are gained.

Based on Clarkson (2012), who investigated RTS and RTS scores, done on 2220 patients by using regressive analysis to predict factors of death. The second, RTS and KTS, are statistically significant to predict death, but after all items are analyzed, KTS with its simple neurology model becomes strong predictor in analyzing death by explaining 10.9% from variation in data (OR-2,6, p<0.001). KTS is also significant predictor in terms of hospitalized time (LOS), explaining 3.5% from variation in data.

According to the research done by Weeks. S.R. *et al* (2015) titled *"A Modified Kampala Trauma Score 9KTS) Effectively predicts mortality in trauma patients"* is done through 18 prospective traumatic centers with level 1 and 51 hospital of non-traumatic in United State of America. The method is taken from ISS, NISS, and KTS showing 4716 people meeting the requirements for the study. Each of 3 statistically significant scores are: modified KTS surpassing ISS (AUC=0.83,95% CI 0.81-0.84 vs 0.77, 95%CI 0.76-0.79,) and showing similar ability compared to NISS (AUC=0.83. 95% CI 0.81-0.84 Vs 0.82, 95% CI0.80-0.83). Thus, KTS is proven to be predicator of mortality tension, by doing significant statistic compared to ISS and NISS while being evaluated on main patients.

Research done by Peng L *et al* (2017) titled "*KTS and CRAMS were useful Trauma Score in a resource-limited settings*" uses retrospective analysis comparing KTRS, RTS, CRAMS, PHI to ISS. Then the study correlatively analyzes those scores with ISS by using correlation person for significant level, P < 0.05. From the data statistics show AUC from 4 systems are 0.598 (P=0.606,CI 0.482-0.713), 0.525(P=0.691. CI 0.405 – 0.645), 0.606 (P=0.606, CI 0.494-0.717) and 0.672 (P=0.672, CI 0.403-0.650). Among those cores, CRAMs and KTS are much better, however, no statistical differences. KTS, RTS, and CRAMS are correlated negatively to ISS (P=0.013, P=0.000 and=0.000). Meanwhile, PHI is positively correlated to ISS (p = 0.002). The study recommends the use of KTS and CRAMS for traumatic patient triage in limited sources. KTS and CRAM have accurate and comprehensive predictors to predict severity level.

Another research done by Roy N *et al* (2016) titled *"Validation of International Trauma Scoring systems in Urban Trauma Centres in India"* has purpose to validate commonly used scoring methods in *Lower-Middle Income Countries* (LMICs) in India. The study uses observational prospective cohort from 7197 patients matching with requirements of ISS, NISS, KTS, RTS, and TRISS scoring systems. All methods have equal effectiveness in terms of prediction but also have their own strong and weak points in their implementation. In this study, KTS, can be recommended in India, especially middle-growing income countries (LCMICS). KTS is practicable and efficient to apply in India to predict early death trauma and improve triage.

Research based on Haac. B. *et al* (2014) titled *"the Utility of the Kampala Trauma Score as a Triage Tool in a Sub-Sahara African Trauma Cohort"* uses prospective cohort in hospital. A study done by Kamuzu investigating the assessment of the scoring models, KTS and RTS, being correlated to length of hospitalized (LOS). The study has registration *mean* KTS equals to $14,5 \pm 0.6$, and RTS equals to 11.9 ± 0.3. KTS and RTS, the improvements are 0.44 and 0.3. This condition also goes for mortality, 0.48, and 0.36. KTS and RTS, (P= regional 0.96, ROC 0.5) or RTS (p=0.25, ROC regional 0.5) are correlated significantly to hospital. Length of hospitalized, KTS, and RTS can be done both in predicting death, but KTS is a better predictor than the others (KTS ROC area 0.62, RTS ROC area 0.55, $P < 0.001$). From the study is gained KTS and RTS can be used as good predictors to assess death possibility of traumatic patients. However, KTS is much better than RTS although both of them are used as predicators to identify LOS.

Based on Weeks. S.R. *et al* (2014) titled *"Is the Kampala Trauma Score an Effective Predictor of Mortality in Low-Resource Setting? A Comparison of Multiple Trauma Severity Scores"* is done prospectively to evaluate KTS' ability in predicting mortality of traumatic patients compared to the others. The findings are 2,855 evaluated patients with mortality number 6 per 1000 and can be gained AUC 0.7748 (95% CI 0,6285-0,9212). When it is compared to RTS, ISS, TRISS, and GCS in pairs, KTS has higher AUC and can be concluded that other KTS comparisons supporting that KTS can be adopted to injury surveillance and triage in limited source regions. KTS shows effective results in predicting mortality similarly to the other systems.

Demyttenaere S.V. *et al* (2009) in his work titled *"Injury in Kampala Uganda: 6 Years Later"* has purpose to describe injury and trauma at primary reference hospital for 1 year period in 2004 using KTS compared to 1998 and 2005. From the study, the spectrum of injury is still same, but mortality number decreases from 7.2% into 2.7%. It can be concluded that KTS is effective to apply in predicting severity and mortality on traumas leading to quicker and accurate clinical action decision.

DISCUSSIONS

There are some scoring methods to use in assessing severity level and as mortality predictors on traumatic patients. Based on Orthon R *et al* (2014), types of scoring systems commonly used are based anatomical, using score to show sever traumatic level of anatomy, as for example *the abbreviated injury scale* (AIS), *injury severity score* (ISS), *anatomic profile* (AP) *characterization, new injury severity score* (NISS), and so on. Meanwhile, physiologic scoring describes dynamic physiology acute dynamics, as for example *trauma score* (TS), *revised trauma score* (RTS), and combinations of the scores to other models as *trauma score injury severity score* (TRISS).

The accuracy of trauma scoring uses influence both clinical decision toward follow ups from the intervention on main patients. By this development, it provides choices to apply scoring models based on the needs and existed facilities. The selection of trauma type depends on

ability of medics in giving analysis toward patient condition accurately and appropriately (Rapsang & Syam, 2015). The use of appropriate trauma scoring model can give valid result in predicting mortality on the trauma. Beside the model, trauma scoring model can help to evaluate and predict prognosis to adjust and improve trauma management in ICU. The problem is not all trauma scorings can be used because of source, facility, procedure, non-computerized, complex execution, requiring skillful medic limitations. Therefore, new type of KTS with much simpler to ease medics analyzing traumas emerges (Weeks *et al*, 2015). Based on Clarkson *et al* (2012) KTS has better advantages than RTS as mortality and length of stay predictors because it uses neurology components. This statement is also strengthened by Haac B *et al* (2014), KTS as LOS predictor.

Based on Peng L *et al* (2017), KTS scoring method is much simpler than TRISS and more useful and accurate than ISS. However, in series of limited sources and facility, KTS is better and quicker to assess than ISS. Besides that, KTS is simple, easy to access, and very comprehensive in assessing. The statement is strengthened by Roy N *et al* (2017) telling KTS is effective and efficient to use in lower-middle income country areas in India. From the findings, TRISS and KTS are equal and both of them significant as mortality predictors in India but TRISS needs much skilful medics and costs. TRISS can be used as standard for traumatic scoring and research for more than 20 years. TRISS is better if applied in HIC, such as United State (Weeks. S.R *et al*, 2015). KTS is cheaper and efficient to apply in developing and limited areas to predict early traumatic prediction.

CONCLUSIONS

KTS is applied and validated in traumatic treatment setting in developing country such as in Indonesia where technology access is still not fully operated and limited availability of trained medics to accurately assess, then to calculate the score based on anatomy such as ISS and NISS mostly adopted by advance country becomes less effective. Therefore, KTS is expected to be one of main scorings applicable as mortality predicators for main patient effectively and efficiently. Much simpler KTS can be used by medics to analyze main patient.

The scoring methods is much simpler KTS compared to other scorings. But, in series with limited sources and facility, KTS is quicker and more accurate to assess and more effective in predicting mortality and trauma severity.

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