

Systematic Review: Effectiveness of GAP (Glasgow Coma Scale, Age and Systolic Blood Pressure) and MGAP (Mechanism, Glasgow Coma Scale, Age, and Arterial Pressure) as an Outcome Predictor of Trauma Patient In Emergency Department

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ABSTRACT

Introduction

The difference between GAP and MGAP is that GAP does not have an injury mechanism parameter. The purpose is to identify the effectiveness of GAP and MGAP in predicting the outcome of trauma patient in emergency department.

Methods

This study collected articles in the years 2011-2015 from Proquest, ScienceDirect, Google Scholar and Pubmed databases, using the keyword "GAP", "MGAP", "Outcome Emergency Patient".

Results

The final selection obtained 6 articles which were finally included in a systematic review with a total sample of $\pm 121,401$. Prediction of short-term (24-hour) and long-term (4 weeks) mortality from MGAP (0.970-0.938), GAP (0.910 -0.904) strength predicting mortality in all trauma assessment systems ($p < 0.001$). The results of subsequent studies between three groups of patients with mortality rates were 75.2%, 9.5% and 0.1% ($P < 0.0001$). Then another study for MGAP and GAP obtained the results of group mortality rates at low risk for MGAP and GAP, respectively 1.3%, and 1.4% ($p = 1,000$). The medium risk groups in MGAP and GAP were 32.1%, and 36.3% ($p = 0.841$). The high risk groups in MGAP and GAP was 72.2%, and 85.7% ($p = 0.782$) for each.

Conclusion

GAP and MGAP can be recommended as trauma scores that are effective in predicting the outcome of trauma patients.

Keywords

GAP; MGAP; Outcome Predictor; Trauma Patient; Emergency

BACKGROUND

Glasgow coma scale, age, and systolic blood pressure (GAP) and mechanism, glasgow come scale, age, and arterial pressure (MGAP) is one of the trauma score measurement tools that can be used as a parameter of the patient's hemodynamic status, provides a clinical picture, predicts death trauma patients in emergency department, and can assist in the proper management of triage in emergency department (Champion, 2002; Songer, 2015; Salim, 2015).

Glasgow coma scale, age, systolic blood pressure (GAP) score is a physiological trauma scoring system developed by Kondo et al in 2011, especially improvements in MGAP Score (Mechanism, Glasgow coma scale, Age and Arterial Pressure) developed by Sartorius et al in 2010 which was considered as one of the best and most recent scoring systems in predicting patient mortality in hospitals. Kondo et al (2011) stated that one of MGAP scoring still allows giving high points for penetrating trauma, where the trauma is not more severe than blunt trauma. In addition, trauma-based scores usually affect 10% of all trauma patients (Sartorius et al., 2010; Shoko et al., 2010; Raux et al., 2011).

Mechanism, Glasgow comma scale, Age and Arterial Pressure (MGAP) is one of the latest scoring systems that has the ability to predict mortality easily in the field. MGAP scoring system uses injury mechanism, GCS, age and also as a risk factor in the hospital. MGAP scores can be used in types of blunt trauma and penetration (Sartorius et al, 2010).

Based on the results of the studies above, the authors are interested in conducting a systematic review of the use of GAP and MGAP trauma score parameters as outcome predictors of trauma patients in emergency departments.

METHODS

Based on the results of a journal article search using the PICO framework (Population: Emergency patients, Intervention: use of GAP and MGAP, Comparison Intervention: GAP and MGAP, Outcome: as a parameter in identifying the condition of trauma patients in the emergency department.

2.1 Research Questions

In this systematic review the questions that will be discussed are whether Glasgow Coma Scale, Age, and Systolic Blood Pressure (GAP) and Mechanism, Glasgow Coma Scale, Age, and Arterial Pressure (MGAP) are effective parameters in predicting the outcome of trauma patients in critical installations emergency.

2.2 Search Strategy

The literature review source is a collection of vulnerable articles in 2011-2015 in a database consisting of Proquest, ScientDirect, and Google Scholar. The search is done using the keyword "GAP" MGAP "Mortality", "Outcome Emergency Patient".

2.3 Feasibility (Inclusion / exclusion)

This type of article which is used as the basis for making systematic review is the relationship between Glasgow Coma Scale, Age, And Systolic Blood Pressure (GAP) and Mechanism values, Glasgow Coma Scale, Age, and Arterial Pressure (MGAP) as a trauma scoring system with clinical outcome outcomes patient. As well as not only making the literature sources of the article whose discussion is only contained in extracted.

2.4 Data Extraction

Two variables consisting of GAP and MGAP were sorted and extracted information about the details of the article, consisting of the author, year, research design, sample size, patient demographics, GAP and MGAP scores.

2.5 Results

The main results for this analysis are predictions of outcomes and mortality in emergency patients based on P Value, Odds Ratio (OR), Confidence Interval (CI)

2.6 Article Selection and Retrieval

Analyzing relevant articles using JBI tools to identify the feasibility of the articles to be used based on the title and objectives discussed in systematic review.

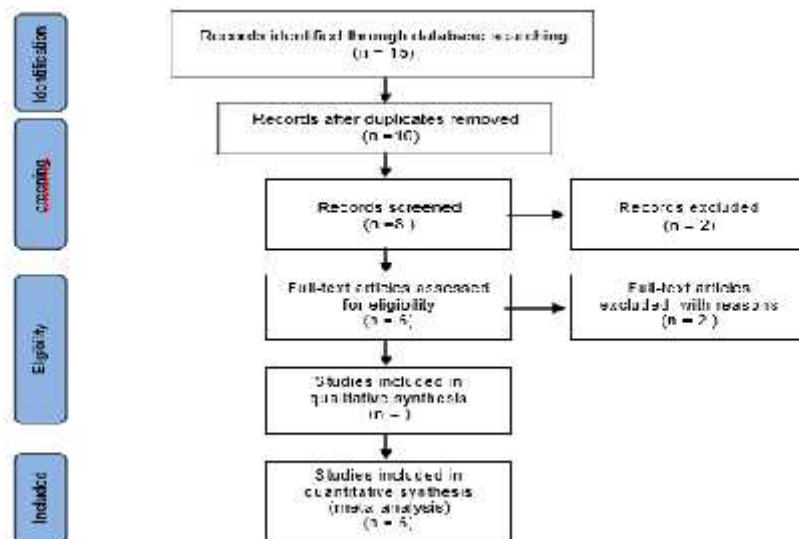


Figure 1. Prisma Flow Chart

RESULT

Based on search results from several journal databases, 15 articles were obtained from database search results and journal literature screening, then several articles were eliminated because they were not relevant from the context of the title and there were several articles that were similar to articles from different databases. After that of the remaining ten articles, two articles were eliminated because they were not in accordance with the variables discussed in the literature review, and did not meet the predetermined requirements and criteria for the population and sample. Then based on the results of the final selection, 6 articles were obtained which eventually could be included in systematic review, with a sample of $\pm 121,401$. then the 6 articles were extracted in Table 1

Table 1. Data extraction

	Author & Year	Title	Level JBI	Purpose	Method (Design, Sample, Data Analysis, instrument)	Major finding
1	Erhan Ahun, Özlem Köksal, Deniz Sı ırlı, Gökhan Torun, Serdar Suha Dönmez, Erol Arma an (2014)	Value of the Glasgow coma scale, age, arterial blood pressure score for predicting the mortality of major trauma patients presenting to the emergency departement	Level 3.c Cohort study with control group	The aim of this study was to determine the prediction of mortality from the GAP scoring system in the main trauma patients treated at ED.	Design: Kohort prospektif Sample: 100 patients Data Analysis: Numerical comparative analysis of data paired using the Shapiro Wilcoxon test. Instrumen: observation sheet	Ahun et al in 2014 obtained a significant positive correlation formed between MGAP and GAP in predicting hospital mortality (p <0.0001). The level of predictions of short-term (24-hour) and long-term (4 weeks) mortality and the area under the curve in the analysis of receiver operating characteristics are, 0.970-0.938 for MGAP, and 0.910-0.904 for GAP. All calculated trauma assessment systems showed significant predictions of mortality (p <0.001). GAP scores were found to be statistically and significantly selective and sensitive in predicting ED and hospital mortality (p = 0.0001).
2.	Yutaka Kondo, Toshikazu Abe, Kiyotaka Kohshi, Yasuharu Tokuda, E Francis Cook and Ichiro Kukitan (2011)	Revised trauma scoring system to predict in-hospital mortality in the emergency department: Glasgow coma scale, age, and systolic blood pressure score	Level 3.c Cohort study with control group	The purpose of this study was to assess whether the GAP scoring system better predicts the mortality rate in a trauma patient's hospital compared to the MGAP score.	Design: Kohort prospektif Sample: 35.742 patients Data Analysis: Multivariate logistic regression analysis Instrumen: observation sheet	Kondo et al in 2011 which compared MGAP and GAP trauma scoring, showed that MGAP (92.4%) and GAP (93.3%) scores in predicting patient mortality in hospitals. GAP results (93.3%) showed slightly better than MGAP results. Then GAP is easily applied in the early stages of trauma treatment in the ED because the calculation process is easy in its application when

						the patient comes to the emergency room.
3	Rebecca M. Hasler, Nicole Mealing, Hans-Ulrich Rothen, Michael Coslovsky, Fiona Lecky, and Peter Ju`ni (2014)	Validation and reclassification of MGAP and GAP in hospital settings using data from the Trauma Audit and Research Network	Level 3.d case controlled study	The purpose of this study was to validate the GAP and MGAP scoring systems as predictions of mortality in trauma patients	Design: Kohort retrospektif Sample: 79.807 patients Data Analysis: Multivariate logistic regression analysis Instrumen: observation sheet	According to Hasler et al in 2104, both MGAP and GAP are good parameters in predicting 30-day mortality, with similar areas under the ROC curve (around 87%) in independent validation of GAP and MGAP. In 79,807 trauma patients from the TARN registry. Calibration is better for MGAP, while GAP is slightly better at distinguishing the original cut off and ROC. For both scores, risk categories improve patient differentiation.
4.	Iraj Baghi · Leila Shokrgozar · Mohamad Rasoul Herfatkar, Kazem Nezhad Ehsan, Zahra Mohtasham Amiri (2015)	Mechanism of Injury, Glasgow Coma Scale, Age, and Systolic Blood Pressure: A New Trauma Scoring System to Predict Mortality in Trauma Patients	Level 4.b cross sectional study	The aim of the study was to assess the MGAP assessment system to predict hospital mortality with trauma patients	Design: Cross sectional study Sample: 5.408 patients Data Analysis: Comparative numerical analysis not paired with the Kolmogorov-Smirnov test (KS test) and mann-whitney test Instrumen: observation sheet	According to Baghi et al in 2015 in a study conducted that patients were divided into three groups: scores less than 18, 18-22 and greater than 22; where mortality rates were 75.2% 9.5% and 0.1% respectively (P <0.0001). The best cut point was 22 in our study, and the MGAP scoring system had a sensitivity of 93.7% and a specificity of 91.3%. So that the MGAP scoring system can be used as an appropriate assessment system to predict mortality in triage trauma patients.

5.	Pande M.W, Tirtayasa, dan Benny Philippi (2013)	Prediction of mortality rate of trauma patients in emergency room at Cipto Mangunkusumo Hospital by several scoring systems	Level 3.d case controlled study	The aim of this study was to find the most appropriate trauma assessment system to be used in comparing the predicted mortality rates in trauma patients using the MGAP and GAP scoring systems.	Design: Kohort retrospektif Sample: 124 patients Data Analysis: Comparative numerical analysis not paired with the Kolmogorov-Smirnov test (KS test) and mann-whitney test Instrumen: observation sheet	According to Tirtayasa and Benny in 2013 by conducting research, it was stated that out of 124 cases were analyzed, with an average age of 32.4 years and a total mortality rate of up to 23 cases (18.5%). The mortality rate of the group was low risk in MGAP and GAP, respectively 1.3%, and 1.4% (p = 1,000). The mortality rates of the medium risk groups in MGAP and GAP were 32.1%, and 36.3% (p = 0.841), respectively. The mortality rates of high-risk groups in MGAP and GAP were 72.2%, and 85.7% (p = 0.782), respectively. So that the results can be obtained showing that there is no difference in the MGAP and GAP assessment systems in predicting mortality rates in trauma patients.
6	Mohamed Amin Selim, Ahmed Gaber Marei, Nadia Fouad farghaly and Ahmed Hafez Farhoud (2015)	Accuracy of mechanism, glasgow coma scale, age and arterial pressure (MGAP) score in predicting mortality in Polytrauma patients	Level 3.d case controlled study	The purpose of this study was to evaluate the accuracy of MGAP and RTS scores in predicting the mortality of trauma patients at the emergency department installation	Design: Kohort retrospektif Sample: 220 patient Data Analysis: Analysis of Chi Square test Instrumen: observation sheet	According to Salim et al in 2015 stated that this study involved 220 patients; all are polytrauma patients who have experienced Blunt and Penetrating trauma including head injuries. Mortality rates in the low-risk group according to MGAP and RTS scores were (8.5% and 1%) respectively (p = 0.01), in the moderate risk group (47.7% and 66.3%) significant (p = 0.04). While the high-risk groups (96.6% and 100%) were not

						significant ($p = 1,000$). RTS is better than MGAP in predicting mortality rates in low-risk groups, MGAP is better than RTS in the medium risk group and there is no difference between the two scores in the high-risk group.
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DISCUSSION

Research conducted by Kondo et al in 2011 which compared MGAP and GAP trauma scoring, found results that scored, MGAP (92.4%) and GAP (93.3%) in predicting patient mortality in hospitals. The calculated GAP score includes the GCS score (3-15 points), patient age <60 years (three points) and SBP (> 120 mmHg, six points; 60 to 120 mmHg, four points). CI GAP score (0.933 for long-term mortality and 0.965 for short-term mortality) is better than or comparable to the trauma score calculated using another scale.

The use of GAP score as a trauma score parameter according to Ahun et al (2014), Hasler et al (2014), Kondo et al (2011) is a GAP scoring system that can be generalized as a more accurate parameter, and the calculation is easier so that it can be applied well prehospital or when the patient enters the ED, has the ability to predict mortality that is equal or even better than other scoring systems so as to facilitate management decisions in patients at the hospital.

According to Baghi et al in 2015 in a study conducted that patients were divided into three groups: scores less than 18, 18-22 and greater than 22; where mortality rates were 75.2% 9.5% and 0.1% respectively (P <0.0001). The best cut point was 22 in our study, and the MGAP scoring system had a sensitivity of 93.7% and a specificity of 91.3%. So that the MGAP scoring system can be used as an appropriate assessment system to predict mortality in triage trauma patients.

The results of this study were strengthened by Hasler et al (2014) cohort study which compared GAP and MGAP scoring with the results of GAP (87.2%) and MGAP (86.8%) in predicting mortality in hospitals.

CONCLUSIONS

Glasgow Coma Scale, Age, and Systolic Blood Pressure (GAP) and Mechanism, Glasgow Coma Scale, Age, and Arterial Pressure (MGAP) are one effective trauma score and have significant results by showing accurate risk results about death in patients emergency. So that GAP and MGAP can be recommended as outcome predictors of trauma patients in emergency departments.

REFERENCES

1. Ahun, E, Köksal, O, Sı rılı, D, Torun, G, Dönmez, S.S, & Arma an, E (2014). Value of the Glasgow coma scale, age, and arterial blood pressure score for predicting the mortality of major trauma patients presenting to the emergency department. *Ulus Travma Acil Cerrahi Derg*, 209(4), 241-247. doi: doi: 10.5505/tjtes.2014.76399
2. Baghi, I, Shokrgozar, L, Herfatkar, M.R, Ehsan, K.E, & Zahra Mohtasham Amiri 3, *. (2015). Mechanism of Injury, Glasgow Coma Scale, Age, and Systolic Blood Pressure: A New Trauma Scoring System to Predict Mortality in Trauma Patients. *Trauma Monthly*. doi: 10.5812/traumamon.2447
3. Champion HR, Sacco WJ, Copes WS (1989): A revision of the trauma score. *J Trauma* ; 29:623- 629
4. Hasler, R.M, Mealing, N, Rothen, H.U, Coslovsky, M, Lecky, F, & Juni, P. Validation and reclassification of MGAP and GAP in hospital settings using data from the Trauma Audit and Research Network. *Trauma Acute Care Surg*, 77. doi: 10.1097/TA.0000000000000452
5. Kondo, Y, Abe2, T , Kohshi, K, Tokuda, Y , Cook, E.F, & Kukita, I. (2011). Revised trauma scoring system to predict in-hospital mortality in the emergency department: Glasgow Coma Scale, Age, and Systolic Blood Pressure score. *Critical Care*, 15.
6. Rahmani, F, Bakhtavar, H.E, Vahdati, S.S, Hosseini, M, & Esfanjani, R.M. (2016). Evaluation of MGAP and GAP Trauma Scores to Predict Prognosis of Multiple-trauma Patients. *Trauma Mon*, 22. doi: 10.5812/traumamon.33249
7. Sartorius D, Le Manach Y, David JS, Rancurel E, Smail N, Thicoi'pi M, Wiel E, Ricard Hibon A, Berthier F, Gueugniaud PY, Riou B (2010). Mechanism, Glasgow Coma Scale, Age, and Arterial Pressure (MGAP): A New Simple Prehospital Triage Score To Predict Mortality In Trauma Patients. *Crit Care Med*. 38:831-837
8. Selim, M.A, Marei, A.G, farghaly, N.F, & Farhoud, A.H. (2015). Accuracy of mechanism, glasgow coma scale, age and arterial pressure (MGAP) score in predicting mortality in Polytrauma patients. *Biolife*, 3(2), 483-495.
9. Songer, T (2015). Measuring injury severity. University of Pittsburgh. Available from: <http://www.pitt.edu/~epi2670/severity/severity.pdf>. On desember 15, 2017
10. Tirtayasa, P.M.W, & Philippi, B. (2013). Prediction of mortality rate of trauma patients in emergency room at Cipto Mangunkusumo Hospital by several scoring systems. *Med J Indones*, 22(4).