Journal of Nursing
Revista de Enfermagem
UFPE On Line
ISSN: 1981-8963

ORIGINAL ARTICLE

TRAUMA IN ADOLESCENTS AND ADULTS: SEVERITY ASSESSMENT BY ANATOMICAL SCORE

TRAUMATISMOS EM ADOLESCENTES E ADULTOS: AVALIAÇÃO DA GRAVIDADE POR ESCORE ANATÔMICO

TRAUMA EN ADOLESCENTES Y ADULTOS: EVALUACIÓN DE LA GRAVEDAD POR ESCORE ANATÓMICO

Mariangela da Silva Nunes[1], Edilene Curvelo Hora[2], Ricardo Fakhouri[3], José Antonio Barreto Alves[4], Maria do Carmo de Oliveira Ribeiro[5], Ana Carla Ferreira Silva dos Santos[6]

ABSTRACT

Objective: to determine the severity of trauma in adolescents and adults by the *New Injury Severity Score*. ***Method***: ecological, retrospective and quantitative study in medical records of 301 victims treated from January 2006 to July 2008 in the Emergency Hospital of Sergipe/SE/Brazil. The collection was performed after approval by the Ethics Committee in Research of the Federal University of Sergipe under No. 2448.0.000.107-08. ***Results***: the head and neck region were the most severely affected in 61.5% and 66.8% had a score ≥ 16 points. There was a significant association between NISS and length of stay, number of body regions, Glasgow Coma Scale and outcome. ***Conclusion***: the level of severity of trauma by the New Injury Severity Score showed that most victims with score ≥ 25 points and head and neck region as most severely affected, prevailing Traumatic Brain Injury. ***Descriptors***: Indices of Severity of the Trauma; Wounds and Injuries; Adolescent; Adult.

RESUMO

Objetivo: determinar a gravidade do trauma em adolescentes e adultos pelo New Injury Severity Score. ***Método***: estudo ecológico, retrospectivo e quantitativo em prontuários de 301 vítimas atendidas entre janeiro de 2006 e julho de 2008 no Hospital de Urgência de Sergipe/SE/Brasil. A coleta foi realizada após a autorização do Comitê de Ética em Pesquisa da Universidade Federal de Sergipe sob nº 2448.0.000.107-08. ***Resultados***: a região da cabeça e pescoço foi a mais gravemente afetada em 61,5% e 66,8% apresentaram escore ≥ a 16 pontos. Houve associação significante entre o escore NISS e o tempo de internamento, número de regiões corpóreas, Escala de Coma de Glasgow e desfecho. ***Conclusão***: o nível de gravidade do trauma pelo New Injury Severity Score demonstrou maioria das vítimas com escore ≥ 25 pontos e a região da cabeça e pescoço a mais gravemente afetada, com predomínio do Trauma Cranioencefálico. ***Descritores***: Índices de Gravidade do Trauma; Ferimentos e Lesões; Adolescente; Adulto.

RESUMEN

Objetivo: determinar la severidad del trauma en adolescentes y adultos por el *New Injury Severity Score*. ***Método***: se trata de estudio ecológico, retrospectivo y cuantitativo en registros de 301 víctimas tratadas entre enero de 2006 y julio de 2008 en el Hospital de Urgencias de Sergipe. La colecta se realizó tras aprobación del Comité de Ética en Pesquisa de la Universidad Federal de Sergipe, bajo Nº 2448.0.000.107-08. ***Resultados***: la región de la cabeza y cuello fueron las más afectadas en 61,5% y 66,8% con puntuaciones ≥ 16 puntos. Hubo asociación significativa entre NISS y duración de internación, número de partes del cuerpo, Escala de Coma de Glasgow y resultados. ***Conclusión***: el nivel de severidad del trauma por el New Injury Severity Score mostró una mayoría de víctimas con puntuación ≥ 25 puntos y región de la cabeza y cuello fueron las más gravemente afectadas, predominando el Trauma Craneoencefálico. ***Descriptores***: Indices de Gravedad del Trauma; Heridas y Traumatismos; Adolescente; Adulto.

[1]Nurse, Master and Doctorate Student of the Post-Graduate Program in Health Sciences of the Federal University of Sergipe/UFS, Assistant Professor I of the Federal University of Sergipe Campus Professor Antonio Garcia Filho/UFS, Sergipe (SE), Brazil. E-mail: mariangela.tao@gmail.com; [2]Nurse, Doctor in Adult Health Nursing, Associated Professor of the Nursing Department and of the Post-Graduate Program in Medicine of the Federal University of Sergipe/PPGENF/UFS/DEN. Sergipe, Brazil. E-mail: edilenechs@yahoo.com.br; [3]Doctor, Doctor in Pathology, Associated Professor I of the Medicine Department of the Federal University of Sergipe/UFS/DME. Sergipe (SE), Brazil. E-mail: ricardofakhouri@gmail.com; [4]Nurse, Master and Doctorate Student of the Post-Graduate Program in Health Sciences of the Federal University of Sergipe/UFS, Assistant Professor I of the Federal University of Sergipe Campus Professor Antonio Garcia Filho/UFS, Sergipe (SE), Brazil. E-mail: antoniobalves@gmail.com; [5]Nurse, Master and Doctorate Student of the Post-Graduate Program in Health Sciences of the Federal University of Sergipe/UFS, Assistant Professor II of the Federal University of Sergipe/UFS. Sergipe (SE), Brazil. E-mail: enffer2@yahoo.com.br; [6]Nurse, Master's Degree Student of the Post-Graduate Program in Health Sciences of the Federal University of Sergipe/UFS. Sergipe (SE), Brazil. Email: carlafss@yahoo.com.br

Article prepared from the master´s dissertation: **Trauma Severity in adolescents and adults in Sergipe by the "New Injury Severity Score"** presented to the Center of Post-Graduate in Medicine of the Federal University of Sergipe/UFS. Sergipe/SE/Brazil/2009.

INTRODUCTION

Trauma is considered a disease of endemic character and the main cause of death in the first four decades of life, whose consequences are capable of producing significant changes in the life of the victim and their families, and, therefore, a serious public health issue.[1-2]

The sequelae that might be present in trauma victims produce strong impact in public health with increase of the needed resources because of the lesions which can be multiple and require immediate specialized care.[3]

The complexity of the trauma victims has encouraged researchers to the study, production and improvement of the so-called Trauma Indices that are mathematical or statistical values, quantified by numerical scores, which varies depending on the injuries severity resulted of trauma.[4] These indices can be used in the evaluation of clinical status of the victim, quantification of the severity of the lesions, orientation of screening during nursing care, standardization of the language, the performance of clinical and epidemiological studies and, also, the orientation of educational campaigns for the prevention of trauma.[5]

The trauma indices are classified into physiological, anatomical and mixed. The anatomic indices assess the severity and extension of lesions in body regions that occurred at the moment of the trauma, using the Abbreviated Injury *Scale* (AIS), created in 1971, in the United States of America, by a committee formed by a group of experts constituted by *the* American Association for Automotive Medicine and the Society of Automotive Engineer.[5] In 2005, it was revised to approximately 2.000 codified lesions, which were updated in 2008.[6]

The role of multiple lesions to predict the outcome is important because most victims present more than one lesion, which can influence the occurrence of clinical complications, the length fo stay and long-term rehabilitation after the traumatic injury.[7-8]

The New Injury Severity Score (NISS) is based on the AIS and calculates the severity of trauma from the sum of the square of three most severe injuries, regardless of body region, which simplifies the calculation and increase the ability to predict the outcome.[9-10]

Studies revealed that it can be also used as mortality indicator and other clinical complications in victims with blunt trauma, especially those who present orthopedic injuries and, also, to indicate the use of mechanical ventilation support in critical patients with respiratory failure.[11-3]

Trauma victims need specialized support by means of multidisciplinary team and nursing, by the nature of work, fulfill a fundamental role in the prevention and control of complications originated from the severity of traumatic injuries.

This study is justified by the lack of studies with this specificity and it is believed that the determination of trauma severity by means of anatomical score helps the identification of severity level of the victims, and, therefore, can determine the nursing care.

OBJECTIVES

- To determine the trauma severity level in adolescents and adults by the New Injury Severity Score.
- To verify its relation with length of hospital stay, number of affected body regions, body region most severely affected, Glasgow Coma Scale and outcome of trauma.

METHOD

Ecological, retrospective study with a quantitative approach, performed at the Emergency Hospital of Sergipe – HUSE, linked to the State Health Department, located in the city of Aracaju, capital of the State of Sergipe/Brazil. It is a reference center for hospital care of trauma victims who are sent after pre-hospital care performed by the Mobile Emergency Care or by the Fire Brigade.

The sample consisted of 301 trauma victims' medical records, who were treated from January 2006 to July 2008, according to the following inclusion criteria: (1) be a victim admitted to the hospital for any type of trauma, (2) length of hospital stay equal to or higher than 24 hours, (3) aged between 12 and 60 years (4) that has been discharged from hospital (excluding the discharge by request and hospital transferences) or death to ensure the description of the complete hospital treatment.

From 999 medical records registered in the Medical Records Service of the Hospital, 905 victims had a discharge outcome and 94 victims died. The sample size calculation was conducted with an error E_0, and established the minimum number of 286 medical records to constitute the sample. The collection was held from September to December 2008, according to the original sequence of

database by register number in the medical record and it was finished after 301 analyzed records. The object of this study did not include; trauma victims younger than 12 years and older than 60 years.

On the data collection instrument was registered the socio-demographic and epidemiological variables: age, sex, external cause, number of hospital days, discharge or death outcome, Abbreviated Injury Scale (AIS), information on the level of consciousness according to the Glasgow Coma Scale (GCS) at the moment of admission. The NISS severity score was calculated after coding the lesions by the manual AIS-2005/2008, considering the sum of the square of the most severe lesions, regardless of body region.

The research began after authorization and signing of confidentiality term by the Director of HUSE to access the records of trauma victims and after the approval of this study by the Ethics Committee in Research of the Federal University of Sergipe, registered under the Protocol No. 2448.0.000.107 -08. The data confidentiality has been provided in accordance with the Resolution 196/96[14] of the National Health Council which regulates the researches that involve Human Beings.

The data were stored in a computerized database in Software Statistical Package for the Social Science (SPSS) version 16.0. The associations between NISS score and the variables: number of affected body regions, body region most affected, GCS and outcome of trauma were conducted by means of the Chi-Square Test. It was used the variance analysis test (ANOVA) and the *Post hoc Tukey test* to verify the comparison of the averages of the variable length of stay in relation to score NISS. For the entire study the significance level of 5% was considered.

There were seven ISS intervals: 1-8, 9-15, 16-24, 25-40, 41-49, 50-74 and 75 and the body divided into six segments (head and neck, face, chest, abdomen or pelvic contents, extremities or pelvic waist, and external surface) in the identification of the most severely affected body regions and the number of lesions presented.[15] The interval between 1 and 15 was classified as mild trauma, between 16 and 24 as moderate trauma and, when greater or equal to 25, indicates severe trauma.

RESULTS

The characterization of victims in this study, previously published, demonstrated that the age average was 27.8±12.8 years, average length of hospital stay of 10.2±15.3 days, the majority (85.7%) were male, from municipalities of the State of Sergipe (56.2%), whose trauma occurred on a public road (78.1%) for transportation accidents (47.2%), followed by aggression (27.6%), which in 74.1% survived to the trauma.[17]

The present study evaluated the trauma severity by NISS score, which revealed variation of 1 to 75 points, with average of 28±20,7 points. The trauma victims distribution, according to level of severity, is shown in Table 1 and reveals a predominance of 23.3 % of victims in the score between 25 and 40 points, being 66.8 % had NISS score equal to or greater than 16 points.

Table 1. Distribution of victims, according to NISS scores. HUSE, Sergipe, 2008.

NISS Score	n	%
1 - 8	42	14,0
9 - 15	58	19,3
16 - 24	46	15,3
25 - 40	70	23,3
41 - 49	24	8,0
50 - 74	44	14,6
75	17	5,6
Total	301	100

The number of affected body regions in trauma victims is represented in Table 2 and showed that there were more than one affected region in 32,9% of victims. The connection between NISS and number of affected body regions present p=0.004, which demonstrates significant statistical association between the variables.

Table 2. NISS X Number of affected body regions in trauma victims. HUSE, Sergipe, 2008.

Number of affected body regions	NISS Score							
	1-8		1-8		1-8		1-8	
One	35	One	35	One	35	One	35	One
Two	7	Two	7	Two	7	Two	7	Two
Three	0	Three	0	Three	0	Three	0	Three
Four	0	Four	0	Four	0	Four	0	Four
Five	0	Five	0	Five	0	Five	0	Five
Total	42	Total	42	Total	42	Total	42	Total

* Chi-square p-value = 0.004

The most severe lesions in the head and neck region were present in 61.5 % of the victims, followed by the region of the abdomen or pelvic contents in 14.6 %, as shown in Table 3. When investigated the association between NISS and body region most severely affected, the Chi-Square test showed p=0.001, which indicates a significant statistical association.

Table 3. NISS X Number of affected body regions in trauma victims. HUSE, Sergipe, 2008.

Location of the most serious injury	NISS Score							
	1-8	9-15	16-24	25-40	41-49	50-74	75	Total
Head and neck	14	31	25	46	18	39	12	185
Face	4	2	0	0	0	0	0	6
Chest	0	3	3	4	1	0	2	13
Abdomen or pelvic content	9	5	9	10	4	5	2	44
Extremities or pelvic waist	6	8	4	4	1	0	0	23
External surface	9	9	5	6	0	0	1	30
Total	42	58	46	70	24	44	17	301

* Chi-square p-value = 0,001

Regarding the length of stay, it was verified that the higher the NISS score the longer the length of stay of the victim. The maximum score of 75 points showed the shorter length of stay. The ANOVA test (p=0.01), and the post-hoc Tukey test (p=0.05) confirmed the significant association between NISS and length of hospital stay (Table 4).

Table 4. NISS X Length of hospitalization (days) of the trauma victims. HUSE, Sergipe, 2008.

NISS Score X Length of hospitalization							
NISS Score	N	Average	Standard Deviation	95% Confidence Interval by Average Limit inferior	Limit superior	Min	Max
1 - 8	42	4,98*	5,969	3,12	6,84	1	34
9 - 15	58	6,45*	8,380	4,24	8,65	1	48
16 - 24	46	9,43*	10,389	6,35	12,52	2	68
25 - 40	70	15,41*	21,206	10,36	20,47	1	160
41 - 49	24	12,33	14,334	6,28	18,39	1	50
50 - 74	44	14,23*	20,843	7,89	20,56	1	95
75	17	3,82	3,557	1,99	5,65	1	14
Total	301	10,24	15,315	8,51	11,98	1	160

ANOVA p-value =0,01 *Tukey HSD=0,05

The GCS score at the moment of admission ranged from 3 to 15 points and 63.8 % of the victims presented a score of 13 to 15. It was observed that 100% of the victims classified with the lowest NISS score between 1-8, were discharged from hospital, as well as 100% of the victims who scored the maximum score of 75 points, had an unfavorable outcome characterized by death. The Chi-square test showed p=0.001, which demonstrates an association between the severity of the victims defined by NISS and trauma outcome as shown in Table 5.

Table 5. NISS X GCS X Outcome in trauma victims. HUSE, Sergipe, 2008.

		NISS Score							
GCS Score	Outcome	1-8	9-15	16-24	25-40	41-49	50-74	75	Total
Severe Trauma: 3 To 8*	Discharged			1	5	4	1	0	11
	Death			0	5	4	21	11	41
	Total			1	10	8	22	11	52
Moderate Trauma: 9 To 12	Discharged	1	6	5	12	4	8	0	36
	Death	0	1	0	6	6	5	3	21
	Total	1	7	5	18	10	13	3	57
Mild Trauma: 13 To 15	Discharged	41	49	40	37	3	5	0	175
	Death	0	2	0	5	3	4	3	17
	Total	41	51	40	42	6	9	3	192

* Chi-square p-value = 0,001

DISCUSSION

The average number of points in the trauma severity level presented of 28±20.7 points, close to that presented in study[16] that evaluated victims of external causes admitted in Intensive Care Unit in São Paulo, through several trauma levels, with NISS identification with average of 23,6±8,8 points, which indicates a need of specialized care.

It was observed in this study that the majority (66,8%) presented NISS equal or higher than 16 points, which has been considered as a critical point in the trauma evaluation[4], prevailing the score between 25 and 40 points, in 23,3% of victims, and, therefore, severe trauma. It is important to highlight that trauma outcome is directly related to several factors, such as: age and pre-existing health condition.

In studies[3,8] with victims who had traumatic injuries punctuated with a score greater than or equal to 16 points were identified, in addition to loss in physical performance, deficiencies, such as: reduction of vitality, mental health disorders and cognitive function, limitations and restrictions related to pain that complicates to perform basic tasks of daily living activities, such as: mobility and, consequently, impairment of social role.

Trauma can achieve a single region or multiple regions with different levels of severity. In this study, the majority (67.1%) were affected in only one body region. However, it was evidenced that 32,9% of victims presented two or more affected body regions. In the association between NISS and number of traumatized regions, it was observed that the higher the number of traumatized regions the greater the trauma severity measured by NISS.

Most victims (61.5%) presented lesions in the head and neck region, followed by the abdomen or pelvic content region (14.6%). The association between NISS and body region most severely affected is demonstrated in the Chi-square test with p=0.001. The association between NISS and length of hospital stay showed a p-value=0.001, evidencing that the length of stay increased in victims who had been scored above 16 points. Scores between 25-40 points, as well as scores between 50-74 points, showed the highest average of length of hospitalization.

Then, it can be considered that the severe trauma predicts a longer hospitalization time for those victims and possible clinical complications, an example is pulmonary disorders, infections and pneumonia associated with the use of respiratory prosthesis in victims who need mechanical ventilation support.[13]

Study[18] identified that the long stay of adolescents victims of external causes was directly related to the need of hospitalization in Intensive Care Unit by comorbidities related to clinical changes, highlighting the hidroelectrolyte disorders and the presence of infection.

The lowest average of admission was verified in the maximum score of 75 points. In this context, this result can be inferred to victims who had unfavorable outcome to trauma and, therefore, a shorter length of stay due to death. This fact can be verified in the NISS analysis with the trauma outcome, which was statistically significant with a p-value=0.001. It was also noticed that 100% of victims classified with the lowest NISS score from 1-8, were discharged from the hospital.

Study of systematic review[19] highlights that, in Brazil, from 2009, there was a predominance of motorcyclists, in victims related to traffic accidents, with higher mortality for running over. It Is revealed that the body region most frequently affected are upper and lower limbs, followed by head region. However, as severity, the injuries of head region, especially the Traumatic Brain Injury is the main lesion that predicts worse clinical prognosis. This fact can be justified by the inexistence of mechanical barrier

between the motorcyclist and the object in which occurs the collision, thus the possibility of increase of mortality among these victims.

The involvement of the head and neck region in traffic accident victims was observed in several studies[8,12-3] that show the need of measuring the consciousness level by GCS. It is noteworthy that, by being a physiological and dynamic index, it is considered an important tool for clinical evaluation of the victims[20-1], it has a wide acceptance, ease of application and good correlation with trauma severity[9]. Nevertheless, the GCS is subject to changes during the hospitalization and, therefore, varies depending on the clinical status of the victim, since this presents complex lesions and often damages of several organs and body regions.[19]

Study[22] conducted with victims trapped in collisions of motor vehicles in the city of São Paulo, has shown that there is a chance three times greater for complications related to shock and hypotension, evidenced in necropsy data which demonstrated hemorrhage as the cause of the fatal outcome. Therefore, the severity and length of service during the accident should be considered in the treatment of these victims.

All the victims with a GCS score between 3 to 8 (17.3%) had fatal outcomes. The score GCS between 3 to 8 was compared with NISS, in which it was observed that all the victims in this interval have been scored with an NISS ≥ 16 points, therefore, between moderate and severe trauma. These data corroborate the need for the GCS measurement as an outcome predictor in traumatic lesions, in which the minimum score of 3 points at the moment of intra-hospital admission seems to be a strong mortality predictor in this victims.[21]

It is noteworthy that two victims scored as mild trauma and a victim scored as moderate trauma, both with an NISS score between 9-15 points presented death as an outcome. It can be inferred that these results are related to complications from multiple risk factors that influenced the mortality in trauma, such as age, pupillary changes, shock, and hypotension. [5]

The physiological changes resulted from trauma, particularly Traumatic Brain Injury, are considered a second trauma, contributing to mortality and influencing the GCS measurement.[4,13] Therefore, the use of anatomical and physiological indices combined might improve the severity measurement of the injuries and ease the victim assistance.

Therefore, the use of anatomical score is an instrument that allows subsidies for systematic evaluation of trauma victims, which can be used in pre and intra-hospital care, as it provides the severity measure, establishes priority to treatment, defines procedures and plans actions of nursing.

CONCLUSION

The determination of trauma severity, according to NISS reveals that most victims had a score ≥ 25 points, compatible with severe trauma. The head and neck region were the most severely affected in the majority of victims. The associations between NISS score and variables hospitalization time, number of affected body regions, body region most severely affected, GCS and trauma outcome presented a statistically significant association in the trauma severity measurement. These results indicate that there was a prevalence of Traumatic Brain Injury as the most severe injury resulted from trauma.

Studies using the registers from medical records may have limitations related to incomplete data. However, to minimize this bias, a thorough reading of all medical and nursing records researched was conducted.

It is expected to have contributed to the knowledge of the importance of the use of anatomical score in trauma victim evaluation in urgency and emergency services. Further studies are suggested with the use of trauma severity indices to assist in evaluating the treatment of victims, with improved of care quality and also encourage government actions that produce impact on reducing and preventing these issues.

REFERENCES

1. Dahlberg LL, Krug EG. Violence a global public health problem. Ciênc Saúde Coletiva on line [Internet]. 2007 [cited 2011 Jan 08];11:1163-78. Available from: http://www.scielo.br/pdf/csc/v11s0/a07v11s0.pdf

2. Hora EC, Sousa RMC. Mudanças nos papéis sociais: uma conseqüência do trauma crânio-encefálico para o cuidador familiar. Rev Latino-am Enfermagem on line [Internet]. 2006 [cited 2011 Apr 14];14(2):183-9. Available from: http://www.scielo.br/pdf/rlae/v14n2/v14n2a06.pdf

3. Soberg HL, Bautz-Holter E, Roise O, Finset AF. Long-term multidimensional functional consequences of severe multiple injuries two years after trauma: a prospective longitudinal cohort study. J Trauma. 2007;62(2):461-70.

4. Champion HR. Trauma Scoring. Scand J Surg on line [Internet]. 2002 [cited 2009 Apr 10];91:12–22. Available from: http://www.fimnet.fi/sjs/articles/SJS12002-12.pdf

5. Sousa RMC, Calil AM, Paranhos WY, Malvestio MA. Atuação no Trauma: Uma abordagem para a enfermagem. São Paulo: Editora Atheneu, 2009. 531p

6. The abbreviated injury scale 2005 – Update 2008, Des Plains, IL 60018: Association for the Advancement of Automotive Medicine, 2008.

7. Di Bartolomeo S, Ventura C, Marino M, Valent F, Trombetti S, De Palma R. The counterintuitive effect of multiple injuries in severity scoring: a simple variable improves the predictive ability of NISS. Scand J Trauma Resusc Emerg Med on line [Internet]. 2011 [cited 2012 June 10];19:26. Available from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3094251/pdf/1757-7241-19-26.pdf

8. Soberg HL, Finset A, Roise O, Bautz-Holter E. The trajectory of physical and mental health from injury to 5 years after multiple trauma: a prospective, longitudinal cohort study. Arch Phys Med Rehabil. 2012;93:765-74.

9. Moore L, Lavoie A, LeSage N, Bergeron E, Émond M, Abdous B. Consensus or data-derived anatomic injury severity scoring? J Trauma. 2008;64(2):420-6.

10. Nogueira LS, Domingues CA, Campos MA, Sousa RMC. Dez anos de new injury severity score (NISS): possível mudança? Rev Latino-am Enfermagem on line [Internet]. 2008 Mar/Apr [cited 2010 June 20];16(2):314-9. Available from: http://www.scielo.br/pdf/rlae/v16n2/es_22.pdf

11. Harwood PJ, Giannoudis PV, Probst C, Van Griensven M, Krettek C, Hans-Christoph P et al. Which AIS based scoring system is the best predictor of outcome in orthopaedic blunt trauma patients? J Trauma. 2006;60(4):334-40.

12. Matewski D, Szymkowiak E, Bilinski P. Analysis of management of patients with multiple injuries of the locomotor system. International Orthopaedics on line [Internet]. 2008 [cited 2011 Dec 08];32:753–8. Available from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2898959/pdf/264_2007_Article_403.pdf

13. Honarmand A, Safavi M. The new injury severity scores: A more accurate predictor of need ventilator and time ventilated in trauma patients than the injury severity scores. 10Indian J Crit Care Med on line [Internet]. 2006 [cited 2011 Jan 10];10(4):219-24. Available from: http://www.ijccm.org/temp/IJCCM104219-4052323_111523.pdf

14. Brasil. Ministério da Saúde. Resolução nº196 de 10 de outubro de 1996: diretrizes e normas regulamentadoras de pesquisa envolvendo seres humanos. Brasília (DF): Ministério da Saúde. 1996 [cited 2011 set 10]. Available from: http://www.datasus.gov.br/conselho/resol96/RES19696.htm

15. Copes WS, Champion HR, Sacco WJ, Lawnick, MM, Keast, SL, Bain, LW. The Injury Severity Score Revisited. J Trauma. 1988;28(1):69-77.

16. Nogueira LS, Sousa RMC, Domingues CA. Gravidade das vítimas de trauma, admitidas em unidades de terapia intensiva: estudo comparativo entre diferentes índices. Rev Latino-am Enfermagem on line[Internet]. 2009 [cited 2011 Feb 12];17(6):1037-42 Available from: http://www.scielo.br/pdf/rlae/v17n6/pt_17.pdf

17. Nunes MS, Hora EC, Fakhouri R, Alves JAB, Ribeiro, MCO, Santos, ACFS. Characterization of victims of trauma treated in an emergency hospital. J Nurs UFPE on line [Internet]. 2011 Nov [cited 2011 Dec 12];5(9):2136-42. Available from: http://www.ufpe.br/revistaenfermagem/index.php/revista/article/view/2020/pdf_684

18. Oliveira LS, Araújo RA, Miranda CA, Nascimento ES, Oliveira EC, Abraão FMS et al. Profile of adolescent victims of violence due to external causes receiving intensive care Rev enferm UFPE on line [Internet]. 2011 July [cited 2012 Jan 21];5(5):1121-28. Available from: http://www.ufpe.br/revistaenfermagem/index.php/revista/article/view/1519/pdf_541

19. Calil AM, Sallum EA, Domingues CA, Nogueira LS. Mapeamento das lesões em vítimas de acidentes de trânsito: revisão sistemática da literatura. Rev latino-am Enfermagem on line [Internet]. 2009 [cited 2011 Jan 18];17(1):120-25. Available from: http://www.scielo.br/pdf/rlae/v17n1/pt_19.pdf

20. Koizumi MS, Araújo GL. Escala de Coma de Glasgow: subestimação em pacientes com respostas verbais impeditivas. Acta Paul Enferm on line [Internet]. 2005 [cited 2009 June 08];18(2):136-42. Available from: http://www.scielo.br/pdf/ape/v18n2/a04v18n2.pdf

21. Tien HC, Cunha JRF, Wu SN, Chughtai T,Tremblay LN, Brenneman FD et al. Do trauma patients with a Glasgow Coma Scale Score of 3 and bilateral fixade and dilated pupils have any chance of survival? J Trauma. 2006;60:274-8.

22. Dias ARN, Abib SCV, Poli-de-Figueiredo LF, Perfeito JAJ. Entrapped victims in motor vehicle collisions: characteristics and prehospital care in the city of São Paulo, Brazil. Clinics on line [Internet]. 2011 [cited 2012 Feb 08];66(1):21-5. Available from: http://www.scielo.br/pdf/clin/v66n1/v66n1a05.pdf

Submission: 2012/07/22
Accepted: 2012/11/17
Publishing: 2013/01/01

Corresponding Address

Mariangela da Silva Nunes
Núcleo de Enfermagem — Universidade Federal de Sergipe
Campus Prof. Antônio Garcia Filho
Rua Padre Álvares Pitangueira, 248 — Centro
CEP: 49400-000 — Lagarto (SE), Brazil