Effectiveness of the triage system in a private emergency service: cohort study

Maria Meimei Brevidelli[1] (iD), Adriana Alves Palmeira Liberato[2] (iD), Minerva Isume Taninaga[2] (iD), Carolina Novak Huss[2] (iD), Rosana Lima Ocon Alves[2] (iD)

ABSTRACT

Background: the overcrowding of emergency services is a worldwide phenomenon. This makes it essential that the triage systems used are effective in identifying priority care. However, little is known about the effectiveness of triage systems in emergency services, especially in the supplementary health network in Brazil. **Objective:** identify the effectiveness of the triage system in a private emergency department, based on the Canadian Triage and Acuity Scale. **Methods:** a retrospective cohort study, with 254,730 records of care, between 2017 and 2018, from a private emergency service, reference in high complexity medicine, in São Paulo (SP), Brazil. Descriptive statistics were used to characterize the attendances, according to year, gender, age, priority rating, and post-acute clinical outcome. Association between the scale priority grades and clinical outcomes was verified by Pearson's chi-square test. To analyze the effectiveness of the screening system, a univariate logistic regression model was designed to predict the outcome "hospitalizations/hospitalizations" compared to "discharges". Due to the robust sample size, the significance level considered was 0.1%. **Results:** about 60% of the cases were classified as non-urgent and 30.8% as urgent. The probability of death and hospitalization corresponded to the increased degree of priority, ranging from more than 12 times for the "semi-urgent" attendances to more than 100 times for the "emergency" degree. Patients seen in 2018, male and over 50 years old, were more likely to be hospitalized or die. **Conclusion:** the screening system analyzed was considered effective in predicting clinical outcomes compatible with the established severity gradation. This is relevant as it expresses, for the first time in Brazil, the effectiveness of a triage system based on the Canadian Triage and Acuity Scale. Moreover, the characterization of the expressive search for low severity care among users of the analyzed service is similar to those presented in several national and international studies. Reflections on sociocultural and economic explanations in the Brazilian context are made, exposing perspectives to be achieved by public policies.

Keywords: Triage, Emergency Medicine, Emergency Nursing, Cohort Studies.

---

1. Universidade Paulista – UNIP. Instituto de Ciências da Saúde, São Paulo (SP), Brasil.
2. Hospital Nove de Julho. Bloco Emergencial, São Paulo (SP), Brasil.

INTRODUCTION

Emergency services experience an expressive growth in the demand of clients seeking assistance of various complexities, generating overcrowding. Currently, overcrowding is a problem observed worldwide, being identified in a huge diversity of countries, such as the United States, Canada, Italy, France, Spain, Finland, Denmark, Iran, and India, among others[1]. A recent systematic review that sought to identify causes and consequences of overcrowding in emergency services pointed to the increase in care complexity, the demand from the elderly, and the volume of low-severity care as the main causes[2].

National studies attribute the increased demand for emergency services to the low capacity of primary care to meet the needs of the population. Consequently, these services are used as the first access to health care for the population, which undermines the premises of the Unified Health System and ends up overloading the health care system[3]. However, this explains part of the problem in Brazil since there is a supplementary health system, which according to data from the National Agency for Supplementary Health (NASH), corresponding to about 24% of the Brazilian population, 50.2% in the capital of São Paulo, in March 2019[4]. In 2018, the National Association of Private Hospitals (NAPH) statistics pointed out that the private hospital network accounted for 61% of Brazil's 6,000 hospitals[5].

Over the years, triage systems in emergency services have been developed to deal with overcrowding, aiming to discriminate the most severe care that needs priority to reduce morbidity and mortality[6]. However, in Brazil, little is known about the effectiveness of triage systems, that is, about the real capacity of the systems to adequately distinguish the priorities for care. Some national studies suggest an association between triage classification and clinical outcomes, with mortality associated with urgent care and discharge associated with non-urgent care[3,7-8]. In addition, many results from national studies are associated with using only the Manchester triage system[9-11].

Although the Canadian Triage and Acuity Scale (CTAS) was adapted to Brazil more than ten years ago, no scientific evidence of its use in the country was found, which shows a gap in knowledge about this triage system. No studies on the evaluation of triage systems in emergency services of the supplementary health network were found either. The results of Brazilian studies on triage in emergency services reflect the reality of emergency services in public hospitals, where[12-13].

Using assumptions adopted in other studies, it was hypothesized that a screening system would be effective if higher levels of classification were associated with higher mortality and hospitalization, acting as a proxy for patient prognosis[7-8,10,14]. Therefore, this research is justified by the urgent need to analyze the use of the Canadian Triage and Acuity Scale as an effective system of internal management of emergency care. Thus, the aim of this study was to identify the effectiveness of a triage system, based on the Canadian Triage and Acuity Scale, as a predictor of mortality and hospitalization in a private emergency department.

METHODS

This was a retrospective cohort study conducted with data from electronic medical records of patients seen in the Emergency Room (ER) of a private general hospital, a reference in high complexity medicine, in São Paulo (SP), Brazil. Annually, about 100 thousand patients are seen in the ER of this hospital. The study complied with the ethical principles defined in the National Health Council Resolution No. 466/12, receiving approval from the Research Ethics Committee of the hospital (CAEE: 3164418.3.0000.5455).

The structured triage in the ER was implemented in 2009, being performed exclusively by nurses of the sector, properly trained, according to the institutional protocol, developed from the Brazilian version of the Canadian Triage and Acuity Scale instrument. This version was obtained based on content validation and intraobserver reliability analysis, with a kappa index of 0.739[15]. The Canadian Triage and Acuity Scale aggregates subjective (chief complaint, onset of the problem, description of pain) and objective (physical appearance, vital signs, medications) information to determine the priority of care in five levels: immediate care, emergency (<15min), urgent (<30min), semi-urgent (<60min), non-urgent (<120min)[16]. However, this process is also dependent on the nurse's clinical judgment, which can interfere by increasing or decreasing the score. A good example is the determination of pain severity. The nurse may

prioritize a patient who evaluates pain as having maximum intensity in the thoracic or cerebral region, to the detriment of another patient who reports pain in the cervical region or one of the limbs, even if the intensity is the same.

With help from the hospital's Information Technology Service, all records of ER attendances between January 2017 and December 2018 available in electronic medical records were obtained, which totaled 256,866 records. Only complete records containing all variables of interest to the study were considered eligible. Thus, the following were excluded: 515 records that had records canceled due to evasion before the first medical care; and 1,621 records that were incomplete regarding sex and post-care outcomes. The final sample totaled 254,730 records. The selected variables were:

- Sociodemographic: year of service; age; gender.
- Classification degree according to CTAS: immediate, emergency, urgency, semi-urgency and non-urgency.
- Clinical outcomes: discharge; evasion (leaving the ER without receiving treatment or, during partial treatment, without being discharged); hospitalization and death.

Descriptive statistics were used to characterize the care, according to the selected variables. Association between the scale priorities and clinical outcomes was verified by Pearson's chi-square test. To analyze the effectiveness of the triage system, a univariate logistic regression model was designed to predict the outcome "hospitalizations/ hospitalizations" compared to "discharges". The outcome "discharge" was removed from the analysis as it was considered a confounding variable, since nothing could be concluded about the real condition of the patient. In addition to the priority level of the scale, the variables "year of care", "age" and "gender "were added as predictors. The variable age was categorized into age groups, with five-year intervals, tof detect greater variability. Due to the robust sample size, the significance level considered was 0.1%. All analyses used the Social Package for Social Science (SPSS) software, version 22.0.

RESULTS

Table 1 shows the characteristics of the patients seen in the ER. It is observed a similar proportion of patients seen in the two years analyzed and a predominance of women (57.3%). The mean and median age of patients were 38.8 years (SD=19.8) and 35.0 years (AIQ=25.0), respectively.

As for the degree of priority, 60.4% of the calls were classified as non-urgent and 30.8% as urgent. Only 2.9% was classified as immediate or emergency care. The most frequent clinical outcome was discharge (90.0%) and hospitalization corresponded to only 8.8%. It is also observed that the number of deaths was so small that proportionally it tended to zero.

Table 2 shows a statistically significant association between the clinical outcomes in the different degrees of priority of CTAS. This implies that in the "Immediate" classification there was a predominance of deaths (59.1%), while in the "Emergency" classification there was a greater number of hospitalizations (61.0%). Moreover, in the other classifications (Urgent, Semi-urgent and Non-urgent) the predominant outcome was discharge (65.4%, 83.9% and 98.0%, respectively).

Table 3 presents the regression analysis for the outcome of hospitalization and mortality. Patients seen in 2018, male and over 50 years old, were more likely to be hospitalized or die. In relation to the classification received in triage, the probability of the outcome increased considerably as the degree of priority increased, ranging from more than 12 times for semi-urgent care to more than 100 times for the "emergency" degree. The OR value obtained in the "immediate" classification should be understood as tending to infinity, which was expected, since all care in this classification progressed to hospitalization or death. Furthermore, it can be seen that, since the number of attendances in this classification was very small, this correlation was not statistically significant. This model was able to explain 32.9% of the variance of the outcome.

DISCUSSION

The contribution of this study is to characterize for the first time the validity of the use of CTAS as a predictor of mortality and hospitalization in a private emergency department in Brazil. The first data that draws attention is the large proportion of non-urgent care. There is evidence that emergency

Table 1. Characteristics of care in the ER, private hospital, São Paulo (SP), Brazil, 2017-2018.

Characteristics of the services	Frequency
Year – N (%)	
2017	130,071 (51.1)
2018	124,659 (48.9)
Sex – N (%)	
male	108,771 (42.7)
female	149,959 (57.3)
Age(years)	
minimum	0
maximum	105
Mean (SD)	38,8 (19.8)
Median (IQR)	35,0 (25.0)
CTAS Classification – N (%)	
Immediate	22 (0,0)
Emergency	7,398 (2.9)
Urgency	15,015 (5.9)
Semi-urgency	78,388 (30.8)
Non Urgency	153,907 (60.4)
Clinical outcome – N (%)	
High	229,264 (90.0)
Hospitalization	22,436 (8.8)
Evasion	3,008 (1.2)
Death	22 (0.0)

Key: SD= Standard deviation; IQR= Interquartile range

Table 2. Clinical outcomes after care in the ER, according to degree of priority, private hospital, São Paulo (SP), Brazil, 2017-2018.

CTAS Classification	Clinical Outcomes N (%)				
	Death	Hospitalization	Discharge	Evasion	Value of p*
Immediate	13 (59.1)	9 (40.9)	0 (0.0)	(0.0)	
Emergency	8 (0.1)	4,514 (61.0)	2,814 (38.0)	62 (0.8)	
Urgency	0 (0.0)	4,867 (32.4)	9,867 (65.4)	281 (1.9)	0.000
Semi-urgency	0 (0.0)	11,206 (14.3)	65,795 (83.9)	1,387 (1.8)	
Non Urgency	1 (0.0)	1840 (1.2)	150,788 (98.0)	1,278 (0.8)	

* Chi-square test

services in Brazil have been used as a resource for low complexity care[3, 8, 11,17]. A multicenter study comparing two emergency services, one in Portugal and another in Brazil, identified important differences between the classification profile of care in triage. While in Brazil, about 46% of the cases were classified as a high priority, in Portugal this same category was identified in approximately 76% of the cases. In Brazil, the authors point out that emergency units are seen as a gateway to health services, even for non-urgent health problems, contributing to overcrowding and low resolutivity of services provided[17].

Table 3. Logistic regression analysis to predict hospitalizations and deaths, São Paulo (SP), Brazil, 2017-2018.

Predictive variables		Adjusted Odds Ratio	95%CI	Value of p
Year	2017	0.93	0.90 – 0.96	0.000
	2018	*		
Sex	Male	1.31	1.27 -1.35	0.000
	Female	*		
Age (years)	Less than 1	1.02	0.86 - 1.19	0.850
	1 - 4	0.53	0.47 - 0.59	0.000
	5 - 9	0.62	0.54 - 0.72	0.000
	10 - 14	0.88	0.76 - 1.02	0.97
	15 - 19	0.73	0.65 - 0.82	0.000
	20 -29	0.61	0.57 - 0.65	0.000
	30 -39	0.79	0.74 - 0.84	0.000
	40 - 49	1.03	0.96 - 1.01x	0.457
	50 -59	1.33	1.25 - 1.42	0.000
	60 - 69	1.27	1.19 - 1.35	0.000
	70 - 79	1.12	1.05 – 1.20	0.001
	More than 80	*		
CTAS Classification	Immediate	107,004,830,800,96	0.000	0.998
	Emergency	108.73	101.38 – 116.62	0.000
	Urgency	34.29	32.28 – 36.42	0.000
	Semi-urgency	12.31	11.70 – 12.96	0.000
	Non urgency	*		

R2 Neglekerke=32.9. Key: *95%CI= 95% confidence interval; *Parameter in Regression*

As already seen, overcrowding in emergency services is a worldwide phenomenon, explained in part by the high demand for low complexity care. However, what stands out in this study is that this also occurs in services of the supplementary health system. Up to the present moment, this result is unprecedented, because no national studies carried out in services of this profile were found. Nor was it possible to obtain aggregate data from these services that characterize the emergency care. In the annual report of the National Association of Private Hospitals (NAPH) the rate of patient admissions via Emergency Room visits was 8.3% in 2019[18]. This data is very similar to that found in the emergency service analyzed, which was 8.8%, which reinforces the hypothesis that the emergency sector assumes the responsibilities of secondary health care, in which the investigation process of signs and symptoms should occur on an outpatient basis, through elective consultations.

There are some socio-cultural and economic explanations for this behavior of seeking answers to health deviations in emergency care. Brazilians, in general, have a low level of preventive behavior and health promotion, consequently, they do not have a personal agenda to search for periodic evaluations of their health status. Another aggravating cultural factor is related to the belief, even in more favored economic levels, that the search for health behavior or early diagnosis "attracts" illness or even death[19-20].

From an economic perspective, the cost of maintaining private health plans may be above the monthly financial planning, and then, one option is the occasional payment in the presence of an acute symptom, a modality allowed in some health plans. In addition, there is evidence that having health insurance is associated with a greater number of

visits to the doctor[21-22]. The unlimited search for low-severity emergency care induces us to reflect on the importance of public health education policies for the desired changes in knowledge, attitudes, and health practices of the population, including investing in the attractiveness and quality of primary and secondary care levels[23-24].

The significant increase in the probability of death and hospitalization occurring according to the increased priority of care expresses strong consistency and confirms the hypothesis that the triage system used is effective of selecting the most severe care. A recent systematic review to evaluate clinical outcomes and reliability of different triage instruments in emergency services found that CTAS has high sensitivity to detect more severe conditions[25]. This is important because, given the great demand for services, the correct identification of the clients' needs implies faster and safer clinical conducts, with better clinical results and lower costs.

This result is similar to others performed with CTAS. A Canadian study using a computerized version of the instrument found a strong correlation between the screening score and patient severity (mortality, hospitalization), resources used (CT scan, length of stay in the ER), and cost of care[26]. In Taiwan, the application of the CTAS in 33 emergency departments made it possible to verify a significant correlation between the degree of priority and rate of hospitalization, resources used and length of stay in the ER[27]. In Japan, a study evaluating an adapted version of CTAS found a high odds ratio between high scores, hospitalization (general and intensive care unit), a longer length of stay in the ER, and mortality[28]. In addition, there is evidence of consistent use of CTAS in Taiwan, Japan, South Korea, Turkey, Costa Rica, Hungary, Saudi Arabia, and Portugal, among others[29]. The contribution of this study is to verify this relationship for the first time in the Brazilian context, making these findings more robust.

It is worth noting that the significance of the explanatory model of almost 33% implies that two-thirds of the outcome variance was not explained by the variables presented. This suggests that other factors may have contributed to mortality and hospitalization in the analyzed service. A study using emergency department data from a large hospital in Singapore suggested the inclusion of sociodemographic, clinical, and administrative variables to explain hospitalizations[30]. In this study, data regarding comorbidities of the patients seen were not available in the databases. Moreover, it was not possible to use data related to the complaint and the diagnostic hypothesis, because they were not standardized by the International Classification of Diseases (ICD). The absence of these data constitutes a limitation of this study.

The analysis also showed that men over 50 years of age were more likely to die or be hospitalized. The relationship between this same outcome, older age and male gender has already been pointed out in another study[10]. Increased life expectancy with increased demand for health care for people with chronic diseases may explain the greater complexity of care in older age groups[22]. In turn, the greater complexity of care implies more severe outcomes. Furthermore, we can infer that historically men are associated with lower adherence to preventive care and higher risk factors for health, which may mean that these individuals seek care in more critical situations, leading to more severe clinical outcomes[10,31].

Besides the limitation in obtaining other data that could contribute as predictor variables of the outcome "hospitalization/deaths", it is important to highlight that this study was carried out in a single center restricts the results to the service evaluated.

CONCLUSION

The screening system analyzed was considered effective in predicting clinical outcomes compatible with the established severity gradation. This is relevant as it expresses, for the first time in Brazil, the effectiveness of a screening system based on the Canadian Triage and Acuity Scale. The evaluation of screening systems contributes to the management of health services and enables the discussion about the improvement of institutional protocols to ensure better allocation of resources. Moreover, this study contributes by the unprecedented character of evaluating a private emergency service, showing the significant search for low severity care among its users, data that is similar to those presented in

several national and international studies. It reflects on the socio-cultural and economic explanations in the Brazilian context, exposing perspectives to be achieved by public policies.

REFERENCES

1. Pines JM, Hinton JA, Webber EJ, Alkemade AJ, Shabanah AL, Anderson PD et al. International perspectives on emergency department crowding. Academic Emergency Medicine 2011; 18 (12): 1358-1370. https://doi.org/10.1111/j.1553-2712.2011.01235.x

2. Morley C, Unwin M, Peterson GM, Stankovich J, Kinsman L. Emergency department crowding: a systematic review of causes, consequences and solutions. PloS ONE 2018; 18(2): e0203316. https://doi.org/10.1371/journal.pone.0203316

3. Oliveira GN, Campanharo CRV, Lopes MCBT, Barbosa DA, Okuno MFP, Batista REB, Ruth Ester. Correlation between classification in risk categories and clinical aspects and outcomes. **Rev. Latino-Am Enfermagem**, 2016; 24:1-9. http://dx.doi.org/10.1590/1518-8345.1284.2842.

4. Agência Nacional de Saúde Suplementar (ANS). Caderno de informação de saúde suplementar [recurso eletrônico]: beneficiários, operadoras e planos. Rio de Janeiro: ANS, ano 13, n.2. Jun 2019. Disponível em: http://www.ans.gov.br/images/stories/Materiais_para_pesquisa/Perfil_setor/Dados_e_indicadores_do_setor/total-cad-info-jun-2019.pdf

5. Associação Nacional de Hospitais Privados – ANAHP. Representação dos associados. Disponível em: https://www.anahp.com.br/associados/

6. Farrohknia N, Castrén M, Ehrenberg A, Lind L, Oredsson S, Jonsson H et al. Emergency department triage scales and their components: A systematic review of the scientific evidence. Scand. J. Trauma Resusc. Emerg. Med. [internet]. 2011 [cited Oct 10, 2019], 19:42. Available from: https://sjtrem.biomedcentral.com/articles/10.1186/1757-7241-19-42.

7. Gonçalves PC, Pinto Jr D, Salgado PO, Chianca TCM. Relationship between risk stratification, mortality and length of stay in an emergency Hospital. Invest. Educ. Enferm. 2015; 33(3):424-431. http://dx.doi.org/10.17533/udea.iee.v33n3a05

8. Mendes TJM, Silveira LM, Silva LP, Stabile AM. Association between reception with risk classification, clinical outcome and the Mews score. REME – Rev Min Enferm.. 2018; 22:e-1077. https://doi.org/10.5935/1415-2762.20180007

9. Souza CC de, Toledo AD, Tadeu LFR, Chianca TCM. Risk classification in an emergency room: agreement level between a Brazilian institutional and the Manchester Protocol. Rev. Latino-Am. Enfermagem 2011; 19(1):.26-33. https://doi.org/10.1590/S0104-11692011000100005.

10. Becker JB, Lopes MCBT, Pinto MF, Campanharo CRV, Barbosa DA, Batista REA. Triagem no Serviço de Emergência: associação entre as suas categorias e os desfechos do paciente. Rev Esc Enfermagem USP 2015 out; 49(5): 783-789. https://doi.org/10.1590/S0080-623420150000500011

11. Silva ADC, Chianca TCM, Pádua DR, Guimarães GL, Manzo BF, Correa AR. Characterization of care of a public emergency room according to the Manchester Triage System. REME – Rev Min Enferm. 2019; 23:e-1178. https://doi.org/10.5935/1415-2762.20190026

12. Pinto Jr D, Salgado OP, Chianca TCM. Predictive validity of the Manchester Triage System: evaluation of outcomes of patients admitted to an emergency department. Rev. Latino-Am. Enfermagem 2012; 20(6):1-8. https://doi.org/10.1590/S0104-11692012000600005

13. Hinson JS, Martinez DA, Schmitz PSK, Toerper M, Radu D, Scheulen J et al. Accuracy of emergency department triage using the Emergency Severity Index and independent predictors of under-triage and over-triage in Brazil: a retrospective cohort analysis. Int. J. of Emerg. Med. 2018; 11:3. https://doi.org/10.1186/s12245-017-0161-8

14. Moll HA. Challenges in the validation of triage systems at emergency departments. J Clin Epidemiol. 2010;63(4):384-8. https://doi.org/10.1016/j.jclinepi.2009.07.009

15. Pires PS. Tradução para o português e validação de instrumento para triagem de pacientes em serviço de emergência: *Canadian Triage and Acuity Scale*. [tese]. São Paulo (SP). Escola de Enfermagem da Universidade de São Paulo. Disponível em: https://teses.usp.br/teses/disponiveis/7/7136/tde-16102006-162026/publico/Patricia_Silva_Pires.pdf.

16. Arafat A, Al-Farhan A, Khalil HA. Implementation of the Canadian Emergency Department

17. Triage and Acuity Scale (CTAS) in an urgent care center in Saudi Arabia. Int. J. Emerg. Med. 2016; 9:17. https://doi.org/10.1186/s12245-016-0112-9

18. Guedes HM. Araújo FA, Pinto Jr D, Martins JCA, Chianca TCM. Outcome assessment of patients classified through the Manchester Triage System in emergency units in Brazil and Portugal. Invest. Educ. Enferm. 2017; 35(2):174-181. http://dx.doi.org/10.17533/udea.iee.v35n2a06

19. Associação Nacional de Hospitais Privados – ANAHP. Observatório 2020. 12° ed. São Paulo: 2020.

20. De Arruda GO, Barreto M da S, Marcon SS. Percepção de homens adultos sobre suas práticas preventivas e redes de apoio em saúde. Rev Rene. 2015 maio-jun; 16(3):363-73. https://doi.org/10.15253/2175-6783.2015000300009

21. Barreto MDS, Mendonça RD, Pimenta AM, Garcia-Vivar C, Marcon SS. Non-use of primary care routine consultations for individuals with hypertension. Cien Saude Colet. 2018 Mar;23(3):795-804. https://doi.org/10.1590/1413-81232018233.12132016 .

22. Almeida APSC, Nunes BP, Duro SMS, Facchini LA, Determinantes socioeconômicos do acesso a serviços de saúde em idosos: revisão sistemática. Rev. Saude Publica. 2017; 51:50. https://doi.org/10.1590/S1518-8787.2017051006661

23. Malta DC, Bernal RTI, Lima MG, Araújo SSC, Silva MMA, Freitas MIF, et al. Doenças crônicas não transmissíveis e a utilização de serviços de saúde: análise da Pesquisa Nacional de Saúde no Brasil. Rev Saude Publica. 2017; 51 Supl 1:4s. https://doi.org/10.1590/S1518-8787.2017051000090

24. Tavares M de FL, da Rocha RM, Bittar CML, Petersen CB, de Andrade M. Health promotion in professional education: challenges in Health and the need to achieve in other sectors. Ciênc. Saude Colet. Jun 2016; 21 (6): 1799-1808. https://doi.org/10.1590/1413-81232015216.07622016

25. Chaves-Costa FB, Oliveira-Branco JG, Rocha-Aguiar FA, da Silva Júnior GB, de Lima-Saintrain, MV, Catrib AMF. Avanços para redução da morbimortalidade das doenças crônicas não transmissíveis na população brasileira. Revista Gerencia y Políticas de Salud, 2019; 18(37). https://doi.org/10.11144/Javeriana.rgps18-37.armd

26. Hinson JS, Martinez DA, Cabral S, George K, Whalen M, Hansoti B et al. Triage performance in emergency medicine: a systematic review. Ann, Emerg. Med. 2018; 11:3. https://doi.org/10.1016/j.annemergmed.2018.09.022

27. Dong SL, Bullard MJ, Meurer DP, Blitz S, Akhmetshin E, Ohinmaa A, et al. Predictive validity of a computerized emergency triage tool. Acad Emerg Med 2007; 14:16-22. https://doi.org/10.1197/j.aem.2006.08.021

28. Ng C, Yen Z, Tsai JC, Chen LC, Lin SJ, Sang YY et al. Validation of the Taiwan triage and acuity scale: a new computerized five-level triage system. Emerg Med J 2011; 28:1026-1031. http://dx.doi.org/10.1136/emj.2010.094185

29. Kuriyama A, Kaihara T and Ikegami T. Validity of the Japan Acuity and Triage Scale in elderly patients: a cohort study, Am J of Emerg Med 2019; 37(12): 2159-2164 https://doi.org/10.1016/j.ajem.2019.03.006

30. Andrusiek D, Bullard M, Atkinson P. #Triage – Formal emergency department triage tools are inefficient, unfair, and they waste time and resources. CJEM Debat Series. CJEM. Cambridge University Press 2018; 20(5):665–70. https://doi.org/10.1017/cem.2018.434

31. Parker CA, Liu N, Wu SW, Shen Y, Lam SSW, Ong MEH. Predicting hospital admission at the emergency department triage: a novel prediction model. Am J of Emerg Med 2018; 37(8): 1498-1504. https://doi.org/10.1016/j.ajem.2018.10.060

32. Botton A, Cúnico SD, Strey MR. Diferenças de gênero no acesso aos serviços de saúde: problematizações necessárias. Mudanças – Psicologia da Saúde Jan.-Jun. 2017; 25(1): 67-72. https://doi.org/10.15603/2176-1019/mud.v25n1p67-72

Contribuição dos Autores

1- Contribuição substancial no esboço do estudo ou na interpretação dos dados: MMB

2- Participação na redação da versão preliminar: MMB

3- Participação na revisão e aprovação da versão final: MMB; AAPL; MIT; CNH; RLOA

4- Conformidade em ser responsável pela exatidão ou integridade de qualquer parte do estudo: MMB; AAPL; MIT:CNH; RLOA

Corresponding Author
Maria Meimei Brevidelli
meimei@alumni.usp.br