

Epidemiological profile of thoracic trauma in a reference hospital of Foz do Rio Itajaí.

Perfil epidemiológico do trauma torácico em um hospital referência da Foz do Rio Itajaí.

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ABSTRACT

Objective: to describe the epidemiological profile of thoracic trauma in the region of Foz do Rio Itajaí, in the state of Santa Catarina, Brazil. **Methods:** observational, descriptive and prospective study performed through the collection of data starting with a form elaborated by researchers and filled in by the team in charge of a reference hospital between June 2017 and May 2018. **Results:** one hundred and nineteen forms from victims of thoracic trauma were analyzed, constituted of 70.5% male patients and 29.4% female patients, with an average of 39.8 years of age. Medical care happened mainly in daytime (67.9%), 30.2% of patients arriving by their own means, and 52.9% of patients one hour after suffering trauma. As to admission exams, most victims only went through chest X-ray (67.2%). There was a prevalence of closed thoracic trauma (89%), whose main cause was motorcycle accidents (35.2%) and the predominant lesion was rib fracture (42%). Most patients (53.8%) went through a conservative treatment. The average admission time was 2.6 days and the death rate was 5%. **Conclusion:** the profile of patients with thoracic trauma in Itajaí comprises young men, admitted during the day, most of them presenting rib fracture, with closed thoracic trauma due to a road traffic accident involving a motorcycle. Chest X-ray were used to confirm most of the diagnoses, and there was a prevalence for conservative treatment. The admission time and the death rate were smaller than those cited in medical literature, which can be explained by the high index of exclusive muscular lesions.

Keywords: Thoracic Injuries. Thorax. Pneumothorax. Hemothorax. Epidemiology. Trauma Centers..

INTRODUCTION

Having a high prevalence in the world, trauma became a public health problem, associated to high morbimortality, either in developed or in under development countries. According to the World Health Organization, more than nine people die per minute victimized by trauma, with an equivalent expenditure rate of 12% of all diseases¹⁻³. In Brazil, data from the Department of Information of the Unified Health System (DATASUS) shows that, in 2015, there were 37,306 deaths due only to road traffic accidents. Physical aggression, car accidents and other kinds of urban violence account for 12.5% of the total number of deaths, being the third main cause of deaths in the country⁴. In the state of Santa Catarina⁵, between 1996 and 2014, there were 72,857 deaths due to external causes, more common in men (80.6%), youngsters between 20 and 29 years of age (29.6%), and the main mechanism

of trauma were road traffic accidents (46.6%). The municipality of Itajaí followed this pattern and had 3181 deaths due to external causes over the same period of time^{5,6}.

Thoracic trauma (TT) represents from 10% to 15% of the total number of traumas in the world. In the United States it corresponds to the third type of more lethal trauma, following cranioencephalic trauma and extremity trauma³. In Brazil, this rate corresponds to 7.3% of the occurrences, being the second more frequent type of trauma, following only extremity trauma⁷. It accounts for approximately 25% of deaths caused by trauma, besides being a contributing factor in another 25% of them. Among TT victims, around 80% are treated only by thoracostomy with closed pleural drainage (TCPD) associated to analgesia and ventilation therapy. Thoracostomy is used in a smaller portion of patients, between 10% and 20% of them.

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Even so, a third of the patients that present severe thoracic injuries die before getting treatment in hospitals, and another 20% have a late death, due to pleural/pulmonary complications of an infectious nature⁸.

According to the protocol from ATLS, early diagnosis and management are fundamental, and treatment within the first hour of trauma, the golden hour, is associated to a greater possibility to reduce morbimortality^{9,10}. Victims of thoracic injury with lesions in an isolated organ present a mortality rate ranging from 4% to 8%; when another organ is involved, this percentage rises to 10% to 25%; when multiple organs are involved this percentage rises to 35%⁸.

TT is classified as open (penetrating) or closed (blunt), and the lesion spectrum will determine its gravity¹¹. According to the type of trauma, lesions can be divided into four big groups: lesions of the thoracic wall, pulmonary, mediastinal and diaphragmatic lesions¹². The most frequent lesions are rib fractures, injuries of the heart, aorta, airways and diaphragm¹³. Injuries that present greater risk of immediate death are: airways obstructions, hypertensive pneumothorax, open pneumothorax, cardiac tamponade and massive hemothorax. The ones that represent a potential death risk and must be diagnosed and treated in a secondary examination are: simple pneumothorax, hemothorax, pulmonary contusion, unstable thorax, cardiac contusion, traumatic aortic rupture, traumatic diaphragmatic rupture, and mediastinum transfixing injuries¹⁰.

Thoracic lesions are not usually expressed in an obvious way, and complementary examinations are necessary. On the other hand, when there is a severe lesion truly clear or highly suspected, although less common, the diagnosis can be made without imaging exams, in the emergency room itself or even in the trauma scene¹⁴. After an initial evaluation the

first choice of imaging exam is a chest X-ray. In most traumatic lesions this proves to be sufficient in order to clarify the diagnosis, the treatment, and medical monitoring¹⁵. An anteroposterior radiograph, along with the clinical history, can evaluate and quickly diagnose intrathoracic involvements that are life threatening, for example, massive hemothorax. However, it presents low sensitivity to diagnose some severe lesions like pulmonary contusion¹⁶.

A CT scan is a more sensitive method but one must be cautious when using it, since its efficacy does not always compensate for the potential risks relating to the time spent on doing it and for its high cost^{17,18}.

This study aims at increasing the knowledge on epidemiology, types and mechanisms of TT in the region of Foz do Rio Itajai, in order to contribute to the organization of a care protocol, as well as to allow that public policies be elaborated based on the results obtained.

METHODS

Observational, descriptive and prospective study performed at the Hospital and Maternity Hospital Marieta Konder Bornhausen, a reference for trauma care in the region of the Municipalities Association of Foz do Rio Itajai (AMFRI), between June, 2017 and May, 2018. The main objective of this research was to describe the profile of patients who suffered thoracic trauma. The specific objectives involved determining demographic characteristics, compiling types of trauma, sorting trauma mechanisms, describing interventions and initial management, quantifying morbimortality, determining time to arrival in hospital, and admission duration. Variables like age, gender, type of trauma, trauma mechanism, diagnosis or specific lesions, imaging exams performed upon admission, management, interventions performed, and outcome were evaluated.

Victims of thoracic trauma aged 18 years and above that were admitted to the service were included. Patients who were under 18 years of age, those who died before the surgeon's management or at the trauma scene, and those who underwent thoracic drainage or thoracostomy due to non-traumatic causes were excluded from the research. For data collection, a form elaborated by the researchers was used and filled out by the team in charge of care in the trauma room. We would like to stress that all the people involved in data collection received orientation instructions and training as to the adequate filling out of the form in order to avoid biases in the research.

Data was tabled in an Excel for Windows spreadsheet, version 2016 (16.0.4639.1000), and analyzed by means of descriptive statistics, using absolute and relative frequencies and mean values to present results.

The project was approved by the Committee of Ethics in Research, CAAE nº 68392917.7.0000.0120, report nº 2.095.811/2017, in June, 2017.

RESULTS

A hundred and nineteen patients were studied, among them 84 (70.5%) males and 35 (29.4%) females, aged 18 to 85 years. The prevalent age range was 30 to 44 years (31.9%), with an average age of 39.98 years, according to table 1.

Regarding pre-hospital care, 36 (30.2%) patients reached service on their own, 32 (26.8%) were taken by firefighters, 22 (18.4%) were taken by ambulances, 20 (18.4%) by the Service of Mobile Urgency Care (SAMU), while only 9 (7.5%) were taken by the Service of Mobile Care from the road service *Autopista Litoral Sul*. Considering the time for arrival in hospital, 63 (52.9%) reached service within more than one hour's time after the trauma and to 46 (38.6%) it took less than one hour. Ten patients arrived in hospital with no record stated by the medical team.

In what comes to imaging exams performed upon admission, 80 (67.2%) patients underwent only a chest radiograph, while 15 (12.6%) underwent only a chest CT scan, and among all the victims, 21 (17.6%) underwent both exams and three (2.5%) did not undergo any exam upon admission. In total, 101 radiographs were performed, representing 73.7% of the exams performed and 36 CT scans (26.2%). Regarding TT classification, 106 (89%) were blunt, with a higher prevalence of car accidents involving motorcycles, in 42 (35.2%). In 13 (10.9%) patients TT was penetrating, more frequent due to injuries caused by a white weapon, in 8 (6.7%) cases (Table 2).

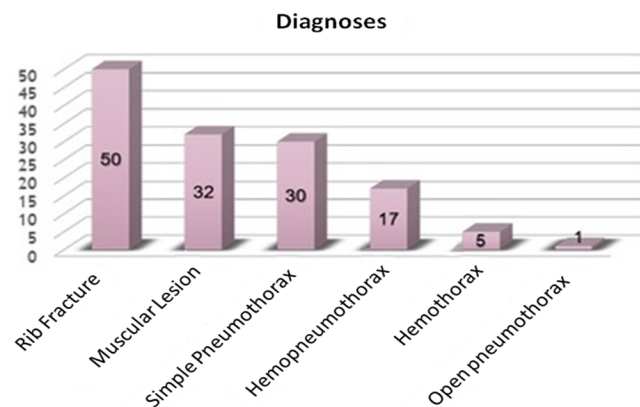
Table 1. Distribution of the forms analyzed according to age range and gender.

Age range	Gender		Total	%
	Female	Male		
18-29	02	35	37	31,0
30-44	13	25	38	31,9
45-59	14	18	32	26,8
60 years or older	06	06	12	10,0
Total	35	84	119	99,7

Table 2. Distribution of trauma mechanisms according to record in analyzed forms.

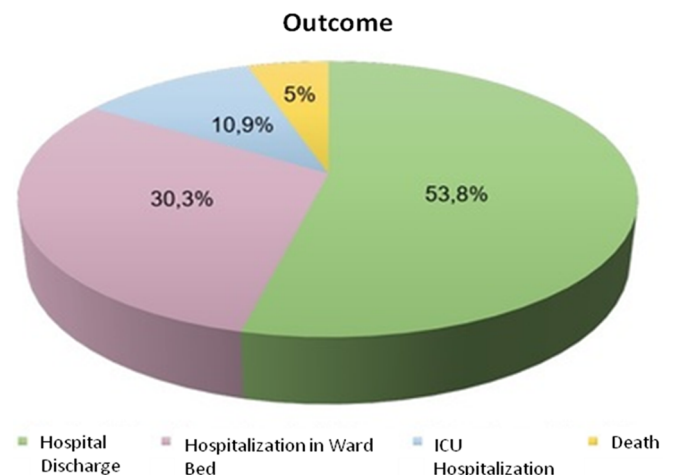
Trauma mechanism	n	%
Blunt	106	89,0
Car motorcycle accident	42	35,2
Fall from elevated plane	32	26,8
Car accident	15	12,6
Physical aggression	09	7,5
Running over	03	2,5
Others	05	4,2
Penetrating	13	10,9
Stab wounds	08	6,7
Fire arm	05	4,2
Total	119	99,9

Regarding types of lesion, rib fractures were the prevalent ones, happening to 50 (42%) patients, followed by muscular lesion in 32 (26.8%) patients, pneumothorax in 30 (25.2%), hemopneumothorax in 17 (14.2%), pulmonary contusion in 15 (12.6%), isolated hemothorax in five (4.2%), and open pneumothorax in one (0.8%) (Figure 1).

**Figure 1.** Proportion of diagnoses recorded in analyzed forms.

As to the association of thoracic lesions, 95 (79.8%) had only one diagnosis, 17 (14.2%) had two, and the predominant one was a combination between simple pneumothorax and rib fracture in 11 (9.2%) patients. Seven patients (5.8%) presented three related diagnoses, with a predominance among simple pneumothorax, pulmonary contusion and rib fracture in five (4.2%) cases.

Regarding management, 55 (46.2%) patients needed hospitalization. Among them, 35 (63.6%) were managed by surgical treatment, of which 33 (94.2%) were submitted to TCPD, and two (5.7%) underwent TCPD associated with exploratory thoracotomy. The remaining 20 (36.3%) patients, even though being hospitalized, underwent a conservative treatment. Figure 2 specifies, in a detailed way, the cases outcome. We can notice that 64 (53.8%) patients were dismissed from hospital, 36 (30.3%) of them were hospitalized in ward beds, 13 (10.9%) were admitted to the Intensive Care Unit (ICU), and six (5%) of them died.

**Figure 2.** Distribution of outcomes according to records in analyzed forms

During primary care, 25 (21%) patients presented hemodynamic instability, and among them 13 (52%) were sent to the ICU, six (24%) of them died and six (24%) of them stabilized and were admitted in ward beds. Furthermore, the average period of time victims of thoracic trauma remained in hospital care was 2.6 days.

DISCUSSION

TT is considered a globally neglected disease and, besides being a financial hindrance to public health, it is also an economic and social welfare problem, since it involves mainly young adults, and is a significant cause of morbimortality and incapacity among the economically active population¹⁹. We can notice in medical literature a similarity of profiles in TT victims, regarding gender and age that are mostly stricken^{4,20-23}. This data suggests that men are more exposed to traumatic events, either due to their most insulting nature, or because they constitute the majority of vehicle conductors in the municipality, according to information from the State Department of Traffic in Santa Catarina²⁴. Besides, there is an association of factors, like excessive speed and alcohol abuse supported by research, which shows that 62 male conductors had a history of high-speed driving, and that there were 2.4 times more men involved in road traffic accidents under the effect of alcohol^{25,26}.

Most events (68%) occurred during the day, contrary to what was observed by Broska Junior *et al.*²⁰, in which there was a prevalence of the nocturnal period in 56.9% of the events, and mainly during late hours. We assume, empirically, that most TT happen during the day, since Itajai, besides being a harbor pole that concentrates much traffic of cargo vehicles, is a reference municipality in the region, and is surrounded by several smaller cities.

Therefore, during the day, pendular migration occurs, either due to work or study, resulting in a higher flow of people and vehicles through the roadways, making this time of day more susceptible to traumatic events. In this sense, it is suggested an in-depth study relating health indicators and pendular migrations. Considering the time patients take to get medical care, 38.36% arrived in up to an hour after the trauma, and 60.8% among them needed hospitalization, which demonstrates that patients in a more severe state receive precocious care, a fact that is confirmed in a study by Ladeira and Barreto²⁷. Besides, considering the index of deaths, 83.3% of the patients were cared for within less than an hour, corroborating a study by Kotwal *et al.*²⁸ which shows that cases with a greater potential for morbimortality were cared for precociously. But 52.9% were cared for within more than an hour after the event, and among them, 34.9% had outcomes that led to hospitalization, while 65% were dismissed from hospital, indicating that these individuals presented traumatism of a lesser magnitude. We would like to stress that 8.4% of the patients did not have the arrival time reported by the trauma team.

Among the means of access to hospitals, SAMU was the more efficient of them, showing a direct association between the service and the severity of lesions, a fact confirmed by medical literature²⁷. On the other hand, it took white ambulances and private means of transportation more than an hour to arrive.

As to approach, Broska Junior *et al.*²⁰ state, in their study, that in 41.1% of cases the association of anamnesis and physical examination were sufficient to reach a diagnosis, chest X-ray being used in 31.8% of the events and CT scans in 26.5% of them. However, our research showed that only 2.5% of the cases did not need complementary examinations to confirm a suspected condition.

This data converges with the research by Souza *et al.*⁴, which shows the performance of radiographs in 69% of the cases, CT scans in 9% and an association of these exams in 15% of them. Only in 7% of the cases, anamnesis and physical examination were enough for a final diagnosis. In 69.3% of the cases, radiographs showed alterations, while 100% of CT scans presented alterations.

Regarding types of trauma, closed TT predominated (89.1%), a fact corroborated by medical literature, with indexes from 56.2% to 97%^{3,9,11}. There was a dissonance in relation to other studies performed in Goiania and São Paulo, which showed a greater incidence of penetrating injuries^{4,21}. The most common mechanism of blunt TT was car accidents involving motorcycles (39.6%), in concordance with medical literature^{3,20,22,27}. The second more prevalent cause were falls, a mechanism that predominates among the elderly, with 66.6% of the events in this age range. In cases of penetrating TT, this research observed a prevalence of injuries from stab wounds, according to other works^{4,21}.

As well as in our research, other studies²¹⁻²³ showed rib fractures as the most preponderant lesions in closed TT. With regard to injuries caused by open trauma, hemopneumothorax was the most frequent finding (46.1%), as found by Souza

*et al.*⁴ and Broska Junior *et al.*²⁰, but divergent from Scapolan *et al.*²¹, that highlighted hemothorax as the main consequence of penetrating trauma.

Almost one third (29.4%) of our patients underwent surgical treatment, of whom 100% underwent TCPD and 5.7% underwent associated exploratory thoracotomy, an element corroborated in the essay by Narayanan *et al.*²², which showed 5.56% of thoracotomies.

The death rate in this analysis was 5%, a lower index compared to that reported by several studies, which presented a death rate between 8,3% and 17,8%⁴. The average permanence time from patients sent to ICU found in medical literature was 10.3 days⁷, while in this research it was 5.6 days. Regarding total time of hospitalization, we observed an average of 2.4 days, a shorter period of time than that verified in medical literature⁷, which can be justified by the great number of patients exclusively diagnosed with muscular lesion and who were dismissed from hospital in a period shorter than 24 hours.

We believe that the data presented in our work can help in the organization of urgency hospital protocols and in the implementation of public policies that can promote prevention and awareness.

R E S U M O

Objetivo: descrever o perfil epidemiológico do trauma torácico na região da Foz do Rio Itajaí, no Estado de Santa Catarina, Brasil. **Métodos:** estudo observacional, descritivo e prospectivo, realizado através de coleta de dados a partir de formulário pré-elaborado pelos pesquisadores e preenchido pela equipe responsável pelo atendimento em hospital de referência, entre junho de 2017 e maio de 2018. **Resultados:** foram analisados 119 formulários de pacientes vítimas de trauma torácico, dos quais 70,5% eram homens e 29,4% mulheres, com média de idade de 39,8 anos. Os atendimentos ocorreram geralmente no período diurno (67,9%), 30,2% dos pacientes chegaram ao serviço através de meios próprios e 52,9% após uma hora do trauma. Quanto aos exames admissionais, a maior parte das vítimas foi submetida exclusivamente à radiografia de tórax (67,2%). Houve prevalência de trauma torácico fechado (89%), tendo como principal mecanismo os acidentes com motocicleta (35,2%) e a lesão predominante foi a fratura de costela (42%). A maioria dos pacientes (53,8%) foi submetida a tratamento conservador. O tempo médio de internação foi de 2,6 dias e a taxa de óbito de 5%. **Conclusão:** o perfil dos pacientes com trauma torácico em Itajaí é de homens jovens, atendidos durante o dia, a maioria com fratura de costela, acometidos por trauma torácico fechado em decorrência de acidente de trânsito envolvendo motocicleta. A radiografia de tórax foi utilizada para a confirmação de grande parte dos diagnósticos e houve prevalência de tratamento conservador. O tempo de internação e taxa de óbito foram menores do que na literatura, o que pode ser explicado pelo alto índice de lesão muscular exclusiva.

Descritores: Traumatismos Torácicos. Tórax. Pneumotórax. Hemotórax. Epidemiologia. Centros de Traumatologia.

REFERENCES

1. Batista SEA, Baccani JG, Silva RAP, Gualda KPF, Vianna Jr RJ. Análise comparativa entre os mecanismos de trauma, as lesões e o perfil de gravidade das vítimas, em Catanduva - SP. *Rev Col Bras Cir.* 2006;33(1):6-10.
2. Guevara Rubio N, Olivarec Bonilla M, Ortega Sánchez R. Perfil epidemiológico del paciente con trauma de tórax em el Servicio de Urgencias Adultos del Hospital General <<José G Parres>>, periodo enero a diciembre de 2009. *Arch Med Urgen Méx.* 2012;4(3):105-11.
3. Potlabathin RP, Kanala A. Experience with chest trauma: Analysis of 400 cases. *J Evid Based Med Healthc.* 2016;3(73):3986-89.
4. Souza VS, Santos AC, Pereira LV. Perfil clínico-epidemiológico de vítimas de traumatismo torácico submetidas a tratamento cirúrgico em um hospital de referência. *Sci Med.* 2013;(2):96-101.
5. Brasil. Ministério da Saúde. DATASUS. Informações de saúde. Estatísticas vitais: óbitos por ocorrência segundo causa externas do Brasil: Brasil por Município: Itajaí [Internet]. Brasília (DF): Ministério da Saúde; 2017 [citado 2017 mar 26]. Disponível em: <http://tabnet.datasus.gov.br/cgi/defctohtm.exe?sim/cnv/ext10uf.def>
6. Santa Catarina. Secretaria de Estado de Saúde. Diretoria de Vigilância Epidemiológica (DIVE). Mortalidade: 1996-2017: Óbitos e APVP por Causas Externas (acidentes, homicídios e suicídios): Itajaí [Internet]. Santa Catarina: SES/SC; 2017 [citado 2017 mar 28]. Disponível em: http://www.saude.sc.gov.br/cgi/defctohtm.exe?sim_causas_externas.def
7. Silva LAP, Ferreira AC, Paulino RES, Guedes GO, Cunha MEB, Peixoto VTCP, et al. Análise retrospectiva da prevalência e do perfil epidemiológico dos pacientes vítimas de trauma em um hospital secundário. *Rev Med.* 2017;96(4):246-53.
8. Fontelles MJP, Mantovani M. Trauma torácico: fatores de risco de complicações pleuropulmonares pós-drenagem pleural fechada. *Rev Col Bras Cir.* 2000;27(6):400-7.
9. Naufel Júnior CR, Talini C, Barbier Neto L. Perfil dos pacientes vítimas de trauma torácico atendidos no Hospital Universitário Evangélico de Curitiba (HUEC). *Rev Med UFPR.* 2014;1(2):42-6.
10. American College of Surgeons. ATLS: Advanced Trauma Life Support for Doctors: student course manual. 10th ed. Chicago (IL): American College of Surgeons; 2018.
11. Pasha MA, Mokhtar MF, Ghazali MZA. A 10-year retrospective review of chest trauma in Hospital Universiti Sains Malaysia. *IOSR J Dent Med Sci.* 2015;14(8):68-74.
12. Whizar-Lugo V, Saucedo-Gastelum A, Hernández-Armas A, Garzón-Garnica F, Granados-Gómez M. Chest trauma: an overview. *J Anesth Crit Care Open Access.* 2015;3(1):2-11.
13. McSawain NE Jr. Blunt and penetrating chest injuries. *World J Surg.* 1992;16(5):924-9.
14. DeArmond D, Carpenter AJ, Calhoon JH. Critical primary survey injuries. *Semin Thorac Cardiovasc Surg.* 2008;20(1):6-7.
15. Fenili R, Alcacer JAM, Cardona MC. Traumatismo torácico: uma breve revisão. *ACM Arq Catarin Med.* 2002;31(1-2):31-6.
16. Majercik S, Pieracci FM. Chest wall trauma. *Thorac Surg Clin.* 2017;27(2):113-21.
17. Aucar JA, Fernandez L, Wagner-Mann C. If a picture is worth a thousand words, what is a trauma computerized tomography panel worth? *Am J Surg.* 2007;194(6):734-9; discussion 739-40.
18. Brink M, Deunk J, Dekker HM, Edwards MJ, Kool DR, van Vugt Ab, et al. Criteria for the selective use of chest computed tomography in blunt trauma patients. *Eur Radiology.* 2010;20(4):818-28.
19. Padovani C, Silva JM, Tanaka C. Perfil dos pacientes politraumatizados graves atendidos em um serviço público de referência. *Arq Ciênc Saúde.* 2014;21(3):41-5.
20. Broska Júnior CA, Botelho AB, Linhares AC, Oliveira MS, Veronese G, Naufel Júnior CR, et al. Perfil dos pacientes vítimas de trauma torácico submetidos à drenagem de tórax. *Rev Col Bras Cir.* 2017;44(1):27-32.

21. Scapolan MB, Vieira NLP, Nitrini SS, Saad Júnior R, Gonçalves R, Perlingeiro JAG, et al. Trauma torácico: análise de 100 casos consecutivos. *Einstein*. 2010;8(3 Pt 1):339-42.
22. Narayanan R, Kumar S, Gupta A, Bansal VK, Sagar S, Singhal M, et al. An analysis of presentation, pattern and outcome of chest trauma patients at an urban level 1 Trauma Center. *Indian J Surg*. 2016;80(1):36-41.
23. Haines KL, Zens T, Beems M, Rauh R, Jung HS, Agarwal S. Socioeconomic disparities in the thoracic trauma population. *J Surg Res*. 2018;224(1):160-5.
24. DETRAN-SC. Departamento Estadual de Trânsito de Santa Catarina [Internet]. Disponível em: <http://www.detran.sc.gov.br/>. Acesso em 2018 Mai18.
25. DETRAN-SP. Departamento Estadual de Trânsito de São Paulo [Internet]. Disponível em: www.detran.sp.gov.br/. Acesso em 2018 Mai 18.
26. Damacena GN, Malta DC, Boccolini CS, Szwarcwald CL, Almeida WS, Ribeiro LS, et al. Consumo abusivo de álcool e envolvimento em acidentes de trânsito na população brasileira, 2013. *Ciênc Saúde Coletiva*. 2016;21(12):3777-86.
27. Ladeira RM, Barreto SM. Fatores associados ao uso de serviço de atenção pré-hospitalar por vítimas acidentes de trânsito. *Cad Saúde Pública*. 2008;24(2):287-94.
28. Kotwal RS, Howard JT, Orman JA, Tarpey BW, Bailey JA, Champion HR, et al. The effect of a golden hour policy on the morbidity and mortality of combat casualties. *JAMA Surg*. 2016;151(1):15-24.

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ERRATUM

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Where it is:

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