

# Trauma Center: alternative model of trauma care in the state of Rio de Janeiro

*Centro de Trauma: modelo alternativo de atendimento às causas externas no estado do Rio de Janeiro*

Elvis da Silva Silveira<sup>1</sup>, Gisele O'Dwyer<sup>2</sup>

---

**ABSTRACT** The objective was to evaluate the Trauma Center of a public hospital in the state of Rio de Janeiro. As methodology the service was observed and indicators were analyzed, including: eligibility criteria; established procedures of service; number and causes of care; and length of stay. The service met the recommended protocols. The mean hospital stay was 11.4 days, similar to the rest of the network, despite the highly complex profile. Seventy-nine percent of the patients were from the prehospital setting and 54.97% were from traffic accidents. The mortality was 4.5%. The Trauma Center fulfilled goals and it is expected that the experience from this center will contribute to the construction of a state policy for trauma care.

**KEYWORDS** Emergency medicine. External causes. Wounds and injuries. Traumas center. Evaluation.

**RESUMO** O trabalho objetivou analisar o Centro de Trauma de um hospital estadual do Rio de Janeiro. Observou-se o serviço e analisaram-se indicadores: critérios de elegibilidade; cumprimento de rotinas de atendimento estabelecidas; número e causa de atendimentos; e tempo de permanência. O atendimento cumpriu os protocolos preconizados. O tempo médio de internação foi 11,4 dias, semelhante ao da rede, apesar da maior complexidade. Dos atendimentos, 79,6% foram originários do ambiente pré-hospitalar e 54,97% foram de acidentes de trânsito. A mortalidade foi de 4,5%. O Centro de Trauma obteve resultado considerado satisfatório nas análises. Espera-se que a experiência contribua para a construção de uma política estadual de atenção ao trauma.

**PALAVRAS-CHAVE** Medicina de emergência. Causas externas. Ferimentos e lesões. Centros de traumatologia. Avaliação.

<sup>1</sup>Fundação Oswaldo Cruz (Fiocruz), Escola Nacional de Saúde Pública Sergio Arouca (Ensp) – Rio de Janeiro (RJ), Brasil.  
elvis.silveira@live.com

<sup>2</sup>Fundação Oswaldo Cruz (Fiocruz), Escola Nacional de Saúde Pública Sergio Arouca (Ensp) – Rio de Janeiro (RJ), Brasil.  
odwyer@ensp.fiocruz.br

## Introduction

Accident-related death and disability have been a neglected epidemic of modern society and the leading cause of death in the first half of life (NATIONAL ACADEMY OF SCIENCES, 1966). Currently, the scenario has not changed; accidents and violence constitute the group of external causes of medical conditions and are responsible for 5.8 million deaths annually worldwide, 32% more than the sum of deaths from malaria, Acquired Immune Deficiency Syndrome (Aids) and tuberculosis (ONUFR, 2014). Moreover, for every million people who die every year, thousands more are temporarily or permanently disabled.

The impact generated by external cause injuries affect several sectors of society, but the health sector is the most affected due to the high burden on emergency services, specialized care, physical rehabilitation, and psychological and social assistance (MELLO-JORGE, KOIZUMI, TONO, 2008).

Over the last decades, an epidemiological transition was seen in Brazil with modifications in the death, morbidity and disability patterns of the population. The country maintains high death and sequelae rates due to external causes, causing serious public health problems, and it can be said that the required system attention for this situation was identified with great delay (BRASIL, 2001).

In Brazil, external cause injuries are the third cause of death and account for 12.5% of total deaths. In the age group of 1 to 39 years, external causes are the first cause of death, accounting for 70.5 deaths per 100 thousand inhabitants, of which 83.1% are males (BRASIL, 2011). Brazil ranks fifth in the world in traffic deaths, with 28% involving motorcycles (BRAZIL, 2015).

Data from 2011, from the Mortality Information System of the Ministry of Health (SIM/MS), also drew attention to the high mortality rate due to external causes among the elderly. With a rate of 118.9 deaths per 100,000 inhabitants, this

can be explained by the greater physical vulnerability of this population.

However, nothing has as a stronger impact than homicide, the first cause of death from external causes. In 2011 alone, according to data from SIM/MS, there were 51,724 murders. Approximately 142 people die every day, or one every ten minutes, victims of homicide in Brazil. In the last 20 years, homicides in Brazil increased more than 200% of which about 70% were committed with firearms, the use of which also increased intensely in that period (BRASIL, 2005). The age group of 20 to 24-year ranks first in the death toll for homicides, revealing the problem's most devastating trait: the early withdrawal of a population just entering adulthood.

In addition to the high economic and social cost generated by mortality, Brazil accumulates numerous negative outcomes with the morbidity from external cause injuries. Among young people, for each homicide there are 20 to 40 non-fatal victims of violence receiving medical treatment (SOUZA, 2005).

In 2011, in line with the new Health Care Networks policy, the Emergency Care Network policy (BRASIL, 2011) was updated from the National Urgency and Emergency policy of 2003. The new policy defined the components of the emergency network that should be integrated, but did not cover special strategies for specific types of care.

In 2013, specific policies on healthcare for external cause injuries began to take shape after the publication of two Ministry of Health statutory laws, the first establishing the trauma line of care in the Emergency Care Network (BRAZIL, 2013A) and the second establishing the Trauma Centers (BRAZIL, 2013B). However, placement of urgencies of clinical and traumatic natures in the same scenario is still common in the country, as seen in most emergency rooms, where clinical and trauma cases share the same space.

The state of Rio de Janeiro has a concentration of hospital units, especially in the

city of Rio, an inheritance from the period the city was the capital of the country. Only in the metropolitan region there are approximately twenty-one federal, state or municipal emergency hospitals, seven of which are under the management of the Rio de Janeiro State Department of Health (SES/RJ). Despite this robust network, many problems still exist, especially with integration between units, and between units from different levels of government.

In general, the external cause injury care model adopted in the state of Rio de Janeiro over the last few years follows the national model, that is, 24-hour emergency units within the network of general hospitals attending to walk-in or referred demand, both clinical and surgical. Normally, these units receive all types of cases, from mild trauma to severe polytrauma patients.

A recent research in a tertiary reference hospital for trauma, which responds indistinctly to traumas and emergencies attributable to primary care, has found operational difficulties for quality care (SOARES; SCHERER; O'DWYER, 2015).

A measure taken towards care for external cause injury was the creation of the Trauma Centers. The model proposed by the SES/RJ was based on the USA model and was implemented following exchange of experiences between the SES/RJ and the Trauma Centers of Baltimore and Miami. The inauguration of the first unit in the state took place in June 2013, in one of the SES/RJ emergency hospitals.

The American model of Trauma Center (CT) has specific characteristics, among them, exclusive care of victims from external cause injury with serious trauma, patient selection by the prehospital services based on pre-established criteria, hospital contact by the prehospital teams with information about the arrival of the patient, the training of the 'trauma teams' responsible for the patient's primary care in the unit, among others (AMERICAN COLLEGE OF SURGEONS, 2006).

Experiences in the US and other countries indicate that the care of patients suffering from external cause conditions based on TC models is a positive strategy, but emphasize that a TC only is not ideal and that a regional trauma system must be created. On average, only 15% of victims of injuries of external causes need to be treated at Level I Trauma Centers (FRAGA, 2007), the highest of the four levels advocated by the American College of Surgeons (AMERICAN COLLEGE OF SURGEONS, 2006). A study comparing the results of severely injured patients treated in systems with Trauma Centers indicate a reduction in the mortality (CELSO ET AL., 2007; VICKERS ET AL., 2015). According to Fraga (2007), the reduction of preventable deaths reaches 50% in these systems. These data and the large number of injuries due to external causes in the state have justified the adoption of this model by SES/RJ (SES/RJ, 2012).

Other than the change in the physical structure and team assembly for the emergency units, the project of creating the Trauma Centers aims to change work processes and the care logistics of the patient with external cause injuries at the entrance of emergency hospitals, increasing the integration between pre- and intra-hospital care (SES/RJ, 2012).

The decision of the state administration is justified since there are structural requirements for the implementation of such units, as the availability of large hospitals and of beds from Intensive Care Centers (ICS) (PESSÔA ET AL., 2016).

In view of this innovative project from the SES/RJ and its impact in the healthcare system, this study aimed to assess the results of the first TC implemented by the SES/RJ, in relation to service profile, performance and operation as recommended by both the SES/RJ and the literature for this type of unit. At the time of this research a second TC was already inaugurated and implementation of other units were being planned, however, the first TC was selected for having a longer time of operation.

## Methodology

This was a case study based on systematic observation and data collection from the TC of a State Hospital of Rio de Janeiro, as well as an extensive documental analysis from the SES, including administrative and management reports (YIN, 2010). All patients with injuries of external causes treated from June 2013 to September 2014 were included in the survey, totaling 1,942 treatments.

The observation phase occurred in different days and periods during the months of March, April and May of 2015, in which procedures and functioning patterns of the TC were examined. This phase aimed to verify if the SES/RJ recommendations for the TC operation were being followed, and to correlate the adopted standards with international standards. Eligibility criteria, previous contact of the pre-hospital team announcing the patient's arrival, compliance of the teams and the standard of the initial care were observed.

The data were obtained through access of the computerized system for attendance entry and other records of the unit. Data were tabulated and converted into assistance indicators undergoing further analysis. We analyzed indicators such as number of patients, patients' age group and origin, cause of admission, average length of stay, among others. The results were confronted with the SES/RJ requirements and with the epidemiological data obtained from a literature review on the subject. The study was approved by the Research Ethics Committee (CEP) Ensp/Fiocruz, under the number CAAE (Certificate of Presentation for Ethical Appreciation) 40152514.7.0000.5240.

## Results and discussion

Located in the metropolitan region of Rio de Janeiro, the TC has a built-up area of 932.36 m<sup>2</sup> composed of the following structures:

trauma stabilization room with 4 beds; computed tomography imaging room; surgical center with three operating rooms; post-anesthetic recovery with 5 beds; and a satellite pharmacy. Moreover, the center has men and women locker rooms; an administrative area, equipment storage space and a staff lounge; and a reception and waiting space for families (SES/RJ, 2012).

The center's configuration allows teams to provide immediate high complexity care to victims of serious trauma, including stabilization, laboratory and imaging exams, and surgeries, without needing to move the patient to other areas of the hospital, and providing the best necessary care within the 'golden hour', as advocated in the literature (AMERICAN COLLEGE OF SURGEONS, 2012).

The emergency department of the hospital maintained its activity after the inauguration of the TC. Therefore, the unit presently has an entrance door for clinical emergencies and traumatic emergencies of lesser complexity, and the TC entrance, exclusively for severe trauma patients brought in by the mobile pre-hospital service or referred by hospital units of lesser complexity.

The TC does not operate as an inpatient unit, therefore after the initial required care, patients are transferred internally to the intensive care unit or infirmary ward, as needed.

Patients who were victims of injuries of external cause with severe trauma are qualified and selected by the SES/RJ 'Eligibility Criteria', which are currently very similar to the criteria established by the American College of Surgeons (AMERICAN COLLEGE OF SURGEONS, 2006). These criteria are also used as parameters for prehospital services and for patient selection in smaller hospitals.

Despite the existence of the eligibility criteria from the SES/RJ, some patients who did not meet these criteria were treated, usually mild trauma patients. As these cases were exceptions and occurred sporadically, they were not totalized in this study.

Another important component of the

TC is the prior contact of the pre-hospital service team. Through this contact, information such as event type, victim status, major injuries and arrival time estimation is forwarded. This allows the TC team to be prepared for the patient arrival, as in North American TCs.

During the research, it was observed that the pre-hospital teams or other health units made direct contact with the TC, informing the case. Unannounced arrivals did occur, but exceptionally, and were with patients taken by pre-hospital care teams.

In relation to care, the TC adopts the concept of trauma team, with simultaneous action of several professionals in the care of the victim, respecting their own specialties and functions. The role of each team member, as well as their positioning during care, is described in the 'Trauma Center Implementation Manual' (SES/RJ, 2012).

According to this manual, the care team should be composed of the following professionals: 1 medical surgeon leader, 1 nurse leader, 1 anesthetist, 2 medical surgeons, 1 nurse and 1 nursing technician.

Care begins with the positioning of the patient in one of the units of the stabilization room. The team members take their position around the patient while the surgeon and nurse leaders supervise and guide the team. The leadership should be practiced by the most experienced professionals of the team. A black line on the floor of the stabilization room delimits the space of the care unit, separating it from the common area. Only the TC team members can trespass the black line into the unit where the patient is.

During the observation phase, the trauma team performed as recommended, regardless of injury type of the patient or patient origin, whether from pre-hospital care or from another health unit. In the event of simultaneous care to more than one victim, the leaders had to withhold their role and act in the direct care of the victim. However, this is the regular and planned conduct for

such situations. After the initial care performed by the trauma team, other specialists that might be needed in the treatment are contacted by radio, including orthopedists, neurosurgeons, vascular surgeons, oralmaxillofacial surgeons, among others.

Although some deviations from the recommended TC guidelines were observed during the research, these were occasional. Even in high-standard units such as this, there is a constant need to monitor the work processes.

Regarding health care indicators, this TC, as defined by the SES/RJ, is intended primarily to serve the region known as Metropolitan II, composed of seven municipalities with a population of two million (IBGE, 2015). However, it also serves patients from other hospital units and patients transported by helicopter from any region of the state. As termed in the regulations, all TCs, as part of the urgency and emergency network, must have its area of action defined by the socio-demographic characteristics of each region and serve as referral for mobile prehospital services and for hospital units of less complexity (BRAZIL, 2013A).

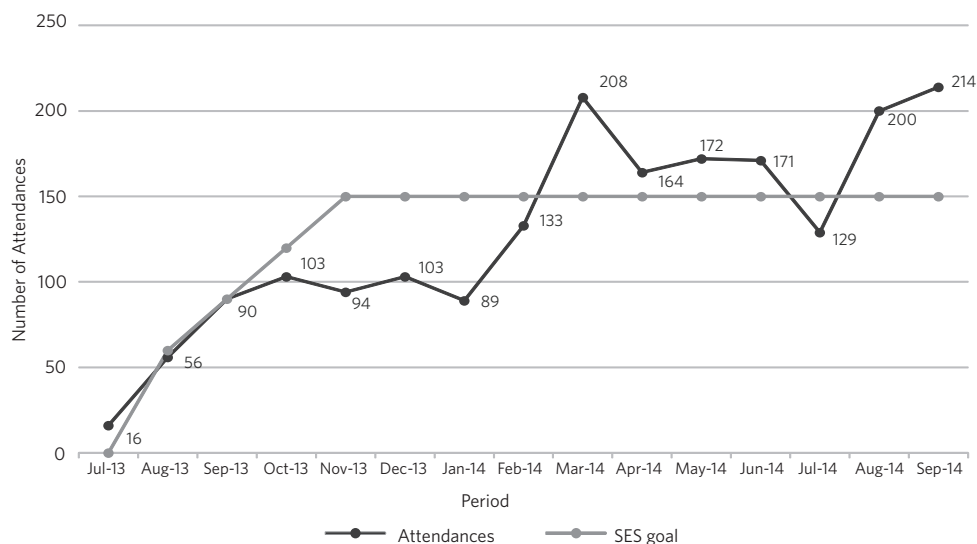
Our results showed that the vast majority of the patients attended in the TC (67.4%) were from São Gonçalo, a municipality with approximately half the population of the Metropolitan II region and where the TC is located. Only 7% of patients were from outside the center's area of action. Of the total number of assistances, 79.6% came from the pre-hospital setting, of which 54.2% were brought in by ambulances from the Fire Department; the other patients were transported by other agents such as the Emergency Mobile Service (Samu), ambulances from healthcare plans, rescue helicopter, among others. The remainder 20.4% was transferred from other hospital units.

The SES/RJ predicted demand for this TC was a monthly average of 150 patients. As the unit only receives eligible patients

from the pre-hospital setting or from other hospitals, the interaction between these components must be consistent in order to serve the planned demand. The proper operation of the TC requires that the patient is

correctly selected and quickly transported to the unit, taking into account his or hers characteristics and severity of the lesions. *Graph 1* shows the evolution of the TC's attendances in 2013 and 2014.

Graph 1. Number of attendances per month in the Trauma Center from July 2013 to September 2014



As can be seen, the TC did not continue the growth curve of attendances that had been planned by SES/RJ from the fourth month of operation, stabilizing around 100 services/month. Only after the ninth month of operation the unit exceeded the established target. Initially, the TC used more restrictive eligibility

criteria that were modified after analyzing the evolution of the services. The aim was not only to increase the number of attendances, based on the planned capacity of the unit, but also to better conform the criteria used internationally for this type of care, especially the one recommended by the American College of Surgeons.

Chart 1. Eligibility criteria

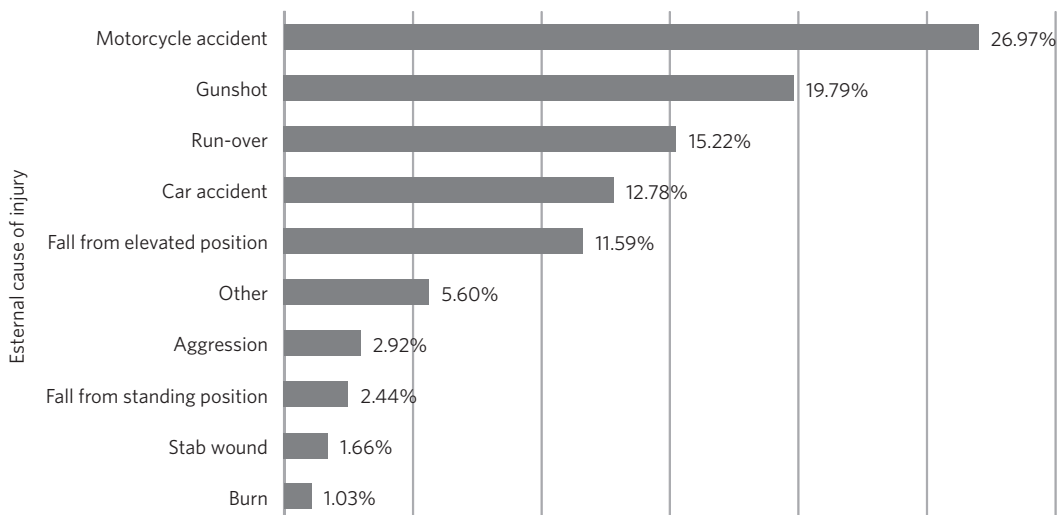
Up to January 2014	From February 2014 onward
Glasgow coma scale < 09	Glasgow coma scale < 14
Respiratory Rate <10 or > 30 breaths per minute in adults and <10 breaths per minute in pediatric patients; Or use of any auxiliary device for maintenance of airway stability	Respiratory Rate <10 or > 30 breaths per minute in adults and <10 breaths per minute in pediatric patients; Or use of any auxiliary device for maintenance of airway stability
Systolic Blood Pressure <90 mmHg in adults or <70 mmHg in children	Systolic Blood Pressure <90 mmHg in adults or <70 mmHg in children
Penetrating wound in skull, neck, thorax or abdomen	Penetrating wound in skull, neck, thorax or abdomen
Pelvic instability	Pelvic instability
	Thorax instability
	Two or more long bone fractures
	Extremities laceration or crush
	Limb amputation
	Spinal cord trauma

There was also an effort by the SES/RJ to promote the service among managers of the local network and also from other regions, evidence of which was found by researching meetings minutes.

Regarding the cause for the service, the

research showed that patients who received treatment were exclusively victims of injuries of external cause, as recommended by SES/RJ and the literature, and demonstrated in *graph 2* below.

Graph 2. Percentage of trauma center visits according to injury cause from July 2013 to September 2014. N = 1,268 attendances





The analysis shows a high prevalence of traffic accidents, including from motorcycles, run-overs, and from car accidents that totaled 54.97%. Of these, victims of motorcycle accidents accounted for almost half of the services. These data are supported by the literature that indicates traffic accidents as the main cause of morbidity among external causes, with motorcycles accidents as protagonists.

Attention is also drawn to interpersonal violence, which include aggressions, and perforations by cold weapons and by firearms, the latter being the main means of interpersonal violence. Together, these account for 24.37% of all attendances, which demonstrates the highly violent profile of the region. Brazil, along with Mexico, are the two countries in the Americas where homicide is the main *causa mortis* among external causes (BIROLINI, 2001). As in this TC we found the highest prevalence of cases to be from traffic accidents, it can be concluded that the majority of homicide deaths occur in the pre-hospital setting, that is, a major part of these victims have not even the chance of being treated after the aggression.

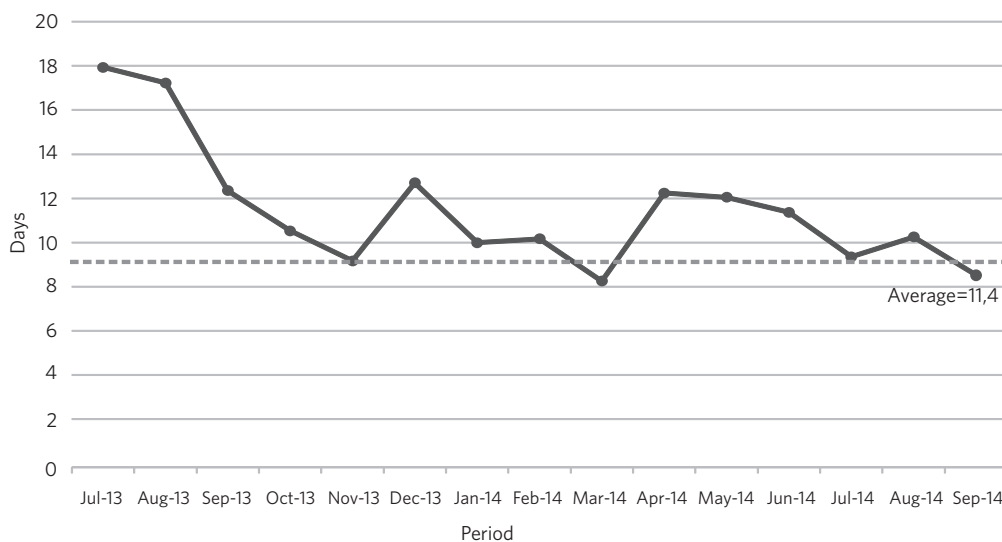
On the other hand, injuries do to falls, mainly falls from a standing position, were not significantly reported as causes for visits in the

TC, although being the main external cause of hospitalization in the Unified Health System (SUS) units, especially of elders. This finding is justified perhaps because the injuries caused by most of the falls from a standing position, such as the unilateral femoral fractures, are not within the eligibility criteria. Contrarily, the American College of Surgeons include the age extremes, i.e., children and elderly, in the eligibility criterion for care at a TC.

Data on patient profile show similarities with the epidemiological data on external causes of injuries, demonstrating a high prevalence of male young adults. In the analyzed period, 82% of the patients attended were male, with 59.7% in the age range of 15 to 39 years.

The mean length of hospitalization of the patients from the TC was 11.4 days. Considering that the average time of hospitalization of patients with injuries from external causes in the SUS units in the Metropolitan II region in the same period ranged from 9 to 12 days (Hospital Information System of SUS – SIH/SUS), the TC presented satisfactory results that are compatible with the rest of the network, especially since the center receives highly complex patients. *Graph 3* shows the average length of hospital stay of patients treated in the TC.

Graph 3. Average length of stay of patients seen at the Trauma Center from July 2013 to September 2014





As seen in *graph 3*, the average length of stay of the patient attended in the CT was close to 18 days in July of 2013, and reached its lowest averages in March and September of 2014 with around 8 days of hospitalization, coinciding with the months of a significant increase in the TC treatments. The decrease in length of stay can be explained by the change in the eligibility criteria that allowed the admission of less severe patients than those seen in the first months.

It was not within the objective of this research to analyze death rate indicators of the TC, since other factors would need to be considered, such as the characteristics of the service and of the patients, without which there could be misinterpretation of comparisons. Some predictive indicators of trauma mortality, such as ISS (Injury Severity Score) or RTS (Revised Trauma Score), can be mentioned. Nevertheless, mortality within the first 24 h varied between 4 and 4.5% in the analyzed period, which, in principle, represents a favorable result.

The state decision of creating a TC in a region that structurally supports this service was technically coherent (PESSÔA ET AL., 2016). The importance of the negotiation among the various actors involved in defining the role of the TC in the local network should be highlighted. The health promotion component of the emergency policy, which deals with traffic, seat belt use, drinking and driving, etc., has not yet changed the scenario of traffic accidents at the area studied.

## Conclusions

The care for victims of external cause injuries in the SES/RJ units is currently a mixed model, where two different forms of attention to the trauma victim coexist. The prevalent model in the country is based on general hospital emergencies, which are the gateway for all kinds of emergency. The other model is designed to attend specifically victims

of severe trauma. The comparison between these two models was not the objective of this study, however, it can be stated that the TC model brings forth a new form of attention to trauma in the state, presenting good results.

The findings this research allowed us to conclude that the TC has been fulfilling most of the goals and procedures established by the SES/RJ and has been performing its main function, which is to attend victims of external cause injuries with potential or imminent risk of death or permanent sequelae. This is evident with the analysis of care indicators, such as the average length of stay and patients profile, both in relation to the age group and the type of prevalent injuries. These results demonstrate the relevance of the project developed by the SES/RJ. The project is also adequate when compared to the data from the international literature.

With a little over two years of operation and with more than three thousand patients attended in the first TC of the state, the publication by the SES/RJ of eligibility criteria guidelines, as well as the access and operation procedures came in a timely manner. This measure consolidated this model in the state and represented the legal materialization of this method of care for patients of external cause trauma.

It should be mentioned that TCs alone have little capacity to significantly alter morbidity and mortality due to external causes. The success of these units is directly related to the integration with other emergency services, especially with a well-structured pre-hospital mobile system. In order to reproduce this model in other locations, a previous study on the structural characteristics of the unit, the epidemiological profile of the area and the cost of implementation and maintenance of the project must be carried out.

Considering the high mortality from external causes in the elderly, we suggest that the eligibility criteria be reassessed and include patients over 60 years of age, victims from external cause injuries, which could

contribute to the reduction of morbimortality in this age range, following the model of North American centers.

Finally, we hope that the experience from this TC can contribute to the establishment of a state policy on attention to injuries of

external cause that integrates pre and intra-hospital prevention, care and rehabilitation, enabling the improvement of all parts involved in this process, so that in the near future society can have a better control of the epidemic produced by traumatic events. ■

---

## References

AMERICAN COLLEGE OF SURGEONS (ACS). *Resources for Optimal Care of the Injured Patient*. Chicago: ACS, 2006.

\_\_\_\_\_. *Suporte Avançado de Vida no Trauma – ATLS, Manual do Curso de Alunos*. 9 ed. Chicago: ACS, 2012.

BIROLINI, D. Como Anda a Epidemia de Trauma? *Rev. Assoc. Med. Bras.*, São Paulo, v. 47, n. 1, p. 1-23, 2001.

BRASIL. Ministério da Saúde. *Impacto da Violência na Saúde dos Brasileiros*. Brasília, DF: MS, 2005. (Série B, Textos Básicos de Saúde).

\_\_\_\_\_. Ministério da Saúde. *Plano Nacional de Saúde – PNS, 2012-2015*. Brasília, DF: MS, 2011. (Série B, Textos Básicos de Saúde).

\_\_\_\_\_. Ministério da Saúde. Agência Saúde. *Brasil é o quinto país no mundo em mortes por acidentes no trânsito*. 2015. Disponível em: <<http://www.blog.saude.gov.br/35535-brasil-e-o-quinto-pais-no-mundo-em-mortes-por-acidentes-no-transito>>. Acesso em: 13 dez. 2015.

\_\_\_\_\_. Ministério da Saúde. Portaria nº 737 de 16 de maio de 2001. Institui a Política Nacional de Redução da Morbimortalidade por Acidentes e Violências. *Diário Oficial [da] União*. Brasília, DF, 18 maio 2001.

Disponível em: <<http://pesquisa.in.gov.br/imprensa/jsp/visualiza/index.jsp?jornal=1&pagina=3&data=18/05/2001>>. Acesso em: 17 mar. 2017.

\_\_\_\_\_. Ministério da Saúde. Portaria nº 1.600, de 7 de julho de 2011. Reformula a Política de Atenção às Urgências e institui a Rede de Atenção às Urgências (RAU) no Sistema Único de Saúde (SUS). *Diário Oficial [da] União*. Brasília, DF, 7 jul. 2011. Disponível em: <[http://bvsms.saude.gov.br/bvs/saudelegis/gm/2011/prt1600\\_07\\_07\\_2011.html](http://bvsms.saude.gov.br/bvs/saudelegis/gm/2011/prt1600_07_07_2011.html)>. Acesso em: 2 mar. 2017.

\_\_\_\_\_. Ministério da Saúde. Portaria nº 1.365 de 8 de julho de 2013. Aprova e institui a Linha de Cuidado ao Trauma na Rede de Atenção às Urgências e Emergências. *Diário Oficial [da] União*. Brasília, DF, 8 jul. 2013a. Disponível em: <[http://bvsms.saude.gov.br/bvs/saudelegis/gm/2013/prt1365\\_08\\_07\\_2013.html](http://bvsms.saude.gov.br/bvs/saudelegis/gm/2013/prt1365_08_07_2013.html)>. Acesso em: 2 mar. 2017.

\_\_\_\_\_. Ministério da Saúde. Portaria nº 1.366 de 8 de julho de 2013. Estabelece a organização dos Centros de Trauma, estabelecimentos de saúde integrantes da Linha de Cuidado ao Trauma da Rede de Atenção às Urgências e Emergências (RUE) no âmbito do Sistema Único de Saúde (SUS). *Diário Oficial [da] União*. Brasília, DF, 8 jul. 2013b. Disponível em: <[http://bvsms.saude.gov.br/bvs/saudelegis/gm/2013/prt1366\\_08\\_07\\_2013.html](http://bvsms.saude.gov.br/bvs/saudelegis/gm/2013/prt1366_08_07_2013.html)>. Acesso em: 2 mar. 2017.

- CELSONO, B. *et al.* A systematic review and meta-analysis comparing outcome of severely injured patients treated in trauma centers following the establishment of trauma systems. *J. Trauma*, Baltimore, v. 60, n. 2, p. 371-8, 2007.
- FRAGA, G. P. Programas de Qualidade no Atendimento ao Trauma. *Revista Medicina*, Ribeirão Preto, v. 40, n. 3, p. 321-8, jul./set. 2007.
- INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA (IBGE). *Diretoria de Pesquisas – DPE – Coordenação de População e Indicadores Sociais – COPIS, população estimada 2015*. Disponível em: <www.cidades.ibge.gov.br>. Acesso em: 13 dez. 2015.
- MELLO-JORGE, M. H. P.; KOIZUMI, M. S.; TONO, V. L. Causas Externas: o que são, como afetam o setor saúde, sua medida e alguns subsídios para sua prevenção. *Revista Saúde*, São Paulo, p. 37-47, 2008.
- NATIONAL ACADEMY OF SCIENCES. *Accidental Death and Disability: the neglected disease of modern society*. Washington, DC, Sept.1966.
- ORGANIZAÇÃO DAS NAÇÕES UNIDAS NO BRASIL (ONUBR). *Traumas matam mais que malária, tuberculose e AIDS, alerta OMS*. Disponível em: <http://www.onu.org.br/traumas-matam-mais-que-malaria-tuberculose-e-aids-alerta-oms/>. Acesso em: 26 jan. 2014.
- PESSÔA, L. R. *et al.* Realocar a oferta do SUS para atender problemas do futuro: o caso do trauma no Brasil. *Saúde em Debate*, Rio de Janeiro, v. 40, n. 110, p. 9-19, 2016.
- SASSER, S. *et al.* *Prehospital Trauma Care Systems*. Geneva: WHO, 2005.
- SECRETARIA DE ESTADO DE SAÚDE DO RIO DE JANEIRO (SES/RJ). *Centro de Trauma: Manual de Implantação*. Rio de Janeiro, 2012.
- SOARES, E. P.; SCHERER, M. D. A.; O'DWYER, G. Inserção de um hospital de grande porte na Rede de Urgências e Emergências da região Centro-Oeste. *Saúde em Debate*, Rio de Janeiro, v. 39, n. 106, p. 616-26, 2015.
- SOUZA, E. R. *Impacto da Violência no Brasil e em alguns Países das Américas*. In: MINAYO, M. C. S.; COIMBRA JR., C. E. A. (Org.). *Críticas e atuantes: ciências sociais e humanas em saúde na América Latina*. Rio de Janeiro: Fiocruz, 2005. p. 636-647.
- VICKERS, B. P. *et al.* Comparative study of ED mortality risk of US trauma patients treated at level I and level II vs nontrauma centers. *The American Journal of Emergency Medicine*, Philadelphia, v. 33, n. 9, p. 1158-65, 2015.
- YIN, R. K. *Estudo de caso: planejamento e métodos*. 4. ed. Porto Alegre: Bookman 2010.

---

Received for publication: January 2016

Final version: January 2017

Conflict of interests: non-existent

Financial support: non-existent