Assessment of Lithuanian trauma care service using a conceptual framework for assessing the performance of health system

Raimundas Lunevicius 1, 2, M. Hafizur Rahman 3

1 Department of International Health, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD USA,
2 General Surgery Centre, Emergency Hospital, School of Medicine, Vilnius University, Lithuania
3 Department of International Health, Health Systems Program, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD, USA

Correspondence: Raimundas Lunevicius, Vilnius University Emergency Hospital, 29 Šiltainių Street, LT–04130, Lithuania, tel: + 370 6 87 15736, fax: +370 5 2168984, e-mail: rlunevichus@yahoo.com

Background: Injury is the number one public health problem in Lithuania in terms of disability adjusted life years lost. The trauma system plays an important role in injury statistics. The objective of this article is to describe and assess the performance of Lithuanian trauma sector. Methods: The framework for assessing the performance of health systems proposed by Murray and Frenk (2000) was employed. Results: The primary intention criterion—to reduce the number of trauma cases, injury related mortality and disability rates by 30% by 2010—is well defined. The Lithuanian whole-trauma sector does not substantially contribute to improving the health of the population. The legitimate expectations of the community—respect of persons in terms of dignity, autonomy, confidentiality, client orientation—do not correspond with the responsiveness of the trauma service. Financing of the trauma sector does not correspond with the magnitude of the injury problem. Lithuanian trauma service is decentralized. There is no trauma leadership in the country. There is no national policy for unintentional injury prevention and control, no specialized injury research institute, no system of trauma centres, and no Injury Surveillance System in Lithuania. There is no such specialty as Emergency Medicine as of 2009. A political and public will to reform the trauma sector is not sound. Conclusion: The performance of the decentralized Lithuanian trauma sector does not match with the primary intention criterion and does not correspond to the needs of people. Lithuanian trauma service has to be conceptualized and changed to inclusive.

Introduction

Injury is a major public health problem in Lithuania. The age-standardized death rate (ASDR), from external causes in Lithuania is two times higher than the European Region, and four times higher than the EU. Figure 1 shows the magnitude of this public health problem in Lithuania as well as nearby countries. A linear time trend based on death rates from external causes per 100 000 inhabitants in 1991–2006 (figure 2) shows that it is a stable problem. Furthermore, a linear time trend based on injury incidence rates per 100 000 population in Lithuania in 1991–2005 shows that injury incidence has increased (figure 3). Injury continues to pose as one of the most costly public health problems in Lithuania (figure 4) and EU because it ranks first in terms of potential and disability adjusted years lost.

The possible impact of Lithuanian Emergency Medical Service (EMS) and Trauma Service performance on injury related statistics remains unclear. There is one unframed description of Lithuanian EMS. The Lithuanian Trauma System was modestly defined as less developed after conducting a European survey. However, the systematic assessment of trauma service of Lithuania using a conceptual framework has not been done yet. The objective of this article is to describe and assess the trauma service of Lithuania using a conceptual framework for assessing the performance of health systems.

Methods

A conceptual framework for assessing the performance of health systems proposed by Murray and Frenk was employed for describing and assessing the trauma sector component of the Lithuanian health system. The terms of the framework were used as a tool to define whether the Lithuanian trauma service meets requirements of the primary intent criterion of a health system. This criterion is reported to be a health action for the...
Figure 1 Seven countries of European region with ASDR (>110 mortalities per 100 000 population) and six EU countries with lowest ASDR (<33 mortalities). *M91 codes were only available (Source: The European Detailed Mortality Database).

Figure 2 Linear time trend based on ASDR from external causes rates per 100 000 population in 1991–2006, Lithuania (Source: The European Detailed Mortality Database, Lithuanian Health Information Center).

Figure 3 Linear time trend based on injury incidence rates per 100 000 population in 1991–2005, Lithuania (Source: Lithuanian Health Information Center). Statistics is based on each documented intentional and unintentional injury.
improvement or maintaining of health, as well as responsiveness, social and financial risk protection, and efficiency. The design, management and content of trauma sector of Lithuania were clarified and assessed in terms of socially valued outcomes such as health, responsiveness and fairness in financing. Components of Lithuanian trauma sector were described and assessed. Reforming as an element of performance was also taken into consideration. Specific terms for description of the trauma sector’s management, content, resources, actors and institutions were adapted from the guidelines for trauma and emergency medical service systems.\(^8,9\) A generic term ‘Lithuanian Trauma Service’ is used in this article because there is no uniform public opinion whether this service should be named as ‘Lithuanian Trauma System’.

A literature search of published data and electronic materials was undertaken for articles and reports on injury, EMS and trauma systems in Lithuania. Articles published in English and Lithuanian were reviewed for the 1998–2008 time period. The Medline/Pubmed database and the Index Copernicus database were employed. Only articles addressing injury and trauma system were included. The following World Wide Web search engines were used for retrieving information about Lithuanian trauma service: Google, Yahoo, Ask and Clusty.

The data from three databases were used for this article: the European Detailed Mortality Database, the database of the Lithuanian Health Information Center, and the database of the Lithuanian Police Traffic Supervision Service.\(^2,3,10\) Time trends in data were explored using Microsoft Office Excel 2003.\(^8\)

**Results**

*The primary intent criterion*

The primary intent criterion of the Lithuanian trauma service was defined in the Lithuanian Health Program for 1998–2010.\(^11\) It aimed to reduce number of trauma cases, injury-related mortality and disability rates by 30% by 2010. In reality, there was 5358 injury-related fatalities in 1998 and 5246 fatalities 10 years later, in 2007, and that amounts to only a 2% decrease of deaths due to injury in 10 years. Thus, the absolute number of deaths per year due to injury remained relatively constant, averaging 5301 cases per year with a minimum number of deaths—5077 in 2004, and maximum 5549 in 2005.\(^2\) There was a decrease of injury-related ASDR by only 1%.

*Trauma service design*

Design of the EMS in Lithuania was created and developed in the country’s Soviet period.\(^5\) It is important to note that EMS principles in Sovietized Lithuania corresponded to Franco-German EMS system principles. This system was based on a specialized model of ambulance services. Since 1990 ambulance services have been transformed into less specialized services in sovereign Lithuania. According to recent data of the Lithuanian State Audit Office, 280 physicians and 1360 nurses and feldshers worked in the Lithuanian EMS by 2008.\(^12\) A severely injured trauma patient is currently not considered to be a particular and special object for super-rapid triage to in-hospital care providers.\(^13\)

**Management**

*Trauma system legislation and leadership*

There is the National Concept of Emergency Medical Services signed by Minister of Health in 2002 and 2005. The National Concept of Emergency Medical Services is also called The Concept of Ambulance Services. However, an implementation of this concept is slow or even stalled and was severely criticized.\(^12\)

There is no trauma system legislation. There is no national institute, board or trauma advisory committee responsible for trauma situation assessment in the country, and for planning and devising the implementation, development, and monitoring of Lithuanian Trauma Service. Each component of trauma care services operates independently.

**Financing and human resources**

Financing is mainly from the state-based Lithuanian Compulsory Health Insurance Fund. Financing from the state budget only covers the expenses of trauma basic treatment of inhabitants without health insurance. There is no separate EMS Operations or Trauma Physicians Services Fund for planning, development and implementation of designated and coordinated trauma system.\(^14\)

There is currently a shortage of workforce in EMS and this problem can increase. Also, there is no such university education-based specialty as Emergency Medicine as of 2009. A trauma team on call in a tertiary hospital is composed of several attending sub-specialty physicians. There is a plan to establish Emergency Medicine residency in Kaunas University of Medicine. However, there is no such plan at Vilnius University.

**Pre-hospital component**

*Management, access, dispatching and coordination*

Every city and district has their own local bodies of EMS. The most recent report emphasized that there was 56 state-run and two private emergency service pre-hospital facilities in Lithuania as of 2008.\(^12\) There are three phone numbers for emergencies. The phone number is 01 for rescue services, 02 for police and 03 for ambulance services. All these services may be accessed via the common access emergency number 112.

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fact that in 2008 Lithuania had violated a directive concerning truthful introduction of 112.

A decentralized dispatch system is used for many years. That means that each city or district has its own 24h nurse-based dispatch centre. There is no key dispatch centre, neither regionally, nor nationally for coordination of actions of all emergency services, either pre-hospital or in-hospital.

Ambulance stations
A total of 265 ambulance teams located in ambulance stations (EMS) operate during the day and 210 teams operate during the night. On average, there are three or four teams at each EMS station and each team consists of two or three persons: nurses, physicians or physician assistants and a driver. Half of the EMS stations do not have physicians. Although there is a list of the basic equipment for ambulance vehicles based on WHO recommendations and the order of Minister of Health of Lithuania since 2003, the ambulance vehicles are not equipped properly. It is suggested that ambulance response times should be 15 min in urban areas and 30 min in rural areas for the majority of population. There is only ground-based transportation for trauma patients from the scene of the event.

Triage and transportation
Emergency medical services providers in the pre-hospital level do not have a decision scheme/guidelines approved by a national expert panel on field triage, despite of known fact that this could be helpful to identify those patients who are at the greatest risk for severe injury and properly transport them to the most appropriate facility with resources for optimal care of the injured patient. It is important to note that injured and unstable patients are frequently transported to the nearest health care facility which is a district general hospital in most cases. And that is based on an official requirement of Minister of Health of Lithuania which emphasizes that only those injured patients whose vital functions were stabilized in the nearest hospital can be transported for definitive care to the university or regional level hospital. That means that it neglects a philosophy of ‘Golden hour’ and a universal requirement to transport severely injured patients directly to the appropriate facility where the optimal care for the injured patients can be fully provided.

Specifically, the ambulance team members are rarely capable of performing such procedures as endotracheal intubation cardiac defibrillation and drainage of the pleural cavity, which are considered to be fundamental life support procedures. As a result, an initial assessment of high-energy blunt multiple trauma patients reached 14% and management reached 10.6% of that recommended by ATLS program. It has been determined that the pre-hospital stage of management for trauma patients affected by high-energy vector—34 ± 6.5 min—is too long of a duration and is not acceptable. In addition, infusion was applied for only 75% of patients from the same cohort in the pre-hospital stage, breathing monitoring was performed only for 1.9% and heart rate monitoring for 26.4% of severely injured patients. All of which indicates faulty quality of performance in the pre-hospital stage.

In-hospital component
There are 67 general hospitals in Lithuania. There are no officially verified, approved and ranked de jure trauma centres in Lithuania. A small number of hospitals developed their own criteria and are calling themselves trauma centres. Nevertheless, it remains unclear whether they have trauma standards, protocols and guidelines or not. Only 3.8% of trauma patients who were injured by high-energy vector got intravenous fluid therapy as part of the complex treatment in the very early in-hospital stage. Trauma care in Lithuania is mostly provided by medical staff of general hospitals which have to be regarded as non-trauma centres.

Rehabilitation
The Lithuanian Rehabilitation System itself is considered to be a separate and independent system from the general hospital system. Patients are accepted for rehabilitation after treatment in the hospitals due to major injury according to rules established by the rehabilitation service management office and according to financial requirements of State Patients’ Fund. Patients who experienced minor injury can be rehabilitated in the outpatient clinic.

Injury prevention and control
There is national policy for unintentional road traffic injury prevention and control in Lithuania, but not for intentional injury prevention and control. A recent country-wide assessment demonstrated that 47% of selected effective interventions for injury prevention and 71% for violence prevention in Lithuania were being implemented out of a total of 99 interventions. This was compared with a European regional median of 72% for unintentional injury and of 81% for violence prevention. Prevention and control of injury, either unintentional or particularly intentional, still remains an important field for a number of well-designed enforcement, education and engineering interventions in Lithuania.

Emergency medical services providers’ education
The Advanced Trauma Life Support programme was started in 2004. The Prehospital Trauma Life Support programme was started in 2007. However, programme courses do not correspond to needs. Also, there is no requirement how often the program course has to be repeated. There are no Major Incident Medical Management and Support, Pediatric Advanced Trauma Life Support, Geriatric Trauma Life Support and Advanced Trauma Operative Management programmes in Lithuania so far. In sum, sporadic education not framed into an inclusive trauma system has little chance to be effective.

Information system and evaluation
Basic data on injury incidence and mortality are provided by the Lithuanian Health Information Center and the European Detailed Mortality Database. Injury-related data for injury research can also be accumulated from other databases such as the Lithuanian Police Traffic Supervision Service, the Lithuanian State Enterprise ‘Regitra’, the Lithuanian Road Administration and the Fire and Rescue Department. Nevertheless, there is no National Trauma Database and Registry, and Injury Surveillance System.

Research
Only seven articles related to traffic injury population-based data in Lithuania were identified. All but one analysis of Lithuania data on traffic injury-related deaths revealed mortality time trends due to premature death in children and adolescents under 19-years old within the period 1970–2005.

Lithuanian trauma service assessment in terms of socially valued outcomes

Health and responsiveness
This article demonstrates that Lithuanian trauma service could better contribute to improving the public health. The respect of persons in terms of dignity, autonomy, confidentiality and client orientation are crucial components reflecting the responsiveness of any health system. These legitimate expectations of the Lithuanian community from the trauma service focus on players such as pre-hospital and in-hospital services providers probably do not correspond with the responsiveness of the Lithuanian trauma service. Indeed, when incidence and mortality statistics on injury are not good and they do not show a trend of positive change, it is difficult to think that the current trauma service in Lithuania is on good terms with individuals. It might even be regarded
as a negative ethical dimension between public health policy planners, implementers and the public.

This Lithuanian trauma service analysis shows that the completely decentralized trauma service does not cover the necessary components for an efficient trauma service system. Prevention, standardization, development, evaluation, research, education, not so effective common access and absence of approved trauma centres could be just eight of the body of examples. Furthermore, different requirements for ambulance arrival in urban and rural areas of the country are evidence of inequity when injury faces people. There is a lack of responsiveness of the trauma sector.

**Fairness in financing**

There is not enough additional attention and funding to combat this problem in Lithuania. There are no incentives for medical personnel working at risk with this cohort of emergency patients. The example of developed countries proves that without additional financing the trauma system does not work. This third goal of the health systems is ignored.

**Trauma system assessment in terms of quality, equity and efficiency**

Without a system, the level and quality of care rendered usually varies on a regional basis or even on a daily or hourly basis within the same region. A decentralized service is a prerequisite of non-equitability of the care within the country. As a result, the efficiency of the Lithuanian trauma care service is questionable. A trauma system has to be a coordinated and organized continuum of care from prevention of injury, to acute care of injury and through return to society.

**Reforms**

The purpose of reforming the ineffective trauma related health sector would be to minimize disparities in quality and equity by setting; maintaining, analysing and developing standards of trauma care; and coordinating its consistent delivery. A political, academic and public will to reform the current trauma sector in Lithuania is not sound yet.

**Discussion**

There is much space for improvement of the Lithuanian Trauma Service. Assessment of this health sector using a conceptual framework could be a catalyst for reforming the trauma sector. Several recommendations could be suggested.

First of all, the problems related to trauma injuries have to be analysed by Trauma committee. Whether or not systematic changes of the trauma sector are needed for reduction of the injury burden in Lithuania should be a key task for Trauma committee. The concept of avoidable deaths due to injuries could be an intellectual incentive for starting this first-step of design and organizational change. It says the following: 81% of deaths due to injury in Lithuania might be avoidable. It has recently been demonstrated that an inclusive trauma care system is associated with a significant risk reduction of mortality of 16%. Further reduction of avoidable injury deaths would depend on complex of sustained intensive education, education and engineering preventive measurers. Road traffic law enforcement, increases in fines and a rigid penalty scoring system that might lead to driver license withdrawal and motor vehicle confiscation, permanent persuading drivers to comply with the safety rules, widening of national automated safety camera networks, improvement of road infrastructure and its constant maintenance, implementing educational programs to prevent infant, child and adolescent deaths, promoting mental resilience and raising taxes on alcohol beverages could be just few examples of preventive measures. There should be a need to emphasize the importance of policy of increasing taxation on alcohol. It was estimated that doubling the alcohol tax would substantially reduce the rates of mortality and morbidity in alcohol-related injuries of all kinds (for instance, an average reduction of 35% in alcohol-related mortality, an 11% reduction in traffic crash

dean) (14 Oct 2010, date last accessed).


6 European Detailed Mortality Database (DMDB) of World Health Organization Regional Office for Europe. Available at: http://data.euro.who.int/dmdb (20 May 2009, date last accessed).


**Conflicts of interest:** None declared.

**Key points**

- Injury is the leading public health problem in Lithuania in terms of DALYs lost.
- Lithuanian trauma sector is decentralized.
- Performance of trauma sector does not correspond to needs of public.
- Lithuanian trauma service has to be conceptualized and changed to an inclusive system.

**References**


2 European Detailed Mortality Database (DMDB) of World Health Organization Regional Office for Europe. Available at: http://data.euro.who.int/dmdb (20 May 2009, date last accessed).


Adaptation, data quality and confirmatory factor analysis of the Danish version of the PACIC questionnaire

Helle Terkildsen Maindal\textsuperscript{1}, Ineta Sokolowski\textsuperscript{2}, Peter Vedsted\textsuperscript{1,2}  

\textsuperscript{1}Section of General Practice, School of Public Health, Aarhus University, Aarhus, Denmark  
\textsuperscript{2}Research Unit for General Practice in Aarhus, Aarhus University, Aarhus, Denmark  

Correspondence: Helle Terkildsen Maindal, RN, MPH, PhD, Department of General Practice, School of Public Health, Aarhus University, Bartholins Allé 2, 8000 Aarhus C, Denmark, tel: +45 89 42 60 44; fax: +45 86 12 47 88; e-mail: htm@alm.au.dk

**Background:** The Patient Assessment of Chronic Illness Care (PACIC) 20-item questionnaire measures how chronic care patients perceive their involvement in care. We aimed to adapt the measure into Danish and to assess data quality, internal consistency and the proposed factorial structure. **Methods:** The PACIC was translated by a standardised forward–backward procedure, and filled in by 560 patients receiving type 2 diabetes care. Data quality was assessed by mean, median, item response, missing values, floor and ceiling effects, internal consistency (Cronbach’s \( \alpha \) and average inter-item correlation), item-rest correlations and factorial structure was assessed by confirmatory factor analysis (CFA). **Results:** The item response was high (missing answers: 0.5–2.9%). Floor effect was 2.7–69.2%, above 15% for 17 items. Ceiling effect was 4.0–40.4%, above 15% for 12 items. The subscales had average inter-item correlations over 0.30 and CFA showed high factor loadings (range 0.67–0.77). All had \( \alpha \) over 0.7 and included items with both high and low loadings. The CFA model fit was good for two indices out of six (TLI and SRMR). **Conclusions:** Danish PACIC is now available and validated in primary care in a type 2 diabetes population. The psychometric properties were satisfactory apart from ceiling and floor effects. We endorse the proposed five scale structure. All the subscales showed good model fit, and may be used for separate sum scores.