A global agenda for electronic injury surveillance: Consensus statement from the Trauma Association of Canada, the Trauma Society of South Africa, and the Panamerican Trauma Society

Eiman Zargaran, MD, MHSc, Lauren Adolph, Nadine Schuurman, PhD, Larissa Roux, MD, PhD, Damon Ramsey, MD, Richard Simons, MB, BCHir, Richard Spence, MD, Andrew J. Nicol, MD, PhD, Pradeep Navsaria, MD, Juan Carlos Puyana, MD, Neil Parry, MD, Lynne Moore, PhD, Michel Aboutanos, MD, MPH, Natalie Yanchar, MD, Tarek Razek, MD, Chad G. Ball, MD, MSc, and S. Morad Hameed, MD, MPH, for the Trauma Association of Canada, the Trauma Society of South Africa, and the Panamerican Trauma Society

“The real need (in global health) is to close the data gaps, especially in low and middle-income countries, so that we no longer have to rely heavily on statistical modeling for data on disease burden.”
—Dr. Margaret Chan, Director General, World Health Organization

Trauma remains, despite the steady evolution of trauma systems, a major global public health issue. It is still the leading cause of loss of human potential worldwide. More than 5 million people, many of them young, die each year as a result of trauma, and another 100 million are left with severe, long-term consequences. Ninety percent of these tragedies occur in low- and middle-income countries (LMICs), without adequate resources to allocate to trauma systems development. Once implemented, however, organized systems of trauma care have been shown to improve injury morbidity and mortality by 15% to 20%. It is estimated that more universal trauma systems could save 1.9 million lives each year. Building trauma systems capacity in LMICs is a defining opportunity of this century.

A key first step in the development of trauma systems is the collection and analysis of high-quality injury data or injury surveillance. Data collection is a necessary prerequisite for the improvement of clinical care, for the allocation of finite resources to acute care and rehabilitation, and for evidence-based injury prevention. While North American trauma systems have been built on a foundation of injury surveillance in the form of hospital-based trauma registries, in lower-resource settings, the costs of data collection and analysis have often proven to be prohibitive. This may be about to change. Trauma clinicians and investigators have begun to close data gaps using innovative approaches to creating low-cost trauma registries and, even more exciting, by harnessing the growing power of electronic platforms and mobile devices.

THE STATUS OF GLOBAL INJURY SURVEILLANCE

The notion of trauma registry creation in LMICs is not a novel one. Trauma registries have successfully been introduced in many underresourced trauma centers to guide the maturation of trauma systems. The use of simple hospital-based registries have supported efforts to improve triage of trauma patients, decrease delays in interventions for the most severely injured, and improve trauma mortality in several African sites. The absence of comprehensive, standardized, and timely trauma information systems, however, continues to challenge trauma systems development in most areas of the world. In fact, only approximately 50 trauma registries exist throughout LMICs, and among these, large variations exist in trauma patient inclusion criteria, data collection processes, variables included, data definitions, and how data are used. Most registries collect data from five categories (demographics, injury event, process of care, injury severity, and outcome), with several registries collecting data for less than 20 variables. Standardization of injury severity, an essential prerequisite for rigorous quality improvement and research, is most commonly accomplished in these registries using scoring systems such as the Injury Severity Score (ISS), the Revised Trauma Score (RTS), the Injury Severity Score (TRISS) methodology, and the Kampsala Trauma Score (KTS). Although ISS is commonly used in North American registries as an inclusion criterion or injury severity adjustment tool, only 2 LMIC registries report it. In general, lack of standardization in registry inclusion criteria, along with limited data fields and variability of data definitions between trauma centers, has made it difficult to measure and compare processes and outcomes in trauma care in LMICs.

Despite the challenges of performing valid comparisons across health care systems based on retrospectively collected...
data, early studies do highlight the urgent need to obtain high-quality and standardized information to begin to understand and address disparities in trauma care, and organizations such as the American College of Surgeons’ Committee on Trauma (ACS COT) and the Panamerican Trauma Society (PTS) have advocated for improved global injury surveillance capacity. In the near future, concepts such as the International Trauma Data Bank may begin to establish standards for systems of trauma care and global comparative assessments of trauma outcomes.

INJURY SURVILLANCE 2.0

Exponential growth in computing power and increasing usability of computer interfaces have created unprecedented opportunities for injury surveillance on a global scale. Trauma centers in LMICs have begun to explore the feasibility of electronic trauma registries to streamline injury data collection and analysis.

The PTS, for example, applied experiences acquired in an injury surveillance pilot program in Ecuador, to the design of the Panamerican Trauma Society Trauma Registry (PTSTR), a modular injury surveillance system with both basic and comprehensive data capture capabilities. Currently PTSTR exists as a 25-element registry, based on World Health Organization Data Working Group recommendations. It works as a local hospital-based registry or a regional registry with an imbedded Reference-Counter system to allow for secure data sharing between hospitals with a simple platform that can be used on a desktop or a mobile device. PTSTR has an integrated data quality and error review system and uses various injury severity and outcome scoring systems, International Statistical Classification of Diseases and Related Health Problems 10th Revision service engine, and report analysis and generation capability across all captured elements. Access is through either a secure online Web site or software installation. So far, in the last 2 years, 21,587 patients have been entered across four sites in Colombia and Ecuador. The PTS has been careful in providing the PTSTR in areas where commitment, sustainability, and data quality can be demonstrated. This registry has been used for injury surveillance; monitoring, and auditing of trauma care and research. In the Latin American Region, systematic injury surveillance helped track the burden of injury, identify opportunities for intervention, and allowed monitoring, evaluation, and auditing of the quality of trauma care.

Mobile technologies are also being successfully applied in the advancement of global injury surveillance. mHealth, defined as medical and public health practices supported by the use of mobile devices, is widely considered to be a transformative force in the evolution of global health services delivery. Mobile devices, which include mobile phones, tablet computers, and a variety of patient monitors, are capturing and generating data at astronomical rates. As trauma data begin to be collected using these devices, their low-cost, high storage capacity and great computational power will help to provide fresh and, as yet, unimagined insights and solutions in global injury research and public policy. Wireless, mobile technology allows health care practitioners to perform their acute clinical duties while simultaneously entering data at the point of care. For example, an iPad-based application designed by trauma surgeons (the electronic Trauma Health Record [eTHR]) has collected 15,000 complete trauma records in its first 15 months of implementation at an African trauma center, during the course of standard clinical documentation (including resuscitation, operative and discharge notes). In a trauma environment with previously minimal data collection, eTHR has already wirelessly populated a sustainable electronic trauma registry with an estimated 5,000,000 standardized data points in real time, with minimal database infrastructure and maintenance investment. This is only one mHealth application at one site. These tools are highly customizable to individual trauma systems needs and are eminently scalable for use across the world. Considering the fact that more than 100 million people are severely injured every year, it will not take long to generate bigger data sets than even the US National Trauma Data Bank, the world’s largest trauma data repository, which currently houses approximately 3 million records. Trauma clinicians and researchers have a once-in-a-lifetime opportunity to create deep, agile data sets with actionable data and to begin to apply data every day to reducing the global burden of injury.

THE PROMISE OF HARMONIZING GLOBAL INJURY SURVILLANCE EFFORTS

If the global trauma community can agree on some common data collection methods, data definitions, risk adjustment strategies, process benchmarks, and outcomes measures, the potential value of these data collection efforts will rise exponentially. The liberation of data to standardized digital formats will allow comparisons of injury prevention policy, quality of care, and injury control innovations across borders and will fast track the application of new knowledge in increasingly globalized trauma partnerships. The trauma community will have a data platform to assess the successes and failures of trauma system performance improvement programs in real time.

The sudden creation of a data-rich environment may be chaotic at first. As mHealth tools are developed and tailored to local trauma system capacity and need, there is a strong potential that they will generate incompatible data sets, nongeneralizable performance metrics, and redundancy. Issues of privacy and data security, which are still incompletely understood, may delay or derail surveillance efforts. Furthermore, incomplete integration with existing electronic platforms, which are becoming more and more prevalent in hospitals around the world, or with nonclinical injury data sets such as mortality, road traffic, or police data sets may reduce the functionality or utility and, therefore, widespread adoption of trauma’s new mHealth tools.

These problems can be anticipated and preempted by the global trauma community. The organizations contributing to this consensus are strongly committed to increasing transparency in local initiatives to build injury surveillance capacity and to identifying opportunities to develop more universal data definitions and trauma system performance metrics that will link local and regional surveillance efforts into a global injury surveillance framework. We believe that an electronic global trauma registry will be the sum of individual, grassroots efforts, tailored to meet local needs but integrated by a common
belief in evidence-based change and global partnership and a common commitment to the vast reduction of the global burden of injury.

THE FUTURE: TRANSLATING KNOWLEDGE INTO ADVANCES IN GLOBAL INJURY CONTROL

Our consensus group calls for a creation of an integrated network of injury surveillance as the first step in the effort to reduce the global burden of injury. In the big data era of injury control, the ultimate goal is to create pathways for data linkage and analysis, so that data may flow to guide action in injury prevention and trauma care, almost in real time. Closing the gaps between data collection, analysis and action will be the next great challenge of global trauma systems. The creation of strong partnerships among data scientists, health economists, data engineers, injury prevention workers, trauma clinicians, and policymakers would allow our analytic capacity to keep pace with the newly generated flow of data and allow sophisticated insights to create meaningful change in the safety of our societies. mHealth, big data, thoughtful real-time analysis, and the globalization of injury control have arrived together and will close data gaps to help transform our approach to one of this century’s biggest public health issues.

DISCLOSURE

L.R., D.R. and S.M.H. are founders of health technology companies that support injury surveillance in low and middle income countries. All other authors declare no conflicts of interest.

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