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Improving Trauma Care via Evidence-Based Medicine: Guidance, Guidelines, and Global Impact

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Abstract

Worldwide, over 5 million people die each year from injury. Improvements in global trauma care can be

achieved through clinical decisions driven by data, development of learning healthcare systems, and trauma system infrastructure equipped to provide the highest

quality evidence-based care. Practice management guidelines remain one critical element to delivering evidence-based care at the trauma system level and globally. Trauma guidelines reduce inappropriate practice variation, lower healthcare costs, speed translation of research into practice, improve safety and quality, and reduce disparities. While challenges remain, particularly with respect to global access to guidelines and education, sustained efforts continue to improve trauma care services worldwide. Medical and surgical practice based on a sound scientific foundation facilitates high quality care and allows the best opportunity for meaningful patient-centered clinical outcomes. Evidence-based trauma care saves lives, and trauma guidelines remain one of the most effective ways to impact the care of injured patients worldwide.

Key words: Evidence-based medicine, guidelines, trauma, injury, GRADE methodology

The Global Burden of Injury

Trauma remains a leading cause of morbidity and mortality worldwide with over 5 million people dying each year from injury.¹ The global burden of injury is not distributed evenly, however, with over 90% of worldwide trauma-related deaths occurring in low-income and middle-income countries.²⁻³ Understanding the burden of traumatic injuries remains challenging in many countries due to limited resources for measuring and reporting outcomes in critical care settings.⁴ Furthermore, few low- and middle-income countries have mature trauma systems.³ It is estimated that 34-38% of all injury deaths in low- and middle-income countries are preventable.¹ If case fatality rates from trauma in low- and middle-income countries were decreased to case fatality rates for similarly injured patients in high-income countries with mature trauma systems, as many as 1.9 million lives would be saved around the globe.¹ Trauma systems save lives, and a key driver of improved outcomes is use of evidence-based trauma guidelines at the trauma system level.

A trauma system is a coordinated injury response network with facilities and infrastructure necessary to provide comprehensive evidence-based care for the injured patient. The trauma system includes emergency medical services (dispatch, field triage, transfer), trauma hospitals, inter-facility transfers, trauma teams including surgeons and other physicians, operating rooms, intensive care units, general inpatient care, rehabilitation, and

injury prevention efforts.⁵ The World Health Organization has proposed a Trauma System Maturity Index to classify global trauma systems from least mature to most mature.⁶ Unfortunately, mature trauma systems are absent in most low- and middle-income countries, despite a substantial burden of injury.³ Motor vehicle collisions and other road-related injuries (including pedestrian injuries) remain major contributors to morbidity and mortality from trauma. Countries including China, India, and the United States face some of the greatest healthcare expenditures for road injuries.⁷ The global burden of mortality from firearms is also significant, with 6 countries (Brazil, United States, Mexico, Colombia, Venezuela, and Guatemala) accounting for over 50% of global firearm deaths.⁸ As trauma systems continue to evolve globally, the impact and importance of evidence-based medicine for care of injured patients remains a core feature of trauma system maturation.³ Clinical decisions should be driven by data, and learning healthcare systems should be developed and equipped to provide evidence-based care.⁹ Practice management guidelines remain the key to delivering evidence-based care at the system level and globally.⁹

Evidence-Based Medicine

Evidence-based medicine began as a movement in the early 1990s to educate clinicians to understand and use published scientific literature to optimize the clinical care of patients.¹⁰ The need for evidence-based medicine arose due to the rapidly changing and expanding fund of scientific knowledge available and pertinent to the clinical practice of medicine. Evidence-based medicine provides clinicians with much needed infrastructure to support their current knowledge of the scientific literature as well as their ability to apply the best evidence at the bedside when making decisions about patient care. Today, evidence-based medicine is characterized by three domains: 1) critical appraisal of available scientific evidence with attention to patient values, preferences, and shared decision making, 2) development of rigorous methodology (systematic reviews) for generating trustworthy recommendations, and 3) development of clinical practice guidelines.¹⁰ Evidence-based medicine ensures the clinical practice of medicine is supported by a sound scientific foundation, helps facilitate high quality care, and allows the best opportunity for meaningful clinical outcomes.

Not all scientific evidence is created equally: for

example, randomized controlled trials are usually considered superior to observational studies with respect to the ability to trust the results of the specific treatments. However, even randomized controlled trials may be biased or flawed or not applicable to broader populations than the specific cohorts studied. Not all scientific evidence should apply to the practice of medicine equally. Clinical practice should be based on the *best* available evidence—“science is cumulative, and scientists should cumulate scientifically.”¹¹ The Cochrane Collaboration is responsible for leading the most important advances in methodologic rigor of systematic reviews.¹² However, while evidence and systematic reviews are necessary for appropriate clinical decision-making, they are not sufficient.¹⁰ Clinical decision making should also incorporate and address the following: 1) patient preferences, goals, and values, 2) the clinical context and the environment in which care is provided, and 3) any contextual features of the individual medical case. Ultimately, clinical practice guidelines are developed to incorporate critical appraisal of scientific evidence, systematic reviews, and attention to patient values and preferences as well as resources, environments, and clinical context.

The Grading of Recommendations Assessment, Development and Evaluation (GRADE) framework is the global leader in guideline methodology.¹³ The GRADE approach, first published in 2004, has been adopted by many governments, professional societies, and organizations worldwide including the World Health Organization and the Cochrane Collaboration.¹⁴ GRADE provides a systematic approach to define clinical questions in the PICO format (Population, Intervention, Comparator, Outcomes). Outcomes are prioritized with attention to patient preferences and may be influenced by perspectives of the target population including patients, as well as clinicians, policymakers, and the public. Cultural diversity may influence the relative importance of outcomes of interest, and should be considered to ensure guidelines are appropriate for an international audience. GRADE considers a number of factors with respect to clinical decision making including the certainty of the evidence (sometimes referred to as the quality of the evidence), the magnitude of benefits and harms, values and preferences, and considerations including resource use, feasibility, acceptability, and equity.¹⁴⁻¹⁵ While cost is not a required element of the GRADE process, it must often be considered out of necessity in resource constrained environments.

Trauma Guideline Development

Clinical practice guidelines remain a central tenet of evidence-based medical care of injured patients. The United States Institute of Medicine noted variation in medical practice and varying outcomes which prompted a call in 1990 for standardized medical care through development and implementation of clinical practice guidelines.¹⁶ In response, many professional societies including the American College of Surgeons, Western Trauma Association, and the American Association for the Surgery of Trauma have made development of trauma evidence-based clinical decision support a focus of their work.¹⁷⁻²⁰ The Eastern Association for the Surgery of Trauma (EAST) has been the *de facto* leader in trauma guidelines for decades, having began focusing on development of evidence-based practice management guidelines for trauma care in 1994 under the leadership of Michael Rhodes.²¹ EAST made an early and profound impact with guideline development, and quickly became a global leader through its commitment to evidence-based trauma care.²² Ultimately, EAST transitioned to use of GRADE for development of guidelines in 2012, in a perpetual quest for excellence and leadership in evidence-based trauma care.²³⁻²⁴ While EAST guidelines initially covered only trauma, their scope has expanded; EAST has published over 100 guidelines addressing trauma, emergency general surgery, surgical critical care, and injury prevention.²⁵ These guidelines are freely available at www.east.org and access does not require a paid journal subscription or membership in the organization.²⁵

Guidelines are ubiquitous in global healthcare systems; currently, the Guidelines International Network hosts well over 3,000 guidelines from 56 different countries.^{19,26} Trauma guidelines reduce inappropriate practice variation, lower healthcare costs, speed translation of research into practice, improve safety and quality, and reduce disparities.^{22-23,27} At the same time, a number of challenges are pertinent to the development of guidelines including lack of transparent methodologic practices, lack of scientific rigor, difficulty reconciling conflicting guidelines, and conflicts of interest among those developing and publishing guidelines.²⁶ Development of high-quality evidence-based practice management guidelines requires time, commitment, and a rigorous and transparent approach to ensure guidelines are trustworthy.²⁶ Ensuring guidelines remain relevant as the scientific literature advances requires updates and revisions to existing guidelines. While challenges remain, sustained efforts continue to improve trauma care services worldwide through guideline development.

Guidance versus Guidelines

Under ideal settings, guidelines are developed after thorough systematic review and meta-analysis inclusive of relevant randomized clinical trials and observational studies using an approach such as GRADE. In some circumstances, however, guidance is needed quickly, and scientific studies may be limited to address the pertinent clinical questions. For example, the worldwide COVID-19 pandemic challenged clinicians to provide care for patients with limited knowledge and understanding of the disease process, no previously existing clinical guidelines, and very little guidance. In this setting, many physicians found themselves practicing “eminence-based medicine” rather than truly evidence-based medicine.²⁸ The COVID-19 experience and others have demonstrated that while science takes time, it does not necessarily have to take a long time, especially if answers are needed quickly.²⁹ The Cochrane Collaboration has established methods for ‘rapid review’ which accelerates the traditional systematic review process in a resource-efficient manner. GRADE may be applied to evidence assembled from indirect evidence or other sources when needed. A structured assessment is required but does not have to be time-consuming provided underlying judgments about the certainty of the evidence are transparent and based on GRADE domains.^{13,15} It is entirely possible—and sometimes necessary—to develop evidence-based guidelines with urgency. Rapidity may not necessarily compromise the quality of a systematic review or guideline.³⁰

Global Impact of Trauma Guidelines and Opportunities

While trauma guidelines remain the key to delivering the highest quality evidence-based care within trauma systems, many opportunities remain for improving the practice of evidence-based trauma care globally. Access to costly publications in medical journals, language barriers, and lack of training remain major concerns globally.³¹ Collaboration among global surgical societies, publishers, hospital employers, and international policymakers is needed to ensure all physicians and surgeons are prepared to care for injured patients with appropriate access to guidelines and training in their use and application in clinical settings.³¹ Some guidelines may only be pertinent in certain settings with specific resources. Such guidelines may have limited clinical utility in low resourced settings, including low and middle-income countries or rural areas of high-income countries, for example, where there are

limited critical care facilities.⁴ Options for adapting guidelines to local resources is an important consideration to ensure equitable guidelines are developed with broad opportunities for implementation.²⁰

Future Directions and Further Opportunities

Additional opportunities include development of living guidelines and guidelines designed to be integrated with electronic health records to allow for clinical decision support at the point of clinical patient care. Living guidelines are defined by “an optimization of the guideline development process to allow updating of individual recommendations as soon as new relevant evidence becomes available.”³² While the concept of living guidelines is admirable, the amount of human resources and capital necessary to monitor the literature and facilitate updates to guidelines is considerable. Artificial intelligence may offer some infrastructure to continue the development of living guidelines.³³ Incorporation of clinical practice guidelines at the point of patient care involves development of clinical decision support tools within electronic health records. One successful example has been development of Clinical Practice Guidelines through Fast Healthcare Interoperability Resources, also known as ‘CPG-on-FHIR.’²⁰ Further research is needed to understand impact and outcomes associated with guidelines embedded within electronic health record clinical decision support tools, although early evidence shows improved decision making and reduction of unnecessary tests and studies.³⁴

Conclusion

Practice management guidelines remain a key driver of effective evidence-based global trauma care. Although challenges remain, particularly with respect to global access to guidelines, education, and implementation, sustained efforts continue to improve data driven trauma care services. Clinical practice based on a sound scientific foundation facilitates high quality care and allows the best opportunity for meaningful patient-centered outcomes. Evidence-based trauma care saves lives, and trauma guidelines remain one of the most effective ways to impact the care of injured patients worldwide.

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