



UPDATE IN INTENSIVE CARE: NEUROINTENSIVISM

Quality of trauma care and trauma registries[☆]



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Abstract Traumatic disease is a major public health concern. Monitoring the quality of services provided is essential for the maintenance and improvement thereof. Assessing and monitoring the quality of care in trauma patient through quality indicators would allow identifying opportunities for improvement whose implementation would improve outcomes in hospital mortality, functional outcomes and quality of life of survivors. Many quality indicators have been used in this condition, although very few ones have a solid level of scientific evidence to recommend their routine use. The information contained in the trauma registries, spread around the world in recent decades, is essential to know the current health care reality, identify opportunities for improvement and contribute to the clinical and epidemiological research.

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PALABRAS CLAVE

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Calidad y registros en trauma

Resumen La enfermedad traumática es un gran problema de salud pública. La monitorización de la calidad de los servicios prestados es esencial para el mantenimiento y la mejora de los mismos. La evaluación y monitorización de la calidad asistencial en la atención al paciente traumatizado, a través de indicadores de calidad, permitiría la detección de oportunidades de mejora cuya implementación mejoraría los resultados en mortalidad hospitalaria, resultados funcionales y calidad de vida de los supervivientes. Se han usado muchos indicadores de calidad en esta patología, aunque muy pocos tienen un nivel de evidencia científica sólido para recomendar su uso rutinario. La información recogida en los registros de trauma, de importante difusión en el mundo en las últimas décadas, es fundamental para conocer la realidad asistencial actual, detectar oportunidades de mejora y contribuir en la investigación clínica y epidemiológica.

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Introduction

Traumatism is the leading cause of death in individuals under 45 years of age in most countries, and constitute an important cause of disability, suffering and healthcare resource consumption.¹⁻³ Although the primary and secondary prevention of injuries may be the most efficient approach for dealing with problems of this kind, healthcare professionals that treat trauma patients and the healthcare system as a whole are obliged to monitor the care provided for trauma victims. Only by knowing what is done and the results obtained can measures for improvement be adopted. Effective monitoring of the quality of the services provided is essential for maintaining and improving such services. This implies the definition of objectives, the monitoring of results with comparisons versus the established standards, evaluation and interpretation of the results obtained, identification of areas that require improvement, and the implementation of corrective actions which in turn can be re-evaluated, thereby completing the continuous quality improvement cycle.

Severe trauma disease is a genuine challenge for the healthcare system, since it constitutes a major public health problem.¹⁻³ The diversity of presentations involved, the variability of the care provided, the fact that many patients do not receive the recommended care, the frequent errors,^{4,5} and the fact that part of the associated mortality is avoidable^{6,7} all underscore the need to know the quality of the provided management in order to establish measures for improvement and thus reduce the morbidity–mortality figures and improve the functional condition and quality of life of the survivors.

According to the definition of the International Organization for Standardization, quality is the degree to which the characteristics of a product or service satisfy the purpose for which it was created.⁸ This definition conveys two fundamental concepts: (1) the quality of care can be measured; and (2) quality is the degree of compliance with a given objective, and thus depends on how the latter is defined.

According to the World Health Organization (WHO), quality care is defined as the adequate implementation (according to the existing standards) of interventions confirmed to be safe, that are economically accessible to the society concerned, and are able to cause an impact upon the mortality, morbidity or disability rates.

Because of its important incidence, associated mortality and sequelae, severe trauma disease requires adequate monitoring of the quality of the provided healthcare with a view to detecting areas amenable to improvement that can contribute to secure better results and outcomes.

Quality in trauma care

Evaluation of healthcare quality

Improvement of the quality of emergency care is a generic objective common to all healthcare systems, particularly when the disease in question has a high incidence. It is important to evaluate quality in order to establish strategies for improvement.

According to the model developed by Donabedian,⁹ evaluation of the quality of care has three methodological components or dimensions: evaluation of the structure, evaluation of the care process, and evaluation of the results. Evaluation of the structure is probably the simplest and most objective of all three methods. The structure comprises the minimum characteristics needed to ensure good quality care, though the presence of such characteristics does not actually guarantee quality. In turn, evaluation of the care process, of how care is provided, is currently the most widely used method. It is more complex than the evaluation of structure but is easier to measure than the quality of the results, and what we obtain is an indirect measure of such quality. Lastly, evaluation of the results appears to be the ideal method for measuring healthcare and, although it is highly complex,¹⁰ it is particularly important in disorders characterized by high incidence and severity, such as trauma disease.

Two methods traditionally have been used to assess the care process: medical auditing and monitoring.

Medical auditing is the critical and systematic analysis of the quality of medical care, evaluating healthcare practice on a retrospective basis and by the professionals in charge of providing such care. In 2009, a Cochrane review found no study of sufficient scientific quality to clarify whether auditing in trauma is effective in improving the care of serious trauma patients, or whether it contributes to reduce mortality.¹¹

Monitoring in turn is a continuous and planned quality measurement system that makes use of instruments called indicators, for which concrete optimum levels are established. An indicator is a quantifiable and objective parameter that specifies those healthcare activities and results or outcomes whose quality we seek to evaluate. Indicators allow us to detect situations that are problematic or amenable to improvement, and they inform of whether improvements occur and whether such improvements are maintained over time. Monitoring has two components: (1) identification, selection and construction of the indicators; and (2) definition of the monitoring plan (including at least the periodicity with which the indicator is documented, the mechanisms for data collection, and the methods used for interpreting them).¹²

Quality indicators

An indicator is not a phrase but requires a precise definition of all its terms. The construction of indicators is no simple process and must have a number of sections and a definition: denomination of the indicator, dimension, justification, formula, explanation of the terms, type of indicator, indicator target population, data sources and available standards.¹²

In order to improve patient care and save lives, we need indicators that are accessible, reliable and valid; that can be used to establish reference points for the quality of care; detect success and possible problems; and which follow the trends over time in order to identify imbalances requiring intervention measures. Hussey et al.¹³ identified four general characteristics for the evaluation of quality indicators: importance, usefulness, scientific robustness and feasibility.

Table 1 Types of indicators.

According to type of information provided	According to the phase of healthcare referred to
Sentinel indicators: these detect all serious and often avoidable cases, requiring review of each of the incidences.	Structure indicators: these measure the existence (or absence) of the physical means needed to perform an activity.
Index-based indicators: these measure events in which a certain frequency of appearance may be accepted, and which only require individual assessment if the index shows significant deviations over time or in comparison with other similar centers.	Process indicators: these measure the functioning (efficacy and/or efficiency) of some activity or internal aspect of the process that is crucial for its final outcome; they constitute a complement to outcome assessment and inform of process execution times, scientific-technical quality, and production of services.
Tracer indicators: these are standards for evaluating the care provided by the healthcare system, and reliably reflect overall care; they refer to frequent situations in which care deficiencies are avoidable and where maximum benefit can be derived by correcting such deficiencies.	Outcome indicators: these measure the functioning (efficacy and/or efficiency) of the process; they measure what happens (or does not happen) after completing an activity (process).

Quality indicators can be classified according to the type of information they afford (indicators based on sentinel events, based on indexes, and tracer indicators) or the care phase to which they are referred (structure, process and outcome indicators) (Table 1).

In the critical care setting, strategies have been proposed in recent years to improve healthcare by incorporating the use of quality indicators as measurement instruments.¹⁴ Many indicators have been defined and used in application to trauma patients, their aim being to document all the care received by the patient from the time of injury to recovery. In the 1980s, the American College of Surgeons (ACS) proposed quality indicators for the care of severe trauma patients, and this initiative was followed by the publication of a number of revisions.^{15,16} Different initiatives in the intensive care setting have been launched in Spain to evaluate the quality of the care received by severe trauma patients. In this regard, Azaldegui-Berroeta et al.¹⁷ conducted an analysis of the quality of the care received by severe trauma patients attended in the province of Guipuzcoa (the POLIGUITANIA project). In turn, as part of the GiTAN project, Muñoz-Sánchez et al.¹⁸ published a study on the quality of emergency care in severe trauma cases in three Andalusian provinces, with the evaluation of 17 indicators proposed by the ACS, focusing on pre-hospital and in-hospital care. In the year 2005, the Spanish Society of Intensive and Critical Care Medicine and Coronary Units (*Sociedad Española de Medicina Intensiva, Crítica and Unidades Coronarias*, SEMICYUC), in the context of an initiative aiming to improve the quality of care, developed 120 quality indicators that were updated in 2011, dynamically adapting them to the reality of clinical practice and the available scientific evidence.¹⁹ This initiative also aimed to secure uniformity in the quality of critical patient care and comparability among the different Units. The key indicators referred to critical patient care were contemplated, including those referred to trauma patient care (Table 2).

Many quality indicators are used in trauma patient care, and some of them are reflected in Tables 2–4. A review published by Stelfox et al.²⁰ on quality indicators in trauma care identified 1572 indicators, divided into 8 categories: auditing filters of the American College of Surgeons Committee on

Trauma (ACS-COT) (19.1%), auditing filters of other colleges of surgeons committees on trauma (42%), patient safety indicators (13.2%), indicators for the comparison of care outcomes (7.4%), expert reviews (5.5%), general auditing measures (1.8%), and adherence to clinical practice guides (0.8%). The most common measures were those of pre-hospital and in-hospital processes (60.4%), and outcomes (22.8%), while post-hospital and secondary injury prevention indicators represented less than 5%.²⁰

In another recent study,²¹ an expert committee reviewed the existing literature on quality indicators in trauma care, with the initial consensus-based identification of 84 indicators that were sent to 133 certified trauma care centers in the United States, Canada, Australia and New Zealand for due evaluation to determine whether they afforded important improvements in health, were easy to use and interpret, and globally constituted good indicators. A total

Table 2 Quality indicators in trauma and standard values (SEMICYUC, 2011).¹⁹

Indicator	Standard (%)
Potentially severe trauma attended by the Department of Intensive Care Medicine	95
Tracheal intubation in severe TBI with GCS <9 in the first 24 h	95
Surgery in TBI with epidural and/or subdural hematoma	100
Incidence of adult respiratory distress syndrome in severe trauma	10
Monitoring of intracranial pressure in severe TBI with pathological CT findings	95
Mortality in severe TBI	<40
Early osteosynthesis in diaphyseal femoral fractures	95
Early surgical fixation in open fractures	95

TBI: traumatic brain injury; GCS: Glasgow coma scale; CT: computed tomography.

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Table 3 Structure, process and outcome indicators according to moment of care.

Care phase	Structure	Process	Outcome
Pre-hospital	Alert criteria Training	Total pre-hospital time	Pre-hospital deaths Long-term outcomes
Hospital	Pre-hospital screening (triage) Massive transfusion protocol TBI management protocol	Adequate activation of massive transfusion protocol Proportion of eligible patients managed according to protocol	Deaths due to hemorrhagic shock Risk adjusted mortality in TBI GOS-E determined 6 and 12 months after trauma Severity adjusted return to work
Post-hospital	Community facilities for rehabilitation Standardized rehabilitation protocols	Time to rehabilitation consultation	
Prevention	Activities for trauma prevention	Percentage of eligible patients subjected to alcohol screening and brief motivational intervention	Proportion of patients returning with new trauma related to alcohol or drugs

GOS-E: extended Glasgow outcome scale; TBI: traumatic brain injury.

of 31 indicators were finally established that exhibited validity of content and could be used as guides in practices for the improvement of the quality of trauma patient care²¹ (Table 4).

The quality of severe trauma patient management must be measured, but the potential series of indicators used poses a number of problems, such as the scant scientific evidence warranting many of them; specific development on the part of each institution, thus making generalization difficult; and the use of very basic and sometimes limited variables. Such limited evidence of the quality indicators indicates that there is room for improving and standardizing them and for measuring and managing the quality of trauma patient care. Standardized indicators are necessary in order to establish comparisons among different centers. In addition to hospital survival, we must seek performance indicators that include survival quality after the acute hospital episode and the need for patient rehabilitation and care over the long term.¹⁰

Most of the quality indicators used in the care of trauma patients have scant scientific support.²⁰⁻²³ As an example, the only measure that has been shown to have reliable and valid supporting evidence is the expert review of avoidable deaths.²² This same study describes 7 quality indicators with promising but incomplete evidence which could be candidates for evaluation in the context of controlled studies: (1) time to assistance at the trauma site; (2) time to emergency laparotomy; (3) non-scheduled reintervention within the first 48 h after the initial intervention; (4) complications; (5) reintubation within the first 48 h after extubation; (6) undetected injuries; and (7) expert review of avoidable deaths. In contrast, many of the clinical care parameters in trauma cases lack evidence of sufficient robustness to allow them to be used for the development of quality indicators, including for example the time to craniotomy in severe brain injuries, and therefore should be discarded at least until a more solid body of supporting evidence becomes available.

Quality improvement

Quality improvement is the commitment and the method used for the continuous improvement of any organization process, with the purpose of reaching and surpassing the patient needs and expectations. Continuous quality improvement is focused on the patient and forms part of the quality cycle, which starts with the detection of opportunities for improvement. Among these opportunities, priority attention should center on those that afford more efficient results, performing an analysis of their underlying causes, defining criteria, designing evaluating studies, performing an analysis of the actions for improvement, and implementing such actions. Lastly, a re-evaluation should be made and used to again define priority targets for improvement.

The comparison of outcomes with respect to other healthcare systems is able to detect differences which can lead to internal assessments that identify deficiencies in routine practices, and which can be improved upon in order to secure better outcomes. Such comparisons traditionally have been made by contrasting mortality figures. Although mortality is a robust outcome, raw mortality data are not a good indicator for comparisons among centers. Death can occur in different moments of the care process (pre-hospital, during transfer between centers, or following acute hospitalization). Consequently, in-hospital mortality is only a part of the picture. In this regard, different scores can be used to quantify the severity of trauma. Data collection therefore needs to be standardized in order to contrast groups of homogeneous patients.²⁴ The usefulness of hospital mortality as a quality indicator is limited, since it fails to convey the damage burden perceived at out- and in-hospital level or the cost per patient for the hospital, the healthcare system and the community as a whole. Despite arguments that place greater priority on functional and quality of life outcomes than on patient mortality, many trauma registries (TRs) still do not routinely collect such information.²⁵

Table 4 Dimensions of healthcare evaluated with quality indicators.

	Structure	Process	Outcome
<i>Pre-hospital</i>			
Time to first medical contact		Appropriate	
Acute pain management		Appropriate, effective, patient centered	
Field screening (<i>triage</i>) protocol	Appropriate, effective		
Field screening (<i>triage</i>) rate		Effective, efficient	
Transfer facilitation protocol	Appropriate, efficient, balanced		
Protocol for dispersion monitoring from trauma center	Efficient, balanced		
Time to trauma center		Appropriate	
Documented pre-hospital invasive procedures rate		Effective	
<i>Hospital</i>			
Direct admission to critical care box		Appropriate	
Activation of trauma team		Safe	
Tracheal intubation		Safe	
Time to CT		Appropriate	
Antibiotics for open fractures		Appropriate	
Massive transfusion protocol	Effective		
Massive transfusion protocol activation		Appropriate, effective	
Definitive bleeding control		Appropriate	
Time to acute subdural hematoma evacuation		Appropriate	
Times to limb ischemia management		Appropriate	
Treatment of joint luxation		Appropriate	
Admission to non-trauma or surgical departments		Effective, efficient	
Deep venous thrombosis prophylaxis		Appropriate, effective	
Tertiary evaluation		Safe, appropriate, efficient	
Spinal evaluation		Safe, appropriate, efficient	
Non-scheduled admission to ICU			Safe, effective, efficient
Adverse events rate			Safe
Mortality rate			Effective
Protocol for review and assessment of quality of care of patient with damage	Safe, effective		
<i>Post-hospital</i>			
Evaluation of patient functional condition		Effective	
Multiple hospital visits			Safe, effective, efficient
<i>Secondary prevention</i>			
Drug dependency screening		Effective	
<i>Global indicator</i>			
Perceived damage burden			Effective

CT: computed tomography; ICU: intensive care unit.

Adapted from Santana and Stelfox, 2014.²¹

The comparison of trauma center performance outcomes includes short-term morbidity, as well as complications and functional condition at the time of discharge. Function at discharge varies according to the instrument used to

measure it and the moment in which such measurement is made. Those studies that use patient functionality at discharge to evaluate the quality of care must be interpreted with caution, due to broad variability referred to practices

at discharge, the availability of rehabilitation beds, and the volume of patients. The evaluation of functional and health-related quality of life outcomes must be made at standardized timepoints after trauma, not at hospital discharge or discharge from rehabilitation, since these times of stay can vary considerably among patients²⁶ and institutions.

The validity of the functional capacity index—the only specific functionality measure developed for a general trauma context—in predicting long-term outcomes has been questioned. Its use is therefore not recommended.²⁷ The measurement of functional independence is usually based on rehabilitation and may be useful for assessing functionality at hospital discharge, though it affords less information than other scales such as the Glasgow Outcome Scale (GOS) or its extended version (GOS-E), which considers higher functionality levels and patient participation in different spheres. The recommendation in trauma patients is to use general health condition or health-related quality of life measures such as the SF-12 and SF-36, the EQ-5D, the Quality of Well-being Scale, etc. Such measures allow the comparison of these patients with other disease groups and with the general population.¹⁰ Experience has been gained with some TRs, such as the Victorian State Trauma Registry, which measures quality of life and functional outcomes 6, 12 and 24 months after discharge. These measures have been found to be reliable, relatively inexpensive and useful if investment is made to integrate the quality of life and functional outcome measurement systems with the trauma care system.²⁸

The use of quality indicators based on long-term outcomes is essential and should set the trend. The patient clinical and functional conditions at discharge are usually not definitive: the available data indicate that a clinically stable condition is not reached in patients of this kind until one year has gone by.²⁹ Evaluation of the care provided on the basis of the situation at discharge therefore would not be realistic; mortality and functionality at discharge are variables that can be modified by the standards in each center, the availability of rehabilitation beds, and the volume of patients. Mortality one year after trauma is more significant. Hospital mortality in turn is not correlated to the costs, since the least costly patients are those that die early or those which recover well and regain independence, while most of the long-term burden comes from the care required by permanently disabled individuals.³⁰

Few quality indicator studies based on the secondary prevention of trauma are available, and greater efforts in this field are needed. Studies on the detection of toxic substances in severe trauma victims show that the consumption of such substances favors trauma recurrence.³¹

Information of trauma care

Trauma registries

Trauma registries (TRs) are databases containing uniform and homogeneous information established on a consensus basis by experts in trauma patient care. These registries document the acute care of patients admitted to hospital due to trauma and which have been included in the databases according to specific inclusion criteria. They are designed

to provide information that can be used to improve the efficiency and quality of trauma care, epidemiological and clinical research, and the evaluation of outcomes.^{32,33}

The most important aspects in the creation of a TR are adequate selection of the variables to be entered in the registry; precise definition of the inclusion and exclusion criteria; choice of the software to be used for the registry; the personnel in charge of keeping the registry and their training; and data quality maintenance and control. The variables in turn must be homogeneous and should be established by consensus among the implicated professionals.^{33–36} Inclusion should be made of those variables of greatest impact and coverage, in order to secure maximum representation. In turn, the number of variables should be small enough to facilitate participation, and large enough to allow the objective analysis of outcomes related to mortality, functional and quality of life scales, and medical-sanitary, social and economical factors related to trauma patients. Including few or only very fundamental variables might not suffice to reach the established knowledge objectives, while including too many variables increases the complexity and the costs, and can complicate maintenance of the registry.

Trauma registries should be flexible tools, adaptable to the characteristics of the different geographical and healthcare settings, and modifiable according to the results obtained and the scientific developments occurring during the registry period.

Trauma registries generally include patient demographic data and information on the circumstances of the accident (mechanism and causes), pre-hospital care and transfer to hospital, the care received in the emergency service and during hospital admission, an anatomical description of the injuries, measures of the physiological consequences and severity, complications, outcomes and patient destination. Furthermore, TRs can include information on pre-existing diseases identified as important determinants of outcome. The registries often contain data referred to in-hospital mortality or patient destination after discharge from the acute care center and the stays in the Intensive Care Unit (ICU) and in hospital. However, although such information is very important, it tends to be incomplete and variable or amenable to manipulation depending on the discharge policy of the acute care center attending the trauma patient.³⁷ In this regard it would be advisable to document information on mortality over the middle term (at least 6 months or one year), on the functional situation at discharge, and on patient quality of life after the acute episode.^{38–41}

The main objectives of TRs are health improvement, the prevention of trauma disease, and reduction of its related costs. The registries are used to know the epidemiology of the injuries and their trends; define effective primary and secondary preventive strategies⁴²; evaluate functioning of the trauma centers and systems; improve the quality and efficiency of the care provided (pre- and post-hospital); assess the material and human resource requirements throughout the care process; evaluate the efficacy of the clinical interventions in trauma patients and improve the care provided; document the medical, economical and social effects of trauma; develop scales for assessing morbidity–mortality throughout the trauma disease period and define research hypotheses; and identify centers that are prepared for conducting clinical trials. Trauma

registries are useful for physicians, hospitals, insurance companies and clinical trial designers, but also for legislators, healthcare planners, and even the automobile industry.

In contrast to the specific registries, the hospital administrative and healthcare system databases do not have the volume of information or the data quality needed to adequately answer research issues and questions. Nevertheless, they can contribute to improve our understanding of trauma.

Worldwide trauma registries

Trauma registries are an essential part of developed and integrated trauma systems. In the United States, the development of TRs coincided with the introduction of trauma centers and systems in the 1970s. The consolidation of hospital-based TRs in regional and national databases, together with the growing capacity of computers and statistical analytical programs, led to the rapid expansion of this powerful source of information. In 1982, the ACS-COT coordinated the Major Trauma Outcome Study, which documented information on trauma patients during 5 years in 139 North American hospitals, involving over 80,000 cases, with the principal aim of developing reference standards for trauma care that could be used by hospitals with a view to ensuring quality. Posteriorly, the ACS-COT established the National Trauma Data Bank, which currently collects information on approximately three million patients and from about 900 trauma centers. However, TRs have not been limited to the United States; other both developed (United Kingdom, Germany, Australia, New Zealand, Canada, the rest of Europe, etc.) and developing countries have also established such registries. In the year 2004, the WHO recommended unification of the information on outcomes from both the developed and developing countries.⁴³ In 2009, it published the guides on the improvement of quality in trauma and stated the need to create TRs.³⁶ However, the immense majority of the publications of TRs, the highest quality registries, and the registries with the largest volume of variables and information are found in the more developed countries, while developing countries typically have fewer registries, of lesser quality, and with fewer publications. Indeed, the regions with most trauma and trauma-related mortality (the developing countries) are precisely the regions with the least TRs.^{44,45}

Different TRs have been developed in Europe in the last decades. Many are single-center registries, though some of them, such as the German National Trauma Registry,⁴⁶ the British Trauma Adult Research Network⁴⁷ or the Scandinavian Networking Group for Trauma and Emergency Management⁴⁸ are multicenter registries containing large volumes of information and patients. There have been initiatives to establish consensus regarding the data which a European trauma registry should contain, the way to collect such data, and their statistical processing (Utstein Template for Uniform Reporting of Data following Major Trauma),^{49,50} as a previous step to the creation of a European registry—the latter being feasible with only minimum additional infrastructure and using a web-based system,⁵¹ though there has still not been enough progress in this direction. Since 2008, efforts are being made to unify all the European TRs, with the aim of establishing

a single database—the European Trauma Registry Network⁵² in collaboration with all the professionals involved in the management of polytraumatized patients.

In Spain there have been a number of trauma registry initiatives and publications in the last decades. Most of them are on a provincial scale (the Poliguitania study⁵³ [a broad and prolonged study on trauma patient care in the province of Guipuzcoa], RETRATO⁵⁴ [trauma registry of the province of Toledo] or the study by Belzunegui et al. in the province of Navarre,⁵⁵ to cite some recent examples), while one has been established on an Autonomous Community (regional) scale (the GITAN study),⁵⁶ and analyzes patient trauma care in the multi-provincial Autonomous Community of Andalusia.

A Spanish national registry, contemplating voluntary participation, has recently been started. It includes trauma patients admitted to the ICU, and has been developed by the Trauma and Neurointensive Care Work Group of the SEMICYUC, under the sponsorship of the latter: the RETRAUCI registry.³³ The aim of this project is to gain knowledge of the epidemiology of severe trauma (defined as trauma requiring admission to the ICU for at least 24h, or resulting in death in such Units) in Spain, the management of such traumatisms, resource consumption, and severity-adjusted outcomes. This is a voluntary participation project that attempts to recruit as many collaborating hospitals as possible. The information collected in this registry includes epidemiological and demographic data (age, sex and characteristics of the accident), the implication of toxic substances, pre-hospital transfer, the type of injuries coded by scales, the severity of injuries quantified by scores, treatments and complications in the ICU, and final destination of the trauma patient. Some results are already becoming known from this project.⁵⁷

Limitations of trauma registries

The implementation and maintenance of TRs demands a substantial amount of money, time and effort. The associated financial costs should be covered by those public and private institutions that stand to benefit most from exploitation of the registered information and, ultimately, by the society in which the registries are developed, and their public administrations. In order for this financial effort to be worthwhile, adequate data quality must be guaranteed, attempting to avoid or at least reduce information and screening bias through adequate definition of the variables included, training of the people in charge of collecting the information, data centralization, and the adoption of data control strategies—including the processing of missing data.

The registered data on trauma patients rarely represent a population-based trauma sample. In effect, registries are usually hospital-based and do not include less seriously traumatized patients, patients not needing hospital admission, or the most critical cases where death occurs at the site of the accident or on the way to hospital. On the other hand, the voluntary participation of the centers in such registries can lead to sample representativeness problems, unless the setting of the registry is characterized by a single center or a well organized trauma system that can adequately control participation. In order for the sample to be representative, we must guarantee data confidentiality and

patient anonymity without the need for individual informed consent for inclusion in the registry.

Interpretation of the results of studies derived from TRs requires caution, due to possible disparities in the registered data, inclusion criteria, number and type of variables, use and type of scales, or characteristics of the population included. Nevertheless, the information supplied by TRs is far better and of greater quality than that obtainable from the hospital administrative databases.

The future of trauma registries

Some trauma centers have institutional TRs that contribute to trauma databases on a larger scale, such as the regional and/or national level. An integrated system would be ideal, with an identical definition of variables and structure, allowing the data contributed by each center to feed its own trauma registry, as well as those of the corresponding province, Autonomous Community, country as a whole, and the multinational setting (Europe, in our case). Voluntary participation of all the centers would be desirable or, if this were not possible, mandatory participation of the corresponding centers, in order to ensure a representative sample of the attended population.

The future of TRs lies in open registries where the great volume of information contained is made available to investigators with adequate ideas for exploitation of the data, in improvement of data quality, standardizing the inclusion criteria with precise definition of the variables and training programs for the people in charge of maintaining the registry, and the use of software suited to the purposes of the registry and capable of ensuring maximum efficiency in data collection (avoiding duplicate entries and loss of information). Good data quality in turn would allow the comparison of centers and ensure validity of the evaluations.

Further emphasis should be placed on the outcomes of trauma and the care received,^{58,59} without limiting interest to hospital stay and in-hospital mortality. In this regard, we should seek to include outcomes such as mortality a certain time after hospital discharge, functional outcomes, patient return to previous activities, and quality of life.

The aging of the population in developed countries causes a change in the trauma patient profile and can modify the patient inclusion criteria in TRs, or give rise to specific registries (e.g., geriatric trauma, hip fractures in the elderly).

The knowledge afforded by TRs will probably result in a decrease in the direct and indirect costs associated to trauma (health services, working days lost, compensations, etc.) and in the human suffering caused (mortality and disability). Future studies should quantify such gains in order to offer concrete evidence of the usefulness of TRs.

Conclusions

Knowing the reality of the things we do is the first step toward continuous improvement of severe trauma patient care.

A great variety of trauma care quality indicators have been developed, with scant scientific support and with great variability in the way in which they are used—a situation

that makes it difficult to establish comparisons of results and outcomes between different trauma care systems.

Quality indicators do not draw all the attention in relation to trauma patients. The most widely analyzed indicators focus on processes and outcomes of pre-hospital and hospital care, and very few address care after hospital discharge, patient functional condition and quality of life, or the secondary prevention of trauma. In-hospital mortality as a quality indicator is insufficient, though mortality and morbidity reviews do contribute to quality improvement.

We can improve the quality of care of trauma patients by adopting an international and consensus-based approach for the development of well designed TRs, and a system of indicators that are both useful and of relevance—thereby allowing the comparison of results and outcomes. The existence of differences in outcome should lead us to seek the underlying causes of such differences and identify aspects amenable to improvement.

The great volume of information that can be contained in TRs should serve to expand our knowledge of all the aspects of trauma care and of the effectiveness of the applied measures.

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The authors declare that they have no conflicts of interest.

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