

## The usefulness of a Trauma Registry and the role of the general surgeon in the multidisciplinary approach to trauma patients

### 3-year experience at Sant'Andrea University Hospital in Rome



Ann. Ital. Chir., 2013 84: 1-9  
pii: S0003469X13018344

Gianluca Costa, Francesco Stella\*, Luigi Venturini, Simone Maria Tierno, Federico Tomassini, Pietro Fransvea, Barbara Frezza, Tommaso Bocchetti, Salvatore Di Somma\*\*, Genoveffa Balducci

Università Roma Sapienza, Facoltà di Medicina e Psicologia, Azienda Ospedaliera Sant'Andrea, Roma  
Dipartimento di Chirurgia, UOSD Chirurgia d'Urgenza, AOSA trauma Registry Project Group

\*Direzione Sanitaria

\*\*UOC Medicina d'Urgenza e PS

**The usefulness of a Trauma Registry and the role of the general surgeon in the multidisciplinary approach to trauma patients. 3-year experience at Sant'Andrea University Hospital in Rome**

*The purpose of this study is to verify the usefulness of a multidisciplinary Trauma Registry in the evaluation of trauma, particularly in relation to the number of specialists involved, and to analyze the effective role of the general trauma surgeon in an integrated trauma care system. The present study was performed by analyzing data from the Trauma Registry of the University Hospital Sant'Andrea in Rome, which was set up in March 2006. Data recorded between March 2006 and March 2009 was considered for the present study. The severity of trauma was categorized by dividing patients into 4 subgroups based on the value of ISS: minor injuries (ISS 1-8), moderate (ISS 9-15), severe (ISS 16-24) and very severe (ISS > 24). Patients who had an ISS greater than 9 were taken into account for further analysis and comparison. To evaluate the significance of the multidisciplinary approach the patients were stratified in subgroups considering the number of specialists involved in relation to the anatomic location of injuries. In the 1386 trauma patients entered in the registry, the mean and median ISS value were  $10.7 \pm 8.4$  and 9 respectively. The overall mortality and morbidity were 4.1% and 7.4% respectively. There was a statistically significant linear relationship between the number of specialists involved and the ISS (multidisciplinary / ISS  $r = 0.493$ ,  $p < 0.001$ ). Patients with ISS greater than 9 were 358, 25.8% of all cases. The mean ISS was  $21.4 \pm 10.3$ . Mortality and morbidity rates were 9.8% (35 patients) and 22.1% (79 patients) respectively. The average number of specialists involved was  $2.4 \pm 1.1$ , median 2 (range 1-6). Results confirmed the significance of the multidisciplinary treatment for patients with trauma and the central role played by the general surgeon.*

**KEY WORDS:** Multidisciplinary, Surgery, Trauma, Trauma Registry

---

Pervenuto in Redazione Settembre 2011. Accettato per la pubblicazione Gennaio 2012

Correspondence to: Dr. Gianluca Costa, Azienda Ospedaliera Sant'Andrea, Via di Grottarossa 1035, 00189 Roma (e-mail: gco-sta@ospedalesantandrea.it)

## Introduction

Trauma as disease is a major worldwide public health problem, with incidence increasing in both industrialized and developing countries, being the leading cause of

death and disability in the age group between 15 and 45 years<sup>1-5</sup>. As injuries mainly affect the working age population, they create serious damage to the economy of a country for the loss of work capacity and for the health care expenditure<sup>6-8</sup>. The treatment of trauma as disease requires particular technical skills and organizational peculiarities that must be integrated to form an organic system, the Trauma System<sup>9-12</sup>. The intra hospital trauma Registry is a consolidated study tool in such a system because the information contained within can be used to assess in a standardized way different case series, to promote scientific research and to support targeted prevention programs<sup>13-17</sup>.

The registries are particularly useful also to study patients with severe trauma, often defined poly-trauma patients, whose management is difficult because of their lesions' complexity, which require a coordinated action of several specialists both in the initial evaluation and in the subsequent treatment. Abdominal trauma, a frequent cause of death, is found in 7-10% of all trauma patients, but since abdominal injuries are usually caused by road traffic accidents, it is almost always found in patients with severe trauma, in association with orthopedic, thoracic or CNS injuries.

The purpose of this study is to verify the usefulness of a multidisciplinary trauma registry in the evaluation of trauma, particularly in relation to the number of specialists involved, and to analyze the effective role of the general trauma surgeon in an integrated trauma care system.

## Materials and Method

The present study was performed by analyzing data from the trauma registry of the University Hospital Sant'Andrea in Rome which was set up in March 2006, when the Emergency Department was opened and then integrated in the regional Emergency Health Service of Lazio (ARES 118). The registry, created by using a specific database with the 8.5 version of the FileMaker Pro program (FileMaker Southern Europe, Paris, France), for MacOSX, provided for the enrolment of patients directly admitted or transferred to another hospital, over 16 years of age, victims of either blunt or penetrating trauma, or burn injury using the following inclusion criteria:

- All penetrating trauma of the neck, thorax, and abdomen;
- Blunt trauma and burn injury with the following criteria as regards triage

### RED OR YELLOW CODE

- Presence of at least one significant injury (Abbreviated Injury Scale - AIS = 2), regardless of the specialty in the 6 body regions used for calculating the ISS, (head or neck, face, chest, abdominal or pelvic contents, extremities or pelvic girdle, and external);

- Any death in the emergency room, if information about any epicrises that occurred is available.

### GREEN OR OTHER CODE

- ISS > 15;
- Presence of at least one injury rated AIS = 2, in the chest and/or abdomen.

Trauma severity in each patient was evaluated in accordance with the following indices: the Revised Trauma Score (RTS); the Abbreviated Injury Scale (AIS), using the 2005 version of the AIS-CD manual, updated in 2008 (Association for the Advancement of Automotive Medicine (AAAM), Barrington, IL, USA). The overall classification of trauma severity in each patients was evaluated by the Injury Severity Score (ISS) which was calculated taking the highest AIS severity code in each of the 3 most severely injured body regions and adding the squared numbers of each AIS.

Trauma registry data recorded between March 2006 and March 2009 was considered for the present study. Out of a total of 144969 patients admitted to the emergency department, there were 45043 patients (31.1%) with chief complaints of trauma or burns, 409 (0.9%) with red code triage, and 3912 (8.7%) with yellow code. In the emergency room all patients were submitted to the primary and secondary evaluation by emergency physicians and radiologists according to well established guidelines. A total of 1386 cases that satisfied the inclusion criteria previously established, were entered in the database for the study. The severity of trauma was categorized by dividing patients into 4 subgroups based on the value of ISS: minor injuries (ISS 1-8), moderate (ISS 9-15), severe (ISS 16-24) and very severe (ISS > 24) in accordance with the American College of Surgeons-Committee on Trauma<sup>18</sup>. Patients who had an ISS greater than 9 were taken into account for further analysis and comparison. Age, sex, cause and mechanism of trauma, mean ISS, length of stay, mortality and morbidity both in the general population and in patients with ISS > 9 were evaluated. To evaluate the significance of the multidisciplinarity the 1386 patients were stratified in subgroups considering the number of specialists involved in relation to the anatomic location of injuries. We recognized the need of seven types of professional skills such as that of general (abdominal) surgeon, thoracic surgeon, orthopedist, neurosurgeon, maxillofacial surgeon, plastic surgeon, and vascular surgeon or interventional radiologist. The latter refers to the presence of vascular injuries of named vessels which required treatment (i.e. surgical repair, embolization, or stenting). The reference lesion was defined on the basis of the organ or system injured irrespective of the performance of a therapeutic act. The analysis of the seven groups of patients was carried out in more detail only for those of a good numeric size (subgroups with 2, 3 and 4 specialists). Age, sex, cause and dynamics of trauma, mean ISS, length of stay, presence of the general surgeon, mor-

tality and morbidity were evaluated. Patients transferred to other facilities were excluded in the evaluation of the length of hospital stay, if it was impossible to obtain adequate information about their clinical course as well as any deaths that occurred during the first 48 hours after admission. Morbidity and mortality were analyzed independently of how much time had elapsed since the trauma occurred, provided they could be logically linked to the event. If any data were missing, either a follow-up was conducted by phone, or information was requested from sources in the region such as hospitals patients were transferred to, general practitioners, anagraphic offices, and the police. Statistical analysis was performed using the 17.0 version of the PASW Statistics program (SPSS, Bologna, Italy), for MacOSX, and provided for the use of the chi-square test, Student's t-test, Pearson's test, and ANOVA when applicable. P values < 0.05 were considered significant.

## Results

### GENERAL TRAUMA REGISTRY POPULATION

In the 1386 trauma patients entered in the registry, the average age was  $57.2 \pm 24.1$  years with median of 58 years (range 16-102); 788 (56.9%) patients were male

TABLE I - Cause or mechanism of injuries

	N. (%)
Road traffic accident	626 (45.2)
Domestic (fall or precipitation)	573 (41.3)
Sport	66 (4.8)
Workplace	44 (3.2)
Assault	25 (1.8)
Other	7 (0.5)
Not recorded	45 (3.2)
Total	1386

TABLE II - Type of injuries

	General trauma registry n (%)	Patients ISS>9: n (%)
Orthopedic	1102 (79.5)	240 (67.0)
Thoracic	303 (21.9)	215 (60.1)
Head and/or cervical spinal (CNS)	215 (15.5)	149 (41.6)
Maxillofacial	155 (11.2)	96 (26.8)
Abdominal	126 (9.1)	107 (29.9)
Plastic	72 (5.2)	39 (10.1)
Vascular		
(surgeon or radiologist)	34 (2.5)	22 (6.1)
Total	1386	358

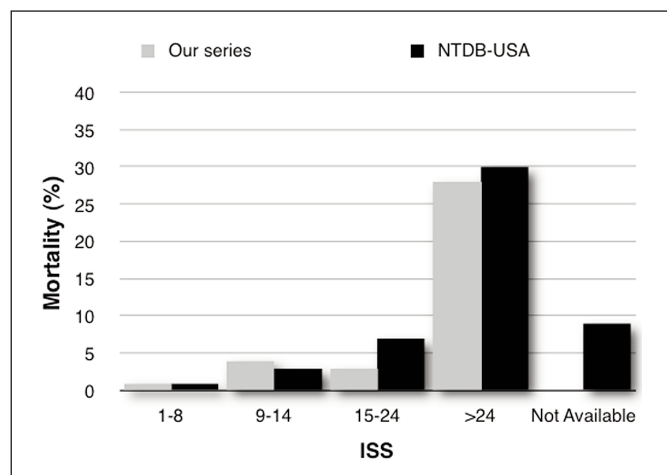


Fig. 1: Mortality stratified across the four subgroups of gravity and comparison with the 2009 edition of NTDB <sup>18</sup>.

TABLE III - Number of specialists involved in trauma treatment and mean ISS

Specialistic skill required	n. (%)	Mean ISS $\pm$ SD
1 Skill	991 (71.5)	7.7 $\pm$ 4.2
2 Skills	240 (17.3)	13.8 $\pm$ 7.6
3 Skills	102 (7.4)	21.5 $\pm$ 10.7
4 Skills	41 (3.0)	32.6 $\pm$ 10.4
5 Skills	9 (0.6)	36.2 $\pm$ 13.4
6 Skills	3 (0.3)	33.0 $\pm$ 14.9
Total	1386	10.7 $\pm$ 8.4

and 596 (43.0%) female. In two cases (0.1%) sex was unrecorded. The cause of trauma and type of the injuries most commonly observed are showed in Tables I, II. In almost all cases it was blunt trauma, having been detected only 23 (1.7%) patients with penetrating trauma and 14 (1.0%) patients with burns. The mean and median ISS value were  $10.7 \pm 8.4$  and 9 respectively. The overall mortality and morbidity were 4.1% (57 patients) and 7.4% (103 patients) respectively. The subdivision of patients on the basis of the gravity showed minor injuries in 472 (34.1%) cases, moderate in 664 (47.9%), severe in 139 (10.0%), and very severe in 111 (8.0%). In patients with minor trauma, the mortality was 0.4%, in those with moderate trauma was 3.2%, and 2.2% in severe trauma subjects; in patients with very severe trauma the mortality was 27.9%. The results of the mortality stratified across the four subgroups of gravity is shown in Fig. 1 where it was also carried out a comparison with data from the 2008 National Trauma Data Bank, published by the American College of Surgeons Committee on Trauma <sup>18</sup>. Such comparison showed similar results. The number of patients related to the number of specialists involved and the average ISS of the various groups is shown in Table III. There was a sta-

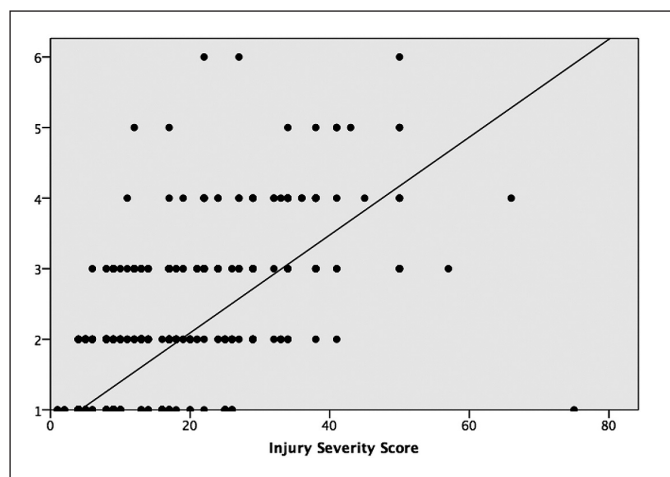


Fig. 2: Relationship between the number of specialists involved and the ISS.

tistically significant linear relationship between the number of specialists involved and the ISS (multidisciplinary / ISS  $r = 0.493$ ,  $p < 0.001$ ) (Fig. 2).

#### POPULATION WITH ISS > 9

Patients with ISS greater than 9 were 358, 25.8% of all cases entered in the database, with an average age ( $46.4 \pm 20.6$  years) significantly lower ( $p < 0.001$ ) than what observed in the 1386 patients of the General Register. It has been noted a high prevalence of men (266 cases, 74.3%) over women. The cause of trauma was found to be in the vast majority of patients a road traffic accident, with a frequency of 73.2% (262 patients) followed by domestic trauma (53 patients, 14.8%). The mean ISS was  $21.4 \pm 10.3$ . The average hospital stay was of  $21.0 \pm 9.8$  days. Mortality and morbidity rates were 9.8% (35 patients) and 22.1% (79 patients) respectively. The frequency and type of injuries are described in table 2. The average number of specialists involved was  $2.4 \pm 1.1$ , median 2 (range 1-6). There was a statistically significant linear relationship between the number of specialists involved and the ISS (multidisciplinary / ISS  $r = 0.223$ ,  $p < 0.001$ ).

### Multidisciplinary assessment

#### PATIENTS NEEDING 2 SPECIALISTIC SKILLS (240 PATIENTS)

The average value of ISS was  $13.8 \pm 7.6$  (median = 13). The overall mortality rate was 3.3% (8 patients) and the mean ISS of the deceased was  $25.6 \pm 11.8$ , statistically significantly increased compared to that seen in survivors ( $13.4 \pm 7.1$ ,  $p < 0.001$ ). The morbidity rate was 9.6% (23 patients). The mean ISS calculated in patients who devel-

oped complications ( $21.7 \pm 8.7$ ) was found to be statistically significantly increased ( $12.9 \pm 7.0$ ;  $p < 0.001$ ). Injuries of orthopedic competence were found in 64.2% of cases (154 patients), of the thoracic surgeon in 54.6% of cases (131 patients), of the neurosurgeon in 29.2% of cases (70 patients), of the abdominal surgeon in 15.0% of cases (36 patients), of the maxillofacial surgeon in 24.2% of cases (58 patients) of the plastic surgeon in 10.8% of cases (26 patients), of the vascular surgeon/radiologist in 3.3% of cases (8 patients). In patients with abdominal injuries the average ISS was  $18.8 \pm 7.9$ , statistically significantly higher compared to that of patients who had not ( $13.0 \pm 7.2$ ,  $p = 0.001$ ). Abdominal trauma was associated with mortality rate of 5.6% (2 patients), constituting 25% of all deaths in the case of 2 specialists involved. The morbidity rate was 22.2% (8 patients) representing the 34.8% of all patients with complications of this subgroup.

#### PATIENTS NEEDING 3 SPECIALISTIC SKILLS (102 PATIENTS)

The average value of ISS was  $21.2 \pm 10.7$  (median = 17). The overall mortality rate was 10.8% (11 patients) and the mean ISS in the deceased was  $37.4 \pm 9.9$  statistically significantly increased compared to that seen in survivors ( $19.2 \pm 9$   $p < 0.001$ ). The morbidity rate was 25.5% (26 patients). The mean ISS calculated in patients who developed complications ( $25.2 \pm 12.2$ ) was found to be statistically significantly increased ( $19.8 \pm 9.9$ ;  $p < 0.03$ ). Injuries of orthopedic competence were found in 87.3% of cases (89 patients), of the thoracic surgeon in 67.6% of cases (69 patients), of the neurosurgeon in 45.1% of cases (46 patients), of the abdominal surgeon in 37.3% of cases (38 patients), of the maxillofacial surgeon in 42.2% of cases (43 patients), of the plastic surgeon in 15.7% of cases (16 patients), of the vascular surgeon/radiologist in 4.9% of cases (5 patients). In patients with abdominal injuries the average ISS was  $24.5 \pm 11.3$ , statistically significantly increased compared to that of patients who had not ( $19.2 \pm 9.9$ ;  $p < 0.002$ ). Abdominal trauma was associated with mortality rate of 15.8% (6 patients), contributing to 54.5% of all deaths with 3 specialists involved. The morbidity rate was 21.1% (8 patients) representing the 50% of all patients with complications of this subgroup.

#### PATIENTS NEEDING 4 SPECIALISTIC SKILLS (41 PATIENTS)

The average value of ISS was  $32.6 \pm 10.4$  (median = 34). The overall mortality rate was of 24.4% (10 patients) and the mean ISS of the deceased was  $40.5 \pm 10.3$ , statistically significantly increased compared to that seen in survivors ( $30.1 \pm 9.2$ ;  $p < 0.005$ ). The morbidity rate was 39.0% (16 patients). The mean ISS calculated in patients who developed complications was consistent with those



that did not ( $354.9 \pm 8.6$  vs  $31.1 \pm 11.2$ ). Injuries of orthopedic competence were found in 97.6% of cases (40 patients), of the thoracic surgeon in 92.7% of cases (38 patients), of the neurosurgeon in 73.2% of cases (30 patients) of the abdominal surgeon in 56.1% of cases (23 patients), of the maxillofacial surgeon in 46.3% of cases (19 patients), of the plastic surgeon in 17.1% of cases (3 patients), of the vascular surgeon/radiologist in 17.1% of cases (7 patients). In patients with abdominal injuries the average ISS was  $36.2 \pm 10.6$ , statistically significantly increased compared to that of patients who had not ( $28.1 \pm 8.3$ ;  $p < 0.02$ ). Abdominal trauma was associated with mortality rate of 34.8% (8 patients), contributing to 80% of all deaths with 4 specialists involved. The morbidity rate was 43.5% (10 patients) representing the 62.5% of all patients with complications of this subgroup.

## Discussion

Trauma is a whole of anatomical and functional alterations induced in the body from an outside force of various kinds (mechanical, thermal, chemical, etc.) capable to affect more or less serious the physical integrity and sometimes the systemic homeostasis. The terms major trauma, severe trauma and poly-trauma are similar and are sometimes used one for the other. The major trauma is a traumatic event characterized by a dynamic that can determine the occurrence of serious injury and requires the activation of well-coded diagnostic and therapeutic procedures; with severe trauma is defined the presence of lesions, regardless of the amount and location that can lead to immediate or potential danger for survival. The severity of the trauma is defined by an index or score including the best known ISS<sup>19-22</sup>. The most common definition of poly-traumatized is one that refers to a patient with two or more lesions in different body areas, including at least one potentially lethal<sup>23</sup>. In a more general analysis the terms poly-traumatized and severe trauma often become synonymous, and refer to the overall assessment of injuries resulting in a value of  $ISS > 15$ . The treatment of trauma is a challenge for the planning of the Healthcare System because it is among the highest costs for a country not only for the cost of health, but also for the lost productivity<sup>6,8,24</sup>. In any workplace data analysis is the main prerequisite to enable an assessment of resources, needs, effectiveness of production processes and quality of final products. In an integrated organization for the care of trauma (the "Trauma Care System") the trauma registry is an indispensable tool for epidemiological analysis and for the verification of facility resources and quality of outcome<sup>13,15,25-27</sup>. The first computerized trauma registry was developed in 1969 at Cook County Hospital in Chicago<sup>28</sup> and since then many registries have been established around the world with inclusion criteria often not uni-

form, but that, in general, take into account demographic information, mechanism of trauma, pre-hospital care, triage and vital signs on arrival, medical and surgical treatments received in hospital, type and severity of lesions detected with computed indices or scores, morbidity and mortality<sup>29-31</sup>. The registry allows to track the patient care and clinical course and to perform comparison between different professional and organizational realities joined by the same interest. However the amount of data and the different inclusion criteria adopted may cause mistakes<sup>32-34</sup> and to overcome this problem in the late '80s it was held a workshop sponsored by the Centers of Disease Control in Atlanta in which it was defined a precise methodology for building trauma registries<sup>35-36</sup>. Today, both in industrialized and in developing countries, either large community hospitals or designed Trauma Centers have their hospital trauma registry and the data are then collected into a national database<sup>37-38</sup>. The best known of these is the National Trauma Data Bank<sup>18</sup> appointed in 1989 by the American College of Surgeons. In Italy, despite the efforts of scientific societies and institutions, there do not exist, regional or national, structured systems for the care of trauma patients nor registries except sporadic cases<sup>39-40</sup>. The project of the University Hospital Sant'Andrea Trauma Registry in Rome began in 2006 following the recommendations of the CDC in Atlanta and was immediately oriented towards those multidisciplinary criteria that are now a fundamental approach to the trauma patients<sup>41-44</sup>. The presence of various specialists in trauma setting raises questions about priorities and the quality of treatment, and that can be a risk compromising the need for the rapid management of these patients. It is therefore crucial that the multidisciplinary medical team takes into consideration implementation of the most appropriate organization to ensure the best possible treatment to the patient<sup>11,42,44,45</sup>. When the significance of multidisciplinary was examined, ISS value greater than 9 have been taken into consideration for the comparisons. The choice of this cut-off was determined by the fact that this value is considered the limit of mild trauma, and in our registry it was the most represented in cases where a single body region was affected by trauma i.e. in hip fracture. Even considering that our experience is limited in time and in size it showed the basic role of the multidisciplinary treatment for patients with significant trauma. For these patients, we found that it is needed on average the presence of more than two specialists and that the skills more involved have been orthopedists followed by neurosurgeons. Analysis by subgroups shows how the severity of patients grows with the growing number of specialists involved and this is underlined by the fact that with the increase of the number of specialists there is a statistically significant increases in the average value of the ISS. Patients with only two body areas affected are not found to be severe trauma cases, both having the mean and

the median ISS less than 15. Instead the analyzes of patients who had three and four specialists involved in treatment, showed a significant increase in the average value of ISS that was higher than 15. In these subgroups, made of patients with severe trauma, also mortality increased, evidence of the importance of the number of injuries and therefore of the number of specialists in determining the severity of trauma. In our analysis was subsequently investigated the presence of abdominal injuries, competence of the general surgeon and its role in the management of patients with severe trauma. The abdomen is not the most commonly involved region all trauma considered, but is among the first when considering only the serious ones. It is important to note, then, that, in our experience, abdominal trauma almost exclusively due to blunt trauma from road accidents, are often associated with orthopedic, thoracic, and CNS injuries and with the increase of the severity of trauma, we noted exponential risk increases to have to face an abdominal injury. The patients who died with abdominal lesions showed an average of four different specialists involved in diagnostic and therapeutic. In addition to these data, the average ISS analysis of patients with abdominal trauma has always shown a marked increase compared with that of the patients without abdominal injury <sup>46</sup>. It seems clear that the role of the general surgeon in the treatment of poly-trauma patients is crucial because the abdominal injuries, although less frequent than those involving other specialists, are among the most serious injuries and those that are more frequently life-threatening for such patients.

## Conclusions

In conclusion, our experience shows that the hospital trauma registry is a very interesting tool for research, that the multidisciplinary approach is effective in the treatment of trauma and that the general surgeon plays an important role in those injuries that represent an immediate risk for the patient's life. Despite the encouraging results achieved in the world, the road to reach the best diagnostic and therapeutic pathway in the treatment of trauma is still very long and hard.

## Acknowledgments

The study was carried out under the sponsorship and supervising of the AOSA Trauma Registry Project Group. All the clinical and administrative staff dealing with trauma patients in the hospital deserves a special gratitude for his kindness and cooperation. The project is improving and a large number of persons is daily joining the starting group. Beside this, the following is a provisional and inevitably incomplete acknowledgment list:

*MP. Corradi, V. Ziparo, A. Ferretti, G. Ramacciato, A. Cancrini, V. David, LM. Fantozzi, G. Pinto, M. Taurino, RA. De Blasi, G. Fini, C. Capotondi, D. Sergi, C. D'Arrigo, E. Ferri, G. Murante, C. Stella, PF. Salvi, G. Pascarella, P. Aurello, G. Nigri, G. Mezzetti, A. Forti, P. Addario Chieco, P. Mercantini, A. Marchetti, L. Pastore, S. Marroni, S. Dellatte, G. Grande, M. Torquato, F. Teragnoli*

## Riassunto

Il trauma rappresenta uno dei principali problemi di sanità pubblica a livello mondiale essendo la prima causa di morte e disabilità nella fascia di età compresa tra i 15 e i 45 anni e richiede competenze organizzative peculiari che debbono essere integrate per costituire un Trauma System. Il registro traumi è uno strumento consolidato di studio in questo sistema. Scopo del presente lavoro è stato quello di verificare l'utilità di un registro traumi multidisciplinare nella valutazione del fenomeno trauma e di analizzare il ruolo del chirurgo generale in un sistema integrato di cura del trauma. Sono stati presi in considerazione i dati del periodo 1 marzo 2006 - 31 marzo 2009. Sono stati inseriti nel database 1386 casi che hanno soddisfatto i criteri di inclusione stabiliti in precedenza e per i quali sono stati analizzati i dati clinico-demografici e le lesioni rilevate. La gravità del trauma è stata valutata dividendo i pazienti in 4 sottogruppi rispetto al valore di ISS: traumi Lievi (ISS < 9), Moderati (ISS tra 9 e 14), Severi (ISS tra 15 e 24) e Molto Severi (ISS > 24). Sono state prese in considerazione età, sesso, causa e dinamica del trauma, gravità del trauma calcolata con l'ISS, la durata della degenza, la mortalità e la morbidità sia nella popolazione generale che nei vari sottogruppi che hanno compreso una popolazione con ISS > 9, una popolazione con trattamento polispecialistico e in questi ultimi è stata valutata la presenza di lesione addominale come fattore prognostico. Pur considerando che la nostra esperienza è limitata nel tempo e ancora contenuta nelle dimensioni si è reso evidente il ruolo cardine della multidisciplinarietà nel trattamento dei pazienti con trauma significativo. Dall'analisi per sottogruppi emerge come la gravità dei pazienti cresca con il crescere del numero degli specialisti coinvolti e questo è testimoniato dal fatto che all'aumentare del numero di specialisti aumenti in misura statisticamente significativa anche il valore medio dell'ISS. L'addome, pur non essendo la regione più comunemente coinvolta qualora vengano considerati tutti i traumi, risulta tra le prime considerando soltanto quelli gravi. I pazienti deceduti con lesione addominale presentavano una media di quattro diversi specialisti coinvolti nel processo diagnostico-terapeutico. In aggiunta a questi dati l'analisi dell'ISS medio dei pazienti con trauma dell'addome ha sempre mostrato un netto aumento rispetto a quello riscontrato nel resto dei pazienti che non presentavano lesione addominale.

## References

1. Krug EG, Sharma GK, Lozano R: *The global burden of injuries*. Am J Public Health, 2000; 90:523-26.
2. Meyer AA: *Death and disability from injury: A global challenge*. J Trauma, 1998; 44:1-12.
3. Patton GC, Coffey C, Sawyer SM, Viner RM, Haller DM, Bose K, Vos T, Ferguson J, Mathers CD: *Global patterns of mortality in young people: A systematic analysis of population health data*. Lancet, 2009; 374(9693):881-92.
4. Demetriades D, Murray J, Sinz B, Myles D, Chan L, Satharagiswaran L, Noguchi T, Bongard FS, Cryer GH, Gaspard DJ: *Epidemiology of major trauma and trauma deaths in Los Angeles County*. J Am Coll Surg, 1998; 187:373-83.
5. Chiara O, Scott JD, Cimbanassi S, Marini A, Zoia R, Rodriguez A, Scalea T: *Milan Trauma Death Study Group. Trauma deaths in an Italian urban area: An audit of pre-hospital and in-hospital trauma care*. Injury, 2009; 33:553-62.
6. Mackenzie EJ, Rivara FP, Jurkovich GJ, Nathens AB, Frey KP, Egleston BL, Salkever DS, Weir S, Scharfstein DO: *The National Study on Costs and Outcomes of Trauma*. J Trauma, 2007; 63(6 Suppl):S54-67.
7. Goldfarb MG, Bazzoli GJ, Coffey RM: *Trauma systems and the costs of trauma care*. Health Serv Res, 1996; 31:71-95.
8. Haeusler JM, Tobler B, Arnet B, Huesler J, Zimmermann H: *Pilot study on the comprehensive economic costs of major trauma: Consequential costs are well in excess of medical costs*. J Trauma, 2006; 61:723-31.
9. Dutton RP, Stansbury LG, Leone S, Kramer E, Hess JR, Scalea TM: *Trauma Mortality in Mature Trauma Systems: Are We Doing Better? An Analysis of Trauma Mortality Patterns, 1997-2008*. J Trauma, 2010; 69:620-26.
10. Mullins RJ, Mann NC: *Population-based research assessing the effectiveness of trauma systems*. J Trauma, 1999; 47(3 Suppl):S59-66.
11. Celso B, Tepas J, Langland-Orban B, Pracht E, Papa L, Lottenberg L, Flint L: *A systematic review and meta-analysis comparing outcome of severely injured patients treated in trauma centers following the establishment of trauma systems*. J Trauma, 2006; 60:371-78.
12. Hoyt DB, Coimbra R: *Trauma systems*. Surg Clin North Am, 2007; 87:21-35.
13. Moore L, Clark DE: *The value of trauma registries*. Injury, 2008; 39:686-95.
14. Guice KS, Cassidy LD, Mann NC: *State trauma registries: Survey and update-2004*. J Trauma, 2007; 62:424-35.
15. Jurkovich GJ, Mock C: *Systematic review of trauma system effectiveness based on registry comparisons*. J Trauma, 1999; 47(3 Suppl):S46-55.
16. Edwards A, Di Bartolomeo S, Chieragato A, et al.: *A comparison of European Trauma Registries. The first report from the EuroTARN Group*. Resuscitation, 2007; 75:286-97.
17. Engel DC, Mikocka-Walus A, Cameron PA, Maegele M: *Pre-hospital and in-hospital parameters and outcomes in patients with traumatic brain injury: A comparison between German and Australian trauma registries*. Injury, 2010; 41(9):901-906.
18. American College of Surgeons – Committee on Trauma. National Trauma Data Bank Report 2009, Available at: <http://www.facs.org/trauma/ntdb/docpub.html>. Accessed 20 Sep 2010.
19. Gance LG, Osler TM, Mukamel DB, Meredith W, Wagner J, Dick AW: *TMPM-ICD9: A trauma mortality prediction model based on ICD-9-CM codes*. Ann Surg, 2009; 249:1032-39.
20. Rutledge R, Fakhry S, Rutherford E, Muakkassa F, Meyer A: *Comparison of APACHE II, Trauma Score, and Injury Severity Score as predictors of outcome in critically injured trauma patients*. Am J Surg, 1993; 166:244-47.
21. Shai L: *The Injury Severity Score- Importance and uses*. Ann Epidemiol, 1995; 5:440-46.
22. Kuwabara K, Matsuda S, Imanaka Y, Fushimi K, Hashimoto H, Ishikawa KB, Horiguchi H, Hayashida K, Fujimori K, Ikeda S, Yasunaga H: *Injury severity score, resource use, and outcome for trauma patients within a Japanese administrative database*. J Trauma, 2010; 68:463-70.
23. Butcher N, Balogh ZJ: *The definition of polytrauma: The need for international consensus*. Injury, 2009; 40 Suppl 4:S12-22.
24. Christensen MC, Ridley S, Lecky SE, Munro V, Morris S: *Outcomes and costs of blunt trauma in England and Wales*. Crit Care, 2008; 12:R23.
25. Shaban S, Ashour M, Bashir M, El-Ashaal Y, Branicki F, Abu-Zidan FM: *The long term effects of early analysis of a trauma registry*. World J Emerg Surg, 2009; 24; 4:42.
26. Nwomeh BC, Lowell W, Kable R, Haley K, Ameh EA: *History and development of trauma registry: Lessons from developed to developing countries*. World J Emerg Surg, 2006; 31; 1:32.
27. Gabbe BJ, Simpson PM, Sutherland AM, Williamson OD, Judson R, Kossmann T, Cameron P: *Functional measures at discharge: are they useful predictors of longer term outcomes for trauma registries?* Ann Surg, 2008; 247:854-59.
28. Boyd DR, Rappaport DM, Marbarger JP, Baker RJ, Nyhus LM: *Computerized trauma registry: A new method for categorizing physical injuries*. Aerosp Med, 1971; 42:607-15.
29. Zhaohui S, Shuxia Z, Xinghua F, Shujun L, Yanpu L, Bin B, Zhongzhi S: *The design and implementation of chinese maxillofacial trauma registry, analysis and injury severity score system*. J Trauma, 2008; 64:1024-33.
30. Datta I, Findlay C, Kortbeek JB, Hameed SM: *Evaluation of a regional trauma registry*. Can J Surg, 2007; 50:210-13.
31. Katsaragakis S, Theodoraki ME, Toutouzias K, Drimousis PG, Larentzakis A, Stergiopoulos S, Aggelakis C, Lapidakis G, Massalis I, Theodorou D: *The implementation of a national trauma registry in Greece. Methodology and preliminary results*. J Trauma, 2009; 67:1421-25.
32. Ringdal KG, Lossius HM: *SCANTEM ad hoc group on Scandinavian MTOS and Trauma Registry. Feasibility of comparing core data from existing trauma registries in Scandinavia. Reaching for a Scandinavian major trauma outcome study (MTOS)*. Scand J Surg, 2007; 96:325-31.
33. Mann NC, Guice K, Cassidy L, Wright D, Koury J: *Are statewide trauma registries comparable? Reaching for a national trauma dataset*. Acad Emerg Med, 2006; 13:946-53.



34. McKenzie K, Walker S, Besenyei A, Aitken LM, Allison B: *Assessing the concordance of trauma registry data and hospital records*. HIM J, 2005; 34:3-7.
35. *Report from the 1988 Trauma Registry Workshop, including recommendations for hospital-based trauma registries*. J Trauma, 1989; 29:827-34.
36. Centers for Disease Control (CDC). *National survey of trauma registries—United States, 1987*. MMWR Morb Mortal Wkly Rep. 1989; 38:857-59.
37. Aharonson-Daniel L, Avitzour M, Giveon A, Peleg K: *A decade to the Israel National Trauma Registry*. Isr Med Assoc J, 2007; 9:347-51.
38. Kobusingye OC, Lett RR: *Hospital-based trauma registries in Uganda*. J Trauma, 2000; 48:498-502.
39. Chiara O, Cimbanassi S, Zoia R, Solito L, Vesconi S, Pugliese R e Gruppo di Studio Trauma Maggiore Ospedale Niguarda: *Il Registro Traumi all'Ospedale Niguarda Ca' Granda di Milano: Dati epidemiologici e verifica di qualità*. Ann Ital Chir, 2004; 75:515-22.
40. Di Bartolomeo S, Nardi G, Sanson G, Gordini G, Michelutto V, Ciminello M, Giugni A, Cingolani E, Cancellieri F: *The first Italian trauma registry of national relevance: methodology and initial results*. Eur J Emerg Med, 2006; 13:197-203.
41. M Assenza, G De Angelis, F Romagnoli, M Portieri, C Pascasio, B Tomei, MI Ruggiero, M Rengo, C Modini: *Multidisciplinary approach to the patient with multiple trauma: A case report*. Chir Ital, 2002; 54:409-15.
42. Sutcliffe AJ: *Multidisciplinary trauma surgery: who should or could do what?* Injury, 1999; 30:385-86.
43. MacKenzie S, Kortbeek JB, Mulloy R, Hameed SM: *Recent experiences with a multidisciplinary approach to complex hepatic trauma*. Injury, 2004; 35:869-77.
44. Ruchholtz S, Waydhas C, Lewan U, Piepenbrink K, Stolke D, Debatin J, Schweiberer L, Nast-Kolb D: *A multidisciplinary quality management system for the early treatment of severely injured patients: implementation and results in two trauma centers*. Intensive Care Med, 2006; 28:1395-404.
45. Sen A, Xiao Y, Lee SA, Hu P, Dutton RP, Haan J, O'Connor J, Pollak A, Scalea T: *Daily multidisciplinary discharge rounds in a trauma center: A little time, well spent*. J Trauma, 2009; 66:880-87.
46. Costa G, Tierno SM, Tomassini F, Venturini L, Frezza B, Cancrini G, Stella F: *The epidemiology and clinical evaluation of abdominal trauma. An analysis of a multidisciplinary trauma registry*. Ann Ital Chir, 2010; 81(2):95-102.

## Commento e Commentary

PROF. STEFANO MINIELLO  
Associato di Chirurgia Generale  
Università degli Studi di Bari

*This study is well managed from the scientific and statistical point of view, and well supplied with bibliographic references. The establishment of a Trauma Registry since 2006 by the University Hospital Sant'Andrea in Rome is highly worthy of consideration and appreciation, in view of just a few emulative examples in Italy. However, recently the effort given by the Italian Society of Emergency Surgery and Trauma in the establishment of a national Trauma Registry should be underlined. The delay in its achievement has several reasons, first of all the failure to enforce a connected and integrated network of Trauma Centers in our country on the whole national territory.*

*The multidisciplinary approach to trauma patient with severe injuries is now a well-established acquisition. This work aims to prove how - in authors experience - the number of specialist skills increases with the severity of injuries.*

*In view of what appears to be a consequential and logic intuition, the Authors have the worth to demonstrate with numbers (and statistics) the scientific substantiation of the empirical perception. In this way, they prove how, in their experience, the transition from two to three or four specialist skills needed is related to a statistically significant increase, in each group, of ISS average value in deceased when compared with that observed in survivors, of mortality and of morbidity.*

*It's interesting that in trauma patients with abdominal injuries the average value of ISS results significantly higher than in trauma patients who had not undergone the injuries above. Moreover, it's interesting that mortality and morbidity rates highly rear up in trauma patients with abdominal injuries (respectively up to 80% and 50% of deaths and complications of the whole sample of the subgroup requiring four specialist skills). And if the purpose was - as effectively was - to demonstrate the effective role of the general surgeon in the multidisciplinary approach to trauma patient, even in this case the goal is reached, with the support of statistic evaluations in relation to a statement shared by everyone, but often supported just by an empirical perception.*

*However, the sample examined by the Authors refers to patients with ISS>9, which indicate moderate injuries, but mostly with ISS>15, which indicates severe and very severe injuries. The Authors consider trauma patients, in which the severity of injuries often appears as a systemic disease: trauma disease. It goes beyond the individual organ injuries, because of the severe insult to body homeostatic mechanisms. Due to multiple immune, hormonal, metabolic and severe systemic complications (SIRS-sepsis; MODS-MOFS, ARDS; coagulopathy; hypothermia; metabolic acidosis) of trauma disease, view to a*



*proper multidisciplinary approach to trauma patient, additional specialist skills, besides those considered by the Authors, are required: resuscitator, coagulologist, nutritionist (nutritional treatment during post-traumatic catabolic phase; any use of biosynthetic recombinant human growth hormone [rhGH]<sup>1,2,3</sup>), ecc. Because, if it's true – as it is – that the figure of the general surgeon in the approach to trauma patient needs to be refound in an intensivist sense, it's also true that the reading cannot and must not lead to the wrong belief of the general surgeon as “know-all doctor”.*

*Therefore, if the Authors in the future wish, a rereading of the conclusions of their valuable case study review will be interesting, but this time extended to the additional specialist skills above.*

\* \* \*

*Il lavoro è ben condotto sotto il profilo scientifico e statistico, oltre che ben corredato di riferimenti bibliografici. Altamente meritevole di considerazione e apprezzamento è l'istituzione fin dal 2006 di un Registro del Trauma da parte dell'Ospedale Universitario S. Andrea in Roma, a fronte di pochi esempi in tal senso emulativi in Italia, anche se di recente va sottolineato lo sforzo espresso dalla Società Italiana di Chirurgia d'Urgenza e del Trauma di istituire un Registro Nazionale del Trauma. Il ritardo nella sua realizzazione ha molteplici motivi, primo fra tutti la mancata attuazione nel nostro Paese di una rete collegata e coordinata di Trauma Center su tutto il territorio nazionale. L'approccio multidisciplinare al paziente traumatizzato con lesioni importanti è ormai acquisizione consolidata. Questo lavoro ha lo scopo di dimostrare come nell'esperienza degli Autori il numero crescente di competenze specialistiche nel trattamento del traumatizzato vada di pari passo con l'incremento della gravità delle lesioni.*

*A fronte di quella che pare una intuizione logica e consequenziale gli Autori hanno il merito di dimostrare con i numeri (e con la statistica) la fondatezza scientifica della percezione empirica. In tal modo viene dimostrato come, nella propria esperienza, il passaggio da due a tre e a quattro competenze specialistiche richieste si accompagni, in ciascun gruppo, a un progressivo e significativo incremento in termini statistici del valore medio di ISS nei deceduti se confrontato con quello rilevato nei sopravvissuti, come pure della mortalità e della morbidità.*

*Molto interessante è il riscontro che in traumatizzati con lesioni addominali l'ISS risulti significativamente più alto che in quelli che non ne avevano subito, come pure che le percentuali di mortalità e di morbidità si impennino così tanto nei pazienti con trauma addominale (fino all'80% dei decessi e al 50% delle complicanze dell'intero campione del sottogruppo richiedente quattro competenze specialistiche). E se l'intento era, come realmente era, di dimostrare il ruolo fondamentale del chirurgo generale nell'approccio multidisciplinare al politraumatizzato, anche in tal caso l'obiettivo è raggiunto, con il conforto di valutazioni statistiche relativamente ad una affermazione da tutti condivisa ma spesso sostenuta soltanto da una percezione empirica.*

*Tuttavia, il campione valutato dagli Autori fa riferimento a pazienti con valori di ISS > 9 che indicano lesioni moderate, ma soprattutto per ISS > 15 lesioni gravi e molto gravi. Sono studiati, cioè, pazienti in cui la gravità delle lesioni si configura spesso come malattia sistemica (malattia trauma) che travalica le singole lesioni d'organo per il severo insulto ai meccanismi dell'omeostasi corporea. Accade così che, per le molteplici implicazioni immunitarie, ormonali, metaboliche e per le severe complicanze sistemiche (SIRS-sepsi; MODS-MOFS, ARDS; coagulopatia; ipotermia; acidosi metabolica) della malattia trauma, nell'ottica di un corretto approccio multidisciplinare al traumatizzato, sono richieste ulteriori competenze specialistiche oltre quelle considerate dagli Autori quali: rianimatore, coagulologo, nutrizionista (trattamento nutrizionale in fase catabolica post-traumatica; eventuale impiego di ormone umano della crescita biosintetico ricombinante [rhGH]<sup>1, 2, 3</sup>), ecc. Perché, se è vero come è vero che la figura del chirurgo generale nell'approccio al traumatizzato deve essere rifondata in senso intensivistico, è pur vero che la rilettura non può e non deve portare alla erronea interpretazione del chirurgo generale come tuttologo.*

*Pertanto sarà interessante, se gli Autori in futuro lo vorranno, rileggere le conclusioni della rivisitazione della loro casistica così preziosa, questa volta però estesa anche alle ulteriori competenze specialistiche sopra citate.*

## References

1. Jeevanandam M, Petersen SR: *Altered lipid kinetics in adjuvant recombinant human growth hormone-treated multiple-trauma patients.* Am. J. Physiol, 1994; 267 (4 Pt 1): E560-65.
2. Petersen SR, Jeevanandam M, Holaday NJ: *Adjuvant recombinant human growth hormone stimulates insulin-like growth factor binding protein-3 secretion in critically ill trauma patients.* J. Trauma, 1995; 39(2):295-300; discussion 300-2.
3. Jeevanandam M, Holaday NJ, Petersen SR: *Integrated nutritional, hormonal, and metabolic effects of recombinant human growth (rhGH) supplementation in trauma patients.* – Nutrition, 1996; 12(11-12): 777-87.

