Original Article

Multi-Injured Patients' Health Self-Assessment at 6 Months after Hospital Discharge

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Abstract

Introduction: Trauma is one of the most difficult to treat problems of global public health with economic, social, political, geographic and national implications. Multitrauma patients face significant life restraints months or years after hospital discharge.
Purpose: It was to systematically record the treatment of multi-injured patient from the accident site to the Emergency Room, its subsequent hospitalization (Clinics and Intensive Care Unit), as well as the health outcome at 6 months after discharge from the hospital.
Methodology: There were recorded 96 multi-injured patients that were presented to the ER. To include an injured person in the study he/she should have two or more serious injuries in at least two areas of the body. The EQ-5D questionnaire (and the VAS scale of the same questionnaire) at 6 months after hospital discharge was used for health quality self-assessment. To assess the severity of the injury, the Injury Severity Score (I.S.S.) was used.
Results: The study population consisted of 96 patients aged 46.5±19.7 years old, 65.6% (n = 63) being male and 34.3% (n = 33) females. A total of 4/96 (7.2%) patients died in ER while the remaining 89/96 were hospitalized. Brain injuries occurred in 45 (46,9%) cases, the abdomen and the pelvis 35(36,6%), the thorax in 33 (34,4%).The 30/89 (33.7%) patients underwent surgery. The mean hospital length of stay was 12.40±3.40 days, while ISS score was 29.17±18.13. The mean EQ-5D value was 10.28, while EQ-5D VAS score was 71.25±15.54 at 6 months. By 6 months, 58/88(68.2%) patients were able of self-care, while 54/88(63.5%) had returned to their job and 15/88(17.6%) faced another critical disease. In multivariate analysis, LOS and ISS remained independent prognostic factors of self-assessment. LOS was positively and ISS negatively related to self-assessment.
Conclusion: Longer LOS and lower ISS were associated with a favorable assessment. Ensuring appropriate care and treatment is vital to the quality of life after a traumatic injury. Patients continue to report long-term health-related quality of life problems, albeit to varying degrees.

Key words: multi-injured patient, outcome, health quality, self-assessment

Introduction

Trauma is one of the most difficult to treat problems of global public health with economic, social, political, geographic and national implications. It has been estimated that every day, nearly 16,000 people die of all kinds of injuries worldwide, accounting for more than five million deaths annually worldwide (Roth, 2011).

In addition, trauma is a cause of temporary or permanent disability, far more frequent than trauma death itself. It is estimated that dozens of

hospitalizations, hundreds of emergency visits and thousands of regular medical visits correspond to each trauma death. As the trauma affects mainly young people, it deprives society of the most creative part of it, resulting in the burden of both the economy and the health systems. The main cause of mortality associated with injury is road accidents, which account for more than 22% of all deaths. As the incidence of traffic accidents tends to increase, it is predicted to be the third leading cause of death worldwide by the year 2020 (Markogiannakis, Sanidas & Messaris, 2006).

Polytrauma (multitrauma) is a short verbal equivalent used for severely injured patients usually with associated injury (i.e. two or more severe injuries in at least two areas of the body), less often with a multiple injury (i.e. two or more severe injuries in one body area). An important condition for the use of the term polytrauma is the incidence of the traumatic shock and/or hemorrhagic hypotension and a serious endangering of one or more vital functions of the organism. At least one out of two or more injuries or the sum total of all injuries endangers the life of the injured person with polytrauma. For its variable and non-homogeneous content the term polytrauma cannot be used as a final diagnosis without an objective quantification of the extent of the severity of the injury and scales such AIS (Abbreviated Injury Scale) or ISS (Injury Severity Score) have been applied to assess the multitrauma patient.

Most deaths occur during the pre-hospital phase. Therefore, pre-hospital wound care has received special attention over the last few decades (Moore, Hanley & Turgeon, 2010; Papa, 2006). Hospital mortality correlates with initial treatment in emergency departments, as well as with age, previous condition of the injured, ~~gravity~~ severity and type of injuries. It also correlates with treatment during hospitalization (Lefering R. et al, 2012; Lansink & Leenen, 2007).

Studies have shown that the analysis of wound epidemiology could improve health system assessment and identify areas that may benefit from education, research and rational resource allocation (Cameron, Gabbe & McNeil, 2005; Hoyt & Coimbra, 2007). The epidemiological and statistical data regarding the multitrauma (mortality, cost, long-term outcome) in our country are sporadic and not systematic, and no definite conclusions data can be extracted. In our study there was a systematic inventory of the epidemiological data of the multi-injured patients that occurred in a State Hospital of Attica. The association with outcome and health self-assessment at 6 months was explored.

Methodology

The purpose of this study was to systematically record the treatment of multi-injured patient from the accident site to the Emergency Room, its subsequent hospitalization (Clinics and Intensive Care Unit), as well as the health outcome at 6 months after exit from the hospital. Correlations between demographic characteristics, clinical severity and outcome were also explored.

Research Design

This was a prospective, epidemiological observation study. It did not require any intervention in patients and involved recording their clinical data, as well as filling in questionnaires.

The assessment of the patient's health status was performed with the EQ-5D questionnaire, which is a general and reliable tool for measuring the quality of health. Patients or caregivers were asked to respond to the EQ-5D questionnaire (and the VAS scale of the same questionnaire) at 6 months after leaving the hospital. To assess the severity of the injury, the Injury Severity Score (I.S.S.) was used. The Injury Severity Score (ISS) is an anatomical scoring system that provides an overall score for patients with multiple injuries. Each injury is assigned an Abbreviated Injury Scale (AIS) score and is allocated to one of six body regions (Head, Face, Chest, Abdomen, Extremities (including Pelvis), External). Only the highest AIS score in each body region is used. The 3 most severely injured body regions have their score squared and added together to produce the ISS score.

The patient independence and rehabilitation were assessed telephone interview at 6 months after hospital discharge.

Data collection

There were recorded 96 multi-injured patients that were presented to the ER. To include an injured person in the study he/she should have two or more serious injuries in at least two areas of the body.

In each patient the following were recorded: demographic data (age, sex, insurance provider, nationality), medical history, time and place of

the accident, means of transportation to the hospital, the presence of a doctor (in the case of ambulance transport), the time from the incident to the hospital arrival, the cause of the incident, the mechanism of the injury, injury localization, the specialties involved, the length of stay in the ER, the clinic involved, the days of hospitalization, surgeries (if any), and the final outcome. This study was carried out in the. "Tzaneio" hospital from March 2011 to March 2013.

Ethics

A protocol was prepared for the conduct of the study and the collection of the data, which was submitted to the Bioethics Committee of the Department of Medicine of the University of Ioannina and to the scientific council of the "Tzaneio" hospital in order to obtain study approval. The data gathered were used exclusively for the purpose of the present study and besides the demographic data, personal data of the patients included in the study are not reported.

Statistical Analysis

In the case of quantitative variables, mean, standard deviation and median values were calculated, while in the case of the nominal variables the absolute and relative frequency were calculated. For comparison of the variables, the Kruskal Wallis test and the Mann-Whitney test and the t-test were used, as appropriate. Linear and logarithmic regression models were applied. Descriptive data are presented with relative frequencies and mean values (standard deviation).
Data processing was performed using the SPSS 22.0 (Statistical Package for Social Sciences) software for Windows.

Results

The study population consisted of 96 patients aged 46.5±19.7 years old, 65.6% (n = 63) being male and 34.3% (n = 33) females. Regarding the cause of the injury, 24 (25%) were involved in a car accident, 24 (25%) in a car with a motorcycle, 15 (15.6%) fell from height and 12 (12.5%) were beaten.

Sixty-five (67.7%) of the cases were transferred to hospital with an ambulance, 23 (24%) with an emergency (ambulance) unit and 8 (8.3%) with private transportation means. The 60 (62.5%) of the ambulance units cases were attended by a doctor, while 21/96 (21.9%) of the multi-injured patients were transported to the hospital 40’minutes? from the time of the accident, 17/96 (17.7%), arrival time was 35' minutes and 15/89 (15.6%) came to ER' from the time of the accident.

The mean length of stay at the ER was 5.04 ±??(1.54) hours. A total of 4/96 (7.2%) patients died in ER while the remaining 89/96 were hospitalized. The clinics involved were: 32 (35.95%) patients were referred to the Neurosurgical Clinic, 29 (32.58%) to the Surgical Clinic, 19 (21.34%) to the Orthopedic Clinic, 4 (4.49%) to ICU and 5 (5.61%) to other clinics. Regarding the localization of the injuries, the brain injuries occurred in 45 (46,9%) cases, the abdomen and the pelvis 35 (36,6%), the thorax in 33 (34,4%), followed by the face, the upper and lower limbs, and finally the neck and the spine.(Table 1)

The 30/89 (33.7%) patients underwent surgery. Six months after the incident 85/92 (96.5%) responded to telephone interview, while 1/88 (1.13%) refused participation and 2/88 (2.27%) died, resulting to 2.24%(2/96) mortality after 6 months and to an overall 6.25%(6/96) mortality, 4 deaths in ER included. The mean hospital length of stay was 12.40±3.40 days, while ISS score was 29.17±18.13. The mean EQ-5D value was 10.28, while EQ-5D VAS score was 71.25±15.54 at 6 months. By 6 months, 58/88(68.2%) were able of self-care, while 54/88(63.5%) had returned to their job and 15/88(17.6%) faced another critical disease. (Table 2)

In univariate analysis, self-assessment at 6 months being the dependent variable, LOS, re-admissions and surgery were all positively related to VAS, as well as the age and co-morbidity. ISS score and transport to ER by private means were negatively related to the dependent variable. (Fig.1&2, Table 3&4)

In multivariate analysis, LOS and ISS remained independent prognostic factors of self-assessment. LOS was positively and ISS negatively related to self-assessment: The longer the hospitalization and the lower the ISS score the better the self-rating. ISS was also positively related to death at 6 months, while ER spending time was negatively related to death (Table 5&6).

Table 1. Injury localization

	N	%
Head	45	21,5
Face	28	13,4
Upper extremity	26	12,4
Lower extremities	23	11,0
Heart, Lung & Chest	33	15,8
Neck & Spinal Cord	19	9,1
Abdomen & Pelvis	35	16,7
Total	209	100,0

Table 2. Self-assessment of multi-injured patients activities 6 months after the incident

Assessment	*Motility*	*Self-care*	*Usual activities*	*Pain-distress*	*Anxiety - Depression*
Good	12 (14%)	28 (32.6%)	20 (23.3%)	11 (12.8%)	8 (9.3%)
Modest	53 (61.6%)	41 (47.7%)	44 (51.2%)	54 (62.8%)	55 (64%)
Not Good	21 (24.4%)	17 (19.8%)	22 (25.6%)	21 (24.4%)	23 (26.7%)

Table 3. Health self-assessment at 6 months after hospital discharge (univariate analysis -VAS)

EQ-VAS at 6 months			
	R^2	B	p
ISS	**0,061**	**-0,223**	**0,024**
LOS (days)	**0,109**	**0,954**	**0,002**
Co-morbidity (Yes=1)	**0,243**	**18,561**	**<0,001**
Doctor presence	0,013	3,729	0,302
Surgery (Yes=1)	**0,047**	**7,044**	**0,048**
Re-admission	**0,220**	**16,746**	**<0,001**
Transport by private means	***0,037***	***-10,714***	***0,081***
ER transport time	0,009	-0,165	0,378
ER staying time	<0,001	0,001	0,973
Age	**0,057**	**0,188**	**0,028**

Table 4. Health self-assessment at 6 months multivariate analysis (VAS)

EQ-VAS (6 months)		
R^2=0,46	B	p
ISS	**-0,164**	**0,050**
LOS (days)	**0,553**	**0,047**
Co-morbidity (Yes=1))	7,679	0,360
Surgery (Yes=1)	1,926	0,536
Re-admission	2,273	0,762
Transport by private means	-2,967	0,584
Age	0,125	0,105

Table 5. Outcome prognostic factors (death/survival): univariate analysis

Death at 6 months (Yes=1)		
	B	p
ISS	**0,082**	**0,003**
LOS	-0,015	0,895
Re-admission	-1,745	0,162
Private transport media other than ambulance	-18,588	0,999
Mean ER transport time	0,006	0,899
ER staying Time	**-0,022**	**0,023**

Table 6. Outcome prognostic factors (death/survival): multivariate analysis

Death at 6 months (Yes=1)			
	B	p	Odds Ratio (95% CI)
ER staying **Time**	**-0,050**	**0,0112**	**0,952(0,916-0,989)**
ISS	**0,133**	**0,007**	**1,14 (1,038-1,258)**

Fig 1. LOS and VAS at 6 months.

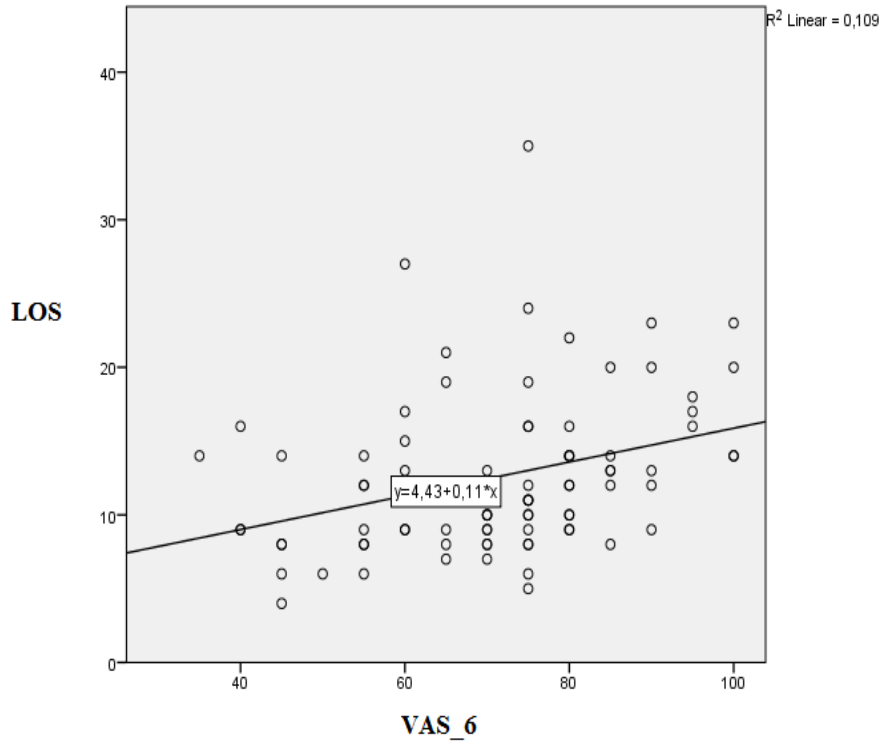
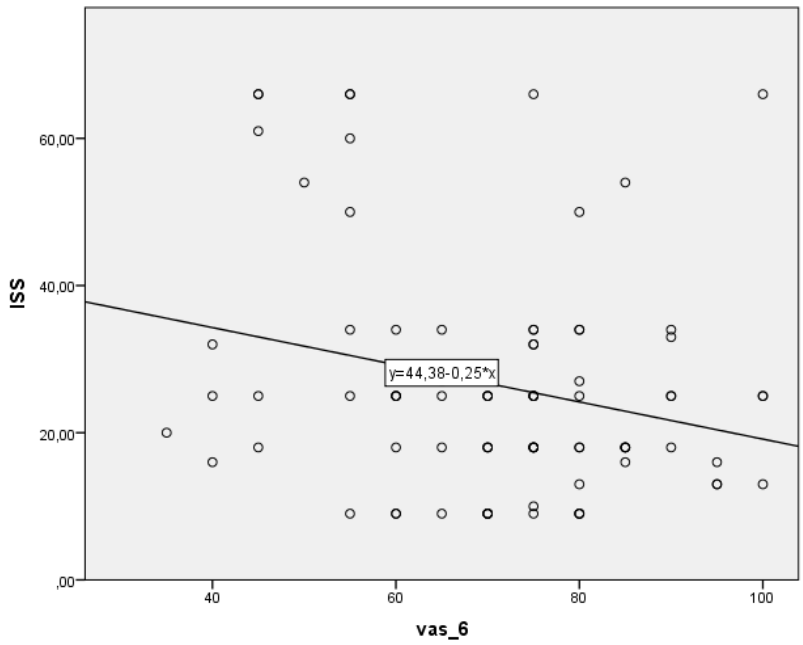


Fig 2. ISS and VAS at 6 months



Discussion

According to the findings of the present study, ISS and LOS were the independent predictors of self-assessment quality of life at 6 months after hospital discharge. Longer LOS and lower ISS were associated with a favorable assessment. Ensuring appropriate care and treatment is vital to the quality of life after a traumatic injury. Although the length of hospital stay may be irrelevant to this procedure, the relationship between hospital stay and quality of care is complicated and difficult to study. The duration of hospitalization is determined by a complex network of supply and demand factors operating at various levels. These factors range from the organizational mentality and availability of hospital beds to the culture of the local population. (Westert, 1992; Roemer, 1961; Clarke, 1996). Apart from these factors, there is usually a desire of the health authorities for a downward trend in hospitalization over time. (Clarke, 1996).

Many of the studies carried out in the past show that the quality of care or health outcomes does not seem to be jeopardized by the decline in hospitalization, and for a long time there have been suggestions that lengthy hospitalization itself could be the cause of increased morbidity resulting, for example, from increased risks of hospital acquired infection or thromboembolic disease (Bundred, Maguire & Reynolds, 1998; Asher, 1947; Kandula & Wenzel, 1993). However, Kossovsky and his colleagues have drawn some interesting conclusions in their study on the relationship between length of hospitalization and quality care in congestive heart failure (Kandula & Wenzel, 1993). The authors found a statistically significant correlation between long-term hospitalization and best-care care and discharge, making the necessary adjustment for confounding factors such as age, co-morbidity and severity. More specifically, for each additional day of hospitalization, the care grade was increased by 0.5% and that on discharge 2.5%.

It can be assumed that the longer the duration of hospitalization allows more time for proper research and treatment, and a shorter duration of hospitalization can be compatible with rapid, organized care, protecting the patient from in-hospital infections and unnecessary examinations. Both very good and very poor quality of care can be provided with the same length of hospitalization for the same condition. The optimal length of hospitalization for each of the pathological conditions is expected to have a range depending on local supply and demand factors such as the needs of each patient or the availability of the relevant health and community services. The duration of hospitalization should not be reduced without taking into account care pathways and appropriate therapeutic standards. Providing appropriate care pathways and therapeutic standards is vital to quality of care.

There is a controversy over whether ISS is a predictive factor of the different dimensions of quality of life. (MacKenzie, et al, 1986) and Bull (Bull, 1985) did not find that ISS was an important predictor of bodily function after injury. Vles et al (Vles, Steyerberg & Essink-Bot, 2005) found that the ISS score predicted all dimensions - with the exception of anxiety and depression - of the quality of life in severely injured patients, as measured using EuroQol. Harris et al (Harris, Young & Rae, 2008) also found that the ISS score independently provided the SF-36 physical fitness score for severely injured patients. Ringdall et al (Ringdal, M. et al, 2009) and Kiely et al (Kiely, Brasel & Weidner, 2006) found no similar effect in severely injured patients and in patients with moderate to severe wounds, respectively. Ringdal et al found that the APACHE II score (a measure of the severity of the disease) was an independent predictor of physical function. Kiely et al. (Vles, Steyerberg & Essink-Bot, 2005) used the Functional Independence Measure as an independent variable in their multifactorial analysis along with the ISS and found that it was also an independent predictor of physical functioning. Perhaps these two variables reflect the severity of the injury and displace the ISS as an independent prediction factor. The study of Kaske investigated the incidence and severity of self-reported injuries of seriously injured patients two years after the trauma. (Kaske, Lefering & Trentzsch, 2014) The study population represented a typical collection of injuries involving victims mainly of men and rather younger patients compared to the general population. It was found that two-thirds of trauma patients underwent a significant reduction in overall quality of life two years after the trauma, as recorded in EuroQoL.

Early and optimal rehabilitation is necessary to minimize the long-term consequences of injuries. Especially in severe trauma with the wide range

of physical, mental and psychological impact, individualized treatment plans are required. In the study of Toien et al. (Toien, Bredal & Skogstad, 2011) it was found that the severity of an injury measured by AIS score did not show a high correlation with SF-36 physical and mental health scores. Only severe head and limb injuries (AIS $\geq$ 3) had a very significant and clinically significant effect on the quality of life. An explanation for this could be disability in patients with severe limb injury. Also serious head injuries could cause mental problems that significantly affect functionality. These results correspond to two previous studies investigating the association of patient characteristics and HRQoL (Vles, Steyerberg & Essink-Bot, 2005). This study recognized several factors related to quality of life. The next step is to investigate the quality of life outcome for each type of injury and patient, which is however very difficult due to a lack of a generally accepted standard. This should be determined for a particular patient category in a particular geographical area.

Age and duration of hospitalization are considered to be independent predictors of quality of life, having an inverse relationship with quality of life. Pre-hospital and early hospital management of seriously injured patients has changed dramatically over the last 20 years. In this context, the factor “time” has become more and more important. While at the beginning of the 1990s the aim was to provide comprehensive treatment at the site of an accident, today the condition is to stabilize injured patients at the point of accident and to transfer them quickly to the hospital - no accident treatment should be performed unless they are of vital importance for life (Hussmann & Lendemans, 2014; Brennan, et al, 1991). The detection of adverse events and errors in these procedures is vital [111,112] According to Davis et al. (Davis, Hoyt & McArdle, 1992), up to 6% of deaths associated with injuries could be avoided.

Mortality and morbidity can be reduced by effectively locating, correctly screening and transferring seriously injured patients to specialized wound centers. An ideal system will promptly mobilize resources in a way appropriate to the patient's condition. Longer transport time may reduce the total time to final treatment, avoiding delays in secondary hospitals prior to transport to specialized centers. Periodic assessment of patient's quality of life should include a general and a specific questionnaire for the disease. Among the general tools should be taken into account SF-36, EuroQol and WHO-QoL, while special instruments for certain organs (i.e brain) should be also used, although literature on this subject is scarce. Therefore, there is a need for further exploration of the quality of life using the appropriate tools. Patients continue to report long-term health-related quality of life problems, albeit to varying degrees.

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