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The Impact of a Progressive Multidisciplinary Program for Trauma in the Elderly: Outcomes were impacted at the Extremes of Age.

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Abstract

Purpose: The growing elderly population requires special consideration for high-risk medical and surgical care related to traumatic injury. The aim of our study is to evaluate the impact of multidisciplinary care program on outcomes in elderly trauma patients. In addition, the impact of the extremes of age on outcomes was evaluated in the elderly cohort.

Materials & methods: A retrospective analysis was conducted of patients > 65 years of age, n = 383. The patients were divided into three comparison groups based on age: Group I (65-74yrs), Group II (75-84yrs) and Group III (over 85yrs). Mechanism of injury, (MOI), injury severity score (ISS), age, co-morbidities, operations, length of stay (LOS) complications, mortality and disposition were recorded.

Patient Demographics- Group I (n = 233) comprised 58%, Group II (n = 126) 33% and Group III (n = 35) 9%. Co-morbidities included hypertension (n = 175, 46%), CAD (n = 73, 20%), and diabetes (n = 76, 20%). MOI included motor vehicle collisions, (n = 246, 64%), falls (n = 38, 10%), pedestrian, (n = 38, 10%), penetrating injury, (n = 16, 4%) and motorcycle collisions (n = 19, 5%).

Results: *Hospital course and Surgical Intervention*- The overall hospital LOS was 5.5 days ± 1.7. Intensive care unit (ICU) LOS was 9.5 days ± 1.2. Of 73 (20%) patients who required operative intervention, 73% were orthopedic procedures.

Outcomes and Disposition- High mortality was observed at the extremes of age, Group III, 17% vs. an overall mortality rate of 5%, $p = 0.004$. The lowest mortality was observed in Group I at 3%. The pattern of high mortality in octogenarian group was further exacerbated at ISS >15.

There were two deaths in patients that required laparotomies but none of the patients that required orthopedic procedures died.

Patients were discharged to home (67%), skilled nursing facility (14%), or rehabilitation facility (6%).

Conclusions: A progressive multidisciplinary trauma program appears to impact favorable outcomes in elderly patients less than 85 years of age, despite known physiologic derangements that often occur in acute stress situations such as traumatic injury and emergency surgery. More prospective data is needed to develop clinical algorithms to impact both short and long-term outcomes following emergency care in the growing elderly demographic.

Introduction

The number of people over the age of 65 years continues to increase worldwide and represents a unique and rapidly growing segment of patients treated in many US trauma centers [1-3]. Older age is an established factor for adverse surgical outcomes. In contrast to elective surgical procedures, patient optimization cannot be planned in advance for emergency surgical or traumatic events [4-6] Management of the elderly trauma patient is especially challenging and demanding as they often arrive with limited physiologic reserve and a high prevalence of co morbidities. As a result these victims are especially vulnerable to poor outcomes, prolonged hospital stay and significant resource consumption [7,8]. To address the complex needs of the elderly, a multidisciplinary elderly trauma program was established at our institution. This program was initiated at the beginning of the study period and thus the aim of this project was to evaluate the impact of this program on outcomes in the elderly, and to also evaluate patterns of injury and outcomes based on advancing age.

Materials and Methods

This retrospective descriptive study was conducted at Kern Medical Center, a public safety net hospital and Level 2 trauma center in Bakersfield California, USA. After institutional review board approval, our trauma registry was queried for patient's ≥ 65 years of age requiring admission from January 2007 to December 2010. Patients were then divided into three groups based on advancing age; Group I: 65 to 74 years of age, Group II: 75 to 84 years of age and Group III: > 85 years of age. Mechanism of injury (MOI), injury severity score (ISS), co-morbid conditions, operations, length of stay (LOS), complications, mortality and disposition were recorded.

Elderly trauma care multidisciplinary protocol

Elderly trauma patients at our institution are treated in a standard manner upon initial evaluation, reflective of advanced trauma life support principles in the pre- hospital and emergency room phase. Patients requiring admission after evaluation in the emergency department are initially evaluated and managed by a multidisciplinary trauma team comprised of ICU physicians, pharmacist, respiratory therapist and nurses. Immediate contact is made with primary care providers for medication lists and medical

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records. Consultations with medical specialist are also obtained if clinically indicated. In addition, daily rounds and clinical plans of care are made with the physicians, dieticians, pharmacist, physical therapist, and nurses, until the time of discharge. Early enteric feeding and progressive mobilization are endorsed and are lead by our nursing staff and physical therapist. All patients are started on their pre-morbid medications including anti-coagulants as soon as their acute injuries have been addressed.

Family discussions occur during the early admission period to establish baseline cognitive and physical status and facilitate care plans based on advance directives and other medical concerns. Weekly meetings also take place with, nursing staff, social workers and case managers to expedite patient care, rehabilitation and discharge planning.

Statistical Analysis

A statistical analysis was performed using SPSS software, version 11.5. Individual factors (such as age, MOI, ISS) were analyzed for their association with survival. Analysis of individual variables was performed using *Fischer's exact* for categorical data *t* test analysis for continuous data. A p value of < 0.05 was considered significant.

Results

Patient demographics

There were 6838 patients admitted to our trauma center between January 2007 and December 2010. The study population consisted of 394 patients that were ≥ 65 years of age. The majority of patients, n = 224, were male. Group I comprised 59% (n = 233) of the total number of patients compared to only 9% (n = 35) in Group III. Mean injury severity scores were similar for all groups but were slightly increased in Group III, (Table 1). Injury mechanisms included motor vehicle collisions, MVC, (n = 276, 70%), falls (n = 40, 10%), pedestrian injuries (n = 40, 10%), penetrating injuries n = 18, 4% and motor cycle collisions, MCC, (n = 20, 5%), (Table 2). Single system injuries were noted in the majority of patients when compared to multi-system injuries, (Table 3). Co-morbid conditions included hypertension (n =175, 44%), CAD (n =73, 18%) and diabetes (n = 76, 19%).

Hospital course and surgical intervention

The overall hospital LOS was 5.5 days (3.8 - 7.2 days) while ICU LOS was 9.6 days (8.4 - 10.8 days). Seventy-three patients (18.5%) required surgical intervention and most were orthopedic procedures n = 53, 73%. Only n = 2 patients underwent laparotomy and both died of sepsis and multisystem organ failure in the early post-operative period. The complication rate was 7% and included pulmonary infections, urinary tract infections, pleural effusions, and less frequently cardiac arrhythmias, deep venous thrombosis and pulmonary embolus, (Table 4).

Outcome and disposition

Overall mortality was (5%) for all patients. The majority, 80%, was due to MVC, 10% to falls and 10% to penetrating injuries. Mortality was increased significantly at the extremes of age as demonstrated at 17% for Group III compared to < 5% in patients younger than 85 years of age, (Table 5). The difference in mortality was further exaggerated when the ISS was > 15. In patients that required orthopedic surgical intervention, no deaths occurred. There were n = 6 gunshot wounds to the head with a 100% mortality rate and n = 5 the majority were self-inflicted. The majority of patients were discharged to home at 67%, while discharges to skilled nursing and rehabilitation facilities were at 14% and 6% respectively.

Table 1: Patient Demographics

	Age	Number of patients	Percentage of total	ISS score
Group I	64-74 years	233	59%	12
Group II	75-84 years	126	32%	13
Group III	≥ 85 years	35	9%	15
Total	≥65 years	394	100%	

Table 2: Mechanism of Injury

	Number of patients	Percentage of total
MVC	276	70%
Pedestrian injuries	40	10%
Penetrating Injuries	18	4%
Motorcycle Collisions	20	5%
Fall	40	10%

Table 3: Single vs. Multi-system Trauma

Injury Type	Group I	Group II	Group III
Single System	n = 101, 44%	n = 65, 52%	n = 15, 43%
Multi-System	n = 63, 27%	n = 24, 20%	n = 14, 40%

Table 4: Complications

Complications	Group I	Group II	Group III
Pneumonia	n = 5	n = 3	n = 2
Urinary Tract Infection	n = 3	n = 3	n = 0
Pleural Effusion	n = 3	n = 1	n = 0
Atria Fibrillation	n = 2	n = 0	n = 0
Deep venous thrombosis	n = 0	n = 1	n = 1
Pulmonary Embolus	n = 0	n = 1	n = 1

Table 5: Mortality / Mortality with ISS > 15

Mortality	Group I	Group II	Group III
All	n = 7 (3%), $p = 1.0$	n = 6 (5%, $p = 0.6$	n = 6 (17%), $p = 0.004$
ISS > 15	n = 1 (11%), $p = 0.4$	n = 1 (16%), $p = 1.0$	n = 4 (80%), $p = 0.005$

Discussion

The rapidly expanding elderly population who benefit from recent advances in medical care will continue to impact trauma care delivery and outcomes. Although falls have been traditionally reported as a significant cause of blunt trauma in this unique group [5], motor vehicle collisions are becoming more common as the baby boomer population enters retirement age and continues to enjoy active and productive lifestyles. Despite co- morbid conditions and limited physiologic reserve which negatively impact survival from less severe injuries, a high percentage of older trauma victims survive and return home or are transferred to rehabilitation facilities [3].

Previous studies that compared patients > 65 years of age to younger groups note significant differences regarding the mechanism of injury, hospital course, morbidity, mortality and outcomes [9,10]. In one of the largest comparisons of trauma victims based on age, Knudson and Colleagues report that ISS most significantly correlates with mortality [11]. Elderly patients ≥ 65 years had significantly higher mortality than younger trauma patients < 65 years after stratification by ISS, revised trauma score and other pre-existing co-morbidities. Patients over 65 years also had a two to three fold increase in mortality risk in mild (ISS < 15), moderate (ISS 15-29) and severe traumatic injury (ISS ≥ 30) when compared with patients less than 65 years [3,5].

One of our study objectives was to indentify high-risk age groups within the elderly population by evaluating outcomes in three consecutive decades. Anecdotally we began to observe favorable outcomes in elderly patients following the implementation of our multidisciplinary trauma program, but the older patients seemed to not be favorably impacted by the program. These data revealed that extremes of advanced age (> 85 years) impacted mortality however the younger "elderly" victim groups had similar outcomes and survival reflective of the younger more general trauma population. Moreover, the majority of the patients that survived were actually discharged to home. We therefore concluded that the favorable outcomes in the younger elderly patients were likely reflective of our comprehensive team approach to their care, however, we recognize the limitations of our conclusion based on the descriptive nature of this study with no control group for comparison.

Valley and Colleagues reported that the leading mechanisms of injury were in decreasing order: MVC, falls and auto versus pedestrian injuries [3,12]. In our study the profile was similar with the most common being MVC, followed by falls and pedestrian injuries. Additionally, motorcycle collisions and penetrating injuries were also noted in surprising numbers. This series also had a small subset of self –inflicted fatal gunshot wounds to the head which may underscore the challenges associated with recognizing and treating depression in the elderly population.

Complications encountered in our series were not uncommon to the elderly population and included nosocomial infections and cardio-pulmonary dysfunction including arrhythmias. These complications may contribute to intensive care unit requirements and prolonged length of stays as other studies have demonstrated that the elderly population is more at risk for these complications compared to their younger counter parts. The loss of physiologic reserve is thought to contribute to these differences [3,13,14].

Although the elderly population makes up about 12% of the US population, they comprise the fastest growing healthcare segment and account for nearly 33% of the resources expended on traumatic injuries [3]. The increasing number of MVC injuries involving older drivers should encourage states to review driving permit requirements for this unique subgroup. Additionally, frank discussions with patients and family to avoid aggressive and costly therapeutic interventions may also be appropriate especially at the extremes of age. No doubt the high frequency of elderly admissions to acute care facilities for all reasons will continue to drive development of care guidelines and clinical pathways that are unique to this population. Finally, discharge planning and transitions of care to rehabilitation institutions or skilled nursing facilities should be initiated early in the hospital process as many of these patients can survive operative intervention.

Conclusion

Recognizing the limitations of this small retrospective uncontrolled study, we documented our collective experience with elderly trauma patients managed at our level II trauma center. The application of a multi-disciplinary treatment team approach in the high-risk elderly trauma group showed favorable outcomes with a large percentage of patients returning to home. Mortality however was significantly impacted at the extremes of age especially when the ISS is > 15. Future plans should address prevention, prompt management as well as post discharge transfer and rehabilitation.

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