Geriatric trauma service: A one-year experience

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BACKGROUND: Trauma centers nationwide have been experiencing an increase in their elderly trauma patients because of an ever growing elderly population within the United States. Many studies have demonstrated the physiologic differences between an older trauma patient versus a younger trauma patient. Coupling these differences with their coexisting medical comorbidities, makes caring for this population extremely challenging. To meet these challenges, we organized a geriatric trauma unit specifically designed with a multidisciplinary approach to take a more aggressive stance to the care of the geriatric trauma patient.

METHODS: We created a geriatric trauma unit at our Level II trauma facility, called the G-60 unit. This unit opened for admission in August 2009. Inclusion criteria included all trauma patients older than 60 years. Data were abstracted from our G-60 unit from the period of August 2009 to July 2010. We compared these data to a similar patient population (control group) from January 2008 to December 2008.

RESULTS: Our Trauma Data Bank yielded 673 patients for the above queried time period. The G-60 group contained 393 patients, while the control group had 280 patients. A decrease was seen among the G-60 group in all categories: average emergency department length of stay (LOS), average emergency department to operating room time, average surgical intensive care unit LOS, and average hospital LOS. A 3.8% mortality rate was found in the G-60 group compared with a 5.7% mortality rate in the control group. Our analysis also showed rate of 0% pneumonia, 1.3% respiratory failure, and 1.5% urinary tract infection in the G-6O group, while the control group had a rate of 1.8% pneumonia, 6.8% respiratory failure, and 3.9% urinary tract infection.

CONCLUSION: Our data from the 1-year experience of our G-60 unit show that addressing the specific needs of elderly trauma patients will lead to better outcomes. (*J Trauma.* 2012;72: 119–122. Copyright © 2012 by Lippincott Williams & Wilkins)

LEVEL OF EVIDENCE: II.

KEY WORDS: Geriatric trauma; geriatric trauma service; geriatric trauma unit; elderly trauma.

The elderly population in the United States continues to increase in size. The 2000 US Census Bureau states that the number of elderly (age >65 years) increased by 12% between the 1990 and 2000 census reports with more than 35 million Americans now categorized as elderly.[1,2] These numbers are expected to increase when the 2010 census data are finalized.[3] As a consequence of America's advancing age, trauma centers will see a rise in their elderly trauma population. The older trauma patient is unique in age, physiologic reserve, and prevalence of chronic illness. Caring for these patients can be complex, requiring multiple physician specialties for optimal care.[2,4] The involvement of multiple physicians with no clear leader may result in fragmentation of medical care and subsequent delivery of suboptimal patient care. Increasingly, the trauma literature is supporting the idea that elderly trauma patients demand specialized attention; they are not just older adults.[2,4] Geriatric trauma patients have significantly worse outcomes compared with younger patients.[5] Therefore, trauma care given to these patients should be distinctively different from care given to their younger cohorts. Thus, the purpose of this study was to evaluate the effectiveness of a multidisciplinary trauma service model (G-60) aimed at improving elderly trauma patient outcomes. The study will test the hypothesis that higher proportions of patients who received treatment for trauma under the surgeon-lead geriatric service model (G-60) are associated with improved morbidity, mortality, and process measurement outcomes compared with matched historical trauma patient controls. The primary study endpoints were in-hospital mortality and morbidity (urinary tract infection [UTI], respiratory failure [RF], congestive heart failure [CHF], acute renal failure [ARF], pneumonia [PNA], deep venous thrombosis [DVT] pulmonary embolus [PE], and decubitus ulcer [DU]). Secondary endpoints were (a) emergency department (ED) length of stay (LOS [hours]), (b) time length from ED to operating room (OR [hours]), (c) intensive care unit (ICU) LOS (days), and (d) hospital LOS (HLOS[days]).

To specifically address the needs of the injured elderly, we established a geriatric trauma service at our institution called the G-60 service. This service was spear-headed by trauma surgeons, although a coordinated effort between other physician specialties, healthcare extenders, and hospital ad-

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ministrators was required for successful implementation and development of the service. A dedicated area of the hospital was identified as the G-60 unit, and all ancillary services were educated on the unique issues of a geriatric trauma patient. Inclusion criteria were established. All patients aged 60 years and above, with a traumatic injury less than 48 hours old warranting hospital admission were admitted to the G-60 service. We chose age equal or greater than 60 years as service entry or inclusion criterion to brand (G-60) program. Once criteria were met, G-60 trauma activation was paged to all relevant services (i.e., trauma service, medical hospitalist, physical medicine and rehabilitation specialist, physical/occupational therapy, respiratory therapy, G-60 nurse supervisor, social work, nutrition, pharmacy, and palliative care). All patients were seen immediately by the trauma service and a hospitalist. All other ancillary services saw the patient as soon as possible within 24 hours. The trauma surgeon was responsible for the initial resuscitation, stabilization, and admission of each patient. In addition to managing preexisting illness, the hospitalists were also in charge of obtaining expedited preoperative medical clearance. Surgical subspecialists were consulted when necessary.

Four efficiency time-to-care goals for the G-60 service were established: (1) G-60 ED activation to trauma service evaluation of 30 minutes or less, (2) G-60 activation to inpatient room arrival of 4 hours or less, (3) G-60 activation to surgery within 36 hours, and (4) discharge within 5 days if safe and appropriate. Twice-weekly multidisciplinary rounds were made with representatives from all G-60 collaborators to discuss patient care issues. Multidisciplinary rounds were led by an assigned G-60 trauma attending.

METHODS

Data were prospectively collected from our G-60 service for the period of August 2009 to July 2010. We compared these data with a similar patient population (control group) from January 2008 to December 2008. All patients aged 60 years and above admitted to the hospital with a traumatic injury over the study time period were included in the appropriate group. Patients deemed critically ill on hospital presentation were sent initially to the ICU. All other G-60 patients were admitted to a dedicated section of the hospital called the G-60 unit. Before the creation of the G-60 unit, patients were admitted to a monitored bed on a regular hospital floor. Patients who presented with no signs of life or those who died in the ED after presentation were excluded. Charts were reviewed for age, gender, Injury Severity Score (ISS), mechanism of injury, ED LOS, ED to OR time, ICU LOS, HLOS, use of consulting services, in-hospital morbidity, mortality, and disposition location on discharge. Pearson correlation coefficients were obtained. A p value <0.05 was considered statistically significant. Approval for this study was obtained through our institutional review board.

RESULTS

Our Trauma Data Bank yielded 673 patients for the above queried time period (Table 1). The control group had 280 patients and the G-60 group contained 393 patients. ISSs were similar between groups with the mean ISS among the control group of 11 and a mean ISS of 10 for the G-60 population. The average age was similar between the two groups (75 vs. 77). The control group comprises 157 (56.1%) females and the G-60 group 236 (60%) females. The ICU admission rate was 18% versus 20% in the control versus G-60 group, respectively.

TABLE 1. Demographics

Patient Characteristics	Control (n = 280)	G-60 (n = 393)
Female	157 (56.1%)	236 (60%)
Age (yr)	75	77
ISS	11	10
Mechanism of injury		
Blunt	274 (98%)	384 (98%)
Falls	189 (67.5%)	294 (75%)
MVC	57 (20.3%)	55 (13.9%)
Autopedestrian	15 (5.3%)	10 (2.5%)
Subspecialist consulted		
Orthopedic surgery	105 (37.5%)	137 (34.9%)
Neurosurgery	43 (15.4%)	123 (31.3%)
Plastic surgery	23 (8.2%)	33 (8.4%)
Thoracic surgery	14 (5%)	12 (3%)
Ophthalmology	17 (6%)	17 (4%)
Otorhinolaryngology	11 (3.9%)	6 (1.5%)

MVC, motor-vehicle collision.

Mechanism of injury was predominantly blunt trauma in both groups (Table 1). In fact, 98% of all admissions were a result of blunt trauma in both groups. The remaining 2% was penetrating trauma. The most common mechanism was fall and most of the falls were ground level falls. There were 189 (67.5%) falls in the control group and 294 (74.8%) falls in the G-60 group. Motor-vehicle collision and autopedestrian collisions were the next most common injuries in both groups.

Surgical subspecialists were consulted in most cases (Table 1). The top three consulting surgical services were orthopedic surgery, neurosurgery, and plastic surgery. One hundred five (37.5%) orthopedic consults were obtained in the control group versus 137 (34.9%) in the G-60 group. The control group had 43 (15.4%) neurosurgery consults, while the G-60 group had 123 (31.3%). Plastic surgery consults were required less frequently, only 23 (8.2%) in the control group and 33 (8.4%) in the G-60 group. Only three (1.1%) control patients versus one (0.3%) G-60 patient required a trauma laparotomy.

Statistically significant decreases were found among the time-to-care efficiency goals that were measured (Table 2). The ED LOS for the control group and G-60 group was 6.1 hours versus 4.2 hours, respectively ($p = 0.0001$). The ED to OR time was 52.9 hours versus 37.6 hours ($p = 0.0103$) among the control group versus the G-60 group. The LOS within the surgical ICU decreased from 5.2 days in the control and 3 days in the G-60 group ($p = 0.0002$). We also compared HLOS and found a decrease from 7 days in the control group to 4.8 days in the G-60 group ($p = 0.0002$).

The following indicators of morbidity, namely patient outcome measures in control and G-60, were compared: UTI,

TABLE 2. Time Efficiency Goals

Results	Control (n = 280)	G-60 (n = 393)	*p*
ED LOS (H)	6.1	4.2	0.0001
Time to OR (H)	52.9	37.6	0.0103
ICU LOS (D)	5.2	3.0	0.0002
Hospital LOS (D)	7.0	4.8	0.0002

TABLE 3. Morbidity and Mortality

Morbidity	Control (n = 280)	G-60 (n = 393)	*p*
UTI	11 (3.9%)	6 (1.5%)	0.05
Respiratory failure	19 (6.8%)	5 (1.3%)	0.0001
Congestive heart failure	4 (1.4%)	0	0.05
Acute renal failure	4 (1.4%)	0	0.05
Pneumonia	5 (1.7%)	1 (0.2%)	0.0078
DVT	0	1 (0.2%)	0.398
PE	2 (0.07%)	0	0.0934
Decubitus ulcer	1 (0.03%)	0	0.2358
Mortality	16 (5.7%)	15 (3.8%)	0.2

RF, new-onset CHF, PNA, ARF, DVT, PE, and DU (Table 3). These patient outcome measures were defined in accordance with standards published in the medical literature and consistent with our institutional practice guidelines.

A statistically significant decrease was found among the UTI, RF, CHF, ventilator-associated PNA, and ARF categories. Eleven (3.9%) control patients versus six (1.5%) G-60 patients were found to have UTI ($p = 0.05$). Respiratory failure was found in 19 (6.8%) control patients and five (1.3%) G-60 patients, $p = 0.0001$. The control group versus G-60 incidences of CHF, ventilator-associated PNA, and ARF were found to be 4 versus 0, $p = 0.05$; 5 versus 1, $p = 0.007$; and 4 versus 0, $p = 0.017$, respectively. No statistical difference was found between rates of DVT, PE, or DU. These were found to be 0 versus 1, $p = 0.398$; 2 versus 0, $p = 0.093$; and 1 versus 0, $p = 0.235$ between the control group and the G-60 group, respectively.

Although the mortality rate among G-60 cohort was 3.8% and lower than the mortality rate of 5.7% in the control group, the difference was not statistically significant ($p = 0.2$).

Patient disposition on discharge did not significantly differ between the two groups. In both groups, more than 50% of patients went to an interim facility for ongoing rehab and medical care.

DISCUSSION

We have shown that patients in the control group and G-60 are matched on key explanatory variables in this study, including age, sex, mechanism of injury, and ISS. Although the ISS was a little higher in the control group (11.23 +/9.39, N = 280) compared with G-60 (9.66 +/7.05 N = 393), $p = 0.019$, the difference in ISS distribution between control and G-60 was not statistically significant (Pearson χ^2 (7 *df*) = 11.383, $p = 0.123$). In this study, we did not present any results on the status of chronic health care problems. As we continue this project, we plan to include descriptions of chronic disease comorbidities among the subjects at baseline as these comorbidities could affect G-60 service driven outcomes. Given that the time interval between the end of the historical control cohort and the start of the G-60 cohort was only 8 months, it is unlikely that differences, if any in the prevalence of chronic disease comorbidities between control and G-60, would be large enough to account for the reported difference in outcomes.

In this study, we also examined and found that there was no difference in the types of surgical procedures used for control and G-60 patients. This is consistent with the reported observation that 98% of the injuries were blunt for both groups. Thus, typical orthopedic procedures appropriate for treating fractures, including femur, hip, pelvis, tibia and fibula, ankle, and wrist, were used to provide care to patients in control and G-60 groups.

Trauma is the fifth leading cause of death in individuals aged 65 years or older.[4] Data from the National Trauma Databank have shown that elderly trauma patients have a threefold increase in morbidity and a fivefold increase in mortality with minor ISS, whereas they have a twofold increase in morbidity and a fourfold increase in mortality with major ISS.[5] Another study showed an 11.4% mortality rate in trauma patients age older than 65 years compared with patients aged 18 to 35 years who only had a mortality rate of 2.4%.[4] The trauma death rate per 100,000 people per year is 56.0 for all age groups combined. For those older than age 65, the death rate is 113.2.[6]

As the US population ages, trauma centers must decide how to effectively deliver optimal care to geriatric trauma patients. These patients present a challenging clinical problem because of coexisting medical conditions and decreased ability to respond to injury. It has been shown that from age 40 to 80 years, the prevalence of preexisting illness increases from 17% to 80%[2] Many of these patients take medications which may hinder their physiologic response to injury or increase their propensity for hemorrhage. Sauaia et al. [7] found that age older than 55 years was an independent predictor of multiple organ failure and felt that decreased physiologic reserve in elderly trauma patients may explain why they do worse than younger injured patients.

In recognition that geriatric trauma patients are a unique population with worse outcomes, we established a geriatric trauma service. Our goals were to expedite triage, optimize chronic illness via a multidisciplinary approach, and facilitate definitive management of injury by subspecialists. In addition, we attempted to coordinate rehabilitation care and provide safe and appropriate discharge. It is imperative to realize that starting a geriatric trauma service is a large undertaking and involves commitment from many different specialties. A key step in development is securing the support of hospital administrators.

Before the creation of the G-60 trauma service, we repeatedly found that our surgical subspecialists and internal medicine physicians were generally unwilling to assume sole responsibility of elderly trauma patients. By assuming this

leadership role ourselves, we were able to coordinate the management of the elderly trauma patient and ensure that appropriate care was given. The hospitalists and subspecialists were very willing to participate with the G-60 program once the trauma surgeons assumed the leadership role and this helped eliminate fragmented patient care. Trauma surgeons provided the initial impetus to launch this service. They continue to provide the momentum and persistence to keep it going. As a result of these changes, we noticed several improvements in patient care. Patients underwent definitive surgery earlier likely due to our time-efficiency goals and expedited preoperative medical clearance. Postoperatively, all of our G-60 patients were evaluated automatically by all ancillary services, leading to earlier mobilization and more rigorous following hospital protocols. Compliance was evaluated at our biweekly multidisciplinary rounds, and suggestions for improvement were instituted as necessary. As a result of these changes, the G-60 patients were able to be both transferred out of the ICU and discharged 2 days earlier than the control group. We saw significant decreases in UTI, RF, new-onset CHF, PNA, ARF, and even a trend toward decreased mortality.

Aggressive early definitive management of elderly trauma patients has been shown to lead to improved outcomes.[8] Return to independent living has been cited as one outcome measure that improves with aggressive care.[9,10] Other studies have also shown that activation of the trauma team and early intensive monitoring, evaluation, and resuscitation of geriatric trauma patients improve survival.[11,12]

The improvements we saw are most likely byproducts of our aggressive time-to-care goals and the streamlined service we developed. One could argue that a trauma surgeon does not need to be involved to make these changes, but we doubt whether these beneficial byproducts would continue if trauma surgeons did not stay committed to maintaining an overseer role in our G-60 service. Geriatric care may not be the glamorous side of trauma surgery, but it is increasingly relevant and all trauma centers must find a solution that optimizes the care of these elderly trauma patients. We doubt whether our improvements came from a change in trauma surgeon practice patterns as the six core trauma surgeons remained the same both before and after the creation of the G60 service.

Our study does not yet have enough data to comment on return to independent living over a longer follow-up period. Around 50% of our patients in both the control group and the G-60 group were discharged to an interim facility of some kind. This needs to be studied further and is being addressed in our G-60 service. It is logical that early operative repair and early discharge may improve the patient's chance for successful return to their preoperative environment.

We have several future directions that we intend to study with our geriatric trauma service. We are in the process of hiring a geriatrician by which we hope to improve our care further. Long-term outcomes of our G-60 patients need to be assessed. Does improved in-hospital care translate into improved outcomes longitudinally? We also plan to evaluate the financial impact of establishing a geriatric trauma program, as we think streamlined care will lead to significant cost savings.

CONCLUSION

Geriatric trauma patients are a unique patient population and management strategies for the delivery of trauma care to the injured elderly should reflect this. A dedicated geriatric trauma service has led to a more streamlined hospital stay and a reduction in morbidity. Other trauma hospitals will need to study this concept further to see if it is applicable to urban Level I trauma centers.

AUTHORSHIP

All authors participated in the design of this study. C.D.M. and V.K.S. conducted the literature searches. C.D.M., V.K.S., and D.J.N. collected the data, which were analyzed by A.J.M., C.D.M., V.K.S., M.L., M.S.T., D.J.N., and E.L.D. A.J.M., C.D.M., V.K.S., M.S.T., and E.L.D. wrote the manuscript. C.D.M. prepared the figures.

DISCLOSURE

The authors declare no conflicts of interest.

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