Should Trauma Surgeons Do General Surgery?

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Objective: Many trauma centers have separated emergency and general surgery from trauma care. However, decreased trauma volume and more frequent nonoperative management may limit operative experience and the economic viability of the trauma service. Trauma surgeons at our Level I trauma center have long provided all emergency surgical care and elective surgery. We sought to determine the impact of this policy.

Methods: We reviewed all admissions to the trauma service from June of 1992 to July of 1998 and cross-referenced this with our trauma registry. The number of major and minor procedures performed was also determined, and we reviewed all operative procedures by the trauma service for June of 1996 to October of 1998.

Results: Total admissions by the trauma service averaged 3,003 patients/year (range, 2,798–3,198 patients). Nontrauma patients accounted for 34% of all trauma service admissions (range, 26–40%). During this time period, there was no change in volume of operative or intensive care unit procedures, whereas minor procedures recently decreased from a peak of 141/month to 50/month. This was largely due to decreased use of diagnostic peritoneal lavage (surgeon reimbursable) and an increased use of computed tomographic scan and ultrasound (not presently reimbursed) to evaluate blunt abdominal trauma. During the past 2 years, nontrauma cases accounted for 33% of all operative procedures by the trauma service.

Conclusions: Maintenance of emergency and general surgical care by the trauma service has allowed us to buffer impact of variations in trauma volume and to maintain operative skills in an era of increased nonoperative management of many injuries.

Many trauma centers have separated emergency and general surgery from trauma care. Some trauma surgeons have voluntarily limited their practice to trauma and/or critical care. In a recent informal email survey of approximately 60 trauma centers, we found that 65% of trauma surgeons also did emergency general surgery while on trauma call, but 25% never did, and 15% did so occasionally. And although 80% of trauma surgeons said they performed elective surgery separate from their trauma practice, almost 30% of these surgeons had their access to these patients limited, either directly or indirectly. However, over 50% of trauma centers reported problems in supporting their physicians, suggesting other means of revenue for the trauma surgeon may be necessary.

A national survey of senior surgical residents cited the common nonoperative management of blunt trauma patients and the negative image of attending trauma surgeons who do not perform elective operations as factors against pursuing a career in trauma. In a survey of approximately 150 trauma directors (Level I and II), Moore reported several disincentives for trauma care, including the nonoperative nature of blunt trauma, poor compensation, and the disruption of an elective surgical practice. This would suggest that efforts to promote an elective surgical practice by “trauma surgeons” might enhance its appeal to residents in training and practicing surgeons. Many surgeons, understandably, may want to limit trauma call later in their careers. Maintenance of elective surgical skills, especially with advances such as minimally invasive techniques, should provide the “trauma surgeon” with late career alternatives.

Our trauma service was modeled after the successful trauma service at Parkland Memorial Hospital under G. Tom Shires, MD. It was designed to include all emergency operations and inpatient consults. Additionally, all attending trauma surgeons have been strongly encouraged to pursue an elective surgical practice. Our objective was to assess the impact of the general surgery model of trauma care on operative experience, patient outcomes, and academic productivity of our trauma service.

PATIENTS AND METHODS

The University of Louisville Hospital is a tertiary teaching hospital and has been verified by the American College of Surgeons Committee on Trauma as a Level I trauma center since its founding. Full-time faculty provides 24 hours a day “in-house” attending coverage. There are eight surgeons who participate along with one or two postresidency fellows. These surgeons provide all of the trauma and emergency surgical care and also a significant amount of the elective surgery at the University of Louisville Hospital. Five of the authors comprise the core of our trauma group. Four of these have critical certificates, two have vascular certificates, and one is board certified in thoracic surgery. The Trauma Institute of the University of Louisville Hospital records all admissions, consults, and major and minor procedures performed by the trauma service. In addition, the admitting diagnosis, reason for consultation and operations performed for every patient on the trauma service are listed in the Department of Surgery monthly morbidity and mortality reports. We used both databases to review all clinical services.
provided by the trauma service between June of 1992 and
July of 1998. This search was also cross-referenced with our
trauma registry to identify all patients admitted for at least 48
hours with an injury-related diagnosis (ICD-9 CM
800–959.9) versus those admitted with a general surgical
condition. The number of major and minor procedures performed
was also determined, and we reviewed all operative
procedures by the trauma service for June of 1995 to October
of 1998. Yearly morbidity and mortality rates for the trauma
service were recorded as well.

To assess the quality of general surgical care provided, we
reviewed the two most common general surgical procedures performed by the trauma staff during a 2-year period (1997
For all patients who underwent appendectomy, pathology
reports were reviewed to identify the accuracy of diagnosis
(i.e., negative appendectomy rate) and perforation rate. We
also reviewed time from consultation to operation. For pa-
tients undergoing laparoscopic cholecystectomy, we re-
viewed the following criteria: conversion rate (elective and
urgent), percentage with documented pathology (i.e., gall-
stones or cholecystitis identified), and duct injury rate. Ad-
ditionally, to quantify the amount of general surgery provided
by our core trauma surgeons, we reviewed the operative
experience from all sources (i.e., University of Louisville
Hospital, VA Medical Center, integrated private teaching
hospitals) during a 2-year period (1997 and 1998).

**RESULTS**

Total admissions and consults to the trauma service averaged
3,003 patients/year (Fig. 1). Non–trauma-related diagnoses
accounted for 34% of all trauma service activities (range,
26–40%). From June of 1995 to October of 1998, there were
no major changes in operating room use by the trauma service
(average 99 ± 15 cases/month; range, 68 to 130). General
surgical procedures accounted for 33% of all operations.
Intensive care unit procedures increased from an average of
continually decreased from a high of 141/month to 50/month.
This reduction was mostly due to replacement of diagnostic
peritoneal lavage (DPL) by computed tomography and fo-
cused abdominal sonography for trauma (FAST scan) as the
primary means to evaluate blunt abdominal trauma. During
the 1993 to 1994 academic year, we performed 638 DPLs
compared with just 52 DPLs in the 1997 to 1998 academic
year, whereas abdominal computed tomographic (CT) scan
use increased from 251/year to 722/year (Fig. 2). Despite the
increased use of abdominal CT scanning, the percentage
positive scans remained stable at approximately 20%, indi-
cating the same degree of discrimination. Operative manage-
ment of hepatic and splenic injuries has recently decreased
from 72% to 35% (Fig. 3).

During these 5 years, the mean Injury Severity Score for all
patients entered in the trauma registry was 13.2 (range, 12.7–
13.9). The morbidity rate was 5%, with an average yearly
mortality rate of 2%. For blunt trauma patients with an Injury
Severity Score ≥ 25, the mortality rate was 26% (range,
24–28). The payer mix for trauma patients is depicted in
Figure 4.

The overall accuracy rate for the diagnosis of acute appen-
dicitis was 86% (53 of 62 patients). The median time from
consultation to operation was 3.6 hours (average, 4.8 hours;
range, 0.7 to 17 hours). Twelve patients had perforation
(19%). Eight of these patients (75%) had symptoms ≥ 2 days


FIG 1. Total admissions to the trauma service from academic year 1993/1994

FIG 2. DPL and abdominal computed tomography use for academic year 1993/

FIG 3. Percentage of liver injuries, spleen injuries, or both, managed operatively.

FIG 4. Payer mix for trauma patients. Black, indigent or self-pay; gray, commer-
cial insurance; white, Medicaid and Medicare; vertical hatch, workmen’s compen-
sation.

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before presentation. Three patients with perforation had symptoms $\leq 24$ hours. One of these patients had a well-formed abscess at the time of operation. The times to operation for the remaining two patients were 5.75 and 7.6 hours, with the latter of these possibly perforating in the hospital. A patient with perforation had an unknown duration of symptoms.

The conversion rate for all patients undergoing laparoscopic cholecystectomy was 12% (20 of 169 patients). The rate for elective operation in the same hospital was 4% (4 of 104 patients), whereas the conversion rate among patients in the urgent category was 25% (16 of 65 patients). There was only one patient with no documented pathologic condition on histologic examination (0.6%) and one patient had a common duct injury (0.6%). This injury was repaired primarily at the initial operation, and the patient had no sequelae at 2 years of follow-up. There were no deaths among patients undergoing either laparoscopic cholecystectomy or appendectomy.

Our core trauma surgeons performed an average of 109 urgent procedures (trauma and emergency surgery; range, 71–144) and 250 elective procedures (range, 60–498) per surgeon per year. Cumulative experience during the past 2 years is shown in Figure 5. During this same 2 years, these five surgeons authored 48 peer-reviewed publications (26 trauma, 11 general surgery, 11 basic science).

**DISCUSSION**

We believe there are several reasons why trauma surgeons should continue to perform general surgery. First, new skills and techniques used in general surgery, such as laparoscopy and thoracoscopy, can be selectively applied to the trauma patient. Second, it provides an opportunity to maintain operative skills in an era of more common nonoperative management of solid organ injuries. Third, it may provide an opportunity for trauma surgeons to be more positive role models. Lastly, there may be financial benefits.

Our continued involvement in general surgery has allowed us to apply new techniques to the care of the trauma patient. We have selectively applied minimally invasive techniques to the care of the trauma patient, often facilitating solutions to difficult problems. Continued experience with elective and emergency vascular surgery has allowed us to provide comprehensive trauma care to patients with vascular injuries. Extensive experience in elective esophageal surgery has led to innovative treatment of complex esophageal injuries.

We firmly believe this is a “two-way street” with both trauma and elective surgical skills and experience complementing each other. Additionally, by maintaining emergency surgery on the trauma service, we have been able to insulate the elective surgery service from disruptions.

Several changes in trauma practice pattern have also impacted both operative experience and reimbursement. DPL, a surgeon-reimburseable procedure, has been replaced in our institution as the primary means of evaluation in blunt abdominal trauma. Focused abdominal sonography for trauma scan, CT scan, or both, are used. However, in many trauma centers, the surgeon is not paid for interpretation of these diagnostic examinations but should be. We have seen a steady decrease in our use of DPL over the past 4 years, and this has led to more frequent nonoperative management of solid organ injuries, similar to other reports. Addition of interventional techniques has also extended the realm of nonoperative management. Although this has greatly benefited the patient, it may also negatively impact physician reimbursement. Sutyak et al. compared the average payment for splenectomy compared with nonoperative management. Nonoperative management reduced hospital charges by approximately $30,000/patient. However, surgeons were reimbursed at only 22% of operative intervention, whereas reimbursement for radiologists was relatively unchanged. They argued that the cognitive component of nonoperative trauma management is widely undervalued.

A survey of senior surgical residents conducted by our department suggested that several factors impacted negatively on residents’ view of trauma surgery. The frequent nonoperative management of blunt trauma patients was cited, “a lot of work, few operations.” It was also believed that providing trauma care was disruptive to an elective surgical practice. Additionally, attending surgeons who only did trauma surgery were sometimes seen as negative role models.

Over 25 years ago, our trauma service was designed to provide all emergency surgical care. We believed that this would increase operative experience and prevent “burn-out” from the nonoperative experience of blunt trauma care. Among our eight surgeons who take regular trauma call, the minimal experience is 7 years and the maximum is 28 years. Although providing considerable trauma and emergency surgical care (average, 109 cases/surgeon per year), our five core trauma surgeons have been able to maintain busy elective practices (average 250 cases/surgeon per year). Additionally, we perform approximately 100 percutaneous endoscopic gastrostomies per year. This group has remained academically productive and two of these surgeons have active, peer-reviewed funded basic science laboratories. We believe this stable group of trauma surgeons, engaged in a variety of activities, have provided positive role models to our surgical residents and fellows and contributed to our long track record of providing trauma surgeons to both community and academic settings.

One could argue that doing too many things prevents excellence in any one area. However, we believe that several lines of evidence argue against this. Our morbidity and mortality results have been excellent consistently. Among the most severely in-

**FIG 5.** Two years of operative experience for the five core trauma surgeons. Urgent cases are both trauma and emergency general surgery. Each shading refers to a single surgeon.
juries patients (i.e., ≥ 25), our mortality rate is 25%, well below the 40 to 50% seen nationally. Our use of abdominal CT scan has increased significantly over the past 4 years. Yet our positive scan rate has remained 20%, similar to other studies, suggesting discriminating use and continued good clinical judgment. Additionally, the academic output of our trauma unit has been consistently productive, as has been that of other trauma centers with similar practice patterns.

We also believe that our general surgical care has not suffered under this arrangement. Over 85% of patients operated on for appendicitis had acute appendicitis according to pathology results, the median time to operation was under 4 hours, and it was believed that only one patient (<2%) might have perforated in the hospital. Our outcomes for laparoscopic cholecystectomy were equally good. Conversion rates for both elective and urgent laparoscopic cholecystectomy were similar to previous reports. Less than 1% of patients had an unremarkable or normal pathology report. The single common duct injury was recognized and treated at the index operation without complication. This incidence of common duct injury (0.6%) is identical to that found in a large review of over 100,000 cases. Although we realize that looking at only two operations is somewhat arbitrary, appendicitis and cholelithiasis did represent the two most common general surgery diagnoses treated by the trauma service.

Although some have reported that trauma centers may be profitable, this is generally seen in trauma centers with an excellent payer mix and a predominantly blunt trauma population. Most trauma centers are reporting financial difficulties and, importantly, approximately 50% are having problems supporting their physicians. This finding is especially true in centers with more penetrating trauma patients who are more likely to be self-pay. Several factors are negatively impacting physician reimbursement for trauma care. There has been a continued decrease nationally in violent crime and motor vehicle crash rates. This decrease has been associated with a decrease in trauma volume at some centers. Along with all other aspects of health care, physician reimbursement from third-party payers and federal programs has been driven down dramatically. In general, payer mix among the entire hospital is more favorable than among the entire hospital. In general, payer mix has been driven down dramatically. In general, payer mix has been driven down dramatically. In general, payer mix has been driven down dramatically. In general, payer mix has been driven down dramatically. In general, payer mix has been driven down dramatically. In general, payer mix has been driven down dramatically.

“Should trauma surgeons do general surgery?” is a philosophical question as much as anything and, therefore, difficult to prove statistically. We believe that the general surgery model of trauma care provides opportunities to mutually enhance each discipline, maintains operative experience, and avoids many of the subtle “second-class” citizen connotations associated with trauma care. Although this is a description of a successful model in one institution, we believe it has worked well and may be more widely applicable to other trauma centers.

REFERENCES

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DISCUSSION

Dr. A. Brent Eastmann (La Jolla, California): I appreciate the opportunity to discuss this important paper, which addresses a critical issue and is authored by one of the most capable and respected groups of trauma/general surgeons in the country.

“Should trauma surgeons do general surgery?” Yes. The answer seems self-evident. By definition, is not trauma surgery the very origin of general surgery. I would remind you that the word “physician” first appeared in Homer’s Iliad and means “the remover of arrows.” The earliest recorded surgical procedures were the treatment of injuries.

However, as the authors point out, some trauma centers have in fact separated general surgery from trauma care. They cite an informal e-mail survey of 60 trauma centers, which showed that 25% of trauma surgeons did no emergency general surgery and 30% had limited access to general surgical cases.

This paper builds a strong case for trauma surgeons performing both emergent and elective general surgery to increase their operative experience. Statistics from this busy trauma service point out the diminishing numbers of operative management of hepatic and splenic injuries. This decrease in trauma operative cases is attributed to several factors: decrease in both crimes of violence and motor vehicle crashes and increase in nonoperative management of solid organ injuries.

I would accept and expect your outcomes to be better, given the extensive operative experience of your trauma general surgeons. It seems intuitive that doing gastrectomies, esophagectomies, pancreatectomies, and complex vascular procedures on a regular basis is going to better prepare the surgeon when one of these organs is injured and requires operation. The real question is, can and will these busy, successful general surgeons dedicate and commit themselves to the rigors of trauma call. How does your surgeon who does 900 elective cases a year balance this with in-house trauma call?

There are several reasons why this is not done in all trauma centers and I will mention only two. Trauma surgeons with busy general surgery practices are simply often not interested in adding the burden of trauma call, particularly the onerous in-house requirement. Secondly, because of economic factors, some institutions will encourage the addition of “trauma surgeons” but will discourage participation of these same surgeons on general surgery call panels. This seems heretical, given our trauma surgical origins.

In closing, I would make several comments. I concur with the answer: trauma surgeons should do general surgery.

I would submit an alternative model, when busy general and vascular surgeons do not take trauma call per se, is to formally involve them in participating with the trauma surgeon on complex cases. We are exploring this model at our own institution.

I agree that trauma/general surgery model is a “two-way street” and the trauma experience in the ATLS approach to resuscitation, “damage control” in the OR, and critical care expertise will enhance the care of the general surgery patient. Most hospitals with trauma centers will site this “halo effect” of improved critical care.

Finally, the addition of both emergent and elective general surgery to the trauma service will improve their threatened financial viability.

I have one question: Have you looked at specific complex injuries (i.e., esophageal, liver, popliteal arteries) to see if your model yields better outcomes? If not, would this not be a natural extension of this study? You build a strong philosophical case but you must also provide us with more evidence-based data to support your model.

I congratulate the authors on this important and provocative work. Hopefully, it will be an impetus for others to emulate your model.

Dr. Gerald O. Strauch (Chicago, Illinois): Dr. Spain was kind enough to send me his manuscript, and I confess fully that I am an absolute, ardent believer in the premise of this paper.

I concur that it is indisputable that in over 90% of hospitals in this country the trauma surgeon needs to be a broadly trained, broadly practicing general surgeon with a genuine interest in trauma care.

I would like to take one issue with one aspect of the discussion, Dr. Spain, and that was when you raised the on-going myth that trauma care is unprofitable for institutions. I really applaud the work of Paul Taheri and the Ann Arbor group which showed that if you strip away all the gobbledygook of hospital economics and get down to the bare facts of real costs and real reimbursement, trauma care is, indeed, profitable.

That study, of course, dealt with an institution where the preponderance of care is heavily into blunt injury, but there are precious few trauma centers in this country where the preponderance of patients have suffered penetrating injury.

I certainly think we should all hope that the pattern of practice described in this paper remains alive and well.

Dr. Charles E. Lucas (Detroit, Michigan): Dr. Spain, all of the Wayne State faculty in the audience are really proud that one of their former students won the Canazaro Award. Speaking on behalf of those faculty, Dr. Spain, we want to know if you have the courage to convince your co-authors to take a leadership role and point out that the guidelines for trauma fellowship developed by this organization are archaic and do not prepare the surgeon for the real world. Please convince your co-authors to lead this organization to mandate that general surgery be part of the trauma fellowship.

Dr. Frank W. Cross (Whitechapel, London, England): I found the topic of this paper somewhat novel, because in the UK, we do not have enough trauma to employ trauma sur-
geons. I think if you had a job as a trauma surgeon and did nothing else, you would become de-skilled fairly rapidly. So all trauma surgeons in the UK, all people who do trauma, do general surgery as well.

It is highly appropriate that Brent Eastman should be the invited discussant on this paper because he and I both did a very busy general surgical job in Norwich in the UK, although some years apart. And he will know that it is the case in the UK, doing general surgery increases your abilities to cope with trauma cases and vice versa. In other words, you learn a lot from both sides of the fence.

And I think the previous commentator was right in what he said about including general surgery and certification in this country because people do not do trauma surgery forever. And when you come out at the other end a little burnt out and not wanting to do anymore trauma, you need to be able to do something.

Dr. Steven R. Shackford (Burlington, Vermont): Dr. Spain, that was a great paper. Two quick questions. First, what is the average hours worked per week for these five surgeons? And, secondly, how is the income distributed? What are the incentives?

Dr. David A. Spain (closing): Dr. Eastman, I will admit some days after running around and making rounds at five different hospitals, our system does get a little bit crazy. And occasionally you do curse it. But, in general, it is all made a lot easier by the people I work with and how enjoyable it has been.

In terms of looking at complex injuries and do we do it better, I think that is actually a great idea. We have luckily been very innovative in some areas. And as Eddy Carrillo presented here last year some of our new modalities and treatment of liver injuries are very innovative.

Dr. Strauch, we were surprised when I looked at the payor mix of our patients of late. Actually, our indigent care has gone down to about 30% currently from a high of about 54% a couple of years ago. I do agree with you that trauma centers can be profitable, and it largely depends on your payor mix as well as your patient mix.

Dr. Lucas, once again, thank you. Your continued friendship and encouragement has meant a great deal to me over the past 10 years. As we all heard in Dr. Richardson’s Presidential Address, he firmly believes that this is what trauma surgeons need to do. We need to continue to take a leadership role both in trauma surgery and in general surgery.

Dr. Cross, I am personally aware of some trauma centers in this country with restrictive policies that limit their general surgeons to doing only trauma. And as a result, these surgeons are doing less than 20 or 25 laparotomies per year, which I think would be an incredibly boring amount of work to do.

Which brings me to Dr. Shackford’s questions, which asked how much we work. I cannot give you an exact number, but I can tell you it is a lot, probably at least 70 to 80 hours/week. But we do enjoy it. Financially, we do have a congress-type system where some of your income is fixed and some is an incentive-type based on how much you bring in. So it does provide a balance to us and encourages us to work hard both on the trauma service and on the elective surgery service.

Again, I would like to thank the AAST for the privilege of presenting our paper.