

Training Dedicated Emergency Physicians in Surgical Critical Care: Knowledge Acquisition and Workforce Collaboration for the Care of Critically Ill Trauma/Surgical Patients

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Background: The Leapfrog Group initiative has led to an increasing public demand for dedicated intensivists providing critical care services. The Acute Care Surgery training initiative promotes an expansion of trauma/surgical care and operative domain, redirecting some of our focus from critical care. Will we be able to train and enforce enough intensivists to care for critically ill surgical patients?

Methods: We have been training emergency physicians (EPs) alongside surgeons in our country's largest Trauma/Surgical Critical Care Fellowship Program annually for more than a decade. We reviewed our Society of Critical Care Medicine Multidisciplinary Critical Care Knowledge Assessment Program (MCKKAP, critical care in-training examination) scores from 2006 to 2009 (4 years). The MCKKAP, administered during the ninth month of a Critical Care Fellowship, is the only known standardized objective examination available in this country to compare critical care knowledge acquisition across different specialties. Subsequent workforce outcome for these Emergency Medicine Critical Care Fellowship graduates was analyzed.

Results: Over the 4-year period, we trained 42 Fellows in our Program who qualified for this study (30 surgeons and 12 EPs). Surgeons and EP performance scores on the MCKKAP examination were not different. The mean National Board Equivalent score was 419 ± 61 (mean \pm standard deviation) for surgeons and 489 ± 87 for EPs. The highest score was achieved by an EP. The lowest score was not achieved by an EP. Ten of 12 (83%) EP Critical Care Fellowship graduates are practicing inpatient critical care in intensive care units with attending physician level responsibilities.

Conclusions: EPs training in a Surgical Critical Care Fellowship can acquire critical care knowledge equivalent to that of surgeons. EPs trained in a Surgical Critical Care paradigm can potentially expand the intensive care unit workforce for Surgical Critical Care patients.

Key Words: Acute care surgery, Critical care, Emergency physician, Fellowship, Workforce.

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Concerns for the viability of trauma surgery as a specialty had prompted significant evolution of its training and practice model. In 1992, Richardson's report on a resident survey about their interest in providing trauma care on completion of residency training revealed that few wanted it as a career, or as a major part of their practice, with the primary reason for negativity being the large amount of nonoperative care.¹ Two years later, Scalea et al² reported their success in enhancing trauma care as a career choice among their residents by linking trauma and critical care, citing the positive cognitive influences of resuscitation physiology and designated intensive care unit (ICU) services.

In 1998, the Leapfrog Group was formed from more than 130 public and private organizations that purchase and provide healthcare benefits to define standards to improve the safety and value of health care.³ One of the evidence-based practices for improved quality of care focused on full-time intensivist staffing, known as the ICU Physician Staffing standard. Eight studies were cited to support the overall reduction in mortality when intensivists staffed, coordinated, and managed the care of patients in ICUs.⁴ In its ICU Physician Staffing model, the Leapfrog Group defines intensivist as one of the following: (1) Critical Care Board-certified physician; (2) Board-certified emergency medicine (EM) physician who completed an Accreditation Council for Graduate Medical Education (ACGME)-accredited Critical Care Fellowship; or (3) Board-certified physicians in medicine, anesthesiology, pediatrics, or surgery who completed training before the availability of Critical Care Fellowships.⁵

Two years later, in 2000, three of the most influential societies with an interest in the critical care workforce formed the Committee on Manpower for Pulmonary and Critical Care Societies.⁶ This committee comprised the American College of Chest Physicians, the American Thoracic Society, and the Society of Critical Care Medicine (SCCM), and the goal was to determine the current patterns of care for the critically ill and to project the future workforce. This group forecasted that the proportion of care provided by intensivists in the United States will fall below standards because of the growing disease burden created by the aging population. Four years later, in 2004, these same critical care organizations, along with the American Association of Critical-Care Nurses, published a white paper imploring federal healthcare policy makers to address the compelling evidence that current trends

predict that the demand for critical care services will increasingly exceed the supply of critical care physicians into 2030.⁷

Still another area of continued controversy in the viability of the specialty of trauma/critical care had been the mandatory nonoperative training requirement for Surgical Critical Care Fellowships imposed by the ACGME Surgery Residency Review Committee.⁸ In 2005, the American Association for the Surgery of Trauma ad hoc Committee to Develop the Reorganized Specialty of Trauma, Surgical Critical Care, and Emergency Surgery proposed a solution to the crisis with a new definition of the trauma surgeon of the future, the Acute Care Surgeon, with the most prominent concept being a reinvigoration of this surgical specialty with an expansion and broadening of surgical skills and operative domain.^{9,10}

The expected impact toward an increased operative commitment from our surgical intensivists, the forecasted continued increase in disease burden from the aging population, and our reliance on advances in technology to maintain prolonged survival of critically ill patients combine to create a new crisis. Will we be able to train and enforce enough intensivists to care for critically ill surgical patients? Emergency physicians (EPs) represent a population of nonoperative specialists who have embraced critical care training, in demand for a new dimension to their specialty that provides intellectual enhancement and academic leadership.

We have been training EPs alongside surgeons in our country's largest Trauma/Surgical Critical Care Fellowship Program annually for more than a decade. Our EP trainees and graduates develop an enthusiastic interest for the knowledge and practice of inpatient critical care services. We hypothesized that EPs and surgeons can acquire an equivalent extent of knowledge in critical care, when trained in the same Surgical Critical Care Fellowship Program. These EPs would subsequently acquire jobs in which inpatient critical care is an important component of their practice.

METHODS

The Surgical Critical Care Fellowship Program at the University of Maryland Medical Center/R Adams Cowley Shock Trauma Center is a 1-year Fellowship Program, receiving initial ACGME accreditation in 1994. Beginning in 1998, we have been training EPs alongside surgeons in this Fellowship Program on an annual basis. Within the Program construct and educational curriculum, both surgeons and EPs are generally treated similarly. Both surgeons and EPs are required to attend identical educational conferences and lectures, and they also have similar rotation assignments. While the notable treatment exception is that EP Fellows are not expected to participate in activities in the operating room (OR), they are not discouraged from participating as assistants in surgery.

The SCCM's Multidisciplinary Critical Care Knowledge Assessment Program (MCKAP), often referred to as the critical care in-training examination, is administered during the ninth month of the Fellowship academic year. The MCKAP is the only known standardized objective examination available in this country to evaluate and compare

critical care knowledge acquisition among Fellows across different critical care subspecialties. The examination contains approximately 200 multiple-choice questions and is developed and reviewed annually by an SCCM editorial committee.

The annual MCKAP administration process begins with Program Directors purchasing the requisite number of examinations from the SCCM for the number of Fellows being tested. Program Directors then administer the examination at their designated University location. All answer sheets and examination books are subsequently returned to the SCCM offices. Answer sheets undergo computer statistical analysis, and anonymous test scores are normalized based on a National Board format. Each Program Director then receives from SCCM their institutional scores and rankings and all individual examinee scores with a report highlighting the incorrect answers for self-evaluation.

We administered the MCKAP examination in the ninth month (March) of each academic year to all Surgical Critical Care Fellows, both surgeons and EPs. Fellows were allotted 4 hours to complete the examination, according to MCKAP instructions. No Fellow sat for the examination after being clinically on-duty overnight (postcall). We reviewed our Fellows' MCKAP examination scores over a 4-year (2006–2009) period, coinciding with the current Fellowship Program administration (current Program Director and Coordinator tenure).

The inclusion criterion was any Fellow, surgeon or EP, in our 1-year Surgical Critical Care Fellowship who had completed residency training before entering our Fellowship Program. Exclusion criteria were as follows: (1) any Fellow who had not completed residency; (2) any Fellow who had not completed a residency in the specialties of Surgery or EM; and (3) any Fellow who was being trained in a nonstandard Fellowship curriculum. Each individual Fellow's MCKAP National Board Equivalent (NBE) score was recorded and ranked. Surgeons' scores were compared with EPs' scores. Subsequent workforce outcome for the EP Critical Care Fellowship graduates was obtained through an electronic mail survey. Because of the small sample size, a descriptive study methodology of data analysis was used to report summary means, standard deviations, and ranges for comparison.

RESULTS

Fellowship Trainees

Over the 4-year (2006–2009) period, we trained 45 Fellows in our Program who also completed the MCKAP examination. Three Fellows were excluded from study analysis: (1) one Fellow underwent his Surgical Critical Care Fellowship after completion of 3 years of surgery residency (PGY-4); (2) one Fellow had completed a residency in internal medicine (PGY-4); and (3) one Fellow had completed his ACGME-accredited Surgical Critical Care Fellowship training at another institution, and spent 1 year with us in a Trauma Fellowship (PGY-7). The remaining 42 Fellows qualifying for this study included 30 (71%) surgeons and 12 (29%) EPs.

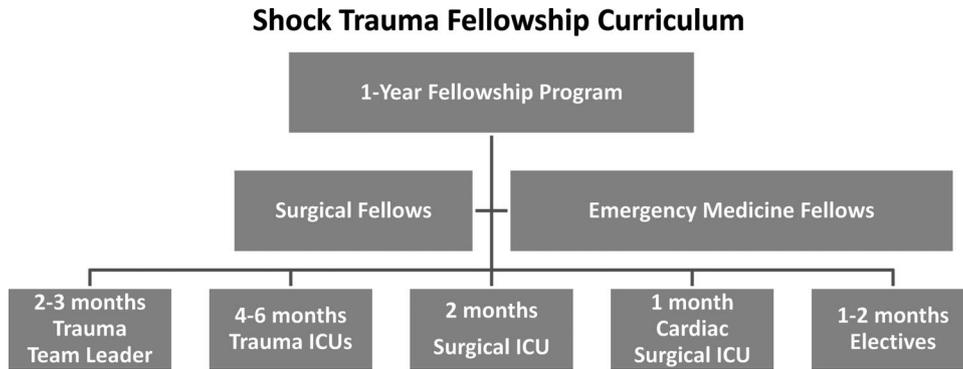


Figure 1. Fellowship Program construct and curriculum at the University of Maryland Medical Center/R Adams Cowley Shock Trauma Center during the 4-year study period (2006–2009). Surgical fellows and EM fellows were all assigned similar clinical rotations.

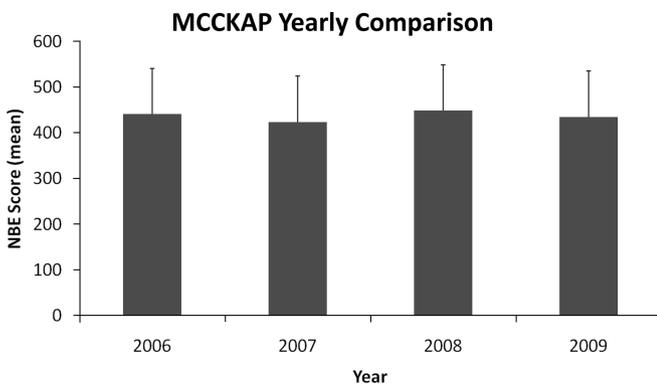


Figure 2. Comparison of Fellows’ MCCKAP mean NBE scores, analyzed by year of graduation. Fellows’ MCCKAP mean NBE scores were similar throughout the 4-year study period (2006–2009).

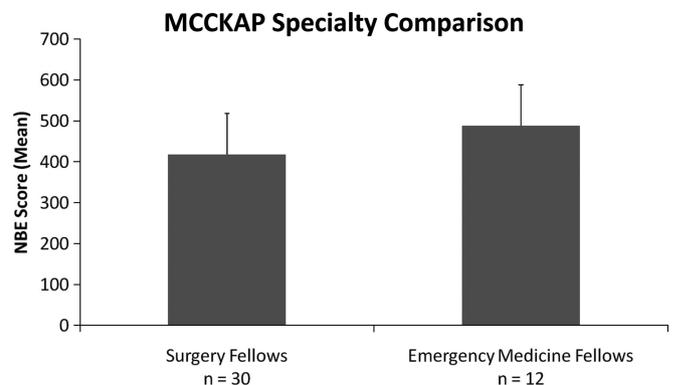


Figure 3. Comparison of fellows’ MCCKAP mean NBE scores, analyzed by base specialty. Fellows’ MCCKAP mean NBE scores were not different between surgery fellows and EM fellows throughout the 4-year study period (2006–2009).

Fellowship Program

The Fellowship Program construct varied slightly through the 4-year period (Fig. 1). All Fellows participate in the Trauma Team Leader rotation, with Fellows having 3 months in 2006 and 2 months in 2007–2009. In 2006 and 2007, Fellows had four rotations in Trauma ICUs (2 months of MultiTrauma ICU and 2 months of NeuroTrauma ICU). With the opening of our third Trauma ICU, the 2008 and 2009 Fellows also had 1 or 2 months in the Select Trauma ICU. Two months of Surgical ICU and 1 month of Cardiac Surgery ICU were standard. Fellows in 2006–2008 had only one elective month, while Fellows in 2009 had two electives. In any given year, surgeons and EPs had similar rotations and experiences.

MCCKAP Scores

The range of NBE scores for all Fellows was 319–629. The mean NBE scores for all Fellows analyzed by Fellowship year were similar (Fig. 2). The mean NBE scores for Fellows analyzed by specialty, comparing surgeons with EPs, also were not different (Fig. 3). The three highest NBE scores were achieved by EPs, and therefore were all in the top decile (Fig. 4). The six lowest NBE scores were achieved by

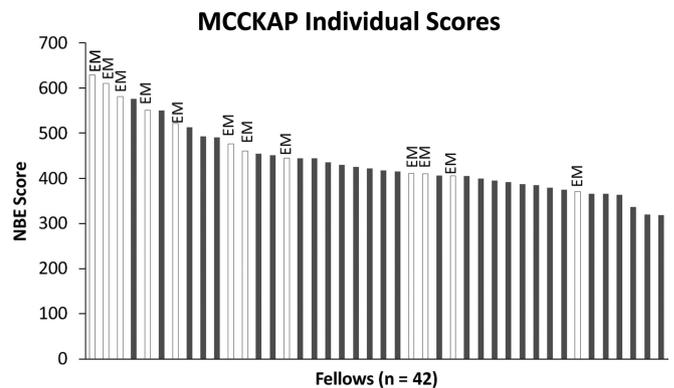


Figure 4. Comparison of individual fellows’ MCCKAP mean NBE scores during the 4-year study period (2006–2009). The three highest NBE scores were achieved by EM fellows.

surgeons. The lowest NBE score by an EP was not in the bottom decile.

Workforce Outcome

Ten of the 12 (83%) EP Critical Care Fellowship graduates have subsequently obtained positions in which the

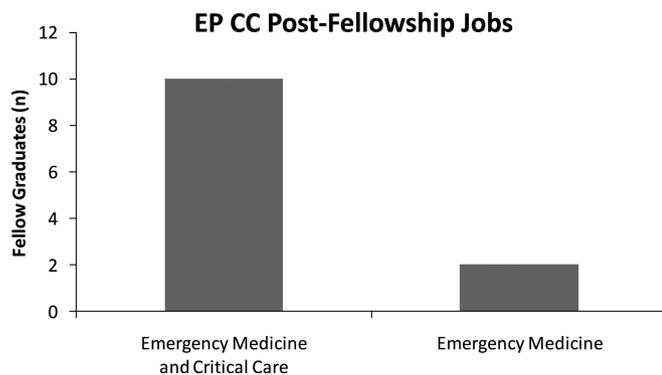


Figure 5. Ten of the 12 (83%) EP Critical Care Fellowship graduates during this four-year study period (2006–2009) have subsequently obtained positions in which inpatient critical care in ICUs with Attending Physician level responsibilities was an important component of the job.

inpatient practice of critical care in ICUs with Attending Physician level responsibilities is an important component of the job (Fig. 5). These EPs currently have jobs in the seven states of CT, FL, MD, NM, NY, TX, and VA. Eight of the 12 (67%) EPs have jobs at University academic institutions. Nine of the 12 (75%) EPs divide their clinical practice between emergency department (ED) and ICU responsibilities. The ICU types that these EPs practice inpatient critical care include Cardiac Surgery ICU, Medical ICU, Medical-Surgical ICU, Neurosciences ICU, NeuroTrauma ICU, Surgical and Trauma ICU, and Trauma ICU.

DISCUSSION

Approximately 20 years ago, an Eastern Association for the Surgery of Trauma Education Subcommittee, under the leadership of Lenworth Jacobs and L.D. Britt, examined the issue of declining resident interest in trauma surgery as a career.¹¹ The Eastern Association for the Surgery of Trauma Careers in Trauma Committee, initially convened by C. William Schwab, had the objective of fostering resident interest in the field of trauma surgery. The initial report identified four main problems with trauma fellowships: (1) lack of specified educational objectives; (2) undefined curricula; (3) inconsistent emphasis on research; and (4) inconsistent surgical exposure.¹² The paramount perception of negativity for surgical residents was deemed to be the increasingly nonoperative nature of trauma and critical care. While there was a steady growth in Trauma Fellowship training programs since 1996, resident interest in this specialty did not keep pace with the available positions.¹³

Even before the establishment of the Acute Care Surgery Fellowship concept, 2-year trauma and critical care fellowships existed which incorporated an increased experience in trauma surgery.¹⁴ The Education Committee of the Surgery Section of the SCCM had reported that the majority of Surgical Critical Care Fellowships included an operative trauma and/or emergency general surgery experience, especially 2-year programs.¹⁵ This new paradigm promoted the attractiveness of an expansion of operative care and domain

to include a greater focus on emergency general surgery, vascular surgery, and thoracic surgery.

Graduates of Acute Care Surgery Fellowships would become emerging “master surgeons,” with the expertise in performing emergent complex abdominal, vascular, thoracic, hepatobiliary, and emergency general surgery cases.¹⁶ Graduates of this new training format will likewise seek post-training practice situations which enhance their operative opportunities and time in the operating room. The potential dichotomy is that these same graduates may seek to prioritize and trade dedicated critical care time for surgical services and operative time. In those practice situations in which the surgeon is responsible for a surgical service and an ICU service simultaneously, these surgeons may have an increasing tendency to devote time to operative responsibilities, rather than to ICU responsibilities.

The 2005 article announcing the Acute Care Surgery effort by the American Association for the Surgery of Trauma made a reference to ancient folklore claiming that the Chinese character for crisis is made up of two character elements signifying danger and opportunity.⁹ In the past 20 years, many other reports have suggested that the following three issues have reached crisis level: (1) the viability of trauma surgery as a career; (2) the critical care workforce shortage; and (3) the national epidemic of hospital, ICU, and ED overcrowding. These three issues combine to create a new crisis: Will we be able to train enough intensivists in a surgical critical care paradigm and enforce them to care for the expanding population of critically ill surgical patients? Who will care for our critically ill surgical patients boarding in the ED overnight or for days? One potential solution would be to train, collaborate, and enforce a group of dedicated nonoperative specialists who share an enthusiasm for the care of critically ill trauma and surgical patients.¹⁷

In the multiprofessional concept, critically ill surgical patients would require the expertise and services of both EPs and surgeons in the continuum of care in the ED, OR, and ICU. These specialists have some similarities and differences regarding critical care exposure. Critically ill patients typically first present to the EP in the ED, where the EP has the initial responsibility for diagnostics and management. One of the foundations of EM training is a knowledge and skill set for resuscitation management. Trauma and critical care-trained EPs practicing in the ED could significantly reduce the trauma surgeon’s nonoperative workload.¹⁸ In busy hospitals, slow throughput to the OR or ICU may require these patients to spend increased time in the ED, being managed by the EP.

The concept of EPs training in a trauma fellowship began to generate interest >10 years ago.¹⁹ The initial efforts to establish the Trauma Resuscitation/Critical Care Fellowship for EPs soon led to a more widely applicable process of recruiting EPs into existing Surgical Critical Care Fellowship programs. The premise for success was that the resuscitation and management of trauma and acute illness is an integral component of EM and that critical care training and practice would be a natural extension to the discipline of EM.²⁰ Since 2000, the interest in Critical Care Fellowship training by EPs

has increased, and this training has occurred in over 35 institutions.²¹

EPs who have completed Fellowship training in critical care are now participating as intensivists managing trauma and critical care patients in several large trauma centers.²² These dual-trained EM/Critical Care physicians will strengthen the delivery of critical care in the ED, will facilitate coordination of the ED-ICU transition, and may expand the available workforce for critically ill surgical patients.²³ Some studies are now beginning to show that Trauma/Critical Care Fellowship-trained “Emergency Traumatologists” can provide trauma care effectively in a group practice covering trauma, surgical critical care, and emergency surgery.²⁴

The SCCM’s MCCKAP examination is the only known in-training examination for Critical Care Fellows that is commonly administered in the United States. Furthermore, the MCCKAP is the only known standardized objective examination available in this country to compare Critical Care knowledge acquisition by Fellows across different specialties. Because the SCCM has recognized Critical Care as a multiprofessional specialty, this single examination is applicable to Critical Care Fellows regardless of base specialty. The 2009 MCCKAP was taken by Critical Care Fellows in Medicine (52%), Surgery (25%), Anesthesiology (14%), and Other (9%), with EM Critical Care Fellows represented in the latter category.

One limitation of this study is the sample size difference between Surgical Fellows and EM Fellows. The number of EM Fellows in the study represented only 29% of the entire group. The results may be different with comparable subsets. Another important limitation of this study revolves around the conceptual knowledge and experience differences among the various critical care specialties. A potential area for speculation is that the MCCKAP, being a multidisciplinary critical care examination, may have an items bias toward concepts more familiar to medical critical care practitioners, compared with surgical or anesthesiology critical care practitioners. A review of the 2009 MCCKAP Editorial Committee member constituents would seem to dispel this argument (6 anesthesiology, 6 surgery, and 7 medical physicians). Furthermore, the curriculum and knowledge set that defines Surgical Critical Care as a different entity from the Critical Care of other specialties has yet to be established with clear distinction. A standardized multiple-choice in-training examination offered by some American Board of Medical Specialties member Boards still remains to be the leading objective assessment tool to evaluate an individual resident or Fellow’s educational progress. Available evidence does support a strong relationship between in-training examination scores and subsequent passing of the Qualifying Examination for both the American Boards of Surgery and Emergency Medicine.

Another limitation of this study is the lack of a definitive translation between knowledge base and clinical skills. All of our Fellows receive formative interval-based (9-point scale, with 1 as most unsatisfactory and 9 as most superior) and narrative evaluations by multiple Faculty after each clinical rotation. These evaluations assess each of the

ACGME competencies (Patient Care, Medical Knowledge, Practice-Based Learning and Improvement, Interpersonal and Communication Skills, Professionalism, and Systems-Based Practice), and also an Overall Clinical Competence category. During the latter 2 years (2008 and 2009) of the study period, the method of submitting evaluations was transitioned from paper records to a commercial electronic database. A post hoc analysis was performed on the available scores in the electronic period. The range of mean clinical scores for these Fellows was 5.7–7.9. The mean clinical evaluation score was 7.2 ± 0.5 (mean \pm SD) for surgeons and 6.8 ± 0.7 for EPs.

Summary

The Acute Care Surgery training initiative promotes an expansion of surgical exposure and operative domain. Will we still be able to train and enforce enough intensivists to care for our critically ill surgical patients? EPs trained in a Surgical Critical Care Fellowship can acquire critical care knowledge equivalent to that of surgeons and may represent a group of nonoperative specialists to support the ICU workforce for critically ill trauma/surgical patients.

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