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Original Research

Effects of an Experiential Trauma Bootcamp on PGY 3 Anesthesiology Residents' Knowledge and Confidence Levels

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Introduction

Bootcamp-style medical education offerings are short, intense sessions, typically with a novice trainee audience and combine didactic sessions with hands-on and simulation activities that have been shown to increase trainee knowledge, skills, and confidence.[1,2] In anesthesiology, these courses have been implemented with first- or second-year residents[3–9] and used a combination of didactics, simulation, and prelearning. Although there is an abundance of literature available regarding bootcamps for novice anesthesia trainees, very little focuses on the education of senior-level anesthesiology residents or fellows.[10,11] Further, while a few publications highlight the use of bootcamp-style courses aimed at trauma care, including airway components such as cricothyrotomy,[12–17] none include senior anesthesia residents as learners. Other disciplines have seen improved confidence and self-reported competence after participating in senior resident bootcamps.[18] As such, a novel, trauma-focused bootcamp for postgraduate year 3 (PGY3) anesthesiology residents was designed to prepare residents for taking senior trauma call.

The University of Alabama at Birmingham (UAB) Hospital is the major tertiary care center for the state with 1,157 beds and is the only American College of Surgeons Level 1 trauma center in Alabama, with a very large catchment area. The trauma team evaluates over 5,000 trauma activations annually, with approximately 20% of those being penetrating trauma, placing UAB among the busiest trauma centers in the United States. While covering senior trauma call, PGY3 anesthesiology residents have many responsibilities, including emergency response to all traumas, urgent airway management, and management of anesthesia services and personnel for the operating room (OR). These residents begin taking senior trauma call in January of their PGY3 year.

Historically in our training program, junior residents have observed and learned from senior residents the roles and responsibilities of taking trauma call. This approach may not have adequately prepared residents for the senior trauma call role, as it did not guarantee exposure and practice with all essential skills. Further, some residents at our institution reported low self-confidence before assuming the senior trauma call role in addition to informal feedback from both residents and faculty that certain skills may need further instruction. In response, UAB Anesthesiology residency education leadership identified the need for additional resident education before taking senior trauma call.

Curriculum Design and Development

A trauma bootcamp was designed to prepare PGY3 anesthesiology residents to begin taking senior trauma call, involving a combination of flipped classroom and didactic components as well as experiential learning through procedural, immersive, and augmented reality (AR) simulations. One tenet of competency-based medical education is that educators must provide experiential, hands-on learning to attain certain learning goals (i.e., mastery requires hands-on experience in addition to observation).[19] Simulation has been used successfully in anesthesia education for decades, resulting in improved individual and team performance as well as transfer of specific skills to the clinical environment.[20]

The simulation modalities of procedural, immersive, and AR have been used successfully in other trauma educational offerings involving different specialties or learner levels. Procedural simulation using airway task trainers to learn trauma-related skills has been shown to improve learner confidence, technical skill, and procedure time as well as perceptions of knowledge and skill acquisition.[14,21] Immersive simulation using high fidelity manikins and trauma scenarios has been shown to result in improved role delegation, crisis resource and airway management, leadership, patient assessments, and overall technical skill.[12,14–16] AR is a newer simulation modality where objects are digitally imposed on electronic representations of

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the real world, appearing to "coexist in the same space as real world objects."[22] Previous researchers discovered that using AR when orienting learners to an emergency cart improved learners' abilities to locate items quickly and successfully.[23] As such, the decision was made to include an AR crash cart simulation that had been previously developed to mirror items stocked within our institution's crash carts as a way of further orienting residents to its contents.

The flipped classroom model of having learners complete readings or watch video-based lectures before attending an in-person session using hands-on learning has been shown to result in increased learner satisfaction, motivation, and knowledge retention among healthcare learners.[24] Further, direct practice-based experience is essential to adult learning. Aligning concrete hands-on experience with recent didactic teaching allows learners to assimilate information into existing knowledge.[25] Based on these adult learning principles, most didactic content was disseminated before the bootcamp, using a flipped classroom approach where residents watched several prerecorded lectures. Then, on the day of the bootcamp, residents were allowed the opportunity to practice and apply gained knowledge through different simulation modalities. Finally, timing of educational interventions is crucial. Applying the educational concept of just-in-time training, which posits that learning and retention are enhanced when there is a high level of interest,[2] the senior trauma bootcamp sessions were scheduled in November to January, just before the residents began senior trauma call.

Past Trauma Bootcamps

In December 2018, 2019, and 2020, researchers conducted prior iterations of the senior trauma bootcamp. These previous bootcamps were much shorter than the modern offering, lasting between 2.5 and 3 hours. Written and verbal feedback from the residents who attended was positive and was used to enhance the experiential portion with the expansion of procedural simulation and addition of AR and immersive simulation components.

Informal resident and faculty feedback led to the authors creating internal surveys and needs assessments. These data were collected after each bootcamp and were used to develop curriculum objectives. Each year, the data were used to improve the subsequent year's bootcamp by providing education on additional topics with which residents reported a perceived lack of knowledge or confidence. All curriculum development efforts were guided by Kern's 6-step model,[26] starting with an annual targeted needs assessment, followed by development of goals, objectives, education strategies, and evaluation methods.

The 2021/2022 bootcamp curriculum was improved and expanded to more effectively communicate the various responsibilities and expectations associated with senior trauma call, deliver straightforward explanations of the processes promoting success, discuss strategies for delegation of trauma roles in the OR, and offer opportunities for deliberate practice with expert coaching and feedback. The newly designed immersive simulation scenarios were piloted with PGY4 residents in September 2021. Using their feedback, changes were made, and these simulations were then incorporated into the bootcamp experience. The purpose of this study was to assess resident self-confidence and fundamental knowledge before and after attending this improved bootcamp session.

Materials and Methods

Modern Bootcamp Offering

In 2021, the fourth senior trauma bootcamp was implemented. This experiential learning event took place over 3 days during November and December 2021 and January 2022, with each resident attending 1 session. Before attending the bootcamp, residents watched 5 prerecorded lectures and demonstrations that covered the following topics: setting up the fiberoptic cart, induction of critically ill patients outside of the OR, resuscitation of trauma patients, OR delegation of provider roles, and managing the OR board and schedule. Residents completed this bootcamp during established protected didactic time where they were free of all clinical responsibilities and protected from call the previous day.

On the morning of the bootcamp, residents were divided into groups and rotated through 4 stations that allowed for hands-on deliberate practice through procedural simulation with expert feedback and coaching. These stations included setup and use of advanced airway equipment and rapid infusers, as well as skills such as cricothyrotomy, needle decompression, and defibrillator use. Additionally, residents took part in an AR simulation designed to help participants gain a better understanding of the institution's crash cart contents. Station instructors consisted of attending anesthesiologists, simulation educators, and a PGY4 resident, who were selected based on their expertise in applicable subject matter. Following the morning's procedural and AR simulation sessions, residents were exposed to a demonstration of flow rates through different sizes and lengths of intravenous catheters, a lecture on trauma transfusion considerations, and an interactive discussion on the trauma senior's role in operative and inpatient case designation and delegation.

After lunch, residents took part in three immersive simulations that allowed participants the ability to apply procedural skills learned that morning to decompensating simulated patients in the operative or inpatient environment. Two to 3 residents took part in each simulation, while the rest observed. Simulation cases were chosen by the authors based on results of the previously mentioned historical feedback and needs assessments and included induction of a hemorrhaging trauma patient, an unanticipated difficult airway in the intensive care unit, and a tension pneumothorax leading to cardiac arrest in the postanesthesia care unit. Following each immersive simulation was a debriefing that included participants and observers and was led by the same 2 anesthesiologists who are trained in simulation design and debriefing.

Setting and Participants

Participants were all UAB PGY3 anesthesiology residents (n = 21) at UAB Hospital in November 2021 to January 2022. The 21 residents were divided into 3 groups ranging from 6 to 8 residents, with each group attending one 8-hour bootcamp day. All bootcamp sessions were completed before resident assignment to senior trauma call.

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Surveys

Two pre/postsurveys were developed that were completed electronically at the beginning and end of each bootcamp day. The first was a 17-item confidence survey using a 7-point Likert scale where responses were indicated with slider bar to the tenth of a point (Appendix A). For example, a respondent could indicate an answer of 6.5 to a question, with 1 being strongly disagree and 7 being strongly agree. The second was a 20-item, multiple-choice knowledge survey (Appendix B). Both surveys contained items relevant to the day's session and were completed anonymously. Content focused on areas identified in the previously discussed needs assessments. At the end of each bootcamp day, an evaluation was completed gauging the residents' satisfaction levels and perceived applicability of bootcamp content to clinical care (Appendix C).

Ethical Consideration

Before each session, one researcher (E.B.) explained to attendees that a research study was being conducted to assess confidence and knowledge levels before and after bootcamp and to assess their satisfaction with the bootcamp itself. Participants were told that participation in the research study was voluntary, and completion of the surveys signified consent to participate. This research was granted exempt approval by the UAB Institutional Review Board on August 30, 2021.

Analyses

Descriptive statistics were used to report frequencies. Likert scale responses on the confidence survey and correct/incorrect answers to the knowledge survey were entered into Stata 17 statistical software. Paired *t* tests were used to test for significant differences in confidence before and after bootcamp. Chi-square tests were used to test for significant changes in knowledge. The Bonferroni correction was used to control for multiple comparisons. There were 37 total confidence (n = 17) and knowledge (n = 20) items, so changes in confidence were considered statistically significant if $P < .001$ (=.05/37).

Results

All 21 (100%) PGY3 residents attended one of the November 2021, December 2021, or January 2022 bootcamp sessions and completed both the knowledge and confidence surveys. Statistically significant ($P < .001$) changes in confidence scores before and after bootcamp were found in 16 of 17 areas (Figure 1), with an average increase in confidence of 34.4 points with a 95% confidence interval of 28.5 to 40.2 (Table 1). The largest increases in reported confidence levels were related to operating a fiberoptic scope and performing needle decompressions and cricothyrotomies. See Table 1 for complete results.

In addition to higher confidence levels, residents had statistically significant ($P < .001$) increases in knowledge scores for 12 of 20 questions (Figure 2). Before the bootcamp, residents answered an average of 8 of 20 questions correctly (40%) (Table 2). Immediately after the bootcamp, the average number of correct responses was 19 of 20 (95%), with the largest increase in knowledge scores related to the rapid infuser, intubating laryngeal mask airway, central venous line flow rates, and items stocked in the crash cart. See Table 2 for complete results.

Fourteen of 21 (66.6%) PGY3 residents completed the postbootcamp evaluation. All (100%) respondents agreed/strongly agreed that the event's objectives were met and the learning experience was valuable. Further, all indicated their belief that the bootcamp would improve their performance in an actual clinical setting and improve their teamwork and communication skills. Most (93%) found the debriefing and feedback to be valuable, with 1 respondent indicating that he/she was neutral. All respondents agreed that the length of time for the event and the debriefing/feedback was appropriate and that they would recommend the event to others. Positive comments included residents highlighting the usefulness of "all the hands-on learning with equipment" and "the practical didactics and the sim cases," in addition to describing the bootcamp as "Very, very helpful!" No negative feedback was conveyed. Finally, several respondents had suggestions for improvements for future sessions, such as including content on bronchial blockers, discussing additional induction strategies, and incorporating "more sim stations."

Discussion

The successful implementation of an expanded and improved PGY3 senior trauma bootcamp demonstrated statistically significant improvements in both fundamental knowledge and self-confidence. These findings align with several previously discussed bootcamp-style educational offerings involving anesthesiology trainees[3,5,6,8,10,11] or components of trauma care.[12–17] To our knowledge, this is the first study combining various educational modalities in a bootcamp format aiming to prepare PGY3 anesthesiology trainees for taking senior trauma call.

Flipped classroom and interactive lectures in combination with immersive, procedural, and AR simulations significantly increased PGY3 anesthesiology residents' knowledge and confidence levels related to the various aspects of trauma patient care and taking senior trauma call. The confidence improvements were particularly evident related to operating a fiberoptic scope, performing a needle decompression, and performing a cricothyrotomy. Overall improvement of knowledge, measured by a follow-up test given immediately after each bootcamp, showed the largest knowledge increases related to the rapid infuser, intubating laryngeal mask airways, flow rates of central venous lines, and items stocked in crash carts. A significant increase in confidence was not seen in relation to operating a defibrillator nor in several items on the knowledge questionnaire, including the location for needle decompression, putting the defibrillator into manual mode, and several questions related to transfusion reactions. Reasons for the lack of statistical increase in confidence in these areas could include the need to spend additional time covering these topics or that they are not appropriate for inclusion in a bootcamp-style format.

In addition to an objective increase in confidence and knowledge levels, residents perceived that the experience would improve the care they delivered in the clinical setting. Components from this trauma bootcamp can be adapted for other anesthesiology residencies and specialties that care for trauma patients, such as

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emergency medicine, critical care, and surgery. Additionally, our findings suggest there may be utility in implementing bootcamp-style education for upper-level anesthesiology residents.

This study has several limitations. First, although the sample included all PGY3 anesthesiology residents at UAB, generalizability is limited due to the small sample size, single site, and questionnaire items related to institutional knowledge. Future studies expanding on this work would benefit from a larger sample from multiple institutions and inclusion of knowledge and confidence questions that are more widely applicable. Second, while two authors (E.B. and L.A.R.) have formal training and experience with survey design and deployment, the questionnaires used in this study were not analyzed for internal consistency nor were they previously validated, which, if established, would strengthen the validity of findings. Third, because the confidence and knowledge questionnaires were completed by participants at the beginning of the bootcamp day, residents were already exposed to flipped classroom-style educational content presented before that day. As such, change in knowledge and confidence surrounding topics initially covered using the flipped-classroom approach may have been more limited than if there had been an assessment before any content delivery. Fourth, given that the knowledge questionnaire was administered on the morning of the bootcamp, participants were attuned to what information they may need to retain for any follow-up testing, making them more likely to listen for and retain that information short term. Further, because there was not a delayed retest, the short-term knowledge gains do not demonstrate if knowledge retention was achieved. Fifth, while this study demonstrated improved learner confidence, authors were unable to assess competence. Outcomes here do not necessarily reflect any change in clinical performance or retention of knowledge over time. A better future approach would be to deploy validated prebootcamp questionnaires and measure confidence and competence on associated skills before and immediately after the educational interventions in addition to incorporating a delayed retest. This would indicate if any change in clinical performance occurred and if changes in those skills, and knowledge and confidence levels, were sustained over time. Sixth, this study used a convenience sample of a single class of anesthesiology residents. Ideally, education would have included other types of medical providers, such as nurses and surgeons, with whom the anesthesiology residents will be working when caring for trauma patients. Future studies would benefit from this interprofessional approach.

In conclusion, the present study suggests that a trauma-specific bootcamp incorporating experiential, flipped-classroom education increases both the knowledge and confidence levels of PGY3 anesthesiology trainees, aligning with previous findings.[1,12] Additional studies are needed to examine objective measures of skill improvement and skill and knowledge retention. This work provides a foundation on which additional bootcamp-style educational activities involving senior trainees or trauma content can be built for numerous specialty areas.

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Abstract

Background: Bootcamp-style education involves short, intense educational sessions and is a proven educational modality in anesthesia medical education. However, rarely has it been used with senior anesthesiology residents and never in exposing these residents to a curriculum aimed at care of the trauma patient. The purpose of this study was to design and implement an experiential bootcamp to prepare anesthesiology residents to take senior trauma call at a Level 1 trauma center in the Southeastern United States.

Methods: Before taking senior trauma call, 21 postgraduate year 3 anesthesiology residents took part in an 8-hour trauma bootcamp that combined flipped classroom-style education with immersive, procedural, and augmented reality simulation facilitated by subject matter experts. Before and after the bootcamp, residents completed 17-item confidence and 20-item knowledge questionnaires developed by the study authors. Results were compared before and after the bootcamp to determine overall change in confidence and knowledge levels pertaining to caring for trauma patients and taking senior trauma call. Additionally, residents completed an evaluation measuring their perceptions of the benefit of the educational offering.

Results: Statistically significant increases were seen in 16 out of 17 confidence questions ($P < .001$) and 12 out of 20 knowledge questions ($P < .001$). Additionally, respondents indicated that they found the content to be valuable and likely to improve their care delivery within the clinical setting.

Conclusions: Following this bootcamp, postcourse surveys demonstrated that residents' knowledge and confidence increased significantly through simulation combined with a flipped-classroom approach in preparation for senior trauma call.

Keywords: Bootcamp, trauma, anesthesia, simulation

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Figures

Figure 1. *Confidence survey. All are statistically significant* (P < .001) *except item 12.*

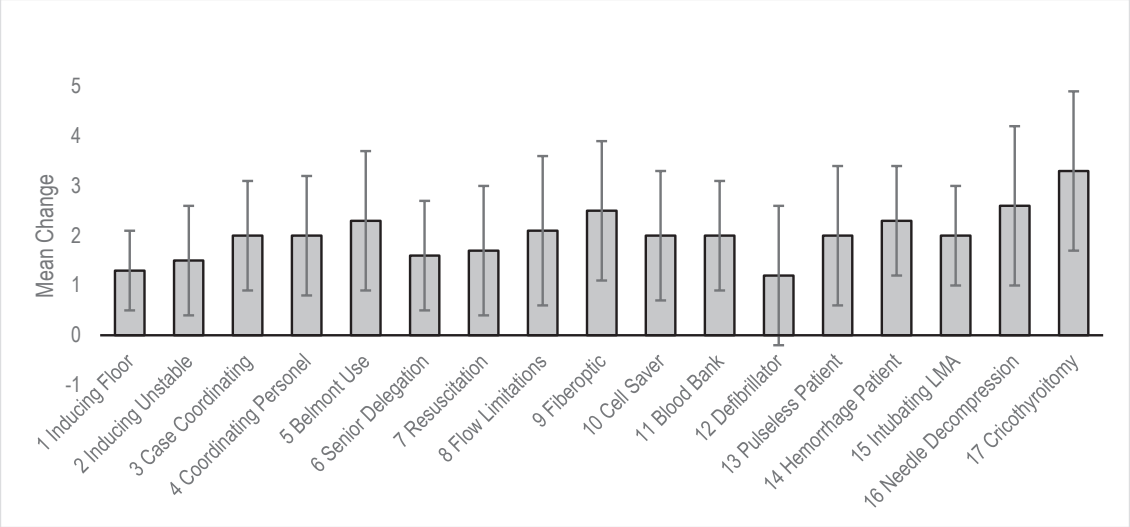
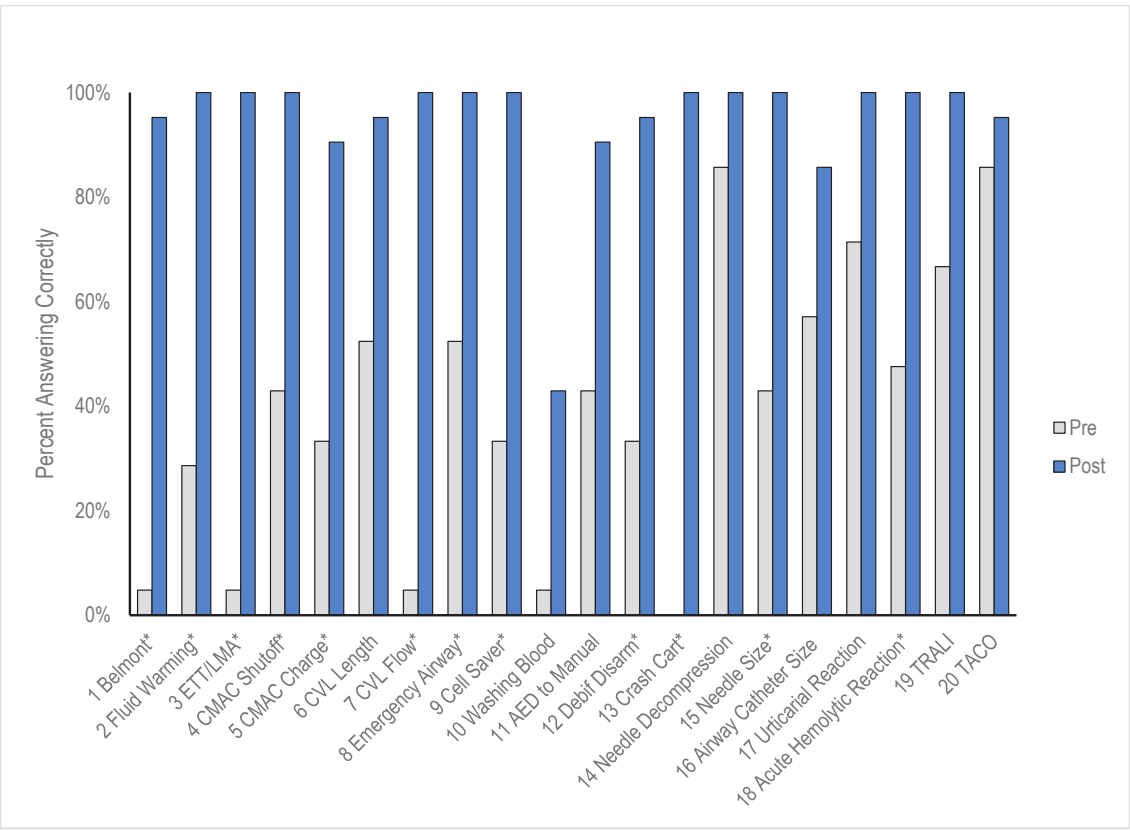


Figure 2. *Knowledge questionnaire. An asterisk (*) indicates statistical significance* (P < .001).



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Tables

Table 1. *Collective Change in Confidence Levels*[a]

Confidence Questions[b]	Change		*P* Value
	Mean (SD)	Minimum, Maximum[c]	
I am confident in my ability to be the primary physician inducing a patient during a floor airway.	1.3 (0.8)	−0.2, 3	<.001
I am confident in the use of alternative induction strategies in the hemodynamically unstable patient.	1.5 (1.1)	−0.3, 3	<.001
I am confident in my role as a trauma senior in case coordination and OR Board Management.	2 (1.1)	0.1, 4	<.001
I am confident in my ability to coordinate anesthetic personnel as the trauma senior.	2 (1.2)	0.5, 5	<.001
I am confident in my ability to independently use the rapid infuser.	2.3 (1.4)	0, 4.6	<.001
In an OR trauma case, I understand my role as trauma senior as well as the delegation of roles to other anesthesia providers.	1.6 (1.1)	−0.9, 4	<.001
I am confident in my understanding of the current guidelines for trauma resuscitation.	1.7 (1.3)	−1.1, 4.1	<.001
I am confident in my understanding of flow limitations and variations of CVLs and PIVs.	2.1 (1.5)	−0.4, 5.2	<.001
I am confident in my ability to independently operate the fiberoptic cart.	2.5 (1.4)	−1.5, 5.2	<.001
I am comfortable with my understanding of when and how to use cell saver.	2 (1.3)	0, 4.9	<.001
I am confident in my understanding of Blood Bank resources and protocols related to trauma cases.	2 (1.1)	0.1, 4.1	<.001
I am confident in my ability to independently operate a defibrillator.	1.2 (1.4)	−2.5, 3.5	.001
I am confident in my ability to be the primary physician in the care of a pulseless trauma patient.	2 (1.4)	0, 5	<.001
I am confident in my ability to be the primary physician in the care of a trauma patient in hemorrhage shock with DIC.	2.3 (1.1)	0.5, 4.3	<.001
I am confident in my ability to independently secure an airway with an intubating LMA.	2 (1)	−0.6, 3.5	<.001
I am confident in my ability to perform a needle decompression.	2.6 (1.6)	−0.6, 6	<.001
I am confident in my ability to perform a cricothyrotomy.	3.3 (1.6)	−0.3, 6	<.001

Abbreviations: SD, standard deviation; OR, operating room; CVL, central venous line; PIV, peripheral intravenous catheter; DIC, disseminated intravascular coagulation; LMA, laryngeal mask airway.

[a] Measured on a 7-point Likert scale to the tenth of a point, with 1 being strongly disagree and 7 being strongly agree.

[b] Full questions can be found in Appendix A.

[c] Minimum and maximum refer to smallest and largest changes in individual confidence levels.

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Table 2. *Change in Knowledge Levels*[a]

Question	Percent Answering Correctly			*P* Value
	Before	After	Change	
What size is the reservoir holder on the rapid infuser?	4.8%	95.2%	90.5%	<.001
What is the minimum rate needed to warm fluids through the rapid infuser?	28.6%	100.0%	71.4%	<.001
What is the maximum size endotracheal tube that will fit through a size 4.5 Air-Q LMA?	4.8%	100.0%	95.2%	<.001
The CMAC display screen will shut off automatically after how many minutes?	42.9%	100.0%	57.1%	<.001
How many hours does it take to fully charge the CMAC battery?	33.3%	90.5%	57.1%	<.001
What is the length of the 9 French double lumen CVL?	52.4%	95.2%	42.9%	.002
What is the flow rate on the distal lumen of the 9 French CVL catheter?	4.8%	100.0%	95.2%	<.001
What emergency airway kit is located in the anesthesia trauma bag?	52.4%	100.0%	47.6%	<.001
Which of the following is an absolute contraindication to using cell saver?	33.3%	100.0%	66.7%	<.001
The process of washing blood reduces the amount of which of these?	4.8%	42.9%	38.1%	.004
On the LifePak 20e defibrillator, pressing which of the below buttons will not get the defibrillator out of AED and into manual mode?	42.9%	90.5%	47.6%	.001
On the LifePak 20e defibrillator, pressing which of these buttons will not disarm the defibrillator?	33.3%	95.2%	61.9%	<.001
Which of these items is routinely stocked in our institution's crash carts?	0.0%	100.0%	100.0%	<.001
A patient comes to the trauma bay with a tension pneumothorax, where should you needle decompress the patient?	85.7%	100.0%	14.3%	.072
What is the minimum size angiocatheter or needle needed to perform needle decompression?	42.9%	100.0%	57.1%	<.001
What is the internal diameter of the catheter for the emergency airway kit located in the anesthesia trauma bag?	57.1%	85.7%	28.6%	.040
Which of the following is the best way to prevent urticarial reactions in patients with no history of such reactions?	71.4%	100.0%	28.6%	.008
Which of the following is the most common presenting symptom of an acute hemolytic transfusion reaction?	47.6%	100.0%	52.4%	<.001
Which of the following measurements in the recipient is part of the diagnostic criterion for TRALI according to the NHSN Hemovigilance Protocol?	66.7%	100.0%	33.3%	.004
TACO is commonly associated with which of the following?	85.7%	95.2%	9.5%	.293

Abbreviations: CMAC, type of video laryngoscope; CVL, central venous line; LifePak 20e, type of defibrillator; TRALI, transfusion-related acute lung injury; NHSN, National Health Safety Network; TACO, transfusion-associated circulatory overload; AED, automated external defibrillator.

[a] Measured with multiple-choice answers that can be found in Appendix B.

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Appendices

Appendix A. Confidence Questionnaire

Please answer the questions below based on how you feel about your applicable abilities AT THIS MOMENT in time.

1. I am confident in my ability to be the primary physician inducing a patient during a floor airway.
2. I am confident in the use of alternative induction strategies in the hemodynamically unstable patient.
3. I am confident in my role as a trauma senior in case coordination and operating room Board Management.
4. I am confident in my ability to coordinate anesthetic personnel as the trauma senior.
5. I am confident in my ability to independently use the rapid infuser (Belmont).
6. In an OR trauma case, I understand my role as a trauma senior as well as the delegation of roles to other anesthesia providers.
7. I am confident in my understanding of the current guidelines for trauma resuscitation.
8. I am confident in my understanding of flow limitations and variations of central venous lines and peripheral intravenous catheters.
9. I am confident in my ability to independently operate the fiberoptic cart.
10. I am comfortable with my understanding of when and how to use cell saver.
11. I am confident in my understanding of Blood Bank resources and protocols related to trauma cases.
12. I am confident in my ability to independently operate a defibrillator.

All questions were answered using a slide bar and 7-point Likert scale recording responses to the tenth of a point, with 1 being strongly disagree and 7 being strongly agree.

Appendix B. Knowledge Questionnaire

The single asterisk (*) denotes institution-specific questions. Two asterisks (**) denote the correct answer.

1. What size is the reservoir holder on the Belmont rapid infuser?*
   a. 2 L
   b. 3 L**
   c. 4 L
   d. 5 L
2. What is the minimum rate needed to warm fluids through the Belmont rapid infuser?
   a. 2.5 mL/min
   b. 5 mL/min
   c. 10 mL/min**
   d. 20 mL/min
3. What is the maximum size endotracheal tube that will fit through a size 4.5 Air-Q laryngeal mask airway?
   a. 7.0 mm
   b. 7.5 mm
   c. 8.0 mm
   d. 8.5 mm**
4. The CMAC display screen will shut off automatically after __ minutes.
   a. 2
   b. 5
   c. 10**
   d. 15
5. How many hours does it take to fully charge the CMAC battery?
   a. 3**
   b. 4
   c. 5
   d. 6
6. What is the length of the 9 French double lumen central venous line?
   a. 10 cm
   b. 10.5 cm
   c. 11 cm
   d. 11.5 cm**

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Appendices *continued*

7. What is the flow rate on the distal lumen of the 9 French catheter?
   a. 10 L/h
   b. 15 L/h
   c. 20 L/h
   d. 30 L/h**
8. What emergency airway kit is located in the anesthesia trauma bag?*
   a. Emergency transtracheal airway catheter
   b. Cuffed emergency cricothyrotomy catheter
   c. Uncuffed emergency cricothyrotomy catheter**
   d. There is not an emergency airway kit in the trauma bag
9. Which of the following is an ABSOLUTE contraindication to using cell saver?
   a. Use of fibrin glue during surgery**
   b. Active infection
   c. Malignancy
   d. Jehovah's Witness
10. The process of washing blood reduces the amount of _____.
    a. Red blood cells
    b. Plasma components
    c. Fibrinogen
    d. Platelets**
11. On the LifePak 20e defibrillator, pressing which of these buttons will NOT get the defibrillator <u>out</u> of automated external defibrillator and <u>into</u> manual mode?
    a. Lead
    b. Pacer
    c. Energy Select
    d. Sync**
12. On the LifePak 20e defibrillator, pressing which of these buttons will NOT disarm (cancel the charge) of the defibrillator?
    a. Pressing the speed dial
    b. Changing the lead view**
    c. Doing nothing for 60 seconds
    d. Changing the energy
13. Which of these items is routinely stocked in University of Alabama at Birmingham's crash carts?*
    a. Laryngeal mask airway
    b. Cricothyrotomy kit
    c. Central venous line kit**
    d. Intraosseous kit
14. A patient comes to the trauma bay with a tension pneumothorax, where should you needle decompress the patient?
    a. Above the rib at the second intercostal space in the mid-clavicular line**
    b. Above the rib at the third intercostal space in the mid-clavicular line
    c. Below the rib at the second intercostal space in the mid-clavicular line
    d. Below the rib at the third intercostal space in the mid-clavicular line
15. What size angiocatheter or needle is needed to perform needle decompression?
    a. 14 gauge
    b. 16 gauge**
    c. 18 gauge
    d. 20 gauge
16. What is the internal diameter of the catheter for the emergency airway kit located in the anesthesia trauma bag?*
    a. 5 mm
    b. 6 mm**
    c. 7 mm
    d. 8 mm
17. Uticarial reactions are one of the most common reactions seen with the transfusion of blood components. Which of the following is the best way to prevent uticarial reactions in patients with no history of such reactions?
    a. Premedicate with acetaminophen
    b. Premedicate with diphenhydramine
    c. Premedicate with prednisone
    d. Premedicate with acetaminophen and diphenhydramine
    e. No treatment is necessary**

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Appendices *continued*

18. Which of the following is the most common presenting symptom of an acute hemolytic transfusion reaction?
    a. Fever**
    b. Hypotension
    c. Oliguria
    d. Flank pain
    e. Rigors
19. Which of the following measurements in the recipient is part of the diagnostic criterion for transfusion-related acute lung injury according to the National Health Safety Network's Hemovigilance Protocol?
    a. Antiheparin/platelet factor 4 antibodies are detected
    b. Increased B-natriuretic peptide
    c. Normal troponin levels
    d. PaO2/FiO2 ≤ 300 mmHg**
20. Transfusion-associated circulatory overload is commonly associated with which of the following?
    a. Anti-human neutrophil antigen antibodies
    b. Anti-IgA antibodies
    c. Leukopenia
    d. Electrocardiographic changes
    e. Pulmonary edema**

Appendix C. Satisfaction Survey

	Strongly Disagree	Agree	Neutral	Disagree	Strongly Disagree
1. The objectives for this event were met	1	2	3	4	5
2. The learning experience was valuable	1	2	3	4	5
3. This debriefing and/or feedback was valuable	1	2	3	4	5
4. This experience will improve performance in actual clinic setting	1	2	3	4	5
5. I would recommend this even to others	1	2	3	4	5
6. The teamwork/communication objective was met	1	2	3	4	5
7. My teamwork/communication skills improved because of this experience	1	2	3	4	5
8. The length of time for this event was appropriate	Agree		Disagree, too short		Disagree, too long
9. The length of time for the debriefing and/or feedback was appropriate	Agree		Disagree, too short		Disagree, too long
10. Two things I liked/learned					
11. Two things I wish we had focused on or that could be improved					
12. Comments/suggestions/recommendations					