

# Hemorrhage-Control Training in Medical Education

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## ABSTRACT

**OBJECTIVES:** To evaluate and analyze the efficacy of implementation of hemorrhage-control training into the formal medical school curriculum. We predict this training will increase the comfort and confidence levels of students with controlling major hemorrhage and they will find this a valuable skill set for medical and other healthcare professional students.

**METHODS:** After IRB and institutional approval was obtained, hemorrhage-control education was incorporated into the surgery clerkship curriculum for 96 third-year medical students at the University of Arkansas for Medical Sciences using the national Stop The Bleed program. Using a prospective study design, participants completed pre- and post-training surveys to gauge prior experiences and comfort levels with controlling hemorrhage and confidence levels with the techniques taught. Course participation was mandatory; survey completion was optional. The investigators were blinded as to the individual student's survey responses. A knowledge quiz was completed following the training.

**RESULTS:** Implementation of STB training resulted in a significant increase in comfort and confidence among students with all hemorrhage-control techniques. There was also a significant difference in students' perceptions of the importance of this training for physicians and other allied health professionals.

**CONCLUSION:** Hemorrhage-control training can be effectively incorporated into the formal medical school curriculum via a single 2-hour Stop The Bleed course, increasing students' comfort level and confidence with controlling major traumatic bleeding. Students value this training and feel it is a beneficial addition to their education. We believe this should be a standard part of undergraduate medical education.

**KEYWORDS:** Stop the Bleed, B-Con, hemorrhage control, medical education, tourniquet training

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## Introduction

Stop The Bleed (STB) is a public health initiative focused on hemorrhage control training for the masses, with the goal of reducing preventable deaths from traumatic injuries.<sup>1,2</sup> The program provides individuals with the skills and basic tools to stop uncontrolled bleeding in an emergency situation using military-grade tourniquets and basic hemorrhage control techniques. These techniques can be applied during mass casualty events and real-world situations encountered during everyday life.<sup>3</sup>

Motivated by the Sandy Hook Elementary School shooting, in April 2013, the Joint Committee to Create a National Policy to Enhance Survivability from Intentional Mass Casualty and Active Shooter Events was convened by the American College of Surgeons (ACS) in collaboration with leaders from law enforcement, the federal government, and the medical community. The Committee was formed under the guidance and leadership of Lenworth M. Jacobs, Jr., a trauma surgeon and Professor of Surgery at the University of Connecticut School of Medicine. The Committee's primary task was to create a protocol for a national policy to enhance

survivability from active shooter and intentional mass casualty events. The committee's recommendations consist of 4 reports that are collectively known as the Hartford Consensus.<sup>4-7</sup> People injured during these events often have severe bleeding and if this bleeding is left uncontrolled, results in high rates of preventable death.<sup>4,8</sup> The participants of the Hartford Consensus concluded that by providing first responders (law enforcement) and civilian bystanders with the skills and tools needed to stop uncontrolled bleeding, lives could be saved.<sup>9</sup> This response sparked the Stop the Bleed (STB) campaign.

STB incorporated recommendations from the Hartford Consensus, the American College of Surgeons Committee on Trauma (ACS-COT), the Committee on Tactical Combat Casualty Care (TCCC), and the National Association of Emergency Medical Technicians (NAEMT) into a simple educational program that anyone can utilize to provide immediate, frontline aid until first responders arrive, thereby reducing the amount of time lost between "point-of-injury" and first medical intervention. It is within this gap where lives can be saved.



To fill this gap, we proposed a structured plan to incorporate hemorrhage control education into the formal medical school curriculum, so that all graduating medical students are comfortable and facile with basic hemorrhage control techniques. In doing so, we aimed to create a network of qualified individuals who have the skills to control life-threatening hemorrhage and will serve as leaders in their communities during times of crisis. By directing the flow of care and triaging limited civilian resources in a coordinated and effective way prior to the arrival of emergency response personnel, physicians and other health-care providers can have a unique and significant impact on decreasing the preventable mortality rate, which is the primary goal of the Stop The Bleed program. Examples of educational programs similar to this have been offered and implemented at other medical schools<sup>10-14</sup> across the country, however evidence is lacking in implementation strategies from these institutions, as well as data presenting learners' perspectives about the STB program and its relevance for all graduating medical students.

In Arkansas, hemorrhage-control education began in December 2013, with the goal of training non-traditional police and fire personnel, and pre-hospital emergency medical services. In 2017, the University of Arkansas for Medical Sciences (UAMS) began to focus efforts on educating and training healthcare professionals across all fields. In any scenario involving injured or bleeding patients, the public will naturally gravitate to those with a medical background for guidance and direction on how to respond. Anyone with a background in healthcare, but especially physicians, by virtue of their profession, will be a resource the public depends upon for help. Unfortunately, outside of those with a surgical or emergency medicine background, there exists a gap in current graduate and undergraduate medical education regarding how to manage potentially life-threatening hemorrhage. This was the primary impetus for us to implement the program at our institution.

For the current study, our objectives were 5-fold: (1) incorporate training in hemorrhage control techniques based on the national Stop the Bleed program into the surgery clerkship curriculum for 3rd year medical students at the University of Arkansas for Medical Sciences (UAMS); (2) evaluate the value of the educational program in terms of knowledge gained and assess trainees' perceptions about the relevance and practicality of the curriculum content for medical professionals; (3) demonstrate this training can provide the confidence necessary for a trainee of any background or interest-level to use life-saving hemorrhage control techniques effectively; (4) assess participants' opinions about the utility of incorporating a bleeding control curriculum into other allied health professional schools; and (5) provide a framework for how and when to integrate training in hemorrhage control techniques into existing curriculum.

## Material and Methods

After IRB and institutional approval, the UAMS Department of Surgery implemented hemorrhage control training into the surgery clerkship curriculum for third-year medical students.

The educational materials used for this course were based on the national Stop The Bleed program's Bleeding Control Basic Course 1.0, the official curriculum of the Stop the Bleed campaign at the time, which was a collaborative effort of the American College of Surgeons Committee on Trauma and the Hartford Consensus.<sup>2,4-10</sup> All utilized educational material and resources can be found at on the Stop the Bleed website.<sup>15</sup> Students participated in a 2-hour program which consisted of didactic and hands-on instruction from a board-certified acute care surgeon assisted by additional certified instructors with an approximate 7-to-1 student to instructor ratio. Students were taught and practiced various hemorrhage-control techniques, including the proper use and application of extremity tourniquets, methodology for the application of direct pressure on a bleeding wound, and basic wound packing techniques, with the goal of stopping or limiting life-threatening exsanguination.

With motivated physician faculty leadership and a few basic course resources such as tourniquets, mannequins, and packing gauze, it was feasible to implement the course into our curriculum. Specifically, resources that were essential in the implementation of this course included a Stop The Bleed course director to administer and teach the course, an outreach and education coordinator to help facilitate instruction sessions and students, as well as a large pool of certified co-instructors to call upon in order to maintain a student to instructor ratio of 7-to-1 without placing a burden on any one group of people. As we are a large, academic, medical institution, many of these resources were met using individuals that we had at our disposal. Our Stop The Bleed course director is an experienced faculty member in the department of surgery, our outreach and education coordinator is a nursing researcher in the division of trauma, and our pool of co-instructors were volunteers and was comprised of recruited medical students, nurses, fellow physicians, and other healthcare professionals who had taken the course and been trained themselves.

Much of the cost associated with implementing a course of this magnitude is also mitigated by the aspect of this course being taught at a large, academic, medical institution. With the positions of the course director and the outreach and education coordinator already being funded through the institution, and the pool of co-instructors acting on a volunteer basis, the personnel required for the endeavor comes at no additional cost. Additionally, the facilities necessary to facilitate a course of this size can easily be done with no extra cost by using rooms appropriate for size within the institution. A majority of the cost incurred through this program was related to supplies for teaching such as STB training kits and extra tourniquets. With a goal of teaching approximately 50 students at any 1 time, our cost for supplies was approximately \$4000 as a 1-time-fee as the supplies procured can be reused for subsequent courses. If this funding is not readily available as was the case at our institution, funds can be acquired through grants or other means of attainable funding. Ultimately, it is important to ascertain the appropriate resources and supplies necessary to achieve an edu-

**Table 1.** Pre-/post-survey  $\chi^2$  tests for goodness of fit analysis.

VARIABLE	PRE-SURVEY (N=96) (%)	POST-SURVEY (N=96) (%)	P-VALUE
Control bleeding	4.25	92.71	<.0001*
Place a tourniquet	7.45	100	<.0001*
Pack a bleeding wound	17.14	98.96	<.0001*
Applying direct pressure	37.93	98.96	<.0001*
Physicians to receive training	95.7	98.96	.03*
Other health professionals to receive training	91.49	97.92	.0001*
Incorporate into medical school curriculum	97.9	100	.21

Data represents students marking 4 or 5 on a Likert scale (1-5) on comfort, confidence, or importance level.

\*Statistically significant.

cational program robust enough to withhold a suitable hemorrhage-control training.

Participation in this course was mandatory as part of the didactic curriculum for the MS3 surgery clerkship but had no impact on the students' overall grade. Completion of the pre- and post-surveys was optional, but students were encouraged to complete surveys for the benefit of this study. All survey items were designed by the course director and a doctoral educator who has extensive survey design and course evaluation experience. Each student was invited to complete an anonymous hard-copy paper survey about their prior experiences with hemorrhage control techniques immediately before the training, and a post-training survey about their comfort/confidence levels with applying these techniques immediately after completion of the course. Students also completed a 10-item knowledge quiz (see Appendix A) immediately after course completion to gauge the efficacy of our teaching and the students' comprehension of the material.

We prospectively analyzed the pre- and post-training surveys (see Appendices B and C) of 96 third-year medical students who completed the educational program between May of 2018 and January of 2019. The educators were blinded as to the individual student's survey responses and student-generated ID codes were used as tracking tool to link pre- and post-surveys.

Survey items for comfort, confidence, and importance were rated on a Likert-type scale ranging from 1 to 5 with 1 indicating no comfort, confidence, or importance and 5 indicating very comfortable, confident, or important. To compare pre-post responses on these items, responses were collapsed into dichotomous groups representing those who responded a 4 or 5 versus those who responded a 1, 2, or 3 (not confident, comfortable, or important). Using JMP Pro (Cary, NC),  $\chi^2$  tests were then used to compare the distribution of responses for pre- versus post improvements. Statistical significance was set at  $\alpha=0.05$  for all analyses.

## Results

Of the third-year medical students who completed the educational program between May of 2018 and January of 2019, 96 completed the surveys, resulting in a 75% response rate. Table 1 presents the results comparing pre- and post-survey responses for comfort, confidence, and importance ratings.

As shown in Table 1, there were significant improvements in students' pre- and post-survey levels of comfort and confidence with controlling bleeding, and for all hemorrhage-control techniques, including the ability to place a tourniquet, pack a bleeding wound, and apply direct pressure. The pre- and post-survey percentages were also significantly different for whether students thought it was important for physicians to receive STB training, and if it was important for other allied healthcare professionals to receive STB training. The majority of respondents also endorsed the importance of including hemorrhage-control education in the medical school curriculum on both pre- (97.9%) and post-tests (100%). Additionally, after the training had been completed, approximately 2/3 of students (65/96) expressed an interest in becoming an STB instructor. The mean percent correct on the post-training knowledge quiz was 96.7%.

Furthermore, we analyzed the willingness of students to intervene, as well as any potential reluctances to intervene. Prior to the training, 88.5% (85/96) of students stated that they would be willing to try and control the bleeding if they saw someone with life-threatening hemorrhage. Following the training, 100% (96/96) of students stated that they would be willing to intervene in this same situation. Of the students that reported apprehensions with intervening in life-threatening hemorrhage (21/96), 80.9% stated that their apprehension was due to lack of knowledge of what to do in order to control the bleeding.

In terms of when this educational curriculum should be incorporated during medical school, most students felt it should be offered in the preclinical years, 34.4% (33/96) prior to training, and 44.8% (43/96) after training, or during the

MS3 surgery clerkship, 61.5% (59/96) prior to training, and 54.1% (52/96) after training.

## Discussion

The implementation of hemorrhage control training in the MS3 surgery clerkship at UAMS was found to be easily and effectively incorporated into the formal medical school curriculum via a Stop The Bleed course that increased students' comfort level and confidence with controlling major traumatic bleeding. In this study, we observed very low pre-course rates of comfort and confidence among students in applying basic hemorrhage-control techniques to manage life-threatening hemorrhage, demonstrating that the current undergraduate medical education paradigm does not adequately prepare students to successfully manage these problems. Prior to the STB course, only 4% of medical students reported being confident with controlling bleeding: 7% with placing a tourniquet, 17% with packing a wound, and 38% with applying direct pressure to a bleeding wound. STB training provided students with significantly improved comfort and confidence in using life-saving hemorrhage-control techniques, and they overwhelmingly believe the training to be both relevant and needed for medical and other allied health professional students. Although we did not specifically ask the reasons that students changed their opinions about the utility of incorporating STB into the curriculum after the course, we have extrapolated that these future-physicians see themselves as frontline workers in their respective communities even if they may not be in the hospital or clinic. Coupling that with the increase in violence that has become prevalent in the world today, their opinions and our study results speak volumes about the necessity of incorporating formal hemorrhage-control training into undergraduate medical education and other allied health educational programs.

Previous work by Ross et al.<sup>16</sup> demonstrated that implementation of a short educational intervention can improve a civilians' self-efficacy and reported willingness to use a tourniquet in a medical emergency.<sup>16</sup> The widespread implementation of STB affords the opportunity to educate and empower the public to improve our local and national response to intentional and unintentional mass casualty events, which has shown to decrease preventable death rates.<sup>17</sup>

In Arkansas, utilizing the NAEMT Tactical Emergency Casualty Care for Law Enforcement Officers and First Responders (TECC-LEO) curriculum, all law enforcement and EMS providers in the state have been trained and it has shown tangible results. In the early morning hours of July 1, 2017, an active shooter incident took place at the Power Ultra Lounge in downtown Little Rock.<sup>18</sup> In total, 25 people were shot, and 3 others were injured while trying to flee the scene, but there were no casualties. Police at the scene used 5

tourniquets and 2 chest seals to save the lives of several injured civilians. Proper application of tourniquets by Little Rock Police Department officers was confirmed by EMS personnel and ED physicians at local area hospitals. The Little Rock Police Department Emergency Management Team after-action report is clear: if this incident happened prior to the implementation of hemorrhage-control training, some of the victims would have perished.<sup>18</sup>

As the Power Ultra Lounge incident demonstrates, the first responder program has been successfully implemented across the United States and in Arkansas. The next evolution of this program is to train civilian bystanders to provide point-of-injury care to traumatically injured patients, thereby narrowing the gap between injury and initiation of care even further. By doing so, we are creating a new category of providers: the "immediate-care" or "first-care" provider. The Division of Trauma and Acute Care Surgery at the University of Arkansas for Medical Sciences (UAMS) has taken an active role in this regard since 2016, along with Metropolitan Emergency Medical Services (MEMS), the primary EMS provider for the Little Rock area. Through courses taught in the community and at the UAMS campus, hundreds of members of the general public have been trained in these life-saving maneuvers. This public health outreach endeavor can be expanded on with the addition of future physicians that have been trained in hemorrhage control through STB via our program implementation. This can be seen by over half of the participating medical students stating their interest in becoming instructors for the course themselves. It is an asset that these future physicians have the capability to teach others life-saving hemorrhage control techniques, but also the addition of increasing the network of trained frontline providers has the potential to have a profound impact on outcomes in patients with pre-hospital life-threatening hemorrhage.

Based on the Arkansas Safe Schools Act (AR Code 6-15-1303) enacted in 2014, the next iteration of STB in Arkansas has been to train all public-school nurses throughout the state and include hemorrhage control training courses as elective continuing education units (CEU's) for state educators. Furthermore, it has instigated the imminent addition of Arkansas House Bill 1014 to include Stop the Bleed or NAEMT B-Con courses as a requirement for graduation from public schools.<sup>19</sup>

A potential limitation of this study could be caused by student response bias. Although this course was not counted toward the formal grade in the surgery clerkship, it still was a mandatory portion of the clerkship didactic curriculum. This concept was explained thoroughly as well as that taking the surveys following the course was completely optional, however this is not to say that some level of bias could not have been present from student responses regardless of appropriate disclosures.

Moving forward, we believe further work needs to be done regarding the long-term retention of STB skills and expanding the educational program into the curricula of other allied health professional schools. To improve retention, we propose that STB training should occur during the pre-clinical years of medical school, with the addition of a refresher course and formal re-assessment during the third year. Based on our initial experience, there is a high degree of enthusiasm and interest to implement STB training into other allied health professional schools as well. We have already successfully trained students in the Colleges of Public Health and Nursing at UAMS, with plans to incorporate this training into the Physician's Assistant Program in the near future. We feel strongly that this essential training should be a formal part of the curricula of all allied-health professional schools at our university and every health care institution across the country.

### Conclusion

From our study, we can conclude that hemorrhage-control education can be easily and effectively incorporated into the formal medical school curriculum via a single 2-hour Stop The Bleed course, increasing students' comfort level and confidence with controlling major traumatic bleeding. Students value this training and reported it was a beneficial addition to their education. We believe this should be a standard part of undergraduate medical education. Further work needs to be done to determine retention of these skills over time and if other allied health professional students will find it as beneficial to their education.

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### Author Contributions

AB and KWS conceived of the presented idea. CT, AP, and AB prepared and edited the surveys and quiz. JTG completed

the data entry. AB and KWS verified the analytical methods. KWS performed the analytic calculations. JTG presented the work at the 2019 Academic Surgical Congress. JTG and AB took the lead in drafting the manuscript. All authors discussed the results and contributed comments on the abstract and final manuscript.

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## Appendix A

**HEMORRHAGE CONTROL POST-TRAINING QUIZ**

(Please fill in all answer choices with a completed circle (•), NOT an X or a ✓)

1. What was the Hartford Consensus' primary conclusion?
  - Bringing doctors to the scene is the best way to save lives
  - By providing first responders and civilian bystanders the basic skills to stop uncontrolled bleeding, lives would be saved
  - Bystanders should wait for trained healthcare providers to arrive before providing aid to injured people
  - Transporting injured patients to a healthcare facility ASAP is the best way to save lives
  
2. Why is it important for immediate responders and civilians to render aid right away, rather than wait for trained healthcare providers to arrive?
  - So they can be the heroes and save the day
  - So they can practice and get comfortable with controlling life-threatening hemorrhage
  - Because delaying care allows more blood loss to occur – the patient may exsanguinate prior to EMS arriving
  - Because intervening quickly decreases infection rates
  
3. Before initiating the ABC's of bleeding, what is first and most important step?
  - Ensure your own safety
  - Get a weapon to protect yourself
  - Run away
  - Call 911
  
4. In the ABC's of bleeding, what does "A" stand for?
  - Airway – intubate the patient
  - Anxiety – run away/take a Xanax
  - Alarm – pull the fire alarm
  - Alert – call 911
  
5. In the ABC's of bleeding, what does "B" stand for?
  - Blast away – use a gun to defend yourself
  - Bleeding – find the source of bleeding
  - Breathing – check for chest rise and breath sounds
  - Bail out – run away and find cover
  
6. In the ABC's of bleeding, what does "C" stand for?
  - Call for help – dial 911 or scream out loud for help
  - Circulation – check a blood pressure
  - Car – put the person in your car and drive to the nearest ED
  - Compression – apply pressure to stop the bleeding
  
7. What is the most commonly recommended device and preferred tourniquet of the US Army?
  - C.A.T. tourniquet
  - SOFTT tourniquet
  - EMT™ tourniquet
  - the belt you are wearing
  
8. If bleeding is not controlled with one tourniquet, what is the next *BEST* step?
  - apply a 2<sup>nd</sup> tourniquet above the first one
  - apply a 2<sup>nd</sup> tourniquet below the first one
  - call for help
  - loosen the 1<sup>st</sup> tourniquet and re-tighten it
  
9. How do you know if a tourniquet is applied correctly?
  - Bleeding drops off to a slow ooze
  - The patient screams out loud says it is too tight
  - The tourniquet feels tight around the arm or leg
  - Bleeding stops and there is no palpable pulse in the affected extremity
  
10. If a tourniquet is not available, what is the best way to control bleeding from an open extremity wound?
  - Pack the wound and hold direct pressure
  - Try to grab the bleeding vessel by placing a clamp into the wound
  - Call 911
  - Stand on the affected extremity

Figure 1. Hemorrhage control post-training quiz.

Appendix B

**STOP THE BLEED PRE-TRAINING SURVEY**

The following is an anonymous, optional survey about bleeding and hemorrhage control. Your decision to complete the survey or not and your individual responses to the questions will have no impact on your clerkship grade, evaluations, or advancement through medical school into residency. This survey and a follow-up survey you will be asked to complete should take less than 10 minutes of your time. We sincerely appreciate your contribution to this work.

**Please fill in all answer choices with a completed circle (●), NOT an X or a √.**

**IMPORTANT: Please complete the first two items to allow us to pair your survey responses with a future survey you will receive.**

1. The first 4 letters of your mother’s maiden name (e.g. Smith = SMIT): \_\_\_\_ \_\_\_\_ \_\_\_\_ \_\_\_\_
2. The day of the month of your birth (range 01-31, if you were born on January 2, enter “02”): \_\_\_\_ \_\_\_\_
3. Are you planning to go into:     a surgical field or emergency medicine     a non-surgical field     Not sure yet
4. What is your prior experience with bleeding/hemorrhage control? *(select the one most applicable response)*  

No experience	Minimal basic first aid training	Formal training in hemorrhage control techniques	Have used hemorrhage control techniques on a live person
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. If you were involved in a mass casualty event tomorrow and saw someone with life-threatening hemorrhage from an amputated leg, would you try to control the bleeding?  

	Yes	No	I don't know
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. What is your reason(s) for **NOT** trying to control the bleeding? *(check all that apply)*  
 I would try to control the bleeding     I am afraid of bleeding/blood     I would just not want to get involved  
 I am unsure of what to do to control the bleeding     I am fearful I would “catch something” if I helped     Something else: \_\_\_\_\_
7. What is your comfort level with trying to control major traumatic bleeding (e.g. an amputated extremity)?  

Not comfortable (1)	Minimal comfort	Moderately comfortable	Comfortable	Very comfortable (5)
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. Have you ever placed a tourniquet on someone, either in training or real-life? .....  

	Yes	No
	<input type="radio"/>	<input type="radio"/>
9. Have you ever packed a wound to control bleeding? .....  

	<input type="radio"/>	<input type="radio"/>
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10. Have you ever held direct pressure on a wound to control bleeding? .....  

	<input type="radio"/>	<input type="radio"/>
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11. How confident are you in your ability to place a tourniquet on a bleeding person? .....  

	Not at all (1)	2	3	4	Very (5)
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. How confident are you in your ability to pack a bleeding wound? .....  

	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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13. How confident are you in your ability to control bleeding by holding direct pressure on a wound? .....  

	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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14. How important is it for you (i.e. physicians) to receive formal hemorrhage-control training? .....  

	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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15. How important is it for **other** health care professionals to receive formal hemorrhage-control training (e.g., RN’s, NP’s, PA’s, X-ray techs, dieticians, administrators)? .....  

	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
--	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------
16. How important is it to have hemorrhage-control kits available in public areas, as AEDs are? .....  

	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
--	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------
17. Should formal hemorrhage-control training be incorporated into the medical school curriculum? If so, when?  

It should not be taught during medical school	It should be optional	During the M1 or M2 year	During the 3 <sup>rd</sup> year surgery clerkship	During a 4 <sup>th</sup> year surgery elective
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Figure 2. Stop the bleed pre-training survey.

## Appendix C

**STOP THE BLEED POST-TRAINING SURVEY**

The following is an anonymous, optional survey about bleeding and hemorrhage control. Your decision to complete the survey or not and your individual responses to the questions will have no impact on your clerkship grade, evaluations, or advancement through medical school into residency. We sincerely appreciate your contribution to this work.

**Please fill in all answer choices with a completed circle (●), NOT an X or a ✓.**

**IMPORTANT: Please complete the first two items to allow us to pair your survey responses below with your prior survey responses.**

1. The first 4 letters of your mother's maiden name (e.g. Smith = SMIT): \_\_\_\_ \_\_\_\_ \_\_\_\_ \_\_\_\_
2. The day of the month of your birth (range 01-31, if you were born on January 2, enter "02"): \_\_\_\_ \_\_\_\_
3. Are you planning to go into:     a surgical field or emergency medicine     a non-surgical field     Not sure yet
4. What is your prior experience with bleeding/hemorrhage control? (*select the one most applicable response*)
 

No experience	Minimal basic first aid training	Formal training in hemorrhage control techniques	Have used hemorrhage control techniques on a live person
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Now that you have received formal training, if there was a mass casualty event tomorrow and you saw someone with life-threatening hemorrhage from an amputated leg, would you try to control the bleeding?
 

Yes	No	I don't know
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. What is your reason(s) for **NOT** trying to control the bleeding? (*check all that apply*)
 

<input type="radio"/> I would try to control the bleeding	<input type="radio"/> I am afraid of bleeding/blood	<input type="radio"/> I would just not want to get involved
<input type="radio"/> I am unsure of what to do to control the bleeding	<input type="radio"/> I am fearful I would "catch something" if I helped	<input type="radio"/> Something else: _____
7. Now that you have received formal training, what is your comfort level with trying to control major traumatic bleeding (e.g. an amputated extremity)?
 

Not comfortable (1)	Minimal comfort	Moderately comfortable	Comfortable	Very comfortable (5)
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. How confident are you in your ability to place a tourniquet on a bleeding person? .....
 

Not at all (1)	2	3	4	Very (5)
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. How confident are you in your ability to pack a bleeding wound? .....
 

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------
10. How confident are you in your ability to control bleeding by holding direct pressure on a wound? .....
 

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------
11. How important is it for you (i.e. physicians) to receive formal hemorrhage-control training? .....
 

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------
12. How important is it for **other** health care professionals to receive formal hemorrhage-control training (e.g., RN's, NP's, PA's, X-ray techs, dieticians, administrators)? .....
 

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------
13. How important is it to have hemorrhage-control kits available in public areas, as AEDs are? .....
 

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------
14. Should formal hemorrhage-control training be incorporated into the medical school curriculum? If so, when?
 

It should not be taught during medical school	It should be optional	During the M1 or M2 year	During the 3 <sup>rd</sup> year surgery clerkship	During a 4 <sup>th</sup> year surgery elective
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15. Did you find "Stop the Bleed" training useful?.....
 

<input type="radio"/> Yes	<input type="radio"/> No
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16. Do you have any interest in becoming a Stop the Bleed Instructor?.....
 

<input type="radio"/> Yes	<input type="radio"/> No
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Figure 3. Stop the bleed post-training survey.