The American Journal of Surgery 220 (2020) 245–248

Contents lists available at ScienceDirect

The American Journal of Surgery

journal homepage: www.americanjournalofsurgery.com

Stop the bleed: The impact of trauma first aid kits on post-training confidence among community members and medical professionals

Erin G. Andrade*, Jane M. Hayes, Laurie J. Punch

Department of Surgery, Washington University in St. Louis School of Medicine, St. Louis, MO, USA

ARTICLE INFO

Article history:
Received 2 October 2019
Received in revised form
16 November 2019
Accepted 18 November 2019

Keywords:
Hemorrhage
Tourniquet
Stop the bleed
Education
Trauma first aid kit

ABSTRACT

Introduction: Bystander training to control life-threatening hemorrhage is an important intervention to decrease preventable trauma deaths. We asked if receiving a trauma first aid (TFA) kit in addition to Bleeding Control (BC) 1.0 training improves self-reported confidence among community members (CM) and medical professionals (MP).

Methods: Anonymous pre- and post-course surveys assessed exposure to severe bleeding, BC knowledge, and willingness to intervene with and without TFA kits. Surveys were compared using chi-squared tests.

Results: 80 CM and 60 MP underwent BC training. Both groups demonstrated improved confidence in their ability to stop severe bleeding after the class; however, post-class confidence was significantly modified by receiving a TFA kit. After training, CM confidence was 36.1% without versus 57.0% with a TFA kit($p = 0.008$) and MP confidence was 53.8% without versus 87.6% with a TFA kit($p = 0.001$).

Conclusion: Receiving a TFA kit was significantly associated with increased post-training confidence among CM and MP.

Summary: Stop the Bleed training improves confidence in stopping severe bleeding among both medical professionals and community members. By providing participants with a trauma first aid kit, post-class confidence improves significantly regardless of medical training.

Introduction

Injury is the leading cause of death in individuals age 1–44 in the United States.[1] Hemorrhage is the leading cause of preventable trauma death.[2] Tourniquet application has been shown to decrease death rates from extremity vascular injuries in both the military and civilian setting.[3,4] However, the survival benefit of tourniquet use is predicated by application prior to onset of shock.[5] The average time for an ambulance to arrive on scene varies from 7.7 min in urban areas to 14.5 min in rural areas.[6] Thus, bystander ability to control life-threatening hemorrhage is an important area for intervention to decrease preventable trauma deaths. Bleeding Control (BC) 1.0 training has been shown to effectively teach tourniquet application to laypersons with 88% of participants correctly applying a tourniquet after a one -hour course.[7]

The American College of Surgeons BC presentation includes slides that direct participants to a website where personal bleeding control kits can be purchased for a cost ranging from $69-$99.[8] While many participants report they intend to purchase a tourniquet after taking the course, less than 20% actually purchase one, citing time and cost as barriers.[9] In order to ensure that our participants had the necessary equipment to employ the skills they learned in our courses, we provided all participants with low cost, self-assembled trauma first aid (TFA) kits that included comparable items to the more expensive bleeding control kits.[10] We hypothesized that access to TFA kits would increase post-training confidence and that this effect would be more pronounced in community members (CM) than among medical professionals (MP).

Methods

BC courses were conducted in the community and on our medical campus between March and June of 2018. Certified BC instructors gave the standardized slide presentation and hands-on demonstrations of tourniquet and pressure dressing use as per the standards set by the ACS BC 1.0 course. Assistant instructors were

* Corresponding author. 9901 Wohl Hospital, Campus Box 8109, 660 South Euclid Avenue, St. Louis, MO, 63110, USA.
E-mail addresses: andradee@wustl.edu (E.G. Andrade), janehayes@wustl.edu (J.M. Hayes), ljpunch@wustl.edu (L.J. Punch).

https://doi.org/10.1016/j.amjsurg.2019.11.028
0002-9610/

used to maintain a 1:5 instructor to student ratio for the hands-on portion of the course. An anonymous pre-course survey was given to all adult participants to assess personal exposure to gun violence, knowledge of bleeding control techniques, and willingness to intervene in a bleeding emergency. Participants were defined as medical professionals (MP) if they worked in the medical community (MD, RN, Surgical technician, paramedic) or were part of a pre-professional program, and otherwise were defined as community members (CM). CM included participants in public classes and classes sponsored by community centers and schools. After completing BC training, participants assembled their own TFA kits in a provided tactical pouch, which included properly sized personal protective equipment, a combat application tourniquet, hemostatic gauze and bandages, a flashlight, a marker, and trauma shears (Image 1). After course completion and TFA kit assembly, a post-course survey assessed knowledge of BC techniques and willingness to intervene with and without the provided TFA kit. Pre- and post-course surveys were compared using t-tests and chi-squared; all analyses were conducted using Stata version 14.2.[11]

Image 1. Contents of Trauma First Aid (TFA) Kit
TFA kit includes a combat application tourniquet, hemostatic gauze and bandages, gloves, a flashlight, a marker, and trauma shears.

Results

Eighty community members (CM) and 60 medical professionals (MP) completed the training in the four-month study period. The groups differed in terms of personal exposure to severe bleeding (CM 54.0% vs. MP 13.6%, p<.0001), where personal exposure was defined as life-threatening bleeding in themselves, a family member or close friend. Among those who had personal exposure to life-threatening bleeding, there was no significant difference in the cause of life-threatening bleeding as penetrating trauma accounted for 53.3% of bleeding exposure in CM versus 44.4% in MP (p = 0.402).

In order to assess basic BC knowledge, we asked, "What is the first thing you should do if someone has severe bleeding?". Prior to the course, 50% of CM correctly answered, "Call 911" compared to 28.3% of MP (p = 0.01). Both groups showed significant improvement in correct response rate after taking the course, CM improved from 50 to 97.3% correct, while MP improved from 28.3 to 90.9% correct (p < 0.0001, Fig. 1). When asked which methods could be used to stop bleeding, 84.9% of MP and 80.6% of CM correctly selected all three methods taught in the course: tourniquet application, holding pressure, and clotting gauze application (p = 0.53).

Prior to taking the BC course, MP had significantly higher confidence in their ability to stop severe bleeding (25.9% MP vs. 6.7% CM, p = 0.002). Both groups had significant improvement in their confidence level after taking the course. Among MP, confidence

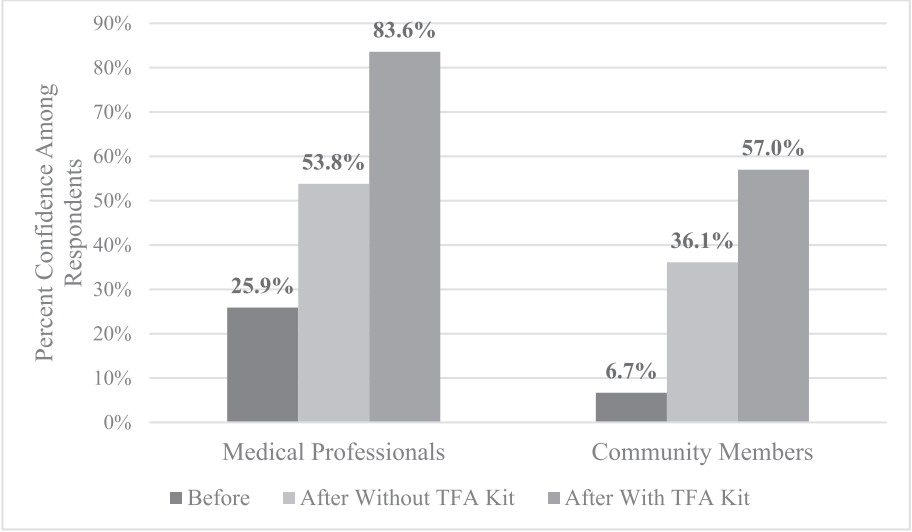

Fig. 1. Impact of Trauma First Aid Kits on Post-Training Confidence.
Percent of medical professionals (MP) and community members (CM) reporting confidence in stopping severe bleeding prior to the training, after training without a trauma first aid (TFA) kit, and after training with a TFA kit.

improved from 25.9% to 83.6% ($p < 0.0001$). Among CM, confidence improved from 6.7% to 57.0% ($p < 0.0001$); however, self-reported confidence remained significantly lower than among MP (57.0% CM vs. 83.6% MP, $p = 0.0013$). After receiving BC training and creating their TFA kit, 88.3% of MP and 91% of CM reported there was no reason why they could not stop severe bleeding ($p = 0.51$). When asked to consider their ability to stop severe bleeding if they did not receive a TFA kit, both groups were significantly less confident, 53.8% without versus 83.6% with kits among MP ($p = 0.001$) compared to 36.1% without versus 57.0% with kits among CM ($p = 0.008$, Fig. 1). The percentage reduction in confidence was equal across groups, 36.7% in CM and 35.6% in MP ($p = 0.894$). Significantly more MP, 24.6%, felt that TFA kits were important enough that they would try to obtain one on their own compared to 12.4% of CM ($p = 0.046$). While we did not quantitatively assess skill level among participants, all participants were required to demonstrate proficiency in tourniquet application, holding pressure, and wound packing as determined by a certified BC instructor in order to receive certification for the course. All 80 CM and 60 MP received BC certification.

Discussion

Our results show that both CM and MP benefit from BC training in terms of increased BC knowledge and self-reported confidence. Both groups had significant increases in confidence in their ability to stop life-threatening bleeding after BC training. However, MP had a higher starting confidence compared to CM and this persisted after BC training. Higher confidence in MP was expected given their background knowledge and training. Provision of TFA kits increased post-training confidence in both CM and MP beyond the confidence gained from the course alone. Although we expected TFA kits to have a greater effect on CM confidence, the percentage reduction in confidence if participants did not receive the TFA kit was equal across groups.

Our results are similar to those reported by Ross et al. who showed an increase in comfort level with tourniquet use after BC training; however, they excluded individuals with medical training.[12] In a prospective trial, increased level of medical training has been shown to increase both the frequency and quality of bystander trauma care.[13] Specifically for tourniquet use, individuals who reported prior hemorrhage control and first aid training had higher rates of correct tourniquet application and willingness to intervene compared with those who only had first aid training or no prior training.[14] In another study, willingness and preparedness to intervene improved with Stop the Bleed training negating the pre-class differences in levels of preparedness.[15] After a 15 min demonstration of tourniquet application, medical professionals had significantly higher confidence for stating the indications for tourniquet use compared to non-medical professionals.[16] While our study showed the difference in bleeding control knowledge between CM and MP was eliminated by the training, confidence in the ability to stop severe bleeding remained higher among MP. Several studies indicate that having prior medical training has a significant impact on confidence in applying bleeding control techniques.[13,14,16]

Although these studies support our results that bleeding control knowledge and confidence are improved through BC training, even among those with prior medical training, none of them studied access to trauma first aid kits and the possible influence that this could have both on confidence and willingness to intervene. Our results indicate that even among MP who have higher confidence levels in their ability to successfully stop bleeding than CM, not having a TFA kit would decrease their confidence rate by more than 30%. In a study by Dhillon et al. of 336 participants who underwent BC training, 74.7% reported they would purchase a tourniquet, but only 16.4% went on to purchase one after one month of follow up; barriers to purchasing a tourniquet included time, cost, and worry that items would not be available at the necessary time.[9] By providing participants with a TFA kit, the cost and time barriers to obtaining the materials are eliminated. While the Dhillon et al. study did not show a significant difference in tourniquet purchase rates between medical and non-medical participants, more MP in our study reported that kits were important enough that they would obtain them. This may be related to different levels of financial ability to purchase kits. Surprisingly, not having TFA kits reduced confidence by the same rate in MP and CM, despite MP having more access to these materials at work.

This study is primarily limited by lack of follow-up to determine if knowledge and confidence gained through BC training decays over time. Furthermore, the results are based on self-reported confidence in the setting of hypothetical severe bleeding rather than actual knowledge and skills application in a true emergency. Despite these limitations, the data demonstrates that providing TFA kits to participants significantly increases their confidence to intervene. Further studies are needed to determine if providing a TFA kit changes retention rates of skills taught in BC training. While cost is a barrier to widespread implementation of providing TFA kits to all participants, our program has been able to reduce the cost of kits to $10-$20 through bulk purchasing of materials. Further studies are needed to determine if providing a TFA kit changes retention rates of skills taught in BC training. If TFA kits are also associated with improved skills retention, the investment in TFA kits is worthwhile to improve the effectiveness of BC training.

Conclusion

Providing BC participants with TFA kits further increases post-training confidence in ability to stop life threatening bleeding and this effect was consistent among CM and MP.

Declaration of competing interest

No funding sources supported this work. The authors serve on the board of Power4STL, a community organization which teaches Stop the Bleed and sells trauma first aid kits at cost. They receive no salary and no profit is earned from selling trauma first aid kits.

References

1. Murphy SL, Xu J, Kochanek KD, et al. *National Vital Statistics Reports Volume*. vol.66. 2015. Number 6, November 27, 2017.
2. Teixeira PGR, Inaba K, Hadjizacharia P, et al. Preventable or potentially preventable mortality at a mature trauma center. *J Trauma Inj Infect Crit Care*. 2007;63:1338–1347. https://doi.org/10.1097/TA.0b013e31815078ae.
3. Teixeira PGR, Brown CVR, Emigh B, et al. Civilian prehospital tourniquet use is associated with improved survival in patients with peripheral vascular injury. *J Am Coll Surg*. 2018;226:769–776. https://doi.org/10.1016/j.jamcollsurg.2018.01.047. e1.
4. Eastridge BJ, Mabry RL, Seguin P, et al. Death on the battlefield (2001-2011): implications for the future of combat casualty care. *J Trauma Acute Care Surg*. 2012;73:431–437. https://doi.org/10.1097/TA.0b013e3182755dcc.
5. Kragh JF, Walters TJ, Baer DG, et al. Survival with emergency tourniquet use to stop bleeding in major limb trauma. *Ann Surg*. 2009;249:1–7. https://doi.org/10.1097/SLA.0b013e31818842ba.
6. Mell H, Mumma S, Hiestand B, Carr B, Holland T. Emergency medical services response times in rural, suburban, and urban areas. *JAMA Surg*. 2017;152:983.
7. Goralnick E, Chaudhary MA, McCarty JC, et al. Effectiveness of instructional interventions for hemorrhage control readiness for laypersons in the public access and tourniquet training study (PATTS). *JAMA Surg*. 2018. https://doi.org/10.1001/jamasurg.2018.1099.
8. American College of Surgeons. Bleeding Control Store- Stop the Bleed Kits. (n.d).
9. Dhillon NK, Dodd BA, Hotz H, et al. What happens after a stop the bleed class? The contrast between theory and practice. *J Surg Educ*. 2018. https://doi.org/10.1016/J.JSURG.2018.08.014.

10. Andrade EG, Hayes JM, Punch LJ. Enhancement of bleeding control 1.0 to reach communities at high risk for urban gun violence. *JAMA Surg*. 2019. https://doi.org/10.1001/jamasurg.2019.0414.
11. StataCorp. *Stata Stat Softw Release*. 2015;14.
12. Ross EM, Redman TT, Mapp JG, et al. Stop the bleed: the effect of hemorrhage control education on laypersons' willingness to respond during a traumatic medical emergency. *Prehospital Disaster Med*. 2018;33:127–132. https://doi.org/10.1017/S1049023X18000055.
13. Pelinka LE, Thierbach AR, Reuter S, Mauritz W. Bystander trauma care—effect of the level of training. *Resuscitation*. 2004;61:289–296. https://doi.org/10.1016/j.resuscitation.2004.01.012.
14. McCarty JC, Caterson EJ, Chaudhary MA, et al. Can they stop the bleed? Evaluation of tourniquet application by individuals with varying levels of prior self-reported training. *Injury*. 2019;50:10–15. https://doi.org/10.1016/j.injury.2018.09.041.
15. Lei R, Swartz MD, Harvin JA, et al. Stop the Bleed Training empowers learners to act to prevent unnecessary hemorrhagic death. *Am J Surg*. 2019;217:368–372. https://doi.org/10.1016/J.AMJSURG.2018.09.025.
16. Jacobs LM, Burns KJ. *Tourniquet Application Training for Individuals with and without a Medical Background in a Hospital Setting*. 2015. https://doi.org/10.1097/TA.0000000000000505.