

Effects of a Web-based Educational Module on Pediatric Emergency Medicine Physicians' Knowledge, Attitudes, and Behaviors Regarding Youth Violence

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Introduction: Youth seen in the emergency department (ED) with injuries from youth violence (YV) have increased risk for future violent injury and death. Pediatric emergency medicine (PEM) physicians rarely receive training in, or perform, YV screening and intervention. Our objective was to examine effects of a web-based educational module on PEM physicians' knowledge, attitudes, and behaviors regarding YV screening and interventions in the ED.

Methods: We invited all PEM fellows and attendings at an urban Level I pediatric trauma center to complete an interactive web-based education module (and 1-month booster) with information on YV's public health impact and how to screen, counsel and refer YV-involved patients. Consenting subjects completed electronic assessments of YV prevention knowledge and attitudes (using validated measures when possible) before and after the initial module and after the booster. To measure behavior change, chart review identified use of YV-specific discharge instructions in visits by YV-injured PEM patients (age 12–17; identified by E codes) 6 months before and after the intervention. We analyzed survey data were analyzed with Fisher's exact for binary outcomes and Kruskal-Wallis for Likert responses. Proportion of patients given YV discharge instructions before and after the intervention was compared using chi-square.

Results: Eighteen (67%) of 27 PEM physicians participated; 1 was lost at post-module assessment and 5 at 1 month. Module completion time ranged from 15–30 minutes. At baseline, 50% of subjects could identify victims' re-injury rate; 28% were aware of ED YV discharge instructions. After the initial module and at 1 month, there were significant increases in knowledge ($p < 0.001$) and level of confidence speaking with patients about avoiding YV ($p = 0.01$, $df = 2$). Almost all (94%) said the module would change future management. In pre-intervention visits, 1.6% of patients with YV injuries were discharged with YV instructions, versus 15.7% in the post-intervention period ($p = 0.006$, 95%CI for difference 3.6%–24.5%).

Conclusion: A brief web-based module influenced PEM physicians' knowledge and attitudes about YV prevention and may have affected behavior changes related to caring for YV victims in the ED. Further research should investigate web-based educational strategies to improve care of YV victims in a larger population of PEM physicians. [West J Emerg Med. 2014;15(5):615–622.]

INTRODUCTION

Youth violence, referring to conflict between adolescent or young-adult peers, leads to over 700,000 emergency department (ED) visits annually in the United States.¹ Youth presenting to the ED with injuries from violence have greatly increased risk for future violent injury and death.^{2,3} Indeed, preventing further violence may be more critical than any immediate clinical care.^{4,5} The American College of Emergency Physicians⁶ and the American Association of Pediatrics⁷ both have policy statements calling for improved identification, counseling, and referral of victims of violence. Identified core competencies for health professionals also include knowledge of youth violence (YV) as a public health problem, the role of physicians in YV assessment and prevention, and physicians' involvement in hospital or community prevention organizations.⁸

Risk assessment, counseling, and discharge planning during a hospital visit for violent injury has been shown to be effective preventative practices.⁹ The time immediately following a YV-related injury, specifically, has been recognized to be a "teachable moment," when youth and parents are more accepting of intervention, with decay of this opportunity observed as time passes.¹⁰ Although studies demonstrate efficacy of brief ED-based interventions to reduce YV re-injury, as well as risk factors for violence such as alcohol use,^{11,12} such comprehensive programs are often logistically difficult for EDs. At a minimum, improved discharge planning and provision of resources to YV victims have been encouraged by specialty societies and expert consensus;¹³ according to some studies, such interventions may be helpful for violence victims in some populations.^{14,15}

YV prevention behaviors, however, are not routinely preformed in practice. In one study, emergency medicine (EM) physicians reported infrequent assessment of re-injury risk or referrals to community resources for pediatric patients who present with YV injuries.¹⁶ Specialties outside of EM share this deficiency in addressing YV. A national survey found that less than 20% of internists and surgeons engage in firearm counseling, and pediatrician surveys demonstrate that screening for YV or weapon carrying is rare.¹⁷⁻¹⁹ Physicians receive little training in public health interventions against violence; in a sample of ED directors surveyed, only 17% reported formal staff training on YV.²⁰

Prior training in YV prevention has been shown to be a major determinant of execution of YV counseling and prevention behaviors.¹⁹ Correspondingly, lack of training is a commonly cited barrier to YV prevention efforts, and physicians identify staff education as a mode to improve behaviors.¹⁶ Rigorous violence prevention courses, ranging from 3 to 15 hours, have been shown to be effective in increasing physicians' skills; however, such a time-intensive format is neither feasible nor sustainable for the average practicing physician.²¹⁻²³ Moreover, the majority of physician

interventions have been aimed at outpatient providers, neglecting providers in the acute care setting.²¹⁻²³

When designing interventions targeted toward physician behaviors, it is most effective to use established theories of behavioral change. Specifically, the theory of planned behavior (TPB) is a commonly used construct that has been shown to correlate with physician behavior change.²⁴⁻²⁶ The theory suggests that a person's behavior is predicted by his/her intention to perform the behavior, which depends on his/her attitude toward the behavior, subjective norms, and perceived behavioral control.²⁷

This study aimed to develop a theoretically-driven, short web-based educational program and examine its effect on pediatric emergency medicine (PEM) physicians' knowledge, attitudes and behaviors regarding YV victims' needs in the ED. We hypothesized that the educational intervention would lead to significant increases in physicians' knowledge about YV, self-reported efficacy in addressing YV, and use of YV-specific discharge instructions, in accordance with the TPB.

METHODS

Study Design

This was a study of a web-based educational intervention (see Figure 1). An interactive, web-based YV education "Core Module," designed to be approximately 30 minutes in length, followed by a 10-minute "Booster Module" 1 month later, was administered to consenting participants. Pre- and post-module surveys assessed participants' knowledge and attitudes regarding YV and YV prevention. As a proxy for physician behaviors, we compared group-wide use of appropriate violence prevention discharge instruction/referral sheets for adolescent patients with violence-related injuries during the 6-month time period prior to and following the completed (core module plus booster) intervention.

Study Participants and Setting

The study took place at 1 large urban children's hospital in the Northeast. This institution is the only Level 1 Trauma Center in the state and its catchment area includes portions of the 2 neighboring states. The pediatric ED located within the children's hospital sees over 50,000 patients yearly. Board-certified PEM physicians supervise all EM and pediatric residents who rotate through the pediatric ED, as well as nurse practitioners who staff the ED.

All PEM attending physicians (n=21) and fellows (n=6) were invited to participate via email. We excluded EM physicians who work occasional shifts in the pediatric ED, yet are not PEM-trained, along with "fast-track" pediatricians, nurse practitioners, residents, and ED nurses. This group was selected to provide a sample of physicians who: a) work primarily in the pediatric ED, b) are most likely to care for pediatric trauma patients, and c) play supervisory roles to residents and nurse practitioners. The first page of all electronic surveys included an informed consent page, which noted that

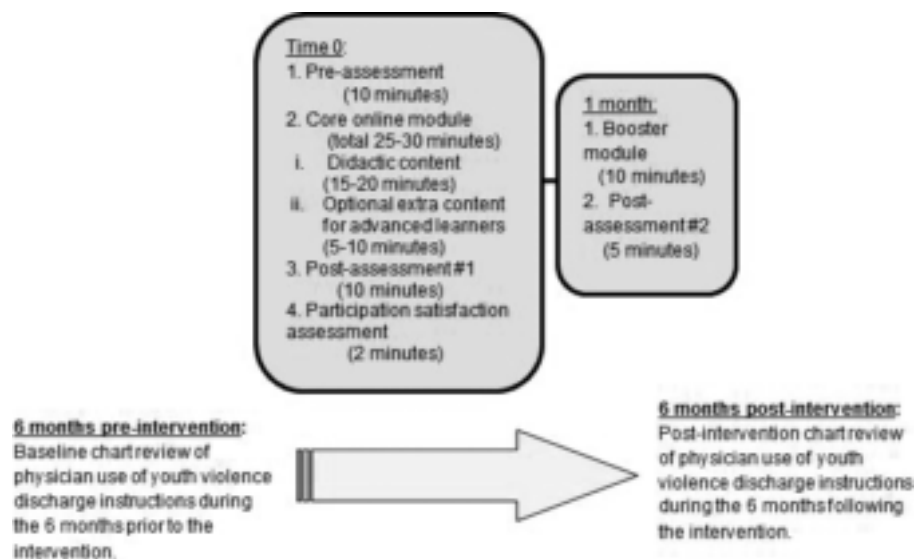


Figure 1. Study overview and timeline.

continuation with the survey implied agreement to participate; a formal written consent process was waived. Approval for the study was granted by the hospital institutional review board.

Educational Intervention

The Core and Booster Modules were internally developed by the authors, based on health professionals' core competencies of YV prevention and expert review.^{28,29} Modules were created based on the TPB/Reasoned Action, a theory describing how changes in attitudes, beliefs about subjective norms, and perceptions of behavioral control lead to alterations in behavioral intentions; as a result, behavioral change occurs.³⁰ We developed the modules using an e-learning software program ["Articulate"], which uses interactive slides with text and graphics along with audio-narrative. After development, they were piloted with topical experts outside the study institution and modified based on their feedback.

The Core Module was divided into 4 sub-modules: 1) Background, 2) History and assessment, 3) Communicating effectively, and 4) Discharge planning. Each sub-module began with learning objectives and concluded with a summary slide and brief, 1 to 2 question quiz. Sub-modules 1 through 3 included content on YV risk factors, morbidity and mortality statistics, re-injury rates, tools to focus the patient history and guide counseling, and use of the ED visit as a teachable moment. The Discharge Planning sub-module included information about available ED discharge resources. Optional extra content was included for advanced learners, consisting of additional screening tools, safety tips, and YV information specific to the region. The Core Module was expected to take 25 to 30 minutes to complete.

The Booster Module was administered one month later and consisted of key points drawn from the Core Module, on 20

slides with text, graphics, and audio-narrative. The Booster was designed to require no more than 5 to 10 minutes.

Outcome Measures

Survey Data: Based on existing literature and expert consultation, we developed pre- and post-module web-based tests of knowledge, attitudes and behaviors regarding YV, and satisfaction with the educational program.³¹ Survey design was based on the TPB/Reasoned Action. We adapted individual survey questions and scales from previously validated surveys.^{16,32-34} Questions pertained to knowledge, attitudes, and behaviors, specifically: knowledge of YV morbidity and mortality statistics, knowledge of preferred tools and strategies to identify and counsel YV victims, knowledge of existing resources, specifically YV-specific discharge instructions, attitudes about the preventability of YV and the appropriateness of performing referrals in the ED, endorsement of current referral practices/ self-reported behaviors regarding treatment and referral of patients with YV-related injuries, and assessment of the educational value of the module itself. The survey instruments were piloted with EM and pediatric residents and revised based on feedback and redundant items.

Behavioral Data: We included for review charts of patients ages 12 to 17 seen in the pediatric ED with YV-related intentional injuries during the 2 6-month periods treated for YV-related injuries by all PEM attendings and fellows (n=27). We identified these charts using E-codes corresponding to physical violence (E960-969, excluding diagnoses codes related to sexual assault or rape (E960.1) and child abuse (E967s)). Because participation in the educational intervention was anonymous, we did not limit the chart review to patients seen by those who completed the educational module. The study was designed in this way to maintain the anonymity of the

Table 1. Summary of youth violence prevention discharge resources.

Content category	Example/description
Motivation to access resources after discharge	Example: "If you are experiencing violence in your life, you do not need to deal with it alone. There are programs and organizations..."
Community-based resources	Types of resources/programs: After-school programs Counseling/mental health Crisis intervention Legal resources Faith based Community-based violence intervention programs
Conversation prompts (drawn from American Association of Pediatrics recommended questions)	Example: "Is the conflict settled?" "Do you feel safe leaving the hospital?"
Opportunity for additional support prior to leaving the hospital	Example: "...please ask your doctor or nurse if you can talk to a clinical social worker."

survey participants and to minimize a potential bias due to loss to follow up.

Each chart was screened for the use of YV-specific discharge instructions, with results reported as proportions of patients that received YV instructions for the time periods before and after the module administration. Table 1 summarizes the content of the study institution's YV prevention discharge instructions. This search resulted in 85 patient charts for the first 6-month period and 76 patient charts for the second 6-month period. Two of the authors reviewed charts and excluded any charts for which a) a non-PEM attending was listed as the attending of record (16 patients); b) the patient was either admitted to the hospital or transferred to another facility (12 patients); c) discharge diagnosis clearly noted sexual or child abuse as the nature of the injury (16 patients); or d) the patient eloped prior to receiving discharge paperwork (4 patients). Both reviewers reviewed 10% of charts; inter-rater agreement on inclusion/exclusion designation and discharge instruction usage was 100%.

Data Analysis

Using STATA version 12.1 (College Park, TX),³⁵ we calculated descriptive statistics (counts, means, proportions) to characterize the overall study population and participation in each part of the study. Kruskal-Wallis test and Fisher's Exact test, for Likert data and binary data respectively, were used to compare scores in knowledge, self-reported attitudes and behaviors. We used Chi Square test to compare frequency of YV discharge instruction use before and after the intervention

RESULTS

Study Participants

Of 27 PEM physicians invited to participate, 67% (n = 18) participated in the pre-assessment and core module. Seventeen

participants (63%) completed the post-module assessment, and 12 (44%) completed the 1-month booster module and assessment. Of participants completing the pre-assessment questions, 44% (n=8) were women and 83% (n=15) were white. Over half of the participants (n=10, 55%) were between 30 and 39 years old. In terms of years of experience, 28% (n=5) of the sample were PEM fellows, 17% (n=3) had less than 5 years of experience as an attending, 28% (n=5) had between 6 and 10 years of experience as an attending, and 28% (n=5) reported being an attending for over 10 years. See Table 2 for all participant characteristics. The demographics were similar to the overall PEM attending and fellow group.

Module Completion

Time to complete the core module ranged from 15 to 30 minutes with a mean completion time of 24 minutes. Ninety-four percent (n=16) of the participants found the module easy to use, and 82% (n=14) reported that they would recommend the module to other physicians.

Assessment of Knowledge

Baseline YV knowledge of participants was low and improved significantly after the module. Initially, the proportion of participants who answered all knowledge items correctly, including YV victims' re-injury rates and awareness of YV discharge resources, was only 11%, versus 100% post module and 83% at the 1-month assessment (p<0.001). Prior to the intervention, 28% (n=5) of participants reported knowledge of the YV discharge instructions; this increased to 100% immediately after viewing the module and remained at 100% at the 1-month assessment (p<0.001). See Figure 2 for the results of individual knowledge questions before and after the intervention.

Table 2. Characteristics of pediatric emergency medicine (PEM) physicians who completed web-based modules on youth violence.

Characteristic	% (n=18)
Women	44% (8)
Race/ ethnicity	
White	83% (10)
Hispanic	17% (2)
Age	
30 to 39	55% (10)
40 to 49	33% (6)
Over 50	11% (2)
Years of experience	
PEM fellow	28% (5)
<5 years as attending	17% (3)
6–10 years as attending	28% (5)
>10 years as attending	28% (5)

Assessment of Attitudes, Norms, and Perceived Behavioral Control

More participants felt confident having conversations about violence prevention after completing the module (50% pre-assessment versus 76.5% immediately post intervention and 75% at 1 month assessment, $p=0.01$, $df=2$). Non-

significant positive trends were observed in the number of participants who felt that their discharge plans make an impact (55.5% pre, 76.5% post, 92% 1-month, $p=0.19$, $df=2$), that PEMs play an important role in YV prevention (72% pre, 82% post, 92% 1-month, $p=0.45$, $df=2$) and that PEMs are expected to provide YV prevention information at discharge (89% pre, 94% post, 92% 1-month, $p=0.18$, $df=2$). Almost all participants (94%) felt the module would change their future management of YV-injured patients.

Assessment of Behaviors

Self-Report. When participants were asked about their behaviors before the module and at the 1-month assessment, there were no significant differences in the proportion of participants reporting that they ask about plans for retaliation, consult a social worker, or give YV discharge instructions (Tables 3, 4).

Observed Behaviors. In our assessment of group-wide PEM physicians' behaviors, however, provider behaviors changed significantly post-intervention. We identified 62 patients treated by PEM attendings or fellows for YV-related injuries in the 6 months prior to the intervention, compared with 51 patients in the 6 months after the intervention. Prior to the intervention, 1.6% ($n=1$) of patients with injuries from YV were discharged with YV instructions, versus 15.7% ($n=8$) in the post-intervention period ($p=0.006$, 95%CI for difference 3.6% to 24.5%) (Tables 3, 4).

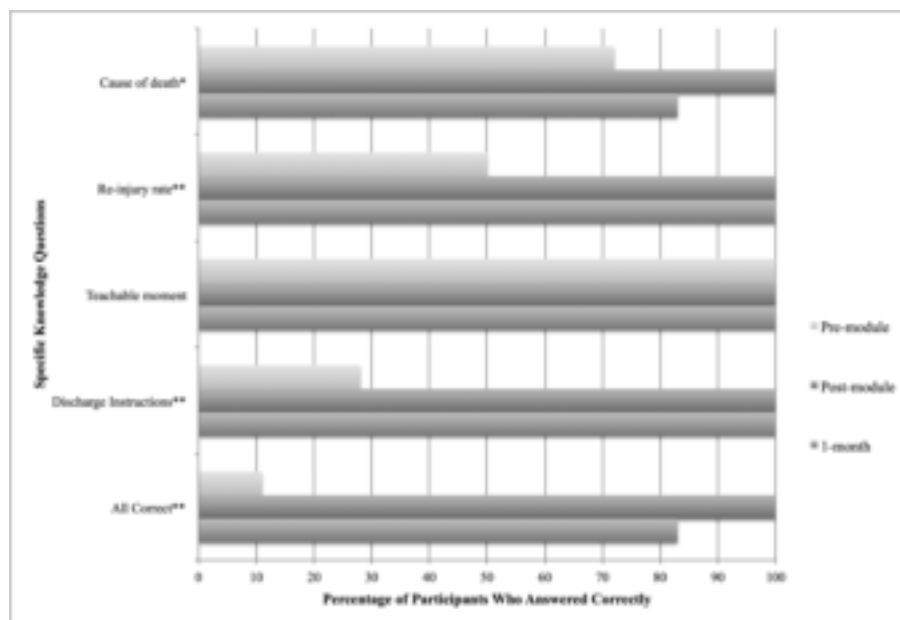


Figure 2. Percentage of participants correctly answering youth violence (YV) knowledge questions. * $p<0.05$ between pre-module and post-module assessments, ** $p<0.001$ between pre-module, post-module, and 1-month assessments. To answer multiple choice questions correctly, participants had to identify that YV is the 2nd leading cause of death among 15–24 year-olds in the United States, that 44% of youth admitted to a trauma center for violent injury have re-injury within 5 years, that emergency department (ED) visits are teachable moments during which youth are more open to discussions about violence prevention, and that YV discharge instructions are available using the study institution's ED discharge software.

Table 3. Self-reported changes of physicians who completed the modules.

Self-reported behavior	Pre-intervention % (n=18)	1-month assessment % (n=12)	p-value (df)
Ask about retaliation	33% (6)	58% (7)	0.24 (1)
Consult social work	33% (6)	50% (6)	0.69 (1)
Discharge patients with YV instructions	22% (4)	33% (4)	0.55 (1)

df, degrees of freedom; YV, youth violence

DISCUSSION

A web-based educational module designed to improve YV knowledge, change attitudes and norms about the effects of ED YV interventions, and increase provider use of YV-specific discharge instructions, was effective in increasing knowledge and changing attitudes among a group of PEM physicians. After implementation of our module, group-wide use of YV prevention discharge instructions increased.

In many ways our results are supportive of previous literature. Only a small percentage of PEM physicians employed YV-specific discharge instructions and community referrals at baseline; this finding is consistent with prior investigations showing low rates of YV prevention strategies among physicians across specialties, including in the ED.^{16,18,19} Previous studies also indicate that clinicians with more training in YV prevention strategies are more likely to use these strategies in clinical practice; our findings of increased use of YV discharge instructions after the educational module support this.^{18,21}

Physicians' increased use of YV prevention discharge instructions may be a result of our initial web-based intervention and booster module; other explanations for behavioral changes, however, should be explored. PEM physicians may have been made more aware of YV-specific discharge instructions because of invitations to participate in the study. Alternatively, physicians that did not complete the web-based module may have been influenced by the practice patterns of their colleagues who completed the educational module. Both of these explanations could have contributed to the group-wide increase in the use of the discharge instructions given previous literature suggesting that increased knowledge of available resources is associated with increased use of YV prevention strategies.¹⁹ It is also possible that the change in behavior was seen only among physicians participating in the

module, and that our results are less significant than they would be had we limited the behavior assessment to study participants. Finally, it is not clear how important the 1-month booster module was in changing participant behaviors given the significant attrition rate between the initial module and booster module. These explanations could be investigated in future studies.

Our findings are novel in that we used a short web-based module to increase the use of YV prevention information and community referrals at discharge compared to previous studies investigating longer and more rigorous violence prevention courses.²¹⁻²³ This web-based program offers a number of advantages compared to traditional instruction that makes it feasible for wide and rapid dissemination. The program cost very little to create and would cost little to maintain; it can be administered across institutions with high fidelity; its interactive format makes it naturally engaging for the learner; and, as an asynchronous learning tool, can easily be integrated into an existing curriculum.

Our study is also unique in that we measured an objective outcome, use of YV-specific discharge instructions for ED patients, as opposed to only measuring self-reported attitudes and behaviors as in other YV studies.^{16,18,19} Furthermore, our findings are generally supportive of the Theory of Planned Behavior as an effective method of changing physicians' behaviors.^{30,36-39} After taking the module, participants had increased confidence conversing with youth about violence (representing increased perceived behavioral control) and reported intentions to change behavior around youth violence prevention. According to the Theory of Planned Behavior, intent and perceived behavioral control are the two most important predictors of behavior change.^{30,37,38} Though we did include some non-participants in our measurement of observed behaviors, the anticipated behavior change was observed

Table 4. Objective behavioral changes of physicians who completed the modules.

Objective behavior	6 month period prior to module % (n=62)	6 month period after module % (n=51)	p-value
Use of YV discharge instructions for patients with YV-related injuries	1.6 (1)	15.7 (8)	0.006*

YV, youth violence

* p < 0.01

among PEM physicians group-wide; physicians changed their behavior by using YV discharge instructions more frequently.

Despite the high frequency of ED visits related to YV, ED providers receive little formal training in YV intervention methods; only 17% of EDs offer formal instruction in YV intervention strategies.^{16,18,40} Our study suggests that the use of a brief, web-based educational module among PEM providers might be an effective method of increasing YV knowledge, changing attitudes, and increasing the use of YV prevention methods including discharge planning and referrals to community resources.

LIMITATIONS

Our study has several limitations. The study was conducted in a single pediatric ED within a large urban academic institution with both a residency and a PEM fellowship. Additionally, we only invited PEMs to participate. These factors may limit the generalizability of our study. One could speculate that physicians working in such an institution are more likely to change their behaviors as a result of an educational module. To confirm generalizability, further studies of this intervention should be performed with EM physicians not trained in pediatrics and in both adult and community EDs.

Our findings of behavioral change among physicians are limited by the inclusion of physicians who did not complete the web-based module. As discussed above, because we measured group-wide use of YV prevention discharge instructions and not just those who participated in the module, it is possible that factors other than our intervention were responsible for the increased use of YV discharge instructions. However, no other YV-related interventions were ongoing in our hospital at the time of our study. Moreover, we would expect that the inclusion of behavioral assessments for physicians who did not complete the module would bias our results toward the null hypothesis.

Another limitation of our study is loss to follow up of 6 participants between the initial module and the 1-month assessment. Those who completed the entire study may have been more motivated to change their behaviors as a result of the module, resulting in a possible bias. To minimize the effect of such a bias, the intervention should be studied in a larger group of physicians and take steps to minimize loss to follow up. Mitigating this effect, however, was our measurement of objective data across the entire group of PEM physicians, study responders and non-responders alike.

Other limitations include a lack of data on physicians' reasons for not using YV-specific discharge instructions and a lack of data regarding whether physicians continued to use the discharge instructions more frequently after the 6-month time period.

CONCLUSION

In conclusion, our study shows that a short web-based educational module has the potential to effectively increase PEM physicians' use of YV discharge instructions for YV

victims treated in the ED. It also increases knowledge about how to screen and refer for youth violence. Future research should be conducted with larger samples of physicians in a variety of practice settings to confirm our findings and to identify whether use of YV prevention resources at discharge is effective at reducing future violent injury.

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