Published in final edited form as:

Subst Abus. 2019 ; 40(2): 240–246. doi:10.1080/08897077.2019.1572048.

Use of Online Opioid Overdose Prevention Training for First Year Medical Students: A Comparative Analysis of Online vs In-Person training

Noah Berland, MD, MS [second year Emergency Medicine],

Resident at Kings County Hospital, SUNY Downstate, Brooklyn, NY.

Daniel Lugassy, MD [assistant professor],

Department of Emergency Medicine and Toxicology at New York University School of Medicine, New York, NY.

Aaron Fox, MD, MS [assistant professor],

Department of Medicine, Division of General Internal Medicine, Albert Einstein College of Medicine, Bronx, NY.

Keith Keith Goldfeld, DrPh [assistant professor],

Department of Population health, at New York University School of Medicine, New York, NY.

So-Young Oh, MS, MS [Program Manager for Curriculum Development & Digital Learning],

Department of Institute for Innovations in Medical Education, at New York University School of Medicine, New York, NY.

Babak Tofighi, MD, MSc [instructor],

Department of Population Health, New York University School of Medicine, New York, NY.

Kathleen Hanley, MD [associate professor]

Department of Medicine, and Associate Director, Primary Care Residency Program, New York University School of Medicine, New York, NY.

Abstract

Purpose: In response to the opioid epidemic and efforts to expand substance use education in medical school, the authors introduced opioid overdose prevention training (OOPT) with naloxone for all first-year medical students (MS1) as an adjunct to required basic life support training (BLST). The authors previously demonstrated improved knowledge and preparedness following in-person OOPT with BLST, however it remains unclear if online administered OOPT would produce comparable results. In this study, the authors perform a retrospective comparison of online administered OOPT with in-person administered OOPT.

Corresponding Author Contact Information: Noah Berland, 834 Sterling Place #305, Brooklyn, NY 11216. Noah.Berland@gmail.com, P: (917) 733-9408, Backup Contact Information, Babak Tofighi, MD, MSc, 227 E.30th St. 7th floor, New York, NY 10016, Babak.Tofighi@nyumc.org, P: 646-501-7743 F: 646.501.2706.

Statement of Authorship: All of the above listed authors meets the requirements for authorship per the Uniform Guidelines for Biomedical Journals Requirements of the ICMJE for determining authorship (Vancouver Group Guidelines, 2010). No other individuals meet these guideline for authorship.

Ethical Approval: The New York University School of Medicine's IRB approved this study.

Objectives—To compare the educational outcomes; knowledge, preparedness, and attitudes, for online vs in-person OOPT.

Methods—In-person OOPT was administered in 2014 and 2015 during BLST, while online OOPT was administered in 2016 during BLST pre-work. MS1s completed pre- and post-training tests covering three measures: knowledge (11 point scale), attitudes (66 point scale), and preparedness (60 point scale) to respond to an opioid overdose. Online scores from 2016 and in-person scores from 2015 were compared across all three measures using analysis of covariance (ANCOVA) methods.

Results—After controlling for pre-test scores, there were statistical, but no meaningful differences across all measures for in-person and online administered training. The estimated differences were: knowledge, $-0.05(0.5\%)$ points (95% CI $-0.47 - 0.36$); attitudes, $0.65(1.0\%)$ points (95% CI $-0.22 - 1.51$); and preparedness, $2.16(3.6\%)$ points (95% CI $1.04 - 3.28$).

Conclusions—The educational outcomes of online-administered OOPT compared with in-person administered OOPT were not meaningfully different. These results support the use of online-administered OOPT. As our study was retrospective, based on data collected over multiple years, further investigation is needed in a randomized controlled setting, to better understand the educational differences of in-person and online training. Further expanding OOPT to populations beyond medical students would further improve generalizability.

Introduction

The opioid overdose epidemic remains a significant public health challenge. Integration of training related to substance use disorders (SUDs) and opioid overdose treatment in medical schools remains limited.^{1,2} In the fall of 2014, we introduced opioid overdose prevention training using naloxone (OOPT) as a part of required basic life support training (BLST) for first-year medical students (MS1).³ Our previously published study was the first study we were aware of focusing on healthcare professionals, meant as a train the trainer model and aiming to increase naloxone prescribing. Since our study was published an article by Maguire et. Al. introduced a well-received mixed modality training program for pharmacy students.⁴

OOPT utilizing naloxone integrated into BLST is aligned with efficacious approaches in community training to reduce opioid overdose-related deaths.^{5–8} Further, incorporating naloxone education into traditional American Heart Association BLST, could increase dissemination of training and improve first responder knowledge and proper management of opioid overdoses. At present OOPT utilizing naloxone rescue kits for patients has shown efficacy in reducing overdose deaths in multiple prescriber setting including the primary care and on release from prison.^{6,8–10} Access to naloxone has expanded to different populations, including non-medical first responders, and access has increased including prescribing by more medical providers as evidenced by rising prescriptions filled at pharmacies.^{10–13}

We initially performed all training sessions for medical students utilizing an in-person model, as documented in our initial study which analyzed data from training in the fall of 2014 and in the subsequent fall of 2015. In order to ensure the sustainability of naloxone training and avoid burdening student educators, instruction was transitioned to a series of

online modules which were required to be completed prior to the in-person component of BLST. Online modules offer a standardized, flexible, and engaging approach to enhance learner satisfaction and knowledge acquisition in compliance with Liaison Committee on Medical Education (LCME) standards and promote and accommodate asynchronous self-directed learning.¹⁴ Although the literature comparing online and in-person training is limited, a meta-analysis by Cook et. al. described a slight benefit for online training compared with “face-to-face” training, but overall results suggested similar effectiveness to traditional in-person training methods.¹⁵ A limited number of more recent studies have compared online training with in-person training modalities; two studies by the same group compared online training with in-person training for ECG interpretation, for both medical students and emergency medicine residents, and showed non-inferiority and no statistically significant difference between online and in-person training respectively.^{16,17} One study of OOPT that was not focused on healthcare professionals demonstrated no meaningful differences in outcomes between computer-based and pamphlet based OOPT, but did not include an in-person training comparison.¹⁸

The objective of our present study was to compare online training with in-person training, in terms effectiveness in improving opioid overdose prevention knowledge, attitudes, and self-reported preparedness for first-year medical students.

Methods

Over a three-year period from fall 2014 through fall 2016, we developed and evaluated OOPT as a part of BLS training for MS1s at a single medical school in a large urban area with a high rate of opioid overdoses. In-person training was administered in the fall of 2014 and the fall of 2015. These findings have been reported previously³. The online training was administered in the fall of 2016. Our evaluations were based on a pre/post-test and a post-training satisfaction questionnaire. Our institution’s institutional review board approved this study.

Development

In our original study we introduced OOPT delivered by medical student trainers as a part of the in-person component of BLST.³ This method though demonstrated to improve self-reported preparedness and knowledge,³ was seen as impractical and time-consuming, thus unsustainable for future training. It was then decided in the Spring of 2016 to transition the training to a series of online modules. Additional support was received from the NYU SOM Department of Emergency Medicine Toxicology division and the Institute for Innovations in Medical Education, which facilitated adapting the in-person training curriculum to a series of online modules.

Approval process

Permission was initially obtained to integrate OOPT into the existing BLS training from the Department of Emergency Medicine, which oversees BLS training, and the Office of Medical Education, which oversees all curricula for the medical students. Both of these groups in 2016 approved switching to online modules.

Participants

First-year matriculating students in 2014 (year one), 2015 (year two) and 2016 (year three) all received OOPT. The evaluations for year two and year three were a modified version of the evaluation used in year one. Our analysis includes year two (in-person group) and year three (online group).

Training

Pre-tests and post-tests in our original study were administered using a combination of REDCap's online data collection system and REDCap paper printed instruments manually entered by into REDCap.³ An hour prior to standard BLST training, OOPT pre-tests were first administered if not completed by participants prior to the training day, then in-person OOPT was provided, with the remaining time reserved for the administration of the post-test.³ In-person OOPT was provided by a single student-educator in a lecture style with frequent questions to the students and concluded with a teach-back by the students being trained.

The online-training consisted of four modules covering the same five domains; "What are Opioids," "What is Naloxone," "Signs and Symptoms of an Opioid Overdose," "Risk Factors for an Opioid Overdose," and "How to Respond to an Opioid Overdose," along with more background information on opioids and the opioid overdose epidemic. The modules were delivered using the medical school's proprietary online learning management system.

Each module includes a module overview and objectives, pre-evaluation, video-based lecture, post-evaluation and module summary. The fourth and final module additionally contained a post-training evaluation of the modules. When multiple videos were utilized each video was presented on a separate page. No text-based script was provided for the videos and students were not able to watch at high speed but were able to pause when necessary. No specific scores on post-tests were required for module completion, but subsequent modules could not be completed without completing the prior module. Detailed organization of each module can be found in Table 1. Video-based lectures were produced using PowerPoint and a stylus, consisting of audio narration and screenwriting for illustrative purposes.

The online modules were provided to students in the online group at the same time they were provided with the required American Heart Association BLS training pre-work modules prior to receiving the in-person component of their BLS training. Students were given direct links to the training modules in the online learning management system. As in year one, no naloxone kits were provided in year two or year three. All but one of the in-person training sessions were conducted by author NB.

Measures and Instruments

As in our previous study, pre- and post-tests covered four domains: 1) participant characteristics; 2) attitudes towards patients with substance use disorders (Attitudes); 3) self-reported preparedness to respond to an opioid overdose (Preparedness); and 4) knowledge of naloxone and how to respond to an opioid overdose (Knowledge).³ However, as previously

stated, unlike in our previous study where all pre- and post-test knowledge questions were completed before and after the in-person training respectively, all online knowledge questions were answered before and after their respective modules, see Table 1. Our primary objective was to compare Knowledge outcomes of online-training vs in-person-training. Our secondary objectives were to compare Attitudes and Preparedness outcomes of online-training vs in-person-training.

The Knowledge measure comprised eleven multiple choice questions, scored zero for incorrect and one for correct, yielding a score ranging from zero to 11. These questions were adapted from the Opioid Overdose Knowledge Scale¹⁹ and can be found in Appendix A part 1.

The Attitudes measure comprised 11 questions scored on a 6-point Likert scale (1 = Strongly Disagree, 6 = Strongly Agree), yielding a score ranging from 11 to 66. These questions were adapted from the Medical Condition Regard Scale (MCRS).²⁰ For the in-person-training we used the term “Substance Abuse Problems”, which we modified to “Substance Use Disorders” for the online training, to conform with new DSM (Diagnostic and Statistical Manual of Mental Disorders) 5 terminology. Details of these questions can be found in Appendix A part 2.

The Preparedness measure comprised 12 questions on a 5-point Likert scale (1 = least prepared, 5 = most prepared), yielding a score from 12 to 60. These questions were adapted from the Opioid Overdose Attitudes Scale¹⁹ and can be found in Appendix A part 3.

We also evaluated student satisfaction, with surveys administered at the end of the fourth and final online module and at the end of the in-person training. Details can be found in Appendix A part 4 and part 5 respectively.

For the in-person training it was necessary to track students across pre- and post-tests using a student-generated unique identifier that is easily remembered, last four digits of the phone number and last letter of the first name. For the online training it was necessary to track answers across modules and pre- and post-test data for each question set was collected within the same module. However, it was necessary to track across modules to generate complete scores. This was accomplished by internal tracking in the online learning management system and was provided to the researchers performing analysis in a completely anonymized manner using randomly generated UIDs.

Analysis

We estimated averages for each of the Knowledge, Preparedness, and Attitude outcomes for both the in-person and on-line groups. We used analysis of covariance (ANCOVA) regression models to control for pre-test scores to estimate an adjusted difference between the two groups, including 95% confidence intervals. These results were plotted for visual analysis and comparison. All analyses were performed using R version 3.3.4 (R Foundation for Statistical Computing, Vienna, Austria).

Results

258 students received OOPT and completed some part of a pre- or post-test in the in-person and online groups. 130 out of 132 first-year students completed some part of the pre- or post-test in the in-person group, of which 114 completed both pre- and post-tests and opted into the study. 127 out of 129 first-year students in the online group participated in the online-training, of which 120 had completed all questions and opted into the study, giving us 86% and 93% response rates for analysis for the in-person and online training groups respectively. The pre-test scores of the online group were slightly higher on average than the in-person group for Knowledge (4.7 vs. 3.7), while slightly lower for Preparedness (27.5 vs. 30.0) and Attitudes (47.2 vs. 47.5), see Table 2. Post-training scores for Knowledge and Preparedness increased from pre- to post training in the online and in-person groups (9.5 vs. 9.4 and 45.1 vs. 44.3 respectively) and Attitudes did not increase meaningfully in the online and in-person groups (48.3 vs 47.9 respectively), see Table 2.

Figure 1 provides three scatter plots of pre-test and post-test scores for Knowledge, Attitudes, and Preparedness respectively. Points above the dashed line indicate individuals whose post-test scores exceeded their pre-test scores, demonstrating that most individuals scores improved after training for both knowledge and preparedness in both training groups. The plot of attitude scores suggests no strong change in average scores after training in either group.

After adjusting for pre-training scores, the estimated difference in post-training scores between the online and in-person groups for knowledge was -0.05 (0.5%, 95% CI: -0.47 , 0.36), for attitudes was 0.65 (1.0%, 95% CI: -0.22 , 1.51), and preparedness was 2.16 (3.6%, 95% CI: 1.04 , 3.28) (Figure 2)

Of the 114 students who completed the in-person pre- and post-training evaluations, 105 (92%) completed the training satisfaction survey; 88 (73%) of the 120 students who opted into the online-training study completed the training satisfaction survey. Students from both years evaluated both in-person and online-training positively, with 96% of the in-person group saying future classes should receive the training and 95% of the online group saying all medical schools should be provided the training. Additionally, 89% in the in-person group enjoyed the training, and 92% of the online group felt the training was good for their medical education. Please see figure 3 for a more detailed breakdown of feedback from students, we did not analyze the free response questions included in Appendix A parts 4 and 5.

Discussion

The pre- to post-training changes in Knowledge, Attitudes, and Preparedness scores for in-person vs online training were not meaningfully different. Our results for online training were consistent with our previously published study, which demonstrated that OOPT as an adjunct to BLST improves Knowledge and Preparedness.³ Findings from this study suggest that training may be successfully administered without relying on in-person instructors.

The small differences in outcomes that we detected between training approaches warrant comment. Confidence intervals for knowledge and attitudes suggest no meaningful difference between the groups. For Preparedness, the estimated difference of 2.16 favoring online training represents a 3.6% difference with a final post-test difference of 0.8 points on average, which we do not believe is an educationally meaningful difference in outcomes. Further this is a self-reported measure. The scatter plots, Figure 1, provide visual confirmation of the consistency of results between in-person and online training. Confirmation is demonstrated by the fit lines closeness. These plots are consistent with the findings in our prior study, where we observed no change in Attitudes, with large increases in Knowledge and Preparedness after receiving OOPT.³

There remain few studies evaluating the relative effectiveness of web-based training compared with in-person training. As previously noted, the literature is inconsistent, but has generally agreed with the results of our study in that the majority of studies demonstrate no meaningful difference and non-inferiority.^{15–17,21} In this study, we have demonstrated that online-training and in-person training for opioid overdose prevention training are associated with similar post-training outcomes for Knowledge, Attitudes, and Preparedness, producing not meaningfully different outcomes. Both online and in-person training received generally positive feedback, but due to a change in instrument, we could not directly compare student satisfaction across groups.

These results demonstrate that for OOPT, online-training is a good alternative to in-person-training.

Limitations

The greatest limitation of this study is that it is not a randomized controlled trial; rather we compare data from two separate years of students, preventing us from performing a non-inferiority analysis. Further, our conclusions are limited in their generalizability as our study was only conducted at a single site and the learners were limited to medical students. Another limitation is due to the temporal nature of our two interventions. During the three-year time period of our training, and the two years studied here, the opioid overdose epidemic has continued to gain attention of the government and the press, which could have had an impact on our study, potentially explaining the higher pre-test mean knowledge score seen for the online group 4.7 (online, 2016) vs 3.7 (in-person 2015). Another possible explanation for the difference in pre-test scores is the multi-part organizational structure of the online module, as detailed in Table 1, which at times leads to testing for information provided in depth in one module which is briefly covered in antecedent modules.

Next Steps

The online modules will continue to be part of first-year BLST at the current institution and OOPT will be brought to at least one other large urban medical school as a part of their first-year medical student BLST, with students randomized to either in-person training or online training. The new format will ensure ease of access and adoption for other institutions to integrate OOPT. We hope that the American Heart Association will integrate online OOPT into their training, which already has a substantial online-module based component. The

American Heart Association including OOPT in their broadly available and utilized training and protocols would be the highest yield to provide OOPT to all first responders.

Conclusions

This study demonstrates that for first-year medical students, OOPT as an adjunct to BLST provided using online modules obtained educational outcomes that were not meaningfully different from in-person training. With evidence that physicians are increasingly prescribing naloxone,^{12,13} we feel that it is even more important to train medical students to be trainers. We believe these findings support that online modules can provide a sustainable, convenient, and engaging approach to facilitate dissemination of this important and lifesaving training.

Acknowledgements:

The Authors wish to thank Dova Marder, MD, Andrew Hallett, Keith Goldfeld, DrPH, Robert Rosenwald, and Ben Suwing.

Funding Source: The study was supported by Substance Abuse Research Education and Training program (NIDA 5R25DA022461-04). Support was provided in the means of a training stipend during the summer of 2014 when the project was being developed, and also provided additional support for future phases of the study in the form of second year follow-up incentives. The funding organization had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

NB initially conceived of the project under the mentorship of BT and advising from AF, later with additional advising from DL and SO, NB designed the training, instruments, and obtained IRB approval with consultation principally with BT, and additional support from AF and KH. NB performed the training, and got support principally from KG for data analysis. The manuscript was prepared by NB with help from BT, AF, SO, KG, and KH. All authors participated in editing the manuscript.

Appendix A: Instruments

1. Knowledge Questions

M1.Q1. How long does naloxone take to start having an effect?

A.	2–5 Minutes
B.	6–10 Minutes
C.	11–20 Minutes
D.	21–40 Minutes
E.	Don't Know

M1.Q2. How long do the effects of naloxone last for?

A.	Less than 20 Minutes
B.	About 1 hour
C.	1 to 6 hours
D.	6 to 12 hours

E. don't know

M1.Q3. Which are side-effects of administering Naloxone?

- (i) Naloxone can give a minor headache
- (ii) Naloxone can precipitate an acute withdrawal
- (iii) Naloxone can cause pulmonary edema

A. 'i' and 'ii'

B. 'i' and 'iii'

C. 'ii' and 'iii'

D. All of the Above

E. Naloxone has no side-effects

M2.Q1. Which are risk factors for an Overdose?

- (i) Going to a new Dealer
- (ii) Mixing Drugs
- (iii) Sharing Needles

A. 'i' and 'ii'

B. 'i' and 'iii'

C. 'ii' and 'iii'

D. All of the above

M2.Q2. Which are risk factors for an Overdose?

- (i) Using Alone
- (ii) Previous Overdose
- (iii) Recent Release from Prison

A. 'i' and 'ii'

B. 'i' and 'iii'

C. 'ii' and 'iii'

D. All of the above

M3.Q1. Which of the following are signs of an Opioid Overdose?

- (i) Blood Shot Eyes
- (ii) Slow or Shallow Breathing
- (iii) Lips and Fingers Turning Blue and Ashen

-
- A. 'i' and 'ii'
-
- B. 'i' and 'iii'
-
- C. 'ii' and 'iii'**
-
- D. All of the above
-

M3.Q2. Which of the following are signs of an Opioid Overdose?

- (i) Unresponsive
- (ii) Seizing
- (iii) Deep Snoring

-
- A. 'i' and 'ii'
-
- B. 'i' and 'iii'**
-
- C. 'ii' and 'iii'
-
- D. All of the above
-

M3.Q3. Which of the following are signs of an Opioid Overdose?

- (i) Pinpoint Pupils
- (ii) Agitated Behavior
- (iii) Rapid Heartbeat

-
- A. 'i'**
-
- B. 'ii'
-
- C. 'iii'
-
- D. All of the above
-

M4.Q1. After reversing an overdose with Naloxone...

-
- A. Let them go home
-
- B. Give them naloxone to use at home
-
- C. Make them go to the ED as they might OD again, and can't be charged with a crime**
-
- D. Make them go to the ED as they might OD again, even though they might be charged with a crime
-

M4.Q2. How many doses of naloxone can be given safely?

-
- A. Only one, which should be more than enough
-
- B. Two, if two doses don't work more won't
-

C. As many as needed to reverse the overdose

D. Don't give naloxone, it's too dangerous

M4.Q3. When should rescue Breaths be given for an Opioid Overdose?

(i) Immediately after identifying an Overdose

(ii) After Administering Naloxone

A. Only 'i'

B. Only 'ii'

C. 'i' and 'ii'

D. You don't need to give rescue breaths

2. Preparedness Scale

	Completely Disagree	Disagree	Unsure	Agree	Completely Agree
How prepared do you feel to handle an overdose?	☐	☐	☐	☐	☐
If I saw an overdose, I would panic and not be able to help	☐	☐	☐	☐	☐
I have enough information about how to manage an overdose.	☐	☐	☐	☐	☐
I would be able to administer naloxone to someone who has overdosed.	☐	☐	☐	☐	☐
I would be able to check that someone who has overdosed was breathing properly.	☐	☐	☐	☐	☐
I am going to need more training before I would feel confident to help someone who has overdosed.	☐	☐	☐	☐	☐
I would be able to perform mouth to mouth resuscitation to someone who has overdosed.	☐	☐	☐	☐	☐
If someone overdoses, I would know what to do to help them.	☐	☐	☐	☐	☐
I would be able to place someone who has overdosed in the recovery position.	☐	☐	☐	☐	☐
I would be able to deal effectively with an overdose.	☐	☐	☐	☐	☐
I would be afraid of giving naloxone in case the person becomes aggressive afterwards.	☐	☐	☐	☐	☐
I would be afraid of doing something wrong in an overdose situation.	☐	☐	☐	☐	☐
I would be reluctant to use naloxone for fear of precipitating withdrawal symptoms.	☐	☐	☐	☐	☐

3. Attitudes Scale*

	Strongly Disagree	Disagree	Not Sure But Probably Disagree	Not Sure But Probably Agree	Agree	Strongly Agree
I prefer not to work with patients with Substance Abuse Problems	☐	☐	☐	☐	☐	☐
Patients with Substance Abuse Problems irritate me	☐	☐	☐	☐	☐	☐
I enjoy giving extra time to patients with Substance Abuse Problems	☐	☐	☐	☐	☐	☐
Patients with Substance Abuse Problems are particularly difficult for me to work with	☐	☐	☐	☐	☐	☐
Working with patients with Substance Abuse Problems is satisfying	☐	☐	☐	☐	☐	☐
I feel especially compassionate toward patients with Substance Abuse Problems	☐	☐	☐	☐	☐	☐
I wouldn't mind getting up on call nights to care for patients with Substance Abuse Problems	☐	☐	☐	☐	☐	☐
I can usually find something that helps patients with Substance Abuse Problems feel better	☐	☐	☐	☐	☐	☐
There is little I can do to help patients with Substance Abuse Problems	☐	☐	☐	☐	☐	☐
Insurance plans should cover patients with Substance Abuse Problems to the same degree that they cover patients with other conditions	☐	☐	☐	☐	☐	☐
Treating patients with Substance Abuse Problems is an ineffective use of medical dollars	☐	☐	☐	☐	☐	☐

* Of note, for the online-training modules Substance Abuse Problems was replaced with substance use disorders to better conform with the DSM 5

4. In-Person-Training-post-training evaluation

Did you enjoy the opioid overdose prevention training?	☐ Yes ☐ No
Do you think future classes should receive opioid overdose prevention training?	☐ Yes ☐ No
Did you take the pre-training survey?	☐ Yes ☐ No
Did the pre-training survey help in your understanding of opioid overdose prevention?	☐ Yes ☐ No
Did the post-training survey help in your understanding of opioid overdose prevention?	☐ Yes ☐ No
Comments:	

5. Online-Training post-training evaluation

The module content was high quality

Strongly Disagree 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ Strongly Agree

Video content was high quality

Strongly Disagree 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ Strongly Agree

The modules were good for my medical education

Strongly Disagree 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ Strongly Agree

All medical schools should provide this training

Strongly Disagree 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ Strongly Agree

How can we improve this module? (A list format/bullet points is acceptable)

What did you like most about these modules? (A list format/bullet points is acceptable)

References

1. Miller Norman S; Sheppard Lorinda M; Colenda Christopher C; Magen J. Why Physicians Are Unprepared to Treat Patients Who Have Alcohol- and Drug-related Disorders. *Acad Med.* 2001;76(5):410–418. [PubMed: 11346513]
2. Polydorou S, Gunderson EW, Levin FR. Training physicians to treat substance use disorders. *Curr Psychiatry Rep.* 2008;10(5):399–404. doi:10.1007/s11920-008-0064-8 [PubMed: 18803913]
3. Berland N, Fox A, Tofighi B, Hanley K. Opioid overdose prevention training with naloxone, an adjunct to basic life support training for first-year medical students. *Subst Abus.* 2017;38(2). doi:10.1080/08897077.2016.1275925
4. Maguire MA, Pavlakos RN, Mehta BH, Schmuhl KK, Beatty SJ. A naloxone and harm reduction educational program across four years of a doctor of pharmacy program. *Curr Pharm Teach Learn.* 2018;10(1):72–77. doi:10.1016/j.cptl.2017.09.007 [PubMed: 29248078]
5. Doe-simkins M, Walley AY, Epstein A, Moyer P. Saved by the Nose : Bystander-Administered Intranasal Naloxone Hydrochloride for Opioid Overdose. 2009;99(5):788–791. doi:10.2105/AJPH.2008.146647.KEY
6. Walley AY, Xuan Z, Hackman HH, et al. Opioid overdose rates and implementation of overdose education and nasal naloxone distribution in Massachusetts: interrupted time series analysis. *BMJ.* 2013;346(jan30_5):f174. doi:10.1136/bmj.f174
7. Walley AY, Doe-Simkins M, Quinn E, Pierce C, Xuan Z, Ozonoff A. Opioid overdose prevention with intranasal naloxone among people who take methadone. *J Subst Abuse Treat.* 2013;44(2):241–247. doi:10.1016/j.jsat.2012.07.004 [PubMed: 22980450]
8. Kerensky T, Walley AY. Opioid overdose prevention and naloxone rescue kits: what we know and what we don't know. *Addict Sci Clin Pract.* 2017;12(1):4. doi:10.1186/s13722-016-0068-3 [PubMed: 28061909]
9. Bird SM, McAuley A, Perry S, Hunter C. Effectiveness of Scotland's National Naloxone Programme for reducing opioid-related deaths: a before (2006–10) versus after (2011–13) comparison. *Addiction.* 2016;111(5):883–891. doi:10.1111/add.13265 [PubMed: 26642424]
10. Coffin PO, Behar E, Rowe C, et al. Nonrandomized Intervention Study of Naloxone Coprescription for Primary Care Patients Receiving Long-Term Opioid Therapy for Pain. *Ann Intern Med.* 2016;165(4):245–252. doi:10.7326/M15-2771 [PubMed: 27366987]

11. Davis CS, Ruiz S, Glynn P, Picariello G, Walley AY. Expanded access to naloxone among firefighters, police officers, and emergency medical technicians in Massachusetts. *Am J Public Health*. 2014;104(8):e7–9. doi:10.2105/AJPH.2014.302062
12. Jones CM, Lurie PG, Compton WM. Increase in Naloxone Prescriptions Dispensed in US Retail Pharmacies Since 2013. *Am J Public Health*. 2016;106(4):689–690. doi:10.2105/AJPH.2016.303062 [PubMed: 26890174]
13. Binswanger IA, Koester S, Mueller SR, Gardner EM, Goddard K, Glanz JM. Overdose Education and Naloxone for Patients Prescribed Opioids in Primary Care: A Qualitative Study of Primary Care Staff. *J Gen Intern Med*. 2015;30(12):1837–1844. doi:10.1007/s11606-015-3394-3 [PubMed: 26055224]
14. FUNCTIONS AND STRUCTURE OF A MEDICAL SCHOOL Standards for Accreditation of Medical Education Programs Leading to the MD Degree. In: LCME® Functions and Structure of a Medical School Standards for Accreditation of Medical Education Programs Leading to the MD Degree. 2018th-2019th ed Washington D.C.: Association of American Medical Colleges and the American Medical Association; 2017.
15. Cook D, Levinson AJ, Erwin PJ. Internet-Based Learning in the Health Professions. *J Am Med Assoc*. 2008;300(10):1181–1196. doi:10.1001/jama.300.10.1181
16. Barthelemy FX, Segard J, Fradin P, et al. ECG interpretation in Emergency Department residents: an update and e-learning as a resource to improve skills. *Eur J Emerg Med*. 2017;24(2):149–156. doi:10.1097/MEJ.0000000000000312 [PubMed: 26287803]
17. Montassier E, Hardouin J-B, Segard J, et al. e-Learning versus lecture-based courses in ECG interpretation for undergraduate medical students. *Eur J Emerg Med*. 2016;23(2):108–113. doi:10.1097/MEJ.0000000000000215 [PubMed: 25386694]
18. Dunn KE, Yopez-Laubach C, Nuzzo PA, et al. Randomized controlled trial of a computerized opioid overdose education intervention. *Drug Alcohol Depend*. 2017;173:S39–S47. doi:10.1016/j.drugalcdep.2016.12.003 [PubMed: 28363318]
19. Williams AV, Strang J, Marsden J. Development of Opioid Overdose Knowledge (OOKS) and Attitudes (OOAS) Scales for take-home naloxone training evaluation. *Drug Alcohol Depend*. 2013;132(1–2):383–386. doi:10.1016/j.drugalcdep.2013.02.007 [PubMed: 23453260]
20. Christison GW, Haviland MG, Riggs ML. The medical condition regard scale: measuring reactions to diagnoses. *Acad Med*. 2002;77(3):257–262. [PubMed: 11891166]
21. Rolskov Bojsen S, Räder SBEW, Holst AG, et al. The acquisition and retention of ECG interpretation skills after a standardized web-based ECG tutorial—a randomised study. *BMC Med Educ*. 2015;15(1):36. doi:10.1186/s12909-015-0319-0 [PubMed: 25889642]

Figure 1.

Scatter plots of post-training scores as function of pre-training score (magenta triangles are the online group and blue dots are the in-person group), with fit lines for each group (solid lines: in-person and dashed lines: online) and identity (gray dotted lines).

Figure 2.
Plot of the point estimates and 95% confidence intervals for online versus in-person training controlled for pre-training scores.

Figure 3.

Response rates for the feedback from students for both the online and in-person training groups. (A) Plot for the in-person training post-training evaluation; responses were binary “yes” and “no” answers; see Appendix A part 4 for detailed questions. (B) The online module’s post-training evaluation, which consisted of 4 questions on a 6-point Likert scale; see Appendix A part 5 for detailed questions.

Table 1.

for details of Knowledge Questions. Covers the topics and objectives covered by each module, as well as the video used and which questions are included

Module #:Name	Videos	Objectives	Pre-Module Questions	Post-Module Questions
1: "Opioid Overdose Prevention Training 1: Primer"	<ul style="list-style-type: none"> • What is an Opioid? (5min) • The Opioid Epidemic (2min) • What is Naloxone? (5min) 	<ul style="list-style-type: none"> • Distinguish Opioids from an Opiates • Recite the Major Effects of Opioids • Explain What Naloxone is and used for • Know Naloxone's: <ul style="list-style-type: none"> ○ half Life ○ time to onset ○ dosing ○ side-effects 	<ul style="list-style-type: none"> • Consent and Choice to Opt-in • Student Background • Attitudes • Preparedness • Knowledge: <ul style="list-style-type: none"> ○ M1.Q1 ○ M1.Q2 ○ M1.Q3 	<ul style="list-style-type: none"> • Knowledge: <ul style="list-style-type: none"> ○ M1.Q1 ○ M1.Q2 ○ M1.Q3
2: "Opioid Overdose Prevention Training 2: OD Risk Factors"	<ul style="list-style-type: none"> • OD Risk Factors (5min) 	<ul style="list-style-type: none"> • Able to identify the five major risk factors for an overdose 	<ul style="list-style-type: none"> • Knowledge: <ul style="list-style-type: none"> ○ M2.Q1 ○ M2.Q2 	<ul style="list-style-type: none"> • Knowledge: <ul style="list-style-type: none"> ○ M2.Q1 ○ M2.Q2
3: "Opioid Overdose Prevention Training 3: Signs of an Opioid Overdose"	<ul style="list-style-type: none"> • Signs of an opioid overdose (3min) 	<ul style="list-style-type: none"> • Be able to identify an opioid overdose: • Recite the major signs of an opioid overdose 	<ul style="list-style-type: none"> • Knowledge: <ul style="list-style-type: none"> ○ M3.Q1 ○ M3.Q2 ○ M3.Q3 	<ul style="list-style-type: none"> • Knowledge: <ul style="list-style-type: none"> ○ M3.Q1 ○ M3.Q2 ○ M3.Q3
4: "Opioid Overdose Prevention Training 3: Signs of an Opioid Overdose"	<ul style="list-style-type: none"> • Responding to an opioid overdose (11min) 	<ul style="list-style-type: none"> • Be able to manage an opioid overdose • Understand basic principles of administering naloxone 	<ul style="list-style-type: none"> • Knowledge: <ul style="list-style-type: none"> ○ M4.Q1 ○ M4.Q2 ○ M4.Q3 	<ul style="list-style-type: none"> • Knowledge: <ul style="list-style-type: none"> ○ M4.Q1 ○ M4.Q2 ○ M4.Q3

Table 2.

Pre-Test and Post-Test Means and Standard Deviations for both Online and In-Person trainings

Measure	Pre-Training Mean (SD)	Post-Training Mean (SD)
Knowledge:		
In-Person	3.7 (1.6)	9.4 (1.5)
Online	4.7 (2.0)	9.5 (1.7)
Preparedness:		
In-Person	30.0 (6.4)	44.3 (5.2)
Online	27.5 (6.5)	45.1 (5.7)
Attitudes:		
In-Person	47.5 (6.9)	47.9 (7.2)
Online	47.2(5.4)	48.3(5.9)