

# Development and Evaluation of an Interactive Training Series for Applying the Centers for Disease Control and Prevention's Guideline for Prescribing Opioids

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## Abstract

**Objective:** Prescription opioid overdose and misuse continue to be serious public health crises in the United States. To promote safer, more effective opioid prescribing practices for the treatment of chronic pain, the Centers for Disease Control and Prevention (CDC) released the *CDC Guideline for Prescribing Opioids for Chronic Pain — United States, 2016*, which include 12 evidence-based recommendations. To help facilitate adoption of the 2016 CDC Guideline, a web-based interactive training series was developed to educate healthcare providers about the CDC Guideline recommendations. The aim of this paper is to describe the development and evaluation of the training series.

**Materials and Methods:** Each module was developed using the Analyze, Design, Develop, Implement, and Evaluate model. Assessment activities included an online course evaluation survey taken immediately after completing a training as well as a one-time survey that was conducted 3 months after training, using the first module in the series, Module 1: Addressing the Opioid Epidemic: Recommendations From CDC.

**Results:** Post-training surveys indicated that healthcare providers were extremely satisfied with the content and design of the modules in the training series. Approximately 90% indicated that the trainings addressed gaps in their knowledge and applied directly to their work. Of those who completed the 3-month post-training survey on Module 1, 90% shared that they felt more knowledgeable about the risks of opioid prescribing for chronic pain after completing the training.

**Conclusion:** Recognizing the potential challenges of adopting clinical practice guidelines, a web-based interactive training series was developed as part of a multifaceted approach to help healthcare providers apply the *CDC Guideline for Prescribing Opioids for Chronic Pain — United States, 2016*. Evaluation activities suggest that the trainings are informative, meet educational needs, and enable clinicians to apply the CDC Guideline.

**Keywords:** Opioid prescribing; Clinical practice guidelines; Medical education; Medical training development; Evaluation

## Abbreviations

ADDIE: Analyze, Design, Develop, Implement, and Evaluate; CDC:

Centers for Disease Control and Prevention; CME: Continuing Medical Education; CNE: Continuing Nurse Education; ISD: Instructional Systems Designer; MME: Morphine Milligram Equivalent; SME: Subject Matter Expert; TCEO: Training and Continuing Education Online

## Introduction

Prescription opioid overdose and misuse continue to be a serious public health crisis in the United States. From 1999 to 2020, overdose deaths involving prescription opioids increased more than five times, with nearly 263,000 Americans having died from an overdose involving prescription opioids [1]. The amount of opioids in morphine milligram equivalents prescribed per person has increased approximately threefold since 1999 [2]. In 2018, almost 50 million Americans had at least one prescription for opioids filled or refilled [3]. While prescribing levels peaked in 2012, they still remain far above what they were in 1999. Additionally, prescribing rates still vary across the United States, remaining very high in certain areas. In 2020, the overall US opioid dispensing rate was 43.3 prescriptions per 100 people, with some counties prescribing opioids nine times higher than the US rate [2,4].

To promote safer, more effective opioid prescribing practices for the treatment of chronic pain while reducing the risk of opioid use disorder, overdose, and death, the Centers for Disease Control and Prevention (CDC) published the *CDC Guideline for Prescribing Opioids for Chronic Pain — United States, 2016*, which outlines 12 evidence-based recommendations [5]. Clinical practice guidelines, which are recommendations on how to diagnose and treat a medical condition, have long been recognized as a means of improving the quality of health care and contribute to continuous improvements in patient safety worldwide [6]. When followed and implemented, guidelines can reduce inconsistencies in practice and bridge the gap between evidence and practice [6].

## Challenges Adopting Clinical Practice Guidelines

Developing and disseminating clinical practice guidelines for healthcare providers does not ensure their implementation. In fact, clinical practice guidelines are not always applied, and there is consistent evidence of gaps between guidelines and clinical practice [7]. Research indicates that some of the barriers healthcare providers face in implementing clinical practice guidelines include being unsure of how to apply recommendations to daily practice as well as a lack of knowledge, awareness, and familiarity with clinical practice guidelines [6,8,9]. Lacking self-efficacy or trust in one's abilities or skills is also reported as a primary barrier to clinical practice guideline implementation [7,9-11]. Additional obstacles can include organizational constraints (e.g., lack of staffing resources, collaboration, and coordination with allied agencies or departments), physician time constraints, competing priorities, legal factors, and/or equipment/system inefficiencies [7,10-13].

To address the barriers of adopting clinical practice guidelines, researchers suggest using an implementation approach comprising two or more components, including training, interactive tools, and resources like checklists and clinical decision tools [6,12]. This multifaceted implementation approach can affect change in professional behavior, improve quality of care, and accelerate the implementation of evidence-based practices and clinical practice guidelines [7,14]. For instance, training resources may also include or refer to mobile apps and other tools, incorporated into electronic health records. Finally, educational resources and tools have been shown to be effective in supporting guideline adherence [6,7].

As part of a multifaceted approach to promote the adoption of the CDC Guideline, CDC contracted ICF to develop an online educational series titled “Interactive Training Series for Healthcare Providers: Applying CDC’s Guideline for Prescribing Opioids.” The goal of the online training series was to educate healthcare providers about the CDC recommendations, using an engaging format that supports information application through interactive patient cases and knowledge checks. This article describes the development, implementation, and evaluation of the interactive training series.

## Materials and Methods

The modules were developed using the Analyze, Design, Develop, Implement, and Evaluate (ADDIE) model [15]. The CDC’s Quality Training Standards (Table 1) were also used to further guide the design and development of the training. Clinical subject matter experts (SMEs) collaborated with instructional systems designers (ISDs) to review modules and ensure the accuracy and relevance of the patient cases presented in the training. An online training series was developed to meet the needs of clinicians with busy schedules who may not have time to attend in-person training. Online self-learning modules provide convenient access to self-paced training on demand [16].

In following the ADDIE model, the development of the modules began with an **analysis** to determine topic areas in which healthcare providers needed additional information about the CDC recommendations on prescribing opioids for chronic pain. The initial analysis included a literature review and consultations with Guideline subject matter experts. This analysis found that healthcare providers had limited knowledge of when and how much to prescribe and had misconceptions about the effectiveness of opioid pain medication. The analysis also identified clinicians’ concerns regarding opioid use disorder and their ability to diagnose and treat it [5]. Having this information allowed these gaps to be addressed in the modules.

Ongoing analysis was used to inform development of future modules. This ongoing analysis entailed reviewing quantitative and qualitative feedback from learner surveys completed online. Survey data from the launch of the first module through October 31, 2017 reflected input from 1,561 unique participants, and data analyzed in 2018 included input from 5,224 learners. This feedback identified a need for topics on how to communicate with patients regarding the risks of opioid medications, and how to motivate patients to engage in nonpharmacologic treatment options. Some learners recommended training specific to nurses. The analysis of the feedback also provided insight into instructional features that learners believed would be beneficial. For example, learner feedback indicated that the interactive patient cases realistically reflected how they would apply knowledge and engage with patients in the real world. Therefore, patient cases were included in all modules. The feedback led to more topics being added to the series. In addition to evaluating learner feedback, there was a review and analysis of existing training to help identify content gaps. This also included examining the training to see if it met the CDC quality standards. While the initial analysis helped provide insight into the development of the training and identification of potential topics, it was not intended to be a complete or final inventory. Rather, it was part of the process of analyzing ongoing feedback that could

help shape future training updates to meet the changing opioid crisis landscape

The work conducted in the analysis phase informed initial module **design and development**. The design process began with establishing specific, measurable learning objectives based on feedback received during the analysis stage. Next, a creative strategy brief was developed to identify the audiences, desired outcomes, primary messages, promotion strategies, and resources. Content for the modules and instructional design strategies were used to create an outline of each training module that would be developed. The development process started with producing detailed storyboards with specific screen content and images. Online modules were programmed based on these storyboards. A variety of interactive features were included to promote engagement and provide feedback while taking a training. For example, in Module 10: Motivational Interviewing, interactive dialogue was included to allow healthcare providers to select effective patient communication strategies and receive feedback and redirection, if needed, based on their choices [17]. Because modules were released as they were developed, feedback from earlier modules was used to guide the design of subsequent modules and to improve the quality of the interactive training series. As part of the process, representatives from the healthcare provider audiences reviewed and provided feedback on the training content, with particular attention given to interactive patient cases. This feedback was used to create clinical cases that reflected the type of patients’ healthcare providers could encounter in real-life settings. The storyboards guided the programming of an online prototype. This prototype was then pilot tested with members from the intended healthcare provider audience. The formative feedback from the pilot testing was used to revise the trainings before finalizing.

During the **implementation** phase, the finalized modules were made available on CDC’s website as well as on CDC TRAIN, CDC’s learning management system for public health organizations. The first module released in the series was Module 1: Addressing the Opioid Epidemic: Recommendations From CDC, which launched in April 2017. The goals of this module were to provide an overview of the CDC Guideline including the rationale for the Guideline’s creation, key recommendations, and the benefits of implementing the Guideline. Additional modules were released as new topics were identified. This approach, rather than launching the series in its entirety, was used to provide immediate and ongoing support to healthcare providers who were taking the training, referred to as learners. Recognizing the importance of offering incentives to promote training participation, all modules offered free continuing education, including continuing medical education (CME), continuing nurse education (CNE), and continuing education units. Additionally, universities, professional associations, and organizations, such as State nursing boards, promoted the training series. Other Federal partners, including the National Institute on Drug Abuse, Substance Abuse and Mental Health Services Administration, and Centers for Medicare and Medicaid Services, also promoted the training series, as did state and local health departments working with CDC through grant programs. Table 2 includes the titles of the 14 current learning modules, along with a [link](#) to the interactive training.

To **evaluate** the trainings, learners took an online course evaluation immediately after completing a module and were required to successfully pass a post-test with a minimum score of 80% to earn continuing education credit. CDC’s Training and Continuing Education Online (TCEO) administered the post-test and course evaluation survey. TCEO tracked the number of learners who registered for a module, completed a module, and successfully passed the post-test. The training evaluation was guided by the Kirkpatrick Model, which uses four levels to evaluate training: (Level 1) reaction, (Level 2) learning, (Level 3) behavior, and (Level 4) results [18]. Level 1 (reaction) typically involves learners completing a post-course evaluation to give their impressions of the training. This level does not necessarily

**Table 1:** CDC’s Quality Training Standards.

1.	Training needs assessment informs training.
2.	Training includes learning objectives.
3.	Training content is accurate and relevant.
4.	Training includes opportunities for learner engagement.
5.	Training is designed for usability and accessibility.
6.	Training evaluation informs improvement.
7.	Training includes opportunity for learner assessment.
8.	Training includes follow-up support for the learner.

**Table 2:** Training Modules.

Module	Title
Module 1	Addressing the Opioid Epidemic: Recommendations From CDC
Module 2	Treating Chronic Pain Without Opioids
Module 3	Communicating With Patients
Module 4	Reducing the Risks of Opioids
Module 5	Assessing and Addressing Opioid Use Disorder
Module 6	Dosing and Titration of Opioids: How Much, How Long, and How and When to Stop
Module 7	Determining Whether to Initiate Opioids for Chronic Pain
Module 8	Implementing CDC's Opioid Prescribing Guideline Into Clinical Practice
Module 9	Opioid Use and Pregnancy
Module 10	Motivational Interviewing
Module 11	Collaborative Patient–Provider Relationship in Opioid Clinical Decision Making
Module 12	A Nurse's Call to Action for Safer Opioid Prescribing Practices
Module 13	Using the Prescription Drug Monitoring Program to Promote Patient Safety in Opioid Prescribing and Dispensing
Module 14	Addressing the Opioid Overdose Epidemic in the Emergency Department

More information on these modules is available at <https://www.cdc.gov/opioids/providers/training/interactive.html>

measure what participants have learned but, rather, gauges whether learners found the training engaging, favorable, and relevant. Level 2 (learning) measured what participants have learned, such as knowledge and skills. Level 3 (behavior) assessed the learners' ability to apply what they learned, and Level 4 (results) measured the long-term impacts of the training. Levels 1 and 2 were assessed through the course evaluation survey completed by learners immediately after completing a module. The course evaluation also measured behavioral intentions to assess level 3.

**Three-Month Follow-up Survey:** To further measure the ongoing impact of the training series and to examine actual behavior change rather than behavioral intention, a follow-up survey was conducted in 2020 to assess knowledge and behavior change 3 months after completing Module 1 (follow-up survey). One hundred participants were targeted for the survey as a pilot to gauge the feasibility of providers participating in a follow-up survey after 3 months, with the goal of eventually expanding future surveys. Module 1 provides a broad overview and introduction to the CDC Guideline for Prescribing Opioids for Chronic Pain, and served as a gateway to additional training; therefore it was selected for the survey. While it is possible that participants also completed other modules in the series before taking the survey, this 12-question assessment aimed to examine knowledge and behaviors specific to module 1 (e.g., changes in prescribing practices) among learners 3 months after participating in the training. A 3-month period was selected to allow sufficient time for learners to apply what they had learned in the training. Several previous evaluations, including an assessment of an opioid-risk-mitigation continuing education program, used similar timeframes [19,20]. To request participation in the survey, invitations were emailed to learners three months after they earned CME or CNE for Module 1 in 2020, starting in March 2020. This process continued, and the survey remained active until a total of 100 responses were received. In addition to the initial invitation, reminder emails were sent 3, 7, and 14 days after the initial invitation to individuals who had not yet completed the survey. The final survey included 61 CME and 39 CNE respondents. All data management and analysis for this study were performed in IBM's SPSS Version 22. Basic descriptive statistics were used to provide frequencies and means, and for further analysis and to assess significant differences we used the Wilcoxon Signed Rank Test. The study protocol for the follow-up survey was reviewed by the ICF Institutional Review Board (IRB) and was determined to be exempt due to posing no risk or no more than minimal risk.

## Results

### Course Evaluation Survey

Since the launch of the modules in April 2017, a total of 125,323

learners have completed the training and course evaluation through October 2021. When examining learners' knowledge, attitudes, and behavioral intentions immediately after completing the trainings, most learners (i.e., 88%) reported that the materials presented in the modules addressed an existing gap in their knowledge or an educational/practice need (Table 3). Approximately 90% of the learners indicated that they would be able to apply the knowledge gained from the training to increase or maintain their competence, and to develop strategies or provide interventions. More than 88% of the learners indicated that they could apply the knowledge gained to their medical practice and to improve performance. Course evaluations were assessed during the April 2017 through March 2021 timeframe. Additional findings can be found in Table 3.

### Three-Month Follow-up Survey

To measure the knowledge gained during the training, respondents who completed the survey were asked to rate their level of agreement with a series of statements that measured their confidence and ability to apply the information provided in the training module. More than 90% either agreed or strongly agreed that they felt confident in the ability to talk with patients about the risks associated with opioid use since completing the training. Likewise, more than 90% of respondents either agreed or strongly agreed that after taking the training they could explain why a guideline is needed, describe the CDC recommendations, and explain the benefits of implementing the guideline as a result of taking the training (Table 4).

Respondents also rated their overall knowledge about the risks of prescribing opioids for chronic pain thinking back to before they took the training and again after completing the training. When asked about their knowledge before the training, 72% strongly agreed or agreed that they were very knowledgeable overall about the risks of prescribing opioids for chronic pain. When asked about their knowledge after the training, 91% felt they were very knowledgeable overall about the risks of prescribing opioids for chronic pain. The increase in knowledge was statistically significant (i.e., based on the Wilcoxon Signed Rank Test with significance at the 0.001 level), indicating that the training was effective in increasing knowledge. More than 50% strongly agreed that they were familiar with the risk of opioid prescribing after the training compared with only 20% before the training, also indicating a significant increase.

Survey respondents also indicated how their prescribing practices had changed since completing the training (Table 5). More than 55% of respondents indicated discussing the risks associated with opioid use more frequently with their patients since completing the training. Since completing the training, approximately 40% of learners indicated



**Table 3:** Course Evaluation Survey Findings.

Survey Item <sup>1</sup>	Percentage Agreement and N	Modules in which survey item was Included
The content and learning materials address a need or a gap in my knowledge or skills, and/or did the content address an educational need or practice gap? (Strongly agree/Agree) <sup>2</sup>	87.7%; n = 99,077	Modules 1–14
This activity effectively met my educational needs. (Strongly agree/Agree) <sup>2</sup>	86.3%; n = 69,643	Modules 1–11
I will be able to apply the knowledge gained from this activity to increase or maintain my competence. (Strongly agree/Agree) <sup>2</sup>	90.8%; n = 69,643	Modules 1–11
I will be able to apply the knowledge gained from this activity to my practice. (Strongly agree/Agree) <sup>2</sup>	88.1%; n = 69,643	Modules 1–11
I will be able to apply the knowledge/skills gained from this activity to develop strategies and provide interventions. (Strongly agree/Agree) <sup>2</sup>	89.1%; n = 69,643	Modules 1–11
I will be able to apply the knowledge gained from this activity to improve performance. (Strongly agree/Agree) <sup>2</sup>	88.7%; n = 69,643	Modules 1–11
Will you use what you learned from this course in your work? (Probably will/Definitely will) <sup>3</sup>	73.4%; n = 29,436	Modules 2–14

<sup>1</sup>Timeframe for course evaluation surveys April 2017 – March 2021

<sup>2</sup>Response options: Strongly agree, Agree, Neither/undecided, Disagree, Strongly disagree.

<sup>3</sup>Response options: Definitely not, Probably not, Possibly, Probably will, Definitely will. This question was added to the course evaluation through the accreditation process and was not included in Module 1.

**Table 4:** Three-Month Follow-Up Survey: Knowledge Items.

Knowledge Items (N=99)	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree
I can explain why a guideline for prescribing opioids is needed.	54.5	41.1	4.0	0.0	0.0
I can describe the key recommendations in the CDC Guideline for prescribing opioids.	36.4	55.6	6.1	2.0	0.0
I can explain potential benefits of implementing the CDC recommendations for prescribing opioids.	40.4	55.6	3.0	1.0	0.0
I feel confident in my ability to talk with patients about the risks associated with opioid use.	45.5	48.5	5.1	0.0	1.0

**Table 5:** Three-Month Follow-Up Survey: Reported Changes in Prescribing Practice.

Since completing the module:	More Frequently (Percent Reporting)	About the Same Frequency (Percent Reporting)	Less Frequently (Percent Reporting)
I prescribe opioids for chronic pain (N = 91)	0.0	58.2	41.8
I prescribe nonopioid alternatives (e.g., physical therapy, behavioral therapy) for chronic pain (N = 91)	39.4	57.4	3.2
I discuss with my patients the risks associated with opioid use (N = 93)	55.9	43.0	1.1

prescribing opioids less frequently, nearly 40% indicated prescribing nonopioid alternatives, and almost 60% of respondents indicated prescribing opioids at about the same frequency as before taking the training.

## Discussion

Healthcare professionals can play a key role in preventing misuse of prescription opioids. To help address the opioid crisis, including high rates of opioid prescribing, CDC released the *CDC Guideline for Prescribing Opioids for Chronic Pain — United States, 2016* to provide recommendations for the safe prescribing of opioid pain medication for patients ages 18 and older. To support implementation of this important Guideline, CDC created an online training series to help providers gain a better understanding of the recommendations, the risks and benefits of prescription opioids, nonopioid treatment options, patient communication, and risk mitigation. Findings from the post-training course evaluations to assess understanding and implementation of the recommendations presented in the CDC Guideline show promise that the training modules are meeting clinicians' educational needs. When reviewing data from the course evaluations, most respondents indicated that the training modules addressed an existing knowledge gap, applied to their work, and met their expectations. The course evaluations focused on assessing the first two levels of evaluation, based on the Kirkpatrick Model, including reaction to the training and assessing

what participants have learned. In both cases, the course evaluations offered promising support that the training modules seemed to have been well received and have the potential to impact clinician behavior with regards to opioid prescribing.

To further examine longer term impacts on knowledge, attitudes, and actual behavior change, a 3-month follow-up survey was implemented among learners who completed Module 1. Initial findings from this survey also showed promising results, suggesting that the training favorably impacted learners' knowledge of opioid prescribing practices and prescribing behavior. The survey found that respondents felt more confident in their ability to talk with patients about the risks associated with opioid use, and that nearly 50% of respondents reported favorable changes in their prescribing behavior. Whereas the course evaluation queried clinicians immediately after completing a training and before they'd had a chance to apply what they had learned (i.e., asking about behavioral intentions), the 3-month follow up survey provided a better understanding of reported behavioral change. Having data from both helped to provide a better understanding of immediate impressions of the trainings as well as longer term impacts of the training. While it is possible that respondents to the 3-month follow up survey also completed other training modules or courses that may have impacted their knowledge, attitudes and behavior over this time period, the survey emphasized content specific to module 1 to examine changes based on this particular module.

Findings from both the post-course evaluation and 3-month follow-up survey suggest that CDC's interactive online training series is meeting a gap in supporting adoption of the CDC Guideline and may be helping to support a culture of safer opioid prescribing. To date, more than 120,000 providers have taken all 14 of the CDC training modules. The on-demand format of the online training creates flexible learning for healthcare providers across the U.S. and facilitates the ease of taking the trainings. This format further allows organizations, such as medical schools and health systems, to make the training available to their students and employees as well as promote the training through their websites. Having access to the course evaluation and 3-month follow-up survey data provided additional insight into what learners valued most in the training and would like to see addressed in future trainings. The iterative approach to launching the modules allowed use of evaluation data from earlier modules to shape those developed later in the series.

## Limitations

There were some limitations with the development of the trainings. First, the pilot testing of the modules included only five participants from each provider category. Given this small sample size and the various information needs and learning styles of the intended audiences, the pilot testers may not have been representative of the intended audiences. With a larger pool of pilot testers, it is possible that there would have been additional or different feedback. Nonetheless, the feedback received was from practicing clinicians and was consistent across the pilot testers, suggesting consensus in the feedback used to develop the trainings. Second, the ongoing feedback that was used to improve the trainings was received through the course evaluations from clinicians who completed the training. It is possible that feedback from learners who did not complete the training may have offered different recommendations.

The evaluation also had several limitations worth noting. First, the use of only a post-course survey may have made measuring knowledge change less conclusive than if a pre-course survey had also been given. Second, because learners completed the survey immediately after the training, their responses reflected their perception of whether and how they might use the trainings rather than their actual behavior. Therefore, we only reached Levels 1 and 2 in the Kirkpatrick Model and relied on behavioral intentions to address Level 3 of the model. To help address these limitations and gauge actual behavior change, we developed and executed a 3-month post-training survey to assess knowledge and behaviors several months after taking the training. Although this survey helped to measure Level 3 of the Kirkpatrick Model more effectively, it also had several limitations. First, the survey had a small sample size of 100 respondents. Part of the intent of the follow-up survey was to assess the feasibility of learners completing a survey at 3-months out. Due to this, we only targeted 100 learners as a pilot. To more fully assess the impact of the training in the future, a larger sample size would be necessary. Second, the survey was conducted only 3 months after training and, therefore, may not accurately reflect behavior change over a longer time period. Third, the survey asked participants to reflect on their knowledge, attitudes, and behavior before the training, and thus recall bias may have influenced their responses.

Approximately half of all respondents indicated that they did not change their opioid prescribing practices. Although this finding is important, it is possible that providers had already made changes to their prescribing practices before taking the training, given the attention that the opioid crisis and overprescribing of opioids have received in the media and among healthcare systems since the modules were first introduced. Additional context about the influences of opioid prescribing and recommendations for nonopioid alternatives can be explored in future data collection to help understand this finding.

## Conclusion

To help support implementation of the CDC Guideline, an interactive online training series was developed for healthcare providers. Findings from the course evaluations and 3-month follow-up survey helped to assess understanding and implementation of the Guideline and suggest that the trainings address an educational need among learners with regards to opioid prescribing. By increasing provider knowledge and awareness of opioid-related harms, the training may have the potential to help foster better patient-provider collaboration for safer opioid prescribing in the management of chronic pain. In turn, this can help reduce the misuse of prescription opioids and ultimately help mitigate drug overdose morbidity and mortality. Data from the evaluations and survey have also been useful for providing new insights into what learners valued in the training as well as for suggesting additional training topics. With the release of the updated CDC Guideline anticipated in late 2022, this insight will be critical for developing future trainings that support clinicians in applying Guideline recommendations into clinical settings to help end the opioid crisis.

## CDC Disclaimer

The findings and conclusions in this report [or presentation] are those of the author(s) and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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