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Development of a Technology-Based, Interactive Intervention to Reduce Substance Use Disorder Stigma Among Medical Students

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Abstract: High levels of stigma among the healthcare workforce impede efforts to increase access to effective substance use disorder (SUD) treatments. Education on SUDs that (1) is tailored to physicians in training and (2) directly addresses and attempts to combat SUD stigma may help produce lasting reductions in SUD stigmatization within the healthcare setting. This study aims to describe the development of a technology-based, interactive SUD stigma intervention for medical students, created in collaboration with medical students, practicing clinicians, and experts in the fields of psychology and addiction medicine. This intervention is unique in its interactive application-based approach and the use of a computerized intervention authorizing system (CIAS) to guide the participant through the training. The final intervention includes four interactive online modules focused on SUD education using a biopsychosocial model, including stigma acknowledgment, an examination of patient perspectives, and the application of skills. Planned future studies will examine the feasibility, acceptability, and preliminary efficacy of the intervention among medical students. This intervention leverages the existing CIAS to provide interactive training that can be used as a part of medical student training and be expanded to other healthcare professionals (e.g., nurses and community health workers). Ultimately, this work will be used to drive a reduction in SUD stigma in medical settings.

Keywords: substance use disorder; stigma; curriculum; intervention; biopsychosocial model; web-based learning

1. Introduction

Substance dependence is an urgent public health matter, and the added effects of the stigma associated with substance use disorders (SUDs) can create barriers to care [1] and impede future efforts to improve access to effective SUD treatments [2]. Patients with SUDs report experiencing stigmatizing encounters within the hospital setting [3], and internalized stigma is associated with a myriad of negative health consequences, including depression,

lower self-esteem, and a greater severity of substance dependency [4]. Due to the significant detrimental effects of SUD stigma on patient welfare and outcomes, education on SUDs with a focus on stigma-reduction interventions targeting medical professionals is warranted. The delivery of such material may be provided through continuing medical education, academic detailing, and/or communication campaigns.

One promising avenue for the dissemination of SUD stigma-reduction campaigns is their incorporation into medical school or residency curricula [2]. During medical school, students are learning the norms of medicine and cultures within their chosen disciplines in addition to didactic information [5]. Thus, early-career SUD stigma education has the potential to hinder the cycles of stigmatization propagation within the healthcare industry [6]. Moreover, physicians often establish the social norms in hospitals or clinics [7], meaning it is important to develop doctors-in-training who are unbiased and can promote inclusive norms in their future workplaces. In light of this, the current study expands upon the work of several recent studies that have attempted to develop SUD stigma interventions for medical students [8–11].

One previous study assessed levels of SUD stigma among medical students at Virginia Commonwealth University (VCU) [11]. Using a five-point Likert scale of strongly disagree to strongly agree, students were asked about a series of subjects commonly encountered by providers working with people with SUDs. Examples of specific questions include the following: "Insurance plans should cover patients with substance use disorders to the same degree that they cover patients with other conditions" and "Working with patients with SUD is satisfying." Overall, medical students demonstrated low–moderate levels of stigma, suggesting that although stigma endorsement is not overwhelmingly high, some stigma may still be pervasive among trainees. Further, previous work found positive associations with SUD stigma and years of clinical experience, reinforcing the need to address SUD stigma in medical students, as addressing stigma in this population can have long-term, positive effects on addiction medicine [12].

Medical school curricula currently have limited formal training opportunities focused on SUD stigma. VCU medical students, for example, have opportunities to learn about SUDs and their stigma either during their core OBGYN rotation through an integrated addiction and obstetric clinic, or in the addiction medicine outpatient clinic during their ambulatory rotation. However, these opportunities are not available for all students as there is no universal exposure to addiction medicine in the third year of medical school, and training in SUD stigma is not standardized during these clinical experiences. Rather, the OBGYN students rotating through the associated SUD clinic complete pre-reading references in person-first language as a tool to destigmatize SUD and participate in informal discussions with addiction medicine teaching providers in the clinical environment between patient encounters. This current project sought to adapt this existing SUD stigma-training educational format so that it is widely accessible to all medical students, expanding upon the curriculum stigma-focused content to make it more comprehensive, and adapting the delivery of this content to a standardized format. Here, we describe the development process for a technology-based, interactive SUD stigma intervention tailored to medical students that is provided on a dynamic platform incorporating multimedia features and an interactive module where users participate in a series of "choose-your-own-adventure" activities.

2. Materials and Methods

2.1. Assembly of a Multidisciplinary Team

The SUD stigma intervention was created by a multidisciplinary team of medical students, practicing clinicians, and experts in the fields of psychology, stigma, and addiction medicine at VCU. This included collaboration with the PROGRESS Lab at VCU, which is a social health psychology laboratory focused on promoting equitable gender, racial and ethnic, sexual and reproductive health outcomes. The team was composed of three second-year medical students, a clinician and lab director who specializes in providing medical care to patients with SUD, a faculty advisor in the psychology doctoral program at VCU, an assistant professor in the field of psychology, two graduate-level students, and research assistants. The medical students chosen to participate in the project were current students at the preclinical stage of training, as they had the most current knowledge of the strategies used to deliver lectures in the medical school setting. These students were selected following their own expressed interest in the field of SUD and stigma training and provided key insight into the best practices for connecting with the intervention's target audience. The development process involved regularly scheduled episodic feedback and collaboration between team members, with an emphasis placed on the medical student-driven presentation of the content. Additionally, two other team members from the VCU School of the Arts (VCUArts) were involved in the development of the script, video, and audio media used for the intervention.

2.2. Format of the Intervention

Previous interventions have aimed to reduce SUD-related stigma among healthcare providers, but very few projects explored the use of web-based educational programs [13]. Moreover, among those that did, the majority were geared towards residents, nurses and other healthcare professionals. The literature demonstrates a need to assess the efficacy of a technology-based intervention among medical students. Considering both the time and energy constraints and limited flexibilities of medical students, we chose a modality that is engaging, self-paced, and easily integrated within the curriculum, and that can be scheduled around complex clinical schedules. The CIAS (Computerized Intervention Authorizing System) platform, developed by Michigan State University, was used as the final home for the training intervention. This platform allowed for the insertion of imagery, videos, and interactive question-and-answer sections, with the intention of elevating the learning experience beyond the traditional lecture format. The content of the intervention (Section 2.3) was divided into four modules, presented through CIAS. Students were able to complete the modules at their own pace and had the ability to leave and return to the content at a later time.

2.3. Content of the Intervention

Through focused group discussion moderated by the senior author, the multidisciplinary team of experts identified four main topics/modules related to SUD stigma as essential for this SUD stigma-reduction intervention. Those topics included SUD education, stigma acknowledgement, patient perspectives, and practical applications. The development process for each of these modules is discussed in detail below. Each module underwent multiple stages of review by the multidisciplinary team, with a particular emphasis on medical student team member feedback. During the meetings, the team would review the content and progress made and open the floor for comments, questions, feedback, and ideas. This feedback was used to refine the modules within CIAS to ensure maximal educational effectiveness and engagement. Additionally, an introductory module was added to orient users to the program and provide an estimated time commitment in

an effort to encourage completion and set expectations for the experience. Each module was expected to take between 20 and 30 min to complete, with a total time of 1–2 h being required to complete the entire intervention. This time estimate was based on internal piloting within the team and a small group of current medical students not involved in the development process. At the end of the intervention, a concluding module was included to encourage self-reflection and program evaluation.

2.3.1. Development of Module 1: SUD Education

The first module was designed to provide education on the biopsychosocial model of SUD. The narrative script was written by the multidisciplinary team to guide the user through the module and provide additional education on the biological, psychological, and social bases of SUD. The module also provides information on behavioral and pharmacological treatment options for SUD. To encourage active learning, checkpoints prompting self-reflection and knowledge checks regarding the topics covered were built in throughout the module. The narrator for this portion of the module, Peedy the Parrot, was built into CIAS and did not require the use of additional resources.

2.3.2. Development of Module 2: Stigma Acknowledgement

The second module was designed to explore the concept of stigma and specifically how individual, structural, and interpersonal SUD stigma may manifest. This module features interactive, playable videos embedded within CIAS to deliver the educational content. To accomplish this, a MP4 file of a Prezi presentation containing the aforementioned content was exported and edited using the site 'WeVideo' to integrate accompanying audio and sound effects. The narrative script, which was written by the multidisciplinary team, was designed to complement the visual content and was narrated using artificial intelligence technology. To further the level of user interaction with the module, checkpoints were inserted within CIAS allowing space for reflection and knowledge checks.

2.3.3. Development of Module 3: Patient Perspectives

The third module deviates from the educational style of the first two phases to incorporate the patient's voice and maximize audience attention. This module features a patient interview in which an individual shares their personal experience with stigmatizing behavior in healthcare and elaborates on how this impacted their perception of their care and their health outcomes. The patient who shared their experience in this training module was recruited by a physician team member. The patient's story was shared via video and was collected using the record function on the platform Zoom with the patient's permission. The resultant MP4 file was then uploaded to the IVY Lab's private YouTube account before being inserted into CIAS. As in the other modules, checkpoints are built into the CIAS platform to provide the user with the opportunity to participate in feedback, knowledge checks, and self-reflections.

2.3.4. Development of Module 4: Practical Application

The final module allows the user to apply the principles of the stigma training they completed in the previous three modules to a clinical scenario, showing the consequences of their choices in real-time. Designed as a "choose your own adventure"-style activity, this module features a series of videos with potential outcomes that differ depending on the choices made by the user. The video and storyline content within this phase were developed with the assistance of the VCUarts. Team members included the original development team in addition to a professional videographer, graduate students enrolled in the VCUarts program, and actors familiar with the standardized patient role. A script was created via collaboration between the stigma research team and the VCUarts team, incorporating

content that was both factual and realistic to a clinical patient scenario. The script (Figure 1) was informed by the team physicians' experience treating patients with SUD and VCUarts students' experience with producing dialog that represents genuine conversation. The final concept map of the module (Figure 2) represented a web of possible outcomes depending on the choices made by the individual completing the training. At the end of the module, students were provided with the opportunity to return to the beginning of the interactive activity and see the impact of different choices on the final outcome. After finalization of the script, the videos for Module 4 were filmed at VCU School of Medicine's simulation center. The files were then edited by the VCUarts team and uploaded to the IVY Lab's private YouTube account for insertion into CIAS.

SCENE 1: MEDICAL OFFICE HALLWAY - DAY

We view everything from a first person perspective as the avatar walks up to a patient room. DOCTOR 1 approaches.

DOCTOR
Hey there! Clocking in?

A nod.

DOCTOR (CONT'D)
Great. You can tackle this. Tox screen came back clean. She claims to have been clean for days but you never know with addicts.

PROMPT:

AGREE (2A): "You're so right. All they need is to take accountability for themselves."

SAY NOTHING (2B): Take the chart and enter the room.

CONFRONT (2C): "You're referring to a patient with a substance use disorder, not an addict."

SCENE 2A:

We see from the inside of the room, as PATIENT overhears the entire conversation.

DOCTOR:
Tell me about it. I'm going to go ahead and get out of here, I'll see you tomorrow!

The avatar enters the patient's room as DOCTOR walks away, but as we enter, we see PATIENT is gone.

PROCEED TO OUTCOME 1

Figure 1. Draft of Module 4 script.

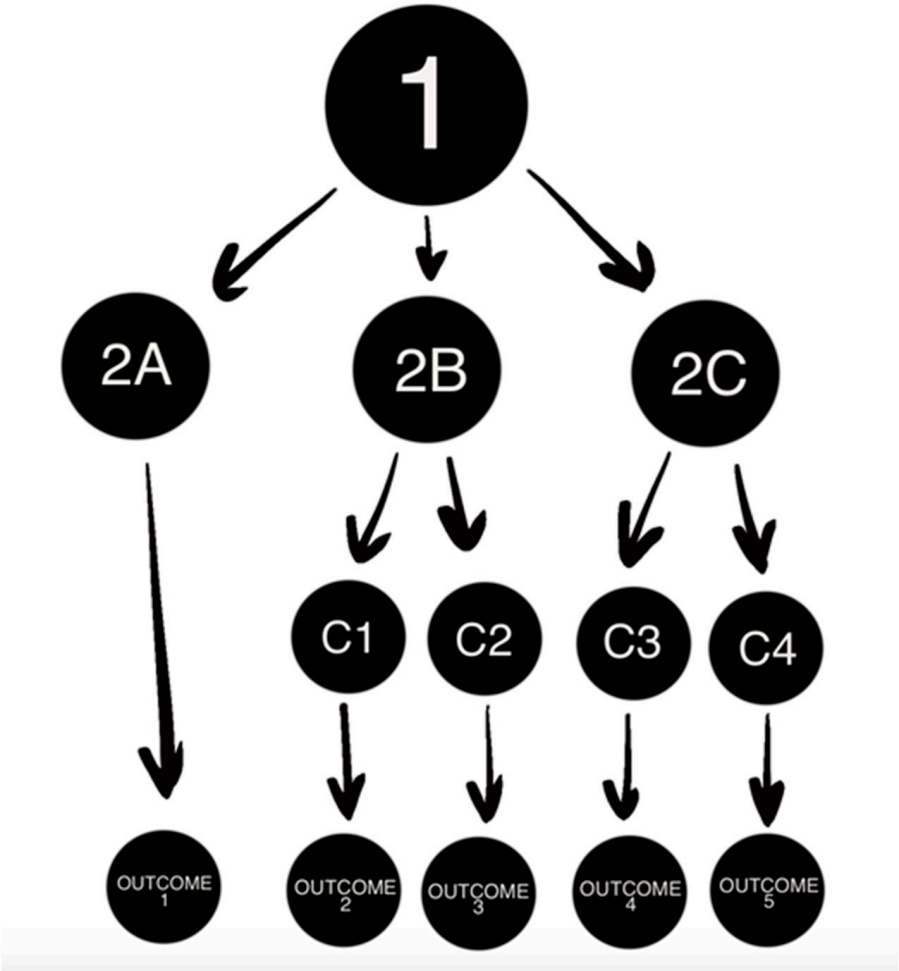

Figure 2. Concept map of potential outcomes in Module 4.

3. Results

The finalized version of the intervention includes the four content-based modules discussed above (Section 2.3), in addition to introductory and user experience component and a final evaluation component. The finalized content of each of the six components is discussed below.

3.1. Intervention Introduction

The introduction to the module provides the user with a brief overview of the upcoming content. This is where users will meet Peedy, an animated parrot character within CIAS, who narrates portions of the material and guides the user through each module. Additionally, the user is introduced to the patient who will share their story as a part of Module 3, "Patient Perspectives", in this section. Navigation through the module consists of simply clicking the "next" arrow at the bottom of each screen, which takes the user to a new page with different content.

3.2. Module 1: SUD Education

Prior to engaging with the educational content, users participate in a short self-assessment to evaluate their initial understanding and perception of addiction. This is accomplished through multiple choice question-and-answer options. Then, the SUD Education phase covers the topic of the biopsychosocial model of addiction, which is split into three categories covering the biological, psychological, and social bases of addiction, as well as the topic of SUD treatments. The content of each of the four subtopics is presented

as a series of images, text, and animated videos, with interspersed knowledge checks and self-reflection opportunities. Each page exposes the user to new information, allowing the user to control the pace at which they complete the training. The biopsychosocial model of SUD is emphasized to provide a comprehensive framework for understanding health and illness by considering the interplay of biological, psychological, and social factors.

3.2.1. Subtopic 1: The Biological Basis of SUD

This section describes the critical role that the brain's mesolimbic dopamine pathway plays in addiction. The section describes the current knowledge regarding dopaminergic underpinnings of drug reinforcement, tolerance, and dependence within the context of SUD.

3.2.2. Subtopic 2: The Psychological Basis of SUD

This section discusses operant and classical conditioning and their manifestations in people who develop SUD. The material guides the user through an investigation of the relationship between mental health disorders and SUD, including the correlation between people who experienced traumatic events and people who then go on to develop SUD. This section also discusses how substance use can be related to an increased risk of developing mental health disorders as a young adult.

3.2.3. Subtopic 3: The Social Basis of SUD

This section explores the user's perception of addiction as it relates to social norms and normative beliefs. In this section, emphasis is placed on the influence a person's perception of social norms can have on their propensity to engage in substance use.

3.2.4. Subtopic 4: Treatment Options

This section provides a brief overview of the common treatment options that patients with SUD may be offered, including medications, behavioral therapy, and addiction support groups. Emphasis is placed on improved outcomes with a multidisciplinary approach to treatment.

3.3. Module 2: Stigma Acknowledgement

Peedy, a virtual character, serves as a guide for the user throughout this module. The module begins by acknowledging the discomfort that can arise when exploring one's own biases and encourages users to perceive the training module as a place without judgment. The sub-topics of this module explore different types of stigma, such as individual, structural, and interpersonal, through videos and images. It is important to address these different aspects of stigma so that one can recognize the impact of stigma on others, as it is influenced by multiple dimensions and manifests through individual thoughts and beliefs, peer and societal interactions, the environment, and cultural norms. There are also knowledge checks and opportunities for self-reflection within this module in the form of free responses. At the end of the module, the user is provided with the opportunity to create their own definition of stigma and reflect on their experiences with stigmatizing phrases.

3.3.1. Subtopic 1: Individual Stigma

This section provides the definition of individual or "self-stigma". Because this intervention is focused on the impact of stigma as it manifests externally, through language, culture, and society, this section was kept brief.

3.3.2. Subtopic 2: Structural Stigma

The concept of structural stigma is explored as the user delves into a discussion of societal-level conditions, cultural norms, and policy. In the video segment on structural stigma, users are exposed to policies that play a direct role in promoting stigmatizing attitudes towards people living with SUDs. The impact of structural stigma is further described through a discussion of the direct relationship between stigmatizing attitudes held by policymakers and healthcare workers and barriers to healthcare leading to poor health outcomes. At the end of this portion of the training, students are asked to share their new knowledge with Peedy.

3.3.3. Subtopic 3: Interpersonal Stigma

Users navigate through another series of videos in which the manifestations of interpersonal stigma with healthcare providers and its effect on patients is discussed. Users are asked to evaluate their own ability to recognize stigmatizing behaviors, and are then presented with real examples of the ways in which structural and interpersonal stigma are mutually reinforcing and have detrimental effects on people living with SUDs. Following this discussion, users are asked to come up with ways in which they might address one issue covered in the video.

3.3.4. Subtopic 4: A Call to Action

The final section of this training module includes a video on the specific actions one may take to combat the impact of structural and interpersonal stigma, ranging from advocating for policy changes to addressing stigma when it is observed.

3.4. Module 3: Patient Perspectives

In this module, users are reintroduced to the patient from the introduction portion of the program, who describes a stigmatizing interaction in the healthcare setting. The patient is joined in conversation by a physician who works within the field of addiction medicine. The discussion focuses on access to care and the impact of the fear of stigmatizing attitudes and discrimination by healthcare providers. Following the video of the patient, users are provided with the opportunity to share their thoughts via free response, focusing on how they are feeling following the discussion of topics such as stigma and SUD. Including this patient interview was crucial to demonstrate the tangible impact that stigmatizing attitudes in healthcare have on individuals. This reinforces the applicability of the intervention's lessons, highlighting their relevance to medical students' interactions with future patients.

3.5. Module 4: Practical Application

In this module, trainees are provided with the opportunity to apply the knowledge they have gained throughout the program to navigate through a series of choices during a fictional patient encounter. The module begins with the animated character, Peedy, introducing and providing directions for the knowledge application task. The patient encounter is presented to the user through a set of embedded videos within CIAS, and users are taken to subsequent pages within the module based on the choices that are made during the patient encounter. The videos are recorded so that the user perceives the events through the point of view of the medical provider. The scenario then progresses through a variety of outcomes as the user makes their decisions. Users are presented with three scenes and asked to make a choice at the end of each scene.

In scene one, the patient assumes the role of a medical provider discussing a patient with a colleague, who uses stigmatizing language to refer to the patient. This conversation is overheard by the patient without either provider's knowledge. As the provider, the user must then choose a response to their colleague before moving to the next video.

In scene two, the provider enters the patient room, where the patient reacts to the conversation they have just overheard. The patient will have a different response to the provider depending on the previous choice made. The user is then provided with the opportunity to engage with the patient as the provider with further choices that use language ranging from reaffirming and informed to stigmatizing and judgmental.

In scene three, the camera follows the patient to their car post-visit, where the choices made by the user then influence the patient's phone call to a friend describing their perception of the care they received and how that influences their decision to proceed with seeking medical treatment.

This practical application section was important to include because it provides users with the opportunity to apply what they have learned throughout the intervention and see various consequences of their actions in real-time. This module is one major aspect of the intervention that makes this training unique and deviates from the format of lecture-based learning that is predominantly seen in medical education.

3.6. User Experience and Evaluation

Once the training modules have been completed, users will be asked to evaluate how much the training changed their ideas about stigma in SUD and the acceptability of the training, and rate how likely they would be to recommend the training module to a peer. Feedback is collected through a sliding rating scale of 1–10 regarding users' level of confidence in their ability to address substance use disorders and stigma, as well as an open space for free response.

4. Discussion

Stigma from medical providers surrounding SUD is a major barrier to individuals with SUD receiving effective and compassionate addiction care. To address this, we developed an online, interactive SUD stigma-reduction intervention for medical school students. Our intervention was developed by an interdisciplinary team, combining perspectives from individuals both within and outside of healthcare at various stages of training and from a diverse spectrum of fields, including stigma and addiction medicine, women's health, and mental health. Students and educators at the graduate level of training in both Arts and Psychology also played an integral role in the development of our intervention. The final product utilizes a web-based learning approach to deliver stigma-reduction training and includes patient narratives and interactive scenarios. This represents a promising and innovative approach to addressing the increasing demand for SUD-trained healthcare professionals. Other projects have shown that online training programs are excellent options as they support flexibility and convenience for providers, promote individualized learning and self-paced content, allow for easier data-tracking and feedback mechanisms, and provide cost-effective solutions for institutions with low resources [14].

This project has particular strengths compared to other SUD stigma interventions. The ability for participants to apply their knowledge through interactive videos and activities in this intervention is a strength and will further contribute to stigma reduction, beyond the effects of traditional methods. Other interventions rely on users participating in a didactic curriculum [15], engaging in lectures [8,10], or viewing a video [9], without an interactive component. However, our interactive component, using self-check questions and allowing users to respond to scenarios, enables learners to think critically in potentially stigmatizing

situations to better understand why a statement or action might be stigmatizing and choose how to best respond. Previous research shows that interactive training and the application of knowledge can more effectively improve knowledge of medical topics than lecture content [16,17]. Moreover, the incorporation of these modules supports the structured, sequential learning of the topic, promoting knowledge retention [14]. Our use of a user-friendly, technology-based online platform balances this structure with additional flexibility to fit within the schedules of busy medical trainees. This structure may also be evaluated for use in, implemented in, and adapted to different disciplines.

One limitation of this study is that, since the protocol is completely virtual, it may be less engaging compared to an in-person presentation and discussion. However, the program's virtual accessibility is advantageous as it allows user flexibility. Another limitation that was considered is bias among the development team. Individuals who choose to participate in this project may already have considered the importance of identifying and reducing stigma and, therefore, may be more receptive to stigma-reduction efforts [3] and potentially less likely to have perspectives similar to the future intended audience of this intervention. Ways to mitigate this limitation during further, larger-scale development could be to incorporate feedback from individuals who are earlier on in their medical student training and may hold more stigmatizing views on SUDs. Additionally, different healthcare professionals, such as nurses, social workers, medical assistants, and community health workers, also play crucial roles in addiction care and could benefit from SUD stigma interventions. This intervention is tailored to medical students but could be expanded in the future to address these other healthcare professionals, informed by needs assessments specific to these other target groups.

Integrating modules like those included in this intervention into the medical school curriculum could potentially address the gaps in stigma-reduction education in medical training and may help standardize the learning about stigmatizing attitudes related to SUDs. This approach could also provide students with early exposure to the principles of compassionate addiction care. Unlike traditional interventions, this intervention uses the innovative CIAS to encourage participants to actively apply their learning. Beyond these potential benefits, this intervention may help medical students develop a foundation for ongoing education on SUD stigma that could extend into residency, fellowship, and their future careers. Ultimately, reducing stigma and changing providers' interactions with patients may encourage patients to continue seeking SUD care.

To advance this work, our team's next steps include a planned mixed-methods feasibility and acceptability pilot study of the intervention among a cohort of medical students. This project will evaluate and inform our research team of the practicability of integrating this intervention into broader medical school curricula and its potential for scale-up in a subsequent study evaluating its impact on students' knowledge and levels of stigma. Ultimately, our goal is to integrate this intervention into the medical school curricula at a larger scale, addressing the gaps in current stigma-reduction efforts and fostering a more equitable healthcare environment for individuals with SUDs.

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Abbreviations

The following abbreviations are used in this manuscript:

CIAS	Computerized Intervention Authorizing System
OBGYN	Obstetrics and gynecology
SUD	Substance use disorder
VCU	Virginia Commonwealth University
VCUarts	VCU School of the Arts

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