Brief Communications

Teaching Basic Knowledge on Substance Use Disorders: The Impact of e-Learning on Health Professionals

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ABSTRACT

Purpose: Recent evolution toward a medical perspective on patients with substance use disorders (SUDs) has led to a lack of medical training in substance abuse. To increase this knowledge, a distance learning course ("e-learning") was implemented to teach the general concepts of SUDs to medical residents and health professionals before delivering on-campus courses. The purpose was to evaluate the impact on participants' basic knowledge.

Methods: The e-learning on the general concepts of SUDs was based on short voiced presentations and additional educational material. It was proposed to 2 populations: medical residents in general practice and health professionals in continuing education. All of the participants answered questionnaires before and after the distance learning course to evaluate their basic knowledge of SUDs. These questionnaires were analyzed along with a satisfaction questionnaire to assess both the acquired knowledge about SUDs and the satisfaction level.

Findings: Participants moved toward higher test scores independently of their initial background and for all the educational objectives targeted by the teachers. The mean progression on a 20-point scale between the pretest and posttest questionnaires was 5.48 (2.63) for health professionals and 5.90 (2.20) for residents in general practice. Satisfaction was rated 4 or 5 on a 5-point Likert scale by at least 84.2% of participants.

Implications: This study is the first evaluation of an online pedagogical tool on SUDs. The positive feedback from participants encourages pursuing development of this e-learning. Used before on-campus courses, it provides an attractive educational option to overcome the usual limitations of online classes. (*Clin Ther*. 2019;41:2154–2161) © 2019 Published by Elsevier Inc.

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INTRODUCTION

Substance use disorders (SUDs) are a complex condition, a brain disease characterized by compulsive substance use (or compulsive behavior) despite harmful consequences.[1] SUDs are mental disorders according to the American Psychiatric Association's *Diagnostic and Statistical Manual, Fifth Edition*.[2] In France, among 70 million inhabitants, 14 million are daily users of tobacco, 5 million are daily users of alcohol, and 700,000 are daily users of marijuana.[3]

The management of this population is shared by different health professionals, most of whom are general practitioners (GPs).[4] In 2009, a total of 90,000 patients per week consulted their GPs for tobacco cessation, 50,000 per week for alcohol withdrawal, and 100,000 per month for opiate substitution treatment.[5] In 2001, 51% of GPs reported having received at least 1 patient who used cannabis in the last year; 25%, at least 1 patient who used cocaine; and 20%, at least 1 patient who used MDMA (3,4-methylenedioxymethamphetamine).[6] In addition, optimized collaboration with community pharmacists is essential to achieving positive outcomes for patient management.[7]

Nevertheless, in a French survey, 2 of 3 GPs reported their refusal to see illicit drug users in consultation.[6] In Ireland, undergraduate students felt moderately prepared to recognize opioid use disorders.[8] In addition, pharmacy students' knowledge of patients who inject drugs was shown to be limited in the United States, and most of them received insufficient training to assist patients with SUDs.[9,10]

One reason for this lack of knowledge might be that the representation of SUDs has significantly evolved over the last few years: the sociological, or even normative, perspective of "junkies" has shifted toward a medical view of patients experiencing SUDs. This evolution has led to a lack of medical training in substance abuse.[11] In parallel, the North American "opioid crisis" has contributed to enhancing awareness about the lack of specific skills in substance abuse among health professionals worldwide,[11,12] leading to the implementation of new curricula.[13,14] Reinforcing education is necessary, as education in SUDs has been shown to increase knowledge.[15] Indeed, contact-based training and education programs for medical students have been shown to decrease the dislike of and the discomfort with working with patients who have SUDs.[16] Teaching pharmacy students about SUDs has produced a positive impact on their attitude and knowledge. In addition, continuing medical education is reportedly effective in improving clinician knowledge and confidence related to opioids.[17]

As medical teachers, we must contribute to improving the knowledge of our students,[18] regardless of their original backgrounds and curricula. The use of alternative educational methods is attractive: e-learning, which is highlighted as an effective method both for knowledge acquisition and user satisfaction, is one of the possible options, provided that the effectiveness of professional behaviors and patient outcomes continues to be evaluated.[19] However, the authors of a recent literature review focused on the curricula of health professionals concluded that online education can be interesting in specific contexts without being intrinsically more effective than conventional education.[20] Other studies have evaluated the effectiveness of using online education among various populations of students after the development of massive open online courses (MOOCs), especially in the United States.[21–23] They concluded that online education can be useful but does not apply to all students because it requires high levels of self-motivation and organization.[24]

Assuming that online education can supplement traditional education without replacing it, we considered the possibility of combining traditional classes with e-learning. We therefore implemented distance learning courses to teach the general concepts of SUDs (neurobiology, definitions, and clinical signs) to medical residents and health professionals undergoing continuing education before attending on-campus courses. Although we used this educational tool for the first time, we aimed to evaluate its impact on participants' basic knowledge.

SUBJECTS AND METHODS

e-Learning: Content, Form, and Access

The educational content of the e-learning (also designated as a distance learning course) was structured according to 5 main pedagogical

Table. Educational content of the e-learning: target objectives and competencies to be acquired.

Objectives (No. and Label)	Competencies
1. To define SUDs	• Class SUDs as a chronic relapsing disease • Know DSM-5 criteria for a substance use disorder • Define "craving"
2. To describe the different types of uses	• Name first, repeated, compulsive uses • Differentiate simple versus problematic use • Describe the chronology of the different uses and identify relapse as a step in the cycle of SUDs
3. To understand the neurobiological mechanism involved in SUDs	• Identify the mesocorticolimbic reward system and dopamine as the neurobiological substratum of SUDs
4. To know the substances and behaviors that can be responsible for SUDs	• List 3 classes of psychoactive substances (depressants, stimulants, and hallucinogenic) • List 3 behavioral SUDs
5. To identify the risk factors of SUDs	• Name Olivenstein's triangle and tell that an interaction among substance—individual—environment exists

DSM-5 = *Diagnostic and Statistical Manual, Fifth Edition*; SUDs = substance use disorders.

objectives, each having a defined list of competencies to be acquired (Table). Ten videos were designed to correspond to these competencies, with 1 video dedicated to 1 specific competence. The term "video" refers to short audio-synchronized presentations, which consisted of sound-added PowerPoint (Microsoft Corporation, Redmond, Washington) presentations transformed with Adobe Presenter 11.1 (Adobe, San Jose, California). Because research in neuropsychology suggests that educational support should remain of short durations, we designed short videos to keep the participants' attention at the highest level (longest duration, 4 minutes).[34]

The home page introduces e-learning in 2 forms (a written text and a filmed oral presentation by the teachers [J.D. and E.J.]) to guide and familiarize participants with this educational tool. The following sections include the videos along with the corresponding slides provided in the form of PDF documents. In addition, e-learning incorporates additional material, including scientific articles or Internet links to websites of interest.

The e-learning is available on the Toulouse University online platform called Moodle, which supports educational material with restricted access. Only participants attending the subsequent on-campus courses could access it by using their personal login and password. The teachers opened access to all content 15 days before the on-campus courses.

Because this analysis was the first evaluation of a newly implemented educational tool, we decided to propose our e-learning to a restricted number of participants. It was proposed on a voluntary basis to 2 distinct populations: medical residents and health professionals in practice undergoing continuing education. Medical residents were last-year residents in general practice participating in compulsory on-campus courses on SUDs and their management. In France, a student can be enrolled in medical school at ~18 years of age, and the schooling lasts 6 years (including 2-month rotations with a clinical elective but limited responsibilities for patients). Residency in general practice follows medical school and lasts 3 years, with 6 clinical rotations with responsibility for patients of 6 months each and a specific teaching of 200 hours. Clinical rotations can take place in hospitals or in GPs' medical offices.

Health professionals were professionals in practice undergoing continuing education specializing in substance abuse. This university training is open to any health professional who may be involved in the management of patients with SUDs, including psychologists, nurses, social workers, physicians, and pharmacists.

The e-learning was made available in December 2016 for the health professionals participating in the continuing education specialized in substance abuse (1 session) and in March and April 2017 for the residents in general practice (2 sessions).

Measurement of the Acquired Knowledge of the General Concepts of SUDs and Assessment of Participants' Satisfaction Level

Online pretest and posttest questionnaires were used to assess the acquired knowledge. Both questionnaires were identical and comprised 11 multiple choice questions (MCQs) with 5 questions each. Ten MCQs focused on the pedagogical objectives; the remaining MCQ consisted of a general clinical vignette dealing with people experiencing SUDs and was designed to explore illness representations about this population of patients. The maximum score was 20, corresponding to 1.82 points per MCQ and a minimum of 0 per MCQ. The teachers analyzed the results of the participants to adapt the content of their on-campus course.

A paper questionnaire distributed at the beginning of the on-campus class was used to measure the participants' satisfaction level with the e-learning. This questionnaire comprised 10 questions about the e-learning content and form and was structured into 4 sections: (1) videos (n = 3 questions); (2) PDF material (n = 2); (3) pretest and posttest questionnaires (n = 3); and (4) additional material (n = 2). Satisfaction was assessed with a 5-point Likert scale (from 1 [completely disagree] to 5 [completely agree]). Two additional open-ended questions collected positive and negative feedback in free-text sections.

Data Analysis

Data from the questionnaires were extracted directly from the Moodle platform in an Excel (Microsoft Corporation) file. Data analysis was performed by using Excel. Continuous variables are described as mean (SD), and categorical variables are described in numbers and percentages.

Ethical Approval

The ethical committee on noninterventional research of Toulouse University reviewed and approved the study protocol (CERNI-2016-021). Participants gave their informed consent by answering the study questionnaire. A specific written statement was included in the e-learning on the Moodle platform.

RESULTS

e-Learning Participation

Overall, the e-learning was proposed to 22 health professionals enrolled in continuing education specialized in substance abuse and to 91 residents in general practice enrolled in compulsory on-campus courses on SUDs and their management. Among the 22 health professionals, there were 8 nurses, 7 psychologists, 6 physicians, and 1 dietitian.

Twenty-one (95.5%) of the 22 health professionals and 30 (33.0%) of the 91 residents in general practice participated in our e-learning. Among the 21 health professionals and the 30 residents in general practice who participated, 16 (76.2%) and 18 (60.0%) completed both the pretest and posttest questionnaires, respectively. The number of health professionals and residents in general practice who completed the pretest questionnaire was 20 (95.2%) and 24 (80.0%); 17 (81.0%) and 23 (76.7%) of them completed the posttest questionnaire.

Concerning on-campus courses, 17 health professionals (77.3%) and 65 residents in general practice (71.4%) were present.

Results From the Pretest and Posttest Questionnaires

The mean score of health professionals was 11.99 (1.75) (n = 20) for the pretest questionnaire and 17.41 (2.30) (n = 17) for the posttest questionnaire. The individual progression of participants ranged from 1.21 to 9.40 points over 20, corresponding to an average of 5.48 (2.63) points.

The residents in general practice had a mean score of 11.79 (1.74) (n = 24) for the pretest questionnaire and 17.17 (2.26) (n = 23) for the posttest questionnaire. The participants' progression was 5.90 (2.20) points on average and ranged from 3.33 to 9.91 points.

Overall, the participants made progress in all 5 objectives (Figure 1). The highest progress was achieved for the first 2 competencies, which refer to Objective 1 ("To define SUDs"). The additional MCQ that presented a clinical vignette and did not refer to a specific objective had the lowest progress (0.11/1.82; 6.3%). The 3 questions with the lowest

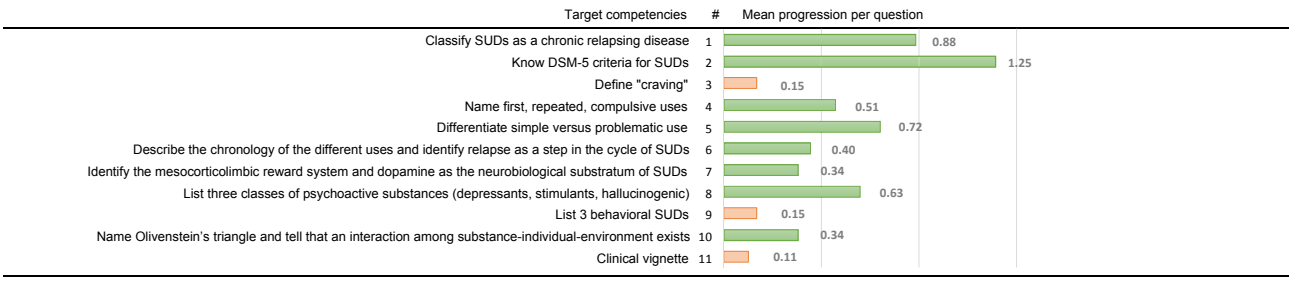

Figure 1. Students' mean progression in the posttest (vs pretest) questionnaire (in points). The maximum score for 1 question was 1.82. DSM-5 = *Diagnostic and Statistical Manual, Fifth Edition*; SUDs = substance use disorders.

progress rate (questions 3, 9, and 11) were those for which the participants had obtained the highest scores during the pretest (initial mean scores, 1.54, 1.36, and 1.61, respectively).

Satisfaction Assessment

Overall, 38 participants answered the satisfaction questionnaire at least partially (17 of 22 health professionals and 21 of 91 medical residents). Twenty-nine participants completed it fully (all 17 health professionals and 12 of 21 medical residents).

The detailed results obtained from the satisfaction questionnaire are summarized in Figure 2. No item was rated with the lowest rate (Rate 1: "Completely disagree" over a 5-point Likert scale). Two participants disagreed with the fact that the pretest and posttest questionnaires were useful for reviewing their lessons without giving details in the free-text section. A third participant felt that the videos were not easy to use and explained in the free-text section that this difficulty was independent from the e-learning itself but rather was linked to the access to the university platform. The proportion of participants who agreed or completely agreed with the proposed affirmations ranged from 84.2% (32 of 38) to 94.7% (36 of 38), corresponding to item 4 ("The pretest and posttest questionnaires were useful for reviewing your lessons") and item 7 ("The content of the videos was adapted to your background knowledge"), respectively.

The free-text sections had 28 and 23 comments in the positive and negative feedback sections, respectively. Positive comments were about the overall presentation of important notions and the

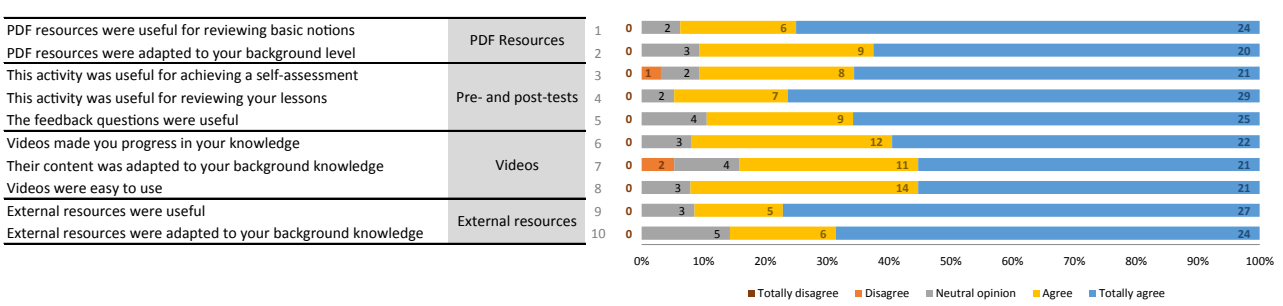

Figure 2. Students' level of satisfaction with the e-learning content and form.

clarity, usefulness, adaptability, ergonomics, and accessibility of the e-learning. Negative comments were mostly related to technical problems linked to difficulties in accessing the platform (this concerned the health professionals, for whom the personal login and password took longer to obtain). In addition, some participants believed that the sound was too low. Another wished that the e-learning would remain accessible anytime with the possibility of downloading its entire educational content.

DISCUSSION

Impact of the e-Learning Course on the Participants' Knowledge of SUDs

Participants in our distance learning course on the general concepts of SUDs moved toward having higher test scores. This finding is consistent with that described in previous studies.[25–27] Test score progression was identical in both groups and independent of their initial background. In the United States, the comparison before and after training on SUDs found a minimal difference in attitudes, knowledge, and behaviors between physicians, nurses, and dental providers[26] and in the knowledge between medical students and internal medicine residents.[28] Given the knowledge gap and pervasive negative attitude toward SUDs in the United States, a 1-week intensive course was offered to primary care internal medicine interns and resulted in a better confidence score; notably, more residents reported that treating SUDs is rewarding and that they could help their patients with SUDs.[29] In addition, in Canada, pharmacology students exposed to an academic service learning pedagogy on substance abuse reported that their view on harm reduction programs was more positive as a result of the course.[30] In France, similar to other parts of the world, the medical curricula lack sufficient instruction and experience in substance abuse, and thus many physicians feel unprepared to treat people with SUDs.[31]

However, the effectiveness of online education programs remains controversial, especially because they require high levels of self-motivation among students and organizational abilities.[21,25] Thus, online programs may be useful for supplementing traditional education but cannot replace it. Introducing distance learning courses before on-campus courses in the curricula of health students, as in our e-learning, seems to be a way to overcome the usual difficulties and limitations of MOOCs and should improve the knowledge of residents, recently graduated health professionals, and (more widely) any professional involved in substance abuse.

Strengths and Limitations

This study is the first evaluation of an educational tool that was newly implemented and proposed to a limited number of participants with varying characteristics.

The target population, consisting of 2 distinct groups, was not homogeneous. This factor limited the interpretation of the results and at the same time provided us with additional feedback on our e-learning. Independent of the pretest and posttest results, the participation rate varied from one group to another, with 95.5% of health professionals and 33.0% of residents in general practice participating. The participation of students in on-campus lectures (which are generally not compulsory in French universities) or online pedagogical material is traditionally meager; thus, the latter participation rate was considered satisfactory in this study.

The low number of participants in our study constitutes another limitation. Previous studies evaluating the knowledge of different populations of students before and after lectures on SUDs generally targeted a larger number of participants,[10,32] although some of them included a similar number of participants.[30] Nonetheless, this study is the first evaluation of a new approach combining a distance learning course with on-campus courses to teach the general concepts of SUDs; it should thus be considered as the first approach to a broader project on distance learning courses. This initial feedback will contribute to substantial changes both in form and in content. The comments written by the participants on this first use and evaluation of our e-learning are constructive and will be useful for improving its quality.

Nevertheless, we have to assume that participants in e-learning may have been more accepting of and willing to utilize e-learning, thus introducing a selection bias.

The difference between the pretest and posttest results may be overestimated, as participants were informed of the right/wrong answers after the pretest, with a possible influence on the posttest results.

Nevertheless, at least 15 days separated the pretest and posttests, limiting this bias.

We believe that our distance learning courses improved the quality of the on-campus courses that had been offered in the preceding years using a traditional method. First, the feedback from the participants was very positive, even though we cannot assume that nonrespondents were satisfied, as only 17 provided feedback. The distance course enabled them to become familiar with the main concepts of SUDs while respecting everyone's pace. Conversely, the teachers could adapt the content of their on-campus courses and could specifically ask questions to the participants about any problematic aspect detected in the questionnaires to check whether there was a need for clarification. The distance learning course was designed to serve as a flexible tool applicable to several situations (ie, to a distinct audience) and used before on-campus courses; in our experience, based on the participants' feedback, our e-learning achieved this objective. Indeed, this flexibility in timelines constitutes an attractive advantage.[33]

CONCLUSIONS

The e-learning that we implemented to teach the general concepts of SUDs before on-campus courses improved the knowledge of participants from different backgrounds, those who were in initial training, or those undergoing continuing education. Together with the positive feedback from the participants, these good results encourage pursuing the development of this educational tool as potentially useful in substance abuse education. Indeed, an online course used before teaching on-campus classes provides an attractive educational option to overcome the usual limitations of online education only, such as the more traditional MOOCs.

In the near future, this e-learning should be extended to other populations, especially pharmacy students.

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DISCLOSURES

The authors have indicated that they have no conflicts of interest regarding the content of this article.

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