

EDUCATION BRIEF REPORT

Development of a self-directed, online-learning curriculum to increase community-engaged research in clinical and translational science

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Journal of Clinical and Translational Science (2017), 1, pp. 135–139 doi:10.1017/cts.2016.19

Background. Medical research strives to improve health; community-engaged research (CEnR) supports translation to the community.

Methods. This article describes the use of andragogical theory to develop asynchronous CEnR training.

Results. A total of 43 researchers and community members completed at least one module. The majority (67%–100%) stated that training met their educational needs and noted a desire for more information.

Conclusion. The curriculum reinforced CEnR principles to enhance medical research.

Received 24 August 2016; Accepted 11 October 2016

Key words: Community-engaged research, curriculum design, education, online curriculum.

Introduction

Medical research has improved the health of individuals and communities over the last 50 years [1]. Nevertheless, it takes several years for patients to benefit from advances translated into clinical practice and public health [1–3]. To address this gap, the National Institutes of Health (NIH) created the National Center for Advancing Translational Science (NCATS) in 2006. NCATS seeks to expedite the translation of biomedical research into new technologies and treatments by funding novel, innovative educational programming, translational research, and

dissemination projects [1]. NCATS has provided funding to 62 academic medical centers through the Clinical and Translational Science Award (CTSA) [1]. The CTSA program provides infrastructure support to academic medical centers to train translational scientists, fund pilot studies and career development awards, build research networks, increase collaborative and team science, and enhance biomedical research [1–4].

In the decade since the first CTSA awards were distributed, NCATS has collaborated with the Institute of Medicine (IOM) to evaluate the program and define focus areas for translational science. This evaluation process indicated that community-engaged research (CEnR) reduces the time needed to translate biomedical research to patients and the public [1]. Furthermore, the evaluators recommended that community-engaged research occur at all phases of biomedical research—including laboratory discoveries, patient-centered outcomes research, and research conducted in and with the public. The IOM report provided room for interpretation about how best to implement this recommendation at each NCATS-funded center. Although the IOM report left room for interpretation, CTSA share a common understanding of CEnR and its impact on health. CEnR is an

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inclusive partnership of researchers and community members affiliated by common interest, geography, or situations that encourages mutual respect, recognition of values, strategies, and actions in order to address health issues affecting the community [5–7]. It is built on a framework of various study designs used in clinical and translational science [4].

Most CTSA's have programs that provide CEnR education to academics, medical researchers, and communities. In 2010, Ahmed and Palermo [5] provided detailed recommendations on establishing training programs to increase CEnR. These recommendations emphasized the importance of finding ways to prepare researchers and potential stakeholders to collaborate in the research process and decrease the time to translate findings to patients and communities. This article describes the development of an online curriculum designed as a self-directed resource to increase CEnR in clinical and translational science. The content is easily accessible and contextually relevant to a diverse group of biomedical researchers and stakeholders as they initiate and facilitate CEnR.

Materials and Methods

Program Overview

Our goal was to provide online curriculum in CEnR for faculty, graduate students, residents, fellows, healthcare providers, and community members. The Mayo Clinic Center for Clinical and Translational Science (CCaTS) has created and delivered online course content in CEnR since 2009. In 2011, the Office for Community Engagement in Research (OCER) began providing research consultations to internal and external stakeholders specific to study design, stakeholder identification and engagement, community outreach, and resource referrals. Incremental demand for consultations and assessment of inquiry themes warranted the development of a traditional classroom-based course offered by the Mayo Clinic Graduate School of Biomedical Sciences in the Clinical and Translational Science program, *What Every Researcher Should Know About Community-Engaged Research*. This initial course generated significant interest, increased awareness, and advanced participants' knowledge of the principles of CEnR. However, the necessity to attend the course in person and its inaccessibility to those outside the institution undermined the collaborative stakeholder relationships and community-action projects that the course was promoting. In order to remove these obstacles, we created a series of online modules for internal and external self-directed, goal-oriented, project-minded adult learners.

Module Objectives

- Increase awareness of the fundamental principles of CEnR.
- Assess readiness to participate in collaborative CEnR partnerships.
- Identify ways to initiate, facilitate, and sustain community-engaged research partnerships.

CCaTS Education Resources

Education Resources oversees curriculum development for undergraduate, graduate, and professional development programs within Mayo Clinic, and has a long-standing relationship with the Mayo Clinic School of Continuous Professional Development and the Mayo Clinic Graduate School of Biomedical Sciences, both of which are accredited schools within the Mayo Clinic School of Medicine. Mayo Clinic School of Continuous Professional Development has a catalog of over 200 unique education and training opportunities in dozens of disciplines delivered through multiple learning platforms for internal and external learners. Learners can receive continuing medical education (CME) credits from the Accreditation Council for Continuing Medical

Education, Accreditation with Commendation, Accreditation Council for Pharmacy Education, American Nurses Credentialing Center, and Maintenance of Certification.

OCER

OCER provides the oversight and determined content needed to make community engagement in research the norm for translational science. OCER is located within CCaTS and is the operational arm of the CCaTS's community-engaged research structure. OCER provides consultations in person, by telephone, and email to internal and external faculty, graduate students, residents, fellows, healthcare providers, and community members at Mayo Clinic.

Curriculum Design

The curriculum-design team, which included OCER and Education Resources personnel as well as internal and external subject matter experts (SME), created a competency/curriculum matrix (Table 1) to prioritize and develop the modules. Inquiries addressed during OCER consultations and discussions with SMEs provided content materials. They chose the initial 4 topics after a review of the CEnR scientific literature, which also delineated best practices, principles, and models to be included in this foundational curriculum.

We have built a searchable library of online modules with links to additional resources at <http://ocerblog.mayo.edu/online-courses/>. This web-based educational portal facilitates the active dissemination of education, assessment of participant usage, online discussion forums, networking capabilities, and project development and tracking.

Theoretical Framework

We referenced Malcolm Knowles Adult Learning Theory and James Prochaska Trans-Theoretical Model to develop the modules [8, 9]. We based the curriculum-design process on assumptions that adult learners are self-directed, goal oriented, reliant on relevance, and able to draw on past experiences and previous knowledge. We organized content to foster retention and enable the application of new knowledge and skills. The online modules may be completed independently of each other and are available on demand. Alternatively, learners can progress sequentially through the module guides. The revised constructs of Trans-theoretical Model Stages of Change identify 4 levels of readiness to apply CEnR. These levels are as follows:

1. contemplation—the learner desires to gain knowledge of community engagement in research;
2. determination—the learner is ready to engage in the research process (there is a project they would like to complete);
3. action—the learner acquires stakeholders and implements a research plan; and
4. maintenance—the learner has stakeholders, has started or completed a project, and aspires to maintain collaborations and disseminate findings to stakeholders and other communities.

Module Development and Content

Fig. 1 shows the timeline for the creation of the first 4 modules with their release dates. The curriculum-design team worked directly with the SMEs to design content. The SME—with additional support from the curriculum-design team—developed the modules within ~7 hours.

The Education Specialist and Curriculum Designer organized content, designed instructional materials, and uploaded modules onto the delivery platforms using PowerPoint and Articulate Storyline software programs. They organized and grouped content to increase retention

Table 1. Module learning objectives

Learning Objectives		Learners readiness to engage			
		I want to learn about community engagement in research (contemplation)	I am ready to engage in the research process (determination)	I have stakeholders and a research plan to implement (action)	I want to sustain my CEnR partnerships (maintenance)
CEnR: an overview	Define CEnR	X	X		
	State the differences between CEnR and traditional research				
	Describe components included in CEnR				
Foundations of community engagement in research	Define a stakeholder	X	X	X	X
	Identify the principles of CEnR				
Overcoming barriers in community engagement in research	Describe insider and outsiders challenges to CEnR	X	X	X	X
	Identify strategies for overcoming barriers				
Measuring your readiness and preparing to engage	Describe the components for measuring readiness and preparing to engage in a CER partnership	X	X	X	X
	Apply components of readiness to engage				

CEnR, community-engaged research.

and application of knowledge. The team used videos, animations, and interactive applications to engage learners in multiple approaches to foster knowledge uptake. Modules are available on the Mayo Clinic learning-management systems for internal and external audiences. The total design time to publish the modules took ~40 hours per module.

Each module contains an interactive presentation and additional reading materials to meet Accreditation Council for Continuing Medical Education accreditation standards for continuing education. Table 1 lists the completed modules with their learning objectives.

The current modules guide learners through the contemplation and determination stages of CEnR. Future modules will facilitate progression through the action and maintenance stages. Each self-paced module is designed to be completed in 25 minutes or less [10]. The modules offer additional supplemental content and resources within the platform for learners seeking a deeper immersion. Each module is worth one *AMA PRA Category 1* CME credit.

Currently Available Modules

1. *Community-Engaged Research: An Overview*—features asynchronous course content highlighting the principles of CEnR in the context of clinical and translational science. Didactic examples include a comparison of traditional research with community-engaged and community-placed research. Community-engaged stakeholder testimonials provide context to the course material and highlight the importance of engaging stakeholders in the research process. Case studies expand on the role of the community advocate by decreasing the translational science gap.
2. *Foundations of Community Engagement in Research*—summarizes stakeholder theory [11] and demonstrates the application of

theoretical principles through real-life scenarios in diverse environments. A community-engaged clinical and translational scientist describes his experience with a juxtaposition of social problems, health, and collaboration.

3. *Overcoming Barriers in Community Engagement in Research*—highlights a number of barriers to CEnR, provides strategies to build trust and respect among community stakeholders and biomedical researchers, and, through an expert testimonial, discusses how to maintain a long-standing research partnership. The module emphasizes sensitivity to the diversity of stakeholders while designing research plans; it reinforces the importance of community engagement during data collection and dissemination of study findings.
4. *Measuring Your Readiness & Preparing to Engage*—focuses on stakeholders' readiness to engage in a collaborative research process. Video testimonials showcase both a clinical and a translational scientist—one has a national focus and the other has a more local context aimed at addressing community health concerns. The module includes several interactive educational tools that facilitate the application of concepts related to readiness to engage.

Results

Evaluation

To date, 43 unique learners have completed 75 modules (81% internal; 19% external). The learners include 6 faculty members (including residents and fellows), 17 research and administrative staff, 2 students, 8 others, and 10 community members.

We incorporated a multifaceted evaluation into the curriculum design and delivery process. Frequent formative evaluation takes place throughout the design of the curriculum following the Successive Approximation Model [12]. Our systematic approach to deliver the curriculum included several assessment checkpoints for soliciting feedback from the SME and the curriculum-design team. The SME and

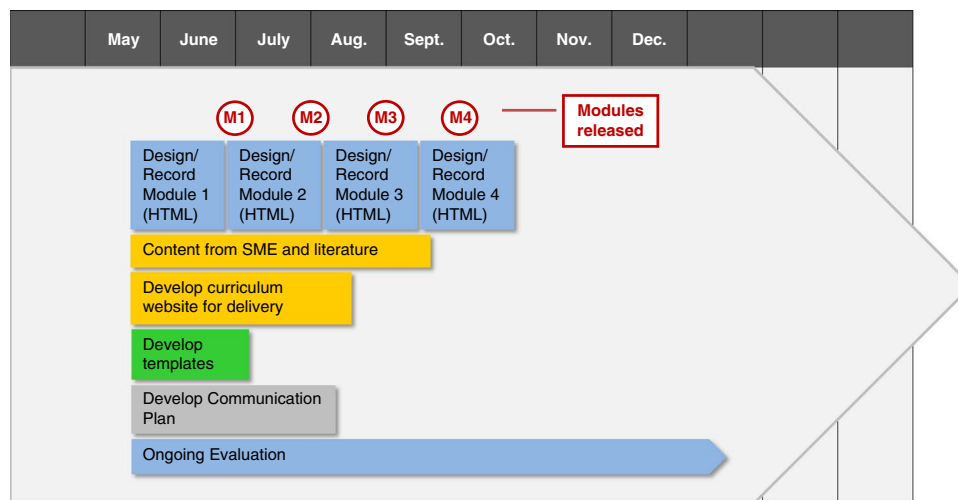


Fig. 1. Curriculum timeline 2014.

Table 2. Learners' evaluation of modules

	Internal learner n (%)	External learner n (%)	Evaluation findings and selected comments
CEnR: an overview	14 (67%)	7 (33%)	100% rated module "Excellent-Average" 100% "Strongly Agree-Agree" met educational needs 100% "Strongly Agree-Agree" information useful in career, job, or position 100% interested in learning more about research 67% needed a refresher specific to this topic Comments: "Good definitions of community-engaged research," most valuable were "the individual interviews"
Foundations of community engagement in research	18 (86%)	3 (14%)	100% rated module "Excellent-Average" 100% "Strongly Agree-Agree" met educational needs 100% "Strongly Agree-Agree" information useful in career, job, or position 75% interested in learning more about research
Overcoming barriers in community engagement in research	13 (81%)	3 (19%)	100% rated module "Excellent-Good" 100% "Strongly Agree-Agree" met educational needs 100% "Strongly Agree-Agree" information useful in career, job, or position 100% interested in learning more about research 25% needed a refresher specific to this topic Comments: "I learned that what I consider self-evident may not be so to others"
Measuring your readiness and preparing to engage	16 (94%)	1 (6%)	100% rated module "Excellent-Fair" 67% "Strongly Agree-Agree" met educational needs 67% "Strongly Agree-Agree" information in career, job, or position 67% interested in learning more about research 33% needed a refresher specific to this topic

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design team managed these checkpoints by videoconferences, teleconferences, and in person. In addition, we used web analytics tools to measure page views, user demographics, navigation through module, and duration of time the module was "open;" pages viewed were also tracked upon exiting the module. We collected outcome evaluation data through CME credit requests, postcourse surveys, and qualitative interviews. This robust amount of data was transformed into information for the group to discuss and inform decision making for improvement purposes. This interactive evaluation practice provides context and content for future revisions of existing modules [13].

Despite as-yet limited evaluation data, an initial analysis suggests that the modules are well received; the majority of respondents reported that they are of fair-to-excellent quality, meet educational needs, and increase their intent to learn more about CEnR (Table 2).

Discussion

The creation and delivery of online education modules ensure that all stakeholders in CEnR can advance their awareness, knowledge, and skills in this growing area of research. These resources are critical to the success of investigators, clinicians, and community members initiating and facilitating community-academic relationships [5]. Our ongoing analysis confirms the feasibility, ease of use, and satisfaction of this type of web-based, online educational modules for a diverse internal and external audience.

Future Directions

Our curriculum plan includes the creation of additional modules with content specific to outreach, recruitment, dissemination, and

implementation of CEnR. We plan to link the modules to social media platforms as well as our collection of digital stories (testimonials) from faculty and community partners to enhance learning opportunities [14].

Colleagues at other minority-serving academic medical centers have asked to utilize the modules in their health disparities and community-engaged research training programs. One community advisory board has already successfully used the modules for training their members on the principles of CEnR; the first module served as a mechanism to spark dialog about research. We will continuously evaluate this curriculum to provide the most appropriate training for diverse learners interested in increasing CEnR in clinical and translational science.

Acknowledgments

The authors thank the following groups from Mayo Clinic: the CCaTS Education Resources Continuous Professional Development Program; eLearning Design and Development Center; the Office of Applied Scholarship and Education Science; the Mayo Clinic Online Learning, Center for Social Media; Public Affairs; and Marlené Boyd for assistance with manuscript submission.

Financial Support

This publication was made possible by CTSA grant number ULI TR000135 (Dr Sundeep Khosla, Principal Investigator) from the NCATS a component of NIH. Its contents are solely the responsibility of the authors and do not necessarily represent the official view of NIH.

Disclosures

None.

Declaration of Interest

The authors report no conflicts of interest.

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