


The Virtual Community of Practice Facilitation Model: A Conceptual Framework for Healthcare Professional Education

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ABSTRACT

This study examines the instructional design, learning experiences, and outcomes of a virtual community of practice (VCoP). In 2019, the Northern Ontario School of Medicine launched a continuing professional development program consisting of an asynchronous online module followed by an optional series of facilitated case-based videoconference workshops, designed as a VCoP. This program evaluation study employed a convergent parallel mixed methods design and combined data sources from participant pre- and post-program surveys and reflections with a content analysis of semi-structured interviews. The paper reports key enablers that contributed to the following outcomes: the value of an online module as a baseline of knowledge; the impact of the shared case studies, experiences, and peer support on reflection and modifications to medical practice; and skill development and patient-centered care as a result of module and VCoP participation. A model for the effective design and delivery of VCoPs is proposed that results in acquisition of new knowledge and skills and promotes patient-centred practice.

KEYWORDS

Continuing Medical Education, Hybrid Education, Online Facilitation, Virtual Care Education, Virtual Community of Practice, Virtual Education

INTRODUCTION

A community of practice (CoP) is defined as a group of people that meets three essential criteria: an identity defined by a shared *domain* of interest, a *community* or group of members that engage in activities to learn and support one another, and a *practice* in which all members are practitioners

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(Lave & Wenger, 1991; Gullick & West, 2016; Mercieca, 2017). The members of the community work together to develop resources that include tools, stories, and approaches to problem-solving based on their shared practice (Wenger et al., 2002). A virtual community of practice (VCoP) shares the characteristics of a CoP, but members interact in a virtual environment using online communication tools (Dubé et al., 2005). The rapid advancement of information communication technologies has given rise to the implementation of VCoPs and has given them flexibility, speed, and the ability to connect members from great distances and a variety of organizations.

While communities of practice were implemented in a variety of healthcare contexts in the early 2000s and much research was conducted on the activities and interactions within CoPs, there is a lack of evidence demonstrating their impact on improving healthcare practice (Braithwaite et al., 2009). Recent publications affirm that few studies use a framework to design virtual communities of practice and that there is an absence of details on facilitation, technology support, and participant roles (Shaw et al., 2022). This lack of frameworks or design guidelines for VCoPs has led to inconsistencies in the definition, design, and facilitation of online communities of practice (Omidvar & Kislov, 2014). To address these gaps, this paper outlines a model for a virtual community of practice developed by the Northern Ontario School of Medicine (NOSM) Continuing Education and Professional Development Office that incorporates key pieces identified by Wenger (2011) for the effective support, facilitation, and collaborative design of VCoPs.

The next section provides a literature review and is followed by the methods and the results sections. The final sections present the discussion, a presentation of the conceptual framework for online VCoP design, areas for further research, and the conclusion.

LITERATURE REVIEW

A recent comprehensive review of literature found that VCoPs offer an informal method of professional development for healthcare professionals and can also decrease professional and social isolation (McLoughlin et al., 2018). Discussion forums, online facilitators, and videoconferencing have been shown as effective strategies for engaging participants and managing content and resources (Bermejo-Caja et al., 2019). Wenger (2011) suggested the following five elements as critical for CoP design:

- The CoP should have active members who are practitioners, or “experts,” in the specific domain of interest.
- Members must participate in a process of collective learning within their domain.
- Social structures must be facilitated within the community to assist in knowledge creation, sharing, and collaboration.
- Instruction-based learning and group discourse should be used as learning strategies for community members.
- Communication and interaction between community members must be facilitated and maintained over a sufficient learning time period. This could be through regular meetings, sharing of case studies, file sharing services, discussion forums, or other online tools.

While this definition of a CoP is fairly clear, in practice a wide range of activities have been labelled as VCoPs, leading to inconsistencies in the design, implementation, and use of educational tools to facilitate meaningful collaborative learning. Many learning communities are discussion forums, blogs, or informal video conferences, and their claim to be virtual communities of practice has led some researchers to deem the term VCoP academically useless (Omidvar & Kislov, 2014). The heterogeneity of VCoPs has also contributed to the challenges in identifying factors that affect the success and effectiveness of VCoPs in the healthcare sector (Alali et al., 2016). In fact, there is little evidence or recommendations for how to best design and administer VCoPs for healthcare

professionals (Shaw et al., 2021). Further recommendations need to be made on how to define and design effective virtual communities of practice for healthcare professionals that can facilitate practical and effective learning outcomes.

Saleh and Mujahiddin (2020) called upon institutions of higher education to develop new technological innovations and problem-solving strategies to promote community development through the sharing of individual knowledge and skills. Virtual communities of practice provide opportunities for universities and professional training programs to improve knowledge management through sharing, communicating, and developing innovative solutions to real-world problems (Al-ghamdi & Al-ghamdi, 2015). VCoPs that are designed with healthcare professionals interacting around a common problem or question with the ability to share advice, problem solve, and provide support have been proven to significantly increase research knowledge, continued collaborations, and leadership skills (Gottlieb et al., 2021). If the VCoPs are built upon content that is perceived as useful, relevant to their job, and presented by a credible source, then healthcare professionals' motivation to participate in VCoPs increases (Yada & Head, 2019). Knowledge-sharing behaviors of participants in VCoPs rely on four key factors: personal beliefs, expertise, and need for affiliation; interpersonal trust, social ties, and expertise; contextual domain, culture, and support; and technological quality, support, and ease of use (Hernández-Soto et al., 2021).

The Integrated VCoPs Success Model created by Alahi and Salim (2013) focuses on a balance between technology implementation and the quality of knowledge sharing activities. They proposed that a VCoP's service quality, knowledge quality, system quality, perceived ease of use, and perceived usefulness all positively influence participant satisfaction, which leads to an increase in knowledge sharing and overall effectiveness. The Value Creation Framework for CoPs developed by Wenger et al. (2011) assesses the value and extent of knowledge sharing that communities can promote. This framework has been used in the evaluation of VCoPs and focuses on experiences/interactions of members, changes in practice, knowledge capital produced by the CoP, and organizational/individual value. Recent evaluations of VCoP effectiveness highlight two main factors to consider when designing VCoPs: their structure and regularity (Valenti & Sutton, 2020), which are both not static due to the open and emergent nature of CoPs, and the role that leadership and facilitation play in shaping the structure and vision of VCoPs (Sibbald et al., 2022). It is this combination of sharing personal experiences, structure, facilitation, and technical support upon which the framework in this study is constructed and evaluated.

METHODS

Intervention

In 2019, NOSM launched "Overcoming Barriers to Safe Opioid Prescribing," a continuing professional development program consisting of a two-hour asynchronous online module followed by an optional virtual community of practice (VCoP), a series of videoconference meetings facilitated by a local expert in opioid prescribing. Seventeen primary care providers completed the online module, including three nurse practitioners and fourteen family physicians. Of these seventeen, four participated in the VCoP with a physician facilitator. Each videoconference consisted of a case study brought by one of the participants, group reflection on their practice, and development of strategies for implementing lessons learned into their own practices. This program evaluation research study examines the learning experiences and outcomes of participants in this VCoP. A content analysis of semi-structured interviews with participants, in combination with program evaluation data, identify successful elements of this VCoP. We show how these reinforce and add to existing recommendations for an effective VCoP and use the results to inform a conceptual framework for the design and development of virtual communities of practice for healthcare professionals—the Virtual Community of Practice Facilitation Model.

Sample and Recruitment

The VCoP cohort included four primary care provider learners and the facilitator. All were invited to participate in 30-minute semi-structured interviews about their learning experiences, the impact of the program on their practice, and their reflections on instructional design and areas for improvement for future VCoPs. Invitations were issued at the end of the VCoP after all learning was complete, and each participant received an informational letter and detailed consent forms. They could choose whether they wished to be interviewed alone or in a focus-group-like setting with other participants. Participants were primary care providers in Northern Ontario. Three participants agreed to participate in the interviews—two primary care provider learners and the facilitator. Two interviews were conducted, one with the facilitator and the second with the primary care providers. Interview data was triangulated with secondary analysis of program evaluation data: the pre- and post-module online survey, virtual community of practice reflections (a post-workshop reflection survey), and a 4-week post-program survey.

Data Collection and Analysis

The interviews were held over WebEx with video and audio recording and were transcribed verbatim. We conducted a conceptual content analysis in which in vivo coding along with inductive and deductive reasoning were used to produce codes from the interview data. Any other emergent themes within and among the data were also coded and reported.

Anonymized, aggregated program evaluation data (pre- and post-module survey, VCoP reflections, and 4-week post-program survey) from those completing the module and/or the VCoP was used to cross-validate the identified themes. Pre- and post-module data consisted of Likert-type items and qualitative questions. A survey at the end of each workshop asked reflective questions (“What was the best part of the discussion today? Why?” “What issues with safe prescribing did this case highlight?” “How did the facilitator make the session effective?” and “What would have improved the discussion?”). A one-month follow up program evaluation survey asked four feedback questions (“What was the most beneficial aspect of the Community of Practice? Why?” “If you could change one thing about the Community of Practice, what would it be?” “How effective was the online platform for discussion?” and “Following participation in this Community of Practice, what further resources would be beneficial?”). Answers to these questions were thematically analyzed and compared to interview themes. The data sources and sample numbers are summarized in Table 1.

RESULTS

Seventeen primary care providers completed the two-hour asynchronous online module, including three nurse practitioners and fourteen family physicians. Five were female, and twelve were male. Five had been practicing 0-5 years, three had been practicing 6-10 years, one 11-15 years, and eight

Table 1. Data sources, instruments, and sample size

Data Source		Instruments	Participant n
Program evaluation	Module	Registration survey Pre-module survey Post-module survey	17
	VCoP	Post-workshop reflection	4
	Follow-up (4 weeks post-completion)	Post-program survey	10
Semi-structured interviews		--	3

had been in practice more than 20 years. Of these seventeen, four participated in a virtual community of practice (VCoP). The VCoP consisted of three urban physicians and one rural nurse practitioner all practicing in Northeastern Ontario. Two participants were female and two were male. Two had 0-5 years of experience and two had 6-10 years of experience.

Interviews

Interview data analysis resulted in inputs across five identified themes, including (a) the role of the module relative to the virtual community of practice, (b) strengths and benefits of facilitation of the VCoP, (c) key enablers of successful VCoP workshops, (d) the impact of the VCoP on patient-centred care, and (e) suggestions for improvement. Table 2 summarizes the themes and identifies which ones were reinforced by program evaluation data.

Online Modules as a Baseline of Knowledge

As identified in the VCoP reflections and the pre and post survey data, interview participants indicated that the online modules provided valuable content with regard to understanding the effects and properties of opioids, knowledge/skills for patient communication, opioid prescribing knowledge/attitudes, tapering strategies/skills, and their knowledge of and access to tools and resources. Participants also noted the comprehensive overview of opioids was a valuable starting point for their discussions in the virtual community of practice. Participant 2 highlighted the value of the online module as both confirming elements of her practice as well as validating and promoting the importance of deprescribing patients that are on opioids. She described the modules as the foundation of the house and the VCoP as the building: "...it's the praxis of taking

Table 2. Interview and program evaluation themes

Theme	Program Evaluation			
	Interviews	Pre- and Post-Module Survey	VCoP Reflections	4-Week Follow-Up Survey
Value of modules vs community of practice	Module as a baseline of knowledge	Baseline knowledge Familiarity of tools and templates	Module as a baseline of knowledge	
Keys to effective facilitation	Promoting the patient Sharing struggles Bringing perspective Experience		Fostering safe environment Sharing struggles Experience/expertise Managing time constraints	
Key enablers of success	Level playing field Case-based learning Administrative support		Case-based learnings Sharing struggles	Sharing struggles
Impact / outcomes	Patient-centred thinking Skill development Confidence / reassurance / validation	Patient-centered goals Tools and resources Promotes discussions with patients Approach to prescribing	Motivational interviewing Collegial advice and feedback on case management Hearing different perspectives Validation of struggles in practice New resources and/or skills	Sharing struggles Participant case experiences Tools and resources Approach to prescribing
Suggestions for improvement	Central resource repository Asynchronous platform Geographic/practice-based cohorts SMART goals			

that knowledge and hearing what other providers are actually doing.” Participant 1 said that the online modules provided him with new knowledge that filled in gaps from his residency program, including “...direct practical approaches to initiation of medications in practice, monitoring, risk assessment.”

Strengths and Benefits of Facilitation

In the post-VCoP session surveys, participants identified numerous ways that the facilitator made the sessions effective and eliminated barriers to participation, including “allowing everyone to discuss topics, making suggestions and helping to maintain time constraints for participants, showed impressive strength and courage in admitting she was struggling with practice issues, encouraged everyone to be involved actively.” Participant interviewees echoed these sentiments. One participant stated, “It was nice to have someone from Northern Ontario in a similar practice setting who was very experienced and knew things that I’d never even heard of.” Participant 2 agreed: “Her expertise (was) certainly felt...she was a frontline worker on the ground delivering the material.”

Reflection and Support Through Shared Experiences

As identified in the VCoP reflections and the post survey, interview participants indicated that the virtual discussions were very effective with regards to collaboration, peer support, and reflection. Participant 1 said:

I think that’s something that the modules of course can’t provide, because it has to be a structured setting and the community of practice workshop was just a great sounding for: I’m trying to do this, it’s not working, have you guys tried this before when you encountered this, what did you do?

Participant 2 noted that the validation of practices and resources was a critical takeaway for her practice:

Specific examples: resources that I probably wouldn’t have had access to that were sort of provided to me and directed to me.... Hey, this is something really good, I’ve vetted this or I’ve looked at this for a while, go and check this out.

In the four-week follow-up survey, participants listed reassurance and the case experience of other primary care providers, feelings of support and sharing difficulties, and sharing stories and struggles as the most beneficial parts of the virtual community of practice.

Shift to Patient-Centred Thinking

Responses on the post-module survey indicated improved communication with patients: through discussions before initiating opioid prescriptions, being proactive and persistent in discussing tapering, sharing the benefits of tapering, and explaining the side effects and impact on activities of daily life. The interviewee comments reflect that the virtual community of practice continued this focus on patient-centred strategies for improving opioid prescribing practices:

I know that I’m sort of doing at least the foundational things, plus trying new things that I’ve learned from the group. I feel comfortable now doing the things I would not have felt comfortable doing i.e starting opiates, deprescribing opiates, cycling opiates- all of these things that are covered in case scenarios in residency when you encounter them. (Participant 1)

I really work hard with my patients on some other techniques and it's really just helped me to really reaffirm that. As I'm working through it, feeling like I'm not being mean, I'm really doing this in the patient's self-interest. (Participant 2)

In addition, the facilitator noted the adoption of motivational interviewing as a key takeaway for physicians from the community discussions:

We were able to pause for just a moment on some tiny moment where motivational interviewing would work really well and hadn't been thought out by the participant.... Everybody said that they were working harder on the motivational interviewing technique of letting the patient state what they feel they needed to do rather than the doc leading with what they feel they needed to do.

Virtual Community Support and Design Recommendations

Feedback from the facilitator of the VCoP indicated many positive aspects of the community design and support. She felt that in some respects the virtual meetings were superior to those in person at conferences because “You’ve created the time, you’ve created the space...so my own experience is that I felt very present, which contributes to authenticity.” In addition, she felt that the administrative support prior to and during the VCoP meetings was critical to the efficiency and success of the sessions. Enablers cited included the organization and scheduling of the meetings, the email list and agenda/attachment communications, real-time technical support for connection and bandwidth issues, time-management reminders during sessions, and sharing of PowerPoint slides and visual aids as critical elements to keep meetings moving. Finally, limiting the participants to five or fewer helped keep participants engaged and build a sense of community as she could see them all on her screen at one time.

DISCUSSION

The identified value of the online modules to provide a baseline of knowledge from which to explore practical applications in the field exemplifies participation in a process of collective learning and ensures that members are active and have a specific level of shared expertise in the domain of interest (Wenger, 1998). Bouchamma et al. (2018) recommended beginning with a shared repertoire to create a “common language” for participants in communities of practice, yet this focused more on identifying objectives and clarifying expectations as elements for effective collaboration rather than establishing a common baseline of knowledge. Domain, community, and practice have been identified as the three fundamental elements of a community of practice by numerous researchers over the years (Ranmuthugala, 2011). The domain is the area of knowledge that assembles the community, gives it an identity, and defines the important issues to address (Bermejo-Caja et. al, 2019).

Virtual communities of practice have proven to be an effective professional development tool for sharing and learning from physician experiences, particularly with regards to the identification of patient issues and the discussion of clinical challenges (Lofters et al., 2016). In these virtual consultations, “...data can be shared, collaborative thinking can be nurtured, and ideas openly discussed and debated” (McLoughlin et al., 2018, p. 139). Cruess et al. (2018) contended that communities of practice result in real-world medical knowledge because participants share authentic experiences that promote reflection, conceptualization, and active experimentation. In the current program, a dedicated facilitator and case-based learning functioned as strategies to assist in sharing and learning and to focus participants on collaborative practice.

The value of virtual facilitation in VCoPs is underreported in the research literature, yet several studies have noted its importance. To begin, Bouchamma et al. (2018) identified that facilitation “...

helped the peer discussions on common issues and enhanced exchange between colleagues for mutual support, which enabled them to share their experiences” (p. 99). Coaching and mentoring in virtual communities is critical in promoting the acquisition of knowledge and skills to treat patients with complex conditions and manage critical public health programs (Struminger et al., 2017). In fact, when designing a VCoP, a focus on practical learning outcomes is supported by effective facilitation: “Goal-oriented communities are driven by external forces to carry out a particular task within a specified timeframe. A learner’s community relies upon the instructor for guidance and results in the generation of both individual and shared products” (Smith et al., 2017, p. 220). Stepanek et al. (2013) listed four key lessons learned for facilitating virtual communities of practice: work from the needs and interests of the members, take an active role in nurturing the community, blend different approaches to maximize participation and learning, and support members who are unfamiliar with the technological tools.

The shift towards patient-centred care aligns with and affirms findings from the research literature. Gonzalo et al. (2017) suggested a community of practice model that promotes experiential learning opportunities that “...allow students to immediately enter an interprofessional community that focuses on the overall needs of the patient and to simultaneously learn about both medicine and systems of care” (p. 1691). Experiential learning or learning by doing is linked to reflection, and it contributes to the identity of a physician through the acquisition of both knowledge and skills in their practice (Monrouxe, 2013).

Finally, Peñarroja et al. (2019) identified that the following had a positive influence on a VCoP’s effectiveness:

- Sense of Virtual Community—eight questionnaire items from the Brief Sense of Community Scale (BSCS) by Peterson et al. (2008)
- Perceived Usefulness—four perceived value items adapted from Lin (2007)
- Perceived Ease of Use—four usability items adapted from Lin (2007)
- Facilitating Conditions—specialized instruction, activities promoting the use of the VCoP, specialized advisors providing assistance, a supportive community manager, and time available

Of importance to this study is that Peñarroja et al. (2019) also found that “...when individuals perceived that the technology was not useful or easy to use, the presence of facilitating conditions did not improve Sense of Virtual Community and, subsequently, VCoP Effectiveness” (p. 852). Both community design and support factors identified in this study, therefore, are interwoven in their importance when creating a conceptual framework for effective VCoP implementation.

A Conceptual Framework for Online VCoP Design

Based on the five participant themes and supporting literature review listed above, Table 3 summarizes design elements that have been identified as important for a virtual community of practice. They are organized into three categories: inputs before the VCoP occurs, the environment for collaboration during the VCoP, and the outcomes and experiences produced by VCoP participation.

The Virtual Community of Practice Facilitation Model (Figure 1) brings these elements together in a streamlined solution to community of practice organization and facilitation for busy healthcare professionals. The first section is inputs and has three components: a community of healthcare professionals from a specific discipline with various levels of experience, an online learning course that sets the baseline knowledge or domain from which the community can grow and sets the context of practical examples or case studies that the community will discuss. The community is based upon a technology model that is easy to use, has high perceived usefulness, and provides easy access to technological support so as to make the experience as easy and rewarding as possible for busy healthcare professionals. The virtual environment is focused by an expert facilitator; guided by negotiated group goals; built on trust, shared repertoire, shared experiences,

Table 3. Inputs, environment, and outcomes of VCoP participation

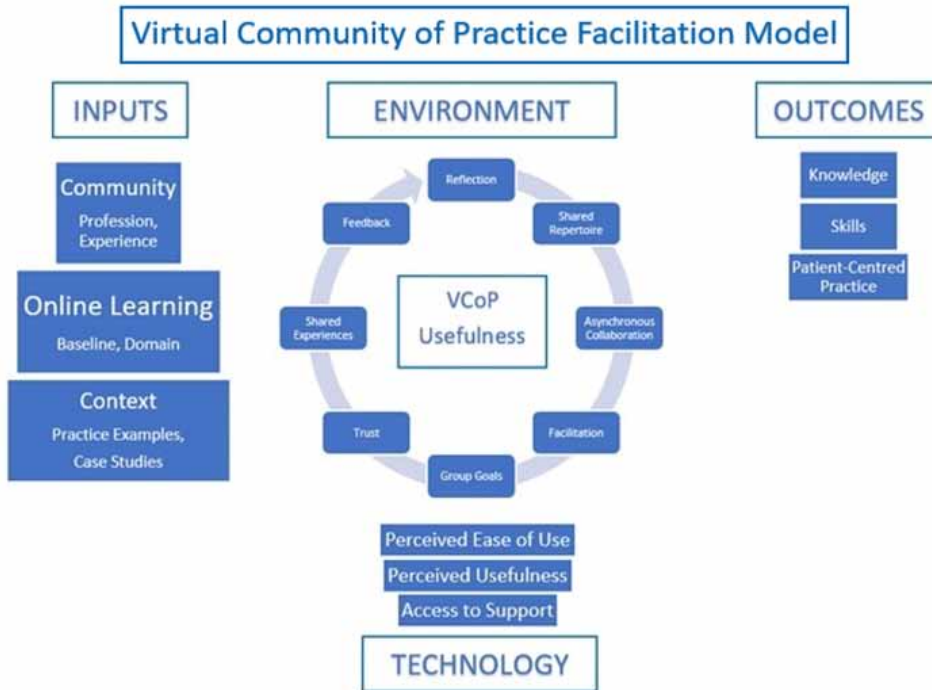
Inputs or Design Elements	Environment for Collaboration	Outcomes and Experiences
Online Learning Baseline <i>Confirming and Validating</i> Interviews <i>New Knowledge and Skills Gaps</i> Interviews <i>Shared Repertoire and Common Language</i> Bouchamma et al. (2018); Murillo (2008)	VCoP Usefulness/ Effectiveness <i>Reflection and Experimentation</i> Interviews; Cruess et al. (2018) <i>Feedback and Discussion</i> – McLoughlin et al. (2018); Richard et al. (2014) <i>Shared Repertoire</i> Interviews <i>Asynchronous Collaboration</i> Interviews and reflections <i>Effective Facilitation</i> Interviews; Bouchamma et al. (2018) <i>Experiential Learning</i> Gonzalo et al. (2017); Richard et al. (2014) <i>Trust and Peer Support</i> Interviews; Hernández-Soto et al. (2021). <i>Shared Experiences</i> Lofters et al. (2016); Richard et al. (2014) <i>Discussion of Challenges</i> Interviews; Lofters et al. (2016) <i>Group Coaching</i> Struminger et al. (2017); Stepanek et al. (2013)	Knowledge <i>Tapering and Impact on Daily Life</i> Post-module survey; Interviews Skills <i>Improved</i> <i>Communication with Patients</i> Post-module survey Motivational <i>Interviewing</i> Facilitator interview; Interviews Patient-Centered Thinking Interviews and reflections <i>Individual and Shared Products</i> Smith et al. (2017)
Establish Community Identity <i>Area of Knowledge</i> Wenger-Trayner (2015)	Technology <i>Perceived Ease of Use</i> Interviews; Peñarroja et al. (2019); Alali and Salim (2013)	
Establishing Context <i>Incorporate Practice Examples and Case Studies</i> Interviews; Wenger et al. (2002)	<i>Perceived Usefulness: Learning by Doing</i> Interviews; Monrouxe (2013); Peñarroja et al. (2019) <i>Access to Support</i>	
Importance of Defining the Domain Facilitator interview; Ranmuthugala et al. (2011)	Facilitator interview and Participant interviews; Peñarroja et al. (2019); Stepanek et al. (2013)	

meaningful feedback, and reflection; and is supported by asynchronous collaboration in order to maximize VCoP usefulness. The outcomes as defined by this study's participants are refined knowledge, adoption of new skills, and a renewed focus on patient-centred thinking. The goal of this model is to promote efficiency and effectiveness in the design, development, and evaluation of virtual communities of practice. Future studies with a greater number of participants can be used to validate this model design.

Study Limitations

Due to the exploratory nature of this study, there were numerous limitations to the generalizability of its findings. To begin, the interviews included data from only three participants (two participants and the facilitator). It would have been valuable to have a focus group with participation from all five community participants to allow for further reflection on its perceived benefits and challenges. In addition, while the quantitative data provides excellent insight into the learning outcomes of study participants, a much larger sample size (at least 400 or more) would be needed in order to achieve a level of confidence of 90% or higher in study findings. It is hoped that with the encouraging data from this project that future iterations of the VCoPs will attract a much larger number of primary care provider participants. Finally, it would be useful to collect samples from study participants at

Figure 1. The virtual community of practice facilitation model



six and twelve-month intervals after the completion of the VCoP to determine if they applied the knowledge and skills acquired during the program.

Areas for Future Research

Several areas for future research have been identified from study findings:

- Time efficiency: How can online modules supported by virtual communities of practice be designed and implemented in order to maximize both time-on-task and practical learning outcomes for busy family care providers?
- Educational applications: What other applications of online modules supported by virtual communities of practice would be useful for healthcare professionals (continuing medical education, support for residents/medical students)?
- VCoP continued support: What types of asynchronous or synchronous virtual collaboration tools are effective for supporting post-virtual community of practice collaboration and knowledge sharing?

CONCLUSION

This study followed the experiences of primary care providers as they participated in an online module on best practices for opioid prescribing and deprescribing, and a subsequent Virtual Community of Practice consisting of five case study discussions via videoconference guided by a facilitator with expertise in opioid prescribing. Findings note the importance of the online module as a baseline of knowledge and common starting point, the value of the shared case studies and experiences for reflection and peer support, a shift to more patient-centred thinking as a result of module and

VcoP participation, the importance of technical support and efficient structure in VcoP design and facilitation, and the strengths and benefits of a facilitator with expertise in the subject matter during a VcoP for practical learning outcomes. Finally, a Virtual Community of Practice Facilitation Model was proposed for the effective design and delivery of VcoPs that result in the acquisition of new knowledge and skills and the promotion of patient-centred practice. More research is required to identify and promote the use of VcoPs as a more effective method of designing medical education both from the standpoint of time efficiency and learning outcomes.

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