Development of a Hybrid, Interprofessional, Interactive Quality Improvement Curriculum as a Model for Continuing Professional Development

Isabelle S Kusters[1,2] (iD), Megan E Gregory[5,6], Jennifer L Bryan[3,7,8], Sylvia J Hysong[4,7], LeChauncy D Woodard[4,7,9], Aanand D Naik[2,4,7,8] and Kyler M Godwin[4,7,8]

[1]Department of Clinical, Health, and Applied Sciences, University of Houston–Clear Lake, Houston, TX, USA. [2]Center for Medical Ethics & Health Policy, Baylor College of Medicine, Houston, TX, USA. [3]Department of Psychiatry, Baylor College of Medicine, Houston, TX, USA. [4]Department of Medicine, Baylor College of Medicine, Houston, TX, USA. [5]Department of Biomedical Informatics, The Ohio State University, Columbus, OH, USA. [6]Center for the Advancement of Team Science, Analytics, and Systems Thinking in Health Services and Implementation Science Research (CATALYST), The Ohio State University College of Medicine, Columbus, OH, USA. [7]Houston Center for Innovations in Quality, Effectiveness and Safety (IQuESt), Michael E. DeBakey VA Medical Center, Houston, TX, USA. [8]VA South Central Mental Illness Research, Education and Clinical Center (MIRECC), Houston, TX, USA. [9]Department of Health Systems and Population Health Science, College of Medicine, University of Houston, Houston, TX, USA.

ABSTRACT: Over the past 20 years, there has been an increased focus on quality improvement (QI) in health care, which is critical in achieving care that is patient-centered, safer, timelier, and more effective, efficient, and equitable. At the center of this movement is QI education, which is known to lead to learning, behavior change, and improved outcomes. However, there is a need for the development and provision of long-duration, interactive, interprofessional training in QI, to allow for in-depth learning and application of learned skills. To this end, we designed a curriculum for an established interprofessional, interactive, web-based QI fellowship for doctorally prepared clinicians. Curricular content is delivered virtually to geographically dispersed learners over a 2-year time span. The didactic curriculum and experiential learning opportunities provide learners with the foundational knowledge and practical skills to engage in—and eventually, lead—QI initiatives around the country. Evaluation of learner satisfaction and cognitive, affective, and skills-based learning has found that this model is an effective method to train geographically distributed learners. A hybrid training structure is used, where learners interact with the material through 3 distinct delivery modes: (1) virtual instruction in QI topics; (2) face-to-face training, mentorship, and the opportunity for practical application of applied knowledge and skills through the completion of QI projects; and (3) opportunities for other types of training, tailored to each learner's Individual Development Plan. This training program model holds value for QI learning in various health care settings, which are interprofessional by nature. These foundational concepts of hybrid learning to distributed learners—wherein an instructor delivers curriculum in small, face-to-face batches, interprofessional learning is supplemented in a virtual, longitudinal manner, and learners are allowed the opportunity to put skills into action for real-world problems in interdisciplinary clinical teams—can be applied in a multitude of settings, with comparatively lower time and cost expenditure than traditional training programs.

KEYWORDS: Quality improvement, hybrid training, curriculum

Introduction

Over the past 2 decades, there has been an impetus to improve health care quality and patient safety. It is recognized that widespread health care improvement can only be accomplished if those in the health care system have the knowledge and skills to address and improve quality and safety. In recognition of the need to train clinicians in these vital areas, licensing and education agencies, such as the Accreditation Council for Graduate Medical Education (ACGME), the American Association of Colleges of Nursing (AACN), and the Accreditation Council for Pharmacy Education (ACPE), have developed training requirements and competencies covering quality improvement (QI), patient safety, and systems-based practices.[1-3] Moreover, a 2003 Institute of Medicine summit on health professions education and training needs identified competencies central to the education of all health professionals for the future, including

providing patient-centered care, applying QI, employing evidence-based practice, and working in interdisciplinary and interprofessional teams.[4]

The Issue

It has been shown that QI education leads to learning, behavior change, and improved outcomes.[5] An essential component of QI education is improving interprofessional teamwork, given that much of today's health care is delivered by interprofessional teams.[6] Effective interprofessional teamwork among members of the health care team is greatly facilitated by interprofessional education (IPE), such as interprofessional team training, which has been associated with improved communication, reduced medical errors, and greater patient satisfaction.[7] Most importantly, IPE has been found to improve health outcomes and is therefore integral to the transformation of health systems.[8] Although it is recognized that interprofessional teamwork is critical for QI, many QI training programs occur within professions, such as during residency training programs or through continuing professional development. Because the provision of health care is—at its core—interprofessional, it is imperative that training in areas such as QI be conducted with an interprofessional focus.[9]

However, the challenge remains on how to train clinicians in interprofessional teams in QI methodologies while considering the competing demands of providing patient-centered care in busy clinical environments. Frequently, QI training programs—like many continuing professional development training programs in healthcare—are delivered in professional silos and structured as short, classroom style (didactic) training events.[10,11] It is often difficult to gather interprofessional health care providers in one room for in-person, interactive training, especially if they are geographically dispersed.[12] Although virtual training is often used, providing passive, one-way information to learners is not aligned with training best practices, as interaction, reflection, and discussion create more effective virtual training programs and is essential for deep learning in adult learners.[13-16] Moreover, interprofessional teamwork is best learned through the application of concepts while practicing in interactive, interprofessional team settings. Finally, spaced training (ie, delivering small amounts of information over long periods of time)—rather than massed training (ie, delivering all information in a short burst)—has been found to result in more effective knowledge and skills transfer for behavioral training programs.[17]

Altogether, there is a need for the development and provision of long-duration, interactive, interprofessional training in QI, to allow for in-depth learning and application of learned skills.

The Solution

An ideal hybrid training program would facilitate the implementation of these known best practices—including spaced, interactive, and interprofessional training—while allowing for a large number of geographically dispersed learners to engage in training. To this end, we designed a curriculum for an established interprofessional, interactive, web-based QI fellowship for doctorally prepared clinicians.[18,19] Curriculum is delivered virtually to geographically dispersed learners over a 2-year time span. As previously reported in the literature, the didactic curriculum and experiential learning opportunities are continuously evaluated and have been found to provide learners with the foundational knowledge and practical skills to engage in—and eventually, lead—QI initiatives around the country.[9,20-22] In this article, we describe the principal concepts and components of an IPE curriculum design for this program to provide guidance for others who wish to use this hybrid, longitudinal structure for other similar health professions training programs. We also include information on the curricular content of this training as a model for future QI training programs.

The Model

The setting

In the late 1990s, the U.S. Department of Veterans Affairs (VA) leadership recognized that the strengths of the VA health system provided an ideal setting for a training program dedicated to the improvement of healthcare quality and value. These strengths include a national health system with strategic initiatives focused on QI and safety, academic affiliations with leading medical and nursing schools, and an administrative structure that promoted innovative training programs.[19] Thus, a plan was developed for a 2-year, postresidency fellowship with a focus on the improvement of health care. Funded through the VA Office of Academic Affiliations and in partnership with The Dartmouth Institute, the VA Quality Scholars Program (VAQS) was born.[18] Originally limited to physicians, the program expanded in 2009 to include pre- and postdoctorally prepared nurses; today, there are approximately 60 interprofessional learners each year throughout 9 sites across North America, including physicians, pre- and postdoctorally prepared nurses, postdoctoral clinical psychologists, and postdoctoral pharmacists. In the 2-year VAQS fellowship, clinician scholar trainees learn to develop and apply new knowledge to lead the ongoing improvement of healthcare for VA and across North America.

At the time of the curriculum design, the program consisted of 8 sites across the United States, as well as an affiliate site in Toronto, Canada, not funded by VA. In late January 2015, the Center for Training in Healthcare Quality at the Michael E. DeBakey VA Medical Center in Houston, Texas, assumed responsibility from The Dartmouth Institute for the hub site, which became known as the VA Quality Scholars Coordinating Center ("central site"). The central site oversees a complex instructional design that incorporates distance learning and face-to-face activities in which each site participates, as well as local instruction from each site including didactics, workshops, and mentored scholar projects. Site-based faculty lead their

Delivery Mode	Year 1			Year 2		
	July	August	September - May	July	August	September - May
Virtual	QI 101		Weekly Sessions with Content Expert	QI 101		Weekly Sessions with Content Expert
Face-to-Face		Summer Institute			Summer Institute	
	Mentorship					
	QI Project					
Varies: tailored to each learner's Individual Development Plan			Special Interest Group			Special Interest Group
			Certification			Certification
	Additional Degree					

Component of Three-Pronged QI Training Model
Boot Camp
Didactic Curriculum
Practical Experience

Figure 1. Two-year program design, showing components of the 3-pronged Quality Improvement (QI) training model.

respective site, serve as mentors to the learners, and assist in aspects of curriculum and programmatic planning (www.vaqs.org). Each site in the United States consists of a partnership between a VA hospital and an academic medicine and nursing institution. The central site conducts a continuous process improvement of the curriculum and program, with weekly evaluations of learner satisfaction, as well as annual reviews, learner knowledge, curriculum content, and program impact.

Program curriculum and logistics

All didactic and practical training components of the program are designed to highlight an interprofessional structure and build upon the unique strengths of each profession. An essential element of the program design requires that each profession is represented by at least one faculty member at each site. The inclusion of faculty members who are national leaders in QI and research is integral to trainees' acquisition of relevant knowledge and skills and allows for the development of broader educational efforts outside the local institution.[23]

The program delivers both national and local instruction. For the national instruction, a hybrid training structure is used, where learners interact with the material through 3 distinct delivery modes: (1) virtual instruction in QI topics; (2) face-to-face training, mentorship, and the opportunity for practical application of applied knowledge and skills through the completion of QI projects; and (3) opportunities for other types of training, tailored to each learner's Individual Development Plan (see Figure 1). All components of the training model are described in subsequent sections. A total of 20 competencies form the foundation of training and drive curricular content, organized into 5 domains: interprofessional collaboration and teamwork, improvement methods and skills, research, teaching and learning, and organization and system leadership for

quality and safety. The curriculum is designed to ensure that all areas of knowledge have both a didactic and practical application component during each trainee's fellowship.

The program relies on technology-mediated distance learning—integrating both asynchronous and synchronous strategies—for curriculum delivery. An online course management system enables learners to access course materials remotely and asynchronously. Documents and assignments for each session are posted at least 2 weeks in advance of the session, and materials from previous sessions—including a recording of the session—are archived for reference. Each learner and faculty member can access all prework and prereading assignments through this system, and completed assignments can be uploaded for the central site and invited speaker to review. This system also allows for the dissemination of other resources, such as job postings and discussion boards.

Participants individually prepare for the synchronous sessions through reading or viewing materials available to them online prior to the synchronous distance learning session. Synchronous curriculum delivery is done through a web-based videoconferencing and virtual collaboration platform (eg, Adobe Connect, Zoom, Skype), allowing for cross-site collaboration and remote instruction. Each site uses a webcam and telephone to connect with other sites and the presenter (see Figure 2). This platform enables a live slide presentation with the speaker's audio, plus the use of a chat box to facilitate discussion and other interactive communication tools. During the synchronous sessions, within- and between-site interaction is also encouraged, through the use of breakout sessions and discussions. Breakout sessions involve learners at each site engaging in small group discussion which is typically followed by a facilitated, large group discussion. Learners can engage in the large group discussion either by speaking on the audio line or typing into the chat box on the web-based platform.

Figure 2. Example of Adobe Connect dashboard during a live didactic session, connecting the invited speaker's audio, video, and presentation slides with audiovisual connectivity to the remote sites.

The Delivery

Boot camp

As first-year learners come from multiple specialties and professions and can enter the program at any point beyond their doctoral training; their incoming knowledge base is highly variable. Consequently, at the start of the academic year, new learners are enrolled into a week-long "QI 101" training, conducted from the central site, that allows national program faculty dedicated time with first-year learners. This synchronous, technology-mediated instruction in condensed, "boot camp" style is designed to level incoming learners with foundational QI topics before the start of weekly didactic curriculum with the remainder of learners and faculty. Learners are allowed time to apply the daily instructional topics through homework and breakout session activities during the sessions. Advanced learners help to facilitate the discussions for novice learners. This hybrid model also affords learners time to conduct brief QI project work and apply the skills and information learned during the daily sessions.

This portion of the program also includes an annual face-to-face component. The VA Quality Scholars Summer Institute is a week-long conference held several weeks into the academic year, during which faculty and learners meet to interact, network, and learn from one another and from national leaders in QI and patient safety. Activities include seminars, workshops, poster sessions, site visits, and networking and mentoring opportunities. This face-to-face component allows for instruction with modalities that are not easily covered virtually, such as learning through simulation. This meeting is held at the beginning of the academic year, enabling the learners and faculty to meet in-person, fostering the importance of collaboration, mentoring, and community building. In addition, the timing of this conference is important for new learners, as it immediately follows and builds upon the foundational curricular elements presented in the first month of the training.

Didactic curriculum

The didactic curriculum is structured around the learning competencies, organized into courses, which are presented in a cycle throughout the academic year. The core curriculum has rotating foundational topics, such as the elements of quality and safety, methods and analysis in QI, and implementation methodology. Because this is an advanced fellowship program, topics on QI scholarship, professional development, and a "fellows forum," during which projects and ideas can be presented, are also included. The curriculum is laid out into a 2-year plan,

such that the themes—and not the specific curricular content—repeat during a learner's time in the program. Second-year learners are involved at a higher level on topics they have previously encountered, such as by coaching first-year learners and reviewing their work under faculty guidance.

Expert speakers are invited to share their knowledge, research, and experience with the learners during the weekly seminars. The central site identifies and invites these speakers at the start of the academic year and acts as a resource to provide information on how the speaker may adapt their learning materials to fit the audience and the web-based platform. The central site creates a rough outline for each session, and during the initial meeting with the invited speaker, a high-level discussion is held on how the speaker's topic expertise best fits to meet the learning objectives of the fellowship as well as ensuring that the session is interactive and interprofessional. For example, active learning strategies, such as the use of a flipped classroom, small group and national-level discussions, site-based projects, and simulation, are used to ensure the learners engage with the didactic curriculum both before and during the session.

Practical experience

A major component of the site-level portion of the fellowship is mentorship under the guidance of one or more faculty members. Learners complete a needs assessment to identify areas upon which they should focus during their time in the program. Learners work with their mentors to complete an Individual Development Plan, which is a working document designed to help learners track their progress toward short- and long-term goals. Apart from the didactic curriculum, each learner's practical experience is tailored to these goals.

In addition to the weekly didactics, other curricular opportunities are available to the learners. Depending on their interests, over time, we have offered varying special interest groups (SIGs), such as an Improvement Measurement SIG, the completion of the coursework and related project for a Lean Six Sigma Green Belt Certification, and the Agency for Healthcare Research and Quality (AHRQ) TeamSTEPPS Master Trainer Certification. Finally, several sites offer learners the opportunity to earn a Master in Public Health or other masters-level degree, through collaboration with their sites' academic affiliate.

Finally, throughout the program, learners must be engaged at the local VA facility and/or academic affiliate in one or more QI research projects. The site faculty members guide learners to existing work and help them to develop original projects. These experiences are an invaluable learning opportunity, as they allow for practical application of the didactic knowledge and interprofessional skills gained during the weekly sessions. Learners are also provided the opportunity to work on national-level QI projects within the VA, such as improving access to care and analyzing hospital system performance. Learners are encouraged to present the progress, roadblocks, or results of their QI projects to their peers and mentors at their own site, and at designated points during the course rotation.

Program Evaluation

As previously reported, the central site systematically evaluates the sessions and program as well as solicits feedback from invited speakers about the process and experience of delivering curriculum to the learners. Each fellow is given a pretest prior to starting the fellowship to assess previous knowledge in QI theory, QI methods and skills, as well as their attitudes and behaviors regarding interprofessional collaboration and teamwork. Fellows also complete these measures in a posttest at the end of both their first and second years to assess knowledge and skills gained during the fellowship. Satisfaction surveys are sent out to all fellows and faculty after each session to gauge satisfaction with the speaker(s), perceived attainment of session learning objectives, and overall satisfaction with the session. The central site reviews satisfaction surveys weekly after each session and adjusts upcoming sessions to incorporate feedback as much as possible. This longitudinal evaluation has shown learners are satisfied with the program and have exhibited statistically significant improvements in cognitive (Cohen's d = .3), affective (.77), and skills-based (.76) learning over time, showing this model is an effective method to train geographically distributed learners.[21] We have also found the program to improve interprofessional attitudes among physicians and nurses.[9] Evaluation of the model in its entirety has been done using a logic model structure, showing the effectiveness of the training model for QI leadership outcomes.[20] Furthermore, innovative solutions for complex health care issues, such as inpatient suicide prevention, have been proposed using this coordinated, multisite approach to hybrid, interprofessional learning.[22]

Discussion

This training program model holds value for QI learning in various health care settings, which are interprofessional by nature. Each site forms one small group, in which didactic learning and practical skills application occur, and effort should be taken to ensure that learners in each group are representative of multiple health care professions. Learners build rapport and community while they learn over the web-based platform, and the interprofessional, interactive nature encourages engagement and facilitates adult learning. In addition, the QI topics covered in didactic training and practical application opportunities are relevant to work that is done every day in a clinical setting, ensuring that the information is relevant to the learners and draws from their personal, practical experience as a clinician.

Although the VAQS program has been successful in delivering a hybrid training in QI, we posit that a more modest program based on the same principles would be feasible to deliver within a health care system. These foundational concepts of hybrid learning to distributed learners—wherein an instructor delivers curriculum in small, face-to-face batches, interprofessional learning is supplemented in a virtual,

longitudinal manner, and learners are allowed the opportunity to put skills into action for real-world problems in interdisciplinary clinical teams—can be applied in a multitude of settings, with comparatively less time and cost expenditure than delivering the same training fully in-person across multiple sites. Interprofessional teams working on real-world problems are naturally occurring within clinical settings and could be trained with a hybrid-type model as suggested above. Based on our experience, we propose 4 key takeaways for the implementation of such a program.

Key takeaways

Takeaway 1: as QI becomes more ubiquitous, training the workforce on a breadth of QI competencies is essential. Many professional organizations and licensing agencies have QI competencies, and this training model can be used by training programs and health care organizations to provide QI curriculum to their learners. Curricular content can be tailored for various types of health care professionals, such as nurses, allied health professionals, health care administrators, and the broad health care workforce.

Takeaway 2: it is possible—and beneficial—to deliver interprofessional, longitudinal, training to geographically distributed practicing clinicians, virtually. A major advantage to our model is that web-based curriculum delivery is often less resource-intensive than face-to-face training programs. As each trainee is located at their own geographic site, there is no need for the allocation of travel time and funds (with the exception of travel for the annual face-to-face Summer Institute) for regular, ongoing instruction. We have found that a key aspect of program delivery is using technology that is relatively simple and easily accessible to our trainees, such as a computer with video camera and Internet connection, and a simple web-based platform. This program model is ideal for geographically dispersed learners such as for trainees in rural areas or in global medicine, as most of the training is conducted from one, central location and it can be accessed synchronously and remotely.

Takeaway 3: a similar hybrid delivery model could be used to build community across an institution to deliver curricular content that is not easily given virtually. The integration of web-based curriculum delivery into education and training programs has expanded the possibilities for learner engagement and outreach.[24] While a considerable amount of training and learning can be done online, many fields still benefit from—or require—face-to-face or synchronous contact. For example, this model is frequently used in executive management and business programs, where learners may also be working full-time and seek a flexible, results-focused curriculum.[25] In other hybrid programs, learners use both synchronous (face-to-face) and asynchronous (web-based) modalities for learning, activities, connection with peers, and mentorship. Similar to other hybrid

delivery models, we have found that bringing all trainees and faculty together face-to-face at the beginning of the academic year for workshops and networking helps set the stage for more effective interprofessional virtual interactions throughout the rest of the program.

Takeaway 4: QI training should prepare learners for practical experiences leading and/or participating in interprofessional QI projects. The focus of training efforts like the VA Quality Scholars program is on practical impact rather than coursework credits. Therefore, the curriculum and structure of the training program must prepare learners to work in interprofessional settings and to manage the daily challenges of designing, implementing, managing, and measuring real-world QI projects. Methods and skills training at the national level prepares learners for these practical as well as conceptual considerations and then guides them through their local implementation efforts. Moreover, departing from the practice of training clinicians in single-profession siloes, which relies on initiatives within each clinical profession, real-world interprofessional collaboration is encouraged through training interprofessional learners together.

Conclusions

We have found a way to design and deliver a spaced QI curriculum to advanced clinicians in an interprofessional, interactive manner. As the focus of the health community continues to be on high-quality patient care, this hybrid training model is an innovative method for didactic learning and practical skill application.

Author Contributions

All authors were involved in the program design and implementation. ISK and KMG conceived of and drafted the manuscript, and ISK, MEG, JLB, SJH, LCDW, ADN, KMG made important contributions to content and structure. All authors critically reviewed the manuscript and approved it for publication.

ORCID iD

Isabelle S Kusters 🆔 https://orcid.org/0000-0002-2740-748X

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