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Show-Me ECHO acts as a catalyst to shift professional development, moving learning from learning in isolation about a complex medical problem to learning as part of a multidisciplinary team and learning how to provide comprehensive care for real patients.

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Abstract

Show-Me ECHO, a state-funded project, provides access to education within a community of learners in order to optimize healthcare for the citizens of Missouri. Through videoconferencing and case-based review, ECHO shifts professional development from learning about medical problems in isolation to experiential learning as part of a multidisciplinary team. The establishment of a statewide COVID-19 ECHO is allowing a rapid response to this novel, unprecedented, and unanticipated health care crisis. There are many ongoing opportunities for clinicians from across the state to join a Show-Me ECHO learning community as a means to elevate their practice and improve ability to respond amidst a constantly evolving health care environment.

Introduction

In a personal interview, Dr. Sanjeev Arora, a Hepatitis C specialist at the University of New Mexico, recalls a patient's story that inspired him to start the Extension for Community Healthcare Outcomes project (Project ECHO). The patient was a 43-year-old woman with Hepatitis C, who was a single mother of two after being widowed when her husband died in a car accident. There was an eight-month wait to see Dr. Arora, a Hepatitis C specialist located hundreds of miles from her home. Unfortunately, by the time the woman was able to get in to see Dr. Arora she had already developed cancer of the liver. The greatest tragedy of this story is that her illness was curable with early treatment. Because providers in her area lacked the evidenced based knowledge about how to treat Hepatitis C, she died a premature death, orphaning her two children.[1]

While every patient's story is unique, this type of situation occurs regularly across the US. Even though the US healthcare system is home to some of the most sophisticated treatments and medical technologies in the world, there are vast discrepancies in the quality of care to which patients have access depending on their geographic location and the knowledge of the providers within their communities.[2] In response to these types of barriers, the Institute of Medicine (IOM) published multiple blue-ribbon reports describing the essential features of quality care: health care that is safe, effective, patient-centered, timely, efficient and equitable. The IOM

Best Care at Lower Cost: The Path to Continuously Learning Health Care in America outlines a vision to catalyze effective, efficient high quality care in a system that continuously learns to become better.[3] Show-Me ECHO, a state-funded telehealth project created and operated by the Missouri Telehealth Network at the University of Missouri, addresses the IOM's six domains of quality care by offering opportunities for health care providers to participate in learning communities aimed at improving access, safety, and elevating the care provided to residents across the State of Missouri and beyond.

ECHO connects primary care providers with each other, with local resources, and with specialists through structured and formalized live-interactive video sessions. By linking rural and underserved populations with specialized expertise, Show-Me ECHO elevates care and promotes lifelong learning by providing clinicians access to the most current knowledge they need to effectively care for their patients. Existing literature demonstrates that the ECHO principles are congruent with other national calls for health care reform: 1) Macy Foundation's 2008 call to shift continuing medical education to focus on practice-based learning; 2) Institute of Medicine's (IOM) 2009 report describing the role of continuing education to achieve and maintain proficiency, and 3) Carnegie Foundation's 2010 description of the significant challenges, and needed changes in preparing physicians for the future.[4] The ECHO model resonates with salient features of Best Care at Lower Cost: The Path to Continuously Learning Health Care in America[3] including the need to: 1) generate and apply knowledge in real time, 2) engage patients, families and communities in the provision of care, 3) manage increasing clinical complexity, and 4) leverage opportunities from technology. The ability of the ECHO model to meet these needs was demonstrated in Show-Me ECHO's quick response to COVID-19 which helped providers to generate and apply knowledge in real time in order to meet the demand of ever-changing guidelines and knowledge.

Background

Show-Me ECHO began in 2014 after a Missouri team visited the University of New Mexico, home to Dr. Sanjeev Arora and Project ECHO. There they learned about the success of

ECHO, a technology-enabled collaborative learning and capacity building model for Hepatitis C. The ECHO model "connects specialists with multiple other health care professionals through simultaneous interactive videoconferencing for the purpose of facilitating case-based learning, disseminating best practices and evaluating outcomes".[5] ECHO has been replicated across the United States and internationally to address a wide variety of disease conditions. Key features of ECHO programs include: 1) a hub and spoke organization where multidisciplinary content experts mentor participants through teleconferencing, 2) regular and recurring virtual meetings, 3) focused didactic presentations, and 4) case-based learning where participants select and present cases from their own practices.[5] ECHO offers an alternative to traditional continuing education as it situates learning within authentic professional practice and connects to workplace learning.[4, 6, 7] Show-Me ECHO connects Missouri primary care providers with each other and with specialists as well as other health care team members. Diverse perspectives are incorporated into ECHO, as the teams may include, among others, persons with lived experience, physicians, nurses, social workers, therapists, community members, counselors, chaplains, administrators, etc. These multidisciplinary participants collaborate in a case-based learning environment where discussions with, and mentoring from, content experts help equip providers with the knowledge and tools they need to give their patients the right care, in the right place, at the right time.

In recognition of its rigorous adherence to the key tenets of ECHO, the University of New Mexico's Project ECHO designated Missouri's Show-Me ECHO as a "Super Hub" training organization, one of only seven global sites. As a super-hub, Show-Me ECHO provides immersion training for new ECHO content expert panels and staff. What began as a partnership with the Missouri Primary Care Association (MPCA) to support one pilot chronic pain management ECHO in 2014 has grown into 22 Show-Me ECHOs with more in the planning stage (Appendix 1). Show-Me ECHOs are scheduled for 1-1.5 hours, and most occur year-round.

Table 1. Show-Me-ECHO Participants from Inception through December 2018

Show-Me-ECHO Project	# of Participants	# of Participants' Cases Presented	# of MO Counties
Autism	93	105	28
Asthma	164	145	34
Child Psychiatry	85	25	28
Community Health Worker	166	25	35
Dermatology	86	392	28
Hepatitis C	39	140	20
HIV	32	3	5
Multi-Tier System of Support	104	9	18
Opioid Use Disorder	116	22	25
Pain Management	101	41	36

Table 2. Pre-Post ECHO Participation Outcomes Data

ECHO	Medicaid Claims Data	Pre-Post ECHO Participation Outcomes
Pain Management	Opioid Prescribing Patterns Morphine Milligram Equivalents (MME)	19% decrease in MME*
Autism	Child Development Screenings	29% increase in screenings
Dermatology	Claims containing one or more specific dermatology diagnosis code	452% increase in coding specificity**

*2 years post participation
**by providers that attended more than one Dermatology ECHO

Learning occurs through three routes: 1) short didactic presentations, 2) deidentified case presentation selected from the clinical practices of participants and 3) opportunities for practice and feedback among all participants as they consider the case.[4, 8] Content experts facilitate discussions and model the best approach in management of each case. Although Show-Me ECHO draws participants from across the United States and internationally, it focuses on the needs of Missourians.

ECHO creates a bridge between academic medical centers, other content experts, and multidisciplinary teams, and increases access to care in rural and underserved areas.[2] Show-Me ECHO recruits expert mentors from across the state, to ensure that these teams have the opportunity to work with specialists in the field. Nearly 300 participants from different health care organizations in 21 counties and three states have been represented on the expert hub teams from inception in 2014 thru December 2018. Additionally, Show-Me ECHO has touched 80 of Missouri's 114 counties plus the city of St. Louis. This geographic diversity is evidence that the University of Missouri recognizes and partners with experts located throughout the state who can best understand local resources, contacts, and realities for providing care in underserved areas. The number of learners engaged by Show-Me-ECHO, the number of Missouri counties participating, and the number of case-based learning opportunities are presented in Table 1.

Other articles in this series examine outcomes in more detail, however, Table 2. provides illustrative examples of the impact of Show-Me ECHO on patient care. It is important to note that patients benefit not only indirectly through the knowledge acquired by participating clinicians, but also directly. Patients whose case is presented during ECHO, directly benefit from the review by a community of learners, whose combined expertise exceeds the knowledge of any one provider.

Although ECHO models are now widespread, a February 2019 Report to Congress calls for strengthening the evidence base to help determine how best to expand use of the ECHO model.[5] One must understand the essential features of ECHO in order to successfully replicate this model. In this article, we draw from rich literature on adult learning, social cognition, situated learning, communities of practice and learning organizations to describe how and why the ECHO model enhances learning and transforms learning into improved patient outcomes. In addition, the article provides a reflection on how established ECHO learning communities were leveraged to generate and apply knowledge in real time during the COVID-19 pandemic.

Connecting Learning to Professional Practice

Lifelong learning is critical to high-quality medical practice. Because clinical information

is constantly growing, successful clinicians must persistently refresh medical knowledge and understand personal limitations related to knowledge acquisition and application. This requires a commitment to self-assessment and to identifying learning needs.[9] Reflection is a necessary skill for self-directed learning because the individual must be able to consider their own strengths and weaknesses in order to pursue learning. Traditional cognitive approaches to expertise often emphasize diagnostic ability and assume that expertise is an end-state of mastery of existing knowledge and technique. However, these assumptions of the cognitive model unnecessarily limit conceptions of expertise in medicine and elucidate the need to distinguish between "routine expertise and "adaptive expertise".[10] Routine expertise involves a set of habits used by the practitioner. Adaptive expertise, on the other hand, is flexible and involves combining old and new knowledge to generate different ways of thinking about a problem in order to achieve meaningful learning.[10] When practitioners engage in meaningful learning it fosters flexibility and a more comprehensive understanding of health in order to better meet the dynamic needs of patients, giving practitioners the tools necessary to incorporate context and alternative approaches into practice.

Adult learning theories tell us that adults prefer learning opportunities that draw upon their life experiences, are problem-centered, experiential, and focus on the "why" behind what they are learning.[11] Learning through doing is an important part of professional preparation and continuing education. Most innovations and changes in practice take place in the context of use, not formal education.[7] Instead of mastering proven procedures, much of professional learning occurs through activities that provide an opportunity to practice and problem solve in contextually relevant situations (i.e., experiential learning).

Theory is usually explicit in "book knowledge" and implicit in "action knowledge;" thus, people have a difficult time verbalizing knowledge gained through experience.[7] This does not imply this type of knowledge is unimportant but rather that it is difficult to articulate and explicitly teach.

One way to address this is through the use of narrative. Narrative thinking (thinking through telling and interpreting stories) involves trying to understand experiences or patient cases.[12] Telling the narrative story of a person or patient turns knowledge into understanding by allowing for reflection and translation of the story to a clinical reality that is actionable information.[13, 14] Problem/patient-based learning is powerful because, it makes the knowledge more accessible and more likely to be used when caring for patients. In contrast to traditional classroom-based learning that seems disconnected from practice, problem or case-based learning is inextricably connected to patient encounters.[15]

Traditional classroom education falls short of meeting the needs of adult learners that have transitioned from formal education programs and into clinical practice. This can be attributed to Kegan's theory of adult development positing that adults use four lenses, instrumental, social, self-authoring, and self-transforming, to enable and constrain what they pay attention to in order to make sense of a given situation.[16] A person is not aware of using a particular lens until the lens becomes inadequate to address a situation. This disorienting case helps the person see the lens they were using. Kegan calls this a shift from subject to object because the lens then becomes something that the individual can perceive and investigate. These shifts reflect transformative learning. For transformative learning to occur, the learner must be able to recognize and critically examine the lens they are using. Through their participation in case-based learning, the clinicians can identify their lens, practice using new lens, reflect on their own knowledge/learning and are therefore better positioned to incorporate new learning into their professional practice. One can begin to see why participation in ECHO not only results in transformative learning, but also results in transformation of clinical practice.

Transformative Learning Through ECHO

ECHO offers an alternative to traditional clinical education and reaches providers where they practice. ECHO is transformative as it not only promotes knowledge acquisition and increases confidence to treat complex conditions; it creates

Table 3. Participant Quotes Related to Learning Principles of Learning Health Systems

Learning Principle	Corresponding Show-Me ECHO Participant Comments
Draw on wisdom of groups and value connections	There is a huge need for pediatric providers in rural settings to be better educated in identifying characteristic and to be able to screen in order to initiate therapies early. I participate because it is a support resource, links me to the professional who educate and guide me in the care of my patients.
	Learning from other professionals that I usually would not be able to connect with on a regular basis.
	There was a need for better care in my area and this was a great opportunity to connect with specialists and other providers to help provide that care.
Embrace sense-making over decision making in dealing with the unexpected	When a case was presented and then talked out with everyone's ideas, I found that it helped me be more open minded.
	Case presentation review - I think I understand something till we talk about it in a particular patient scenario. The opportunity to get expert help is immeasurably important.
	Another way to connect to the asthma community to share ideas and troubleshoot difficult cases.
Bring diverse perspectives to complex challenges	To observe other CHWs styles or approaches to difficult cases. It is reassuring knowing others in this position may have the same struggles. Also, one can learn about resources they might not be aware of.
	I have a better understanding of the legal implications involving guardians, the legal system, and the medical field.
	Learn from other clinicians how they are working though hurdles of accessing and managing HCV treatment for their specific patient populations.
Animate people, provide direction, update regularly, and interact respectfully	The collegial atmosphere is very conducive to learning without feeling threatened or left out.
	There are no stupid questions and we don't have egos in this group. We help each other learn.
	Feels like a true team.
Appreciate the power and ubiquity of emergent change and the limitations of planned change	Made aware that there are occasions that seem to be the right thing to do may be in conflict with regulations.
	I enjoyed finding new resources and helping other CHWs that may have run out of ideas for helping a patient.
	Saw a need in my patients and those in my community-long wait times at specialty centers.
Concentrate on small wins and characterize challenges as mere problems	Passion to make a change in a rural health setting to offer a broader developmental screen to catch these children early for earlier intervention to improve the overall outcome. Brainstorming ideas with fellow peers regarding resources and patient care.
	The wait for referral to [Autism] Center was so long for my patients that I was excited to be able to facilitate quicker access to treatment for children in rural areas.
	Saw a need in my patients and those in my community-long wait times at specialty centers
*Representative quotes come from participants of the following ECHOs: Asthma, Autism, CHW, Derm, Ethics, Hep C, HIV, OUD, Pain.	

the participant's ECHO experience. To understand the power of ECHO as a learning community, we must understand the salient features of ECHO that foster deep learning and the articulating learning outcomes that demonstrate a full understanding and retention of the content presented as well as ability to apply it to future practice. Potts describes six principles of learning health systems.[22] Table 3 illustrates quotes from Show-Me ECHO participants that are congruent with the identified learning principles.

This commentary by the community of learners cultivated through Show-Me ECHO, gives credence to how participation in ECHO creates a learning culture among participants. This draws on the wisdom of groups and values connections, embraces sense making over decision making in dealing with the unexpected, brings together diverse perspectives to complex challenges, provides opportunity to interact respectfully, appreciates the power and ubiquity of emergent change and finally allows participants to concentrate on small wins.[22] ECHO enhances learning, resulting in transformational outcomes that improve patient and community health.

ECHO uses real-time cases depicting the true complexity of health care practice environments. It creates a safe space, where diverse viewpoints are explored. ECHO promotes collaborative, individualized health care choices, drives the process of discovery, is embedded in community, accommodates learners at different stages in the learning process and is a natural outgrowth of clinical care of patients.[3] ECHO

an opportunity for experiential learning so providers can use new knowledge to improve problem solving in order to meet the dynamic needs of patients.[6, 17-20] Current research on ECHO learning outcomes include acquisition of both book and experiential knowledge, improved self-efficacy, improved competency and enhanced clinical performance.[6, 8, 21] Learning outcomes are determined through various means, including quantitative assessment of knowledge acquisition as well as collection of qualitative data outlining

participants engage in learning that not only transforms the clinician's practice, but in turn improves health outcomes of patients. The ECHO model is better able to teach complex, dynamic content reflective of clinical environments and the skills practitioners need to effectively treat patients, current and future; even in cases where future needs are unforeseen.

The COVID-19 pandemic has forever changed delivery of health care across the world. During the early stages of the spread, panic was rampant and misinformation pervasive. In collaboration with the Missouri Department of Health and Human Services and the Missouri Hospital Association, Missouri Telehealth Network (MTN) was able to leverage established Show-Me ECHO learning communities to connect people with diverse areas of expertise, who were willing to work collaboratively in order to address unexpected and complex challenges. The ECHO model was well suited to engage providers in learning how to protect, diagnose and treat patients with COVID-19 as well as support them in working to protect their communities. Starting up the ECHO quickly optimized Missouri's response and saved lives.

Conclusion

This review demonstrates how ECHO helps refresh knowledge and translate that knowledge into practice providing a foundation for replication across the highest-priority care issues for the State of Missouri. This goal is already being realized with the growth in ECHOs across the last 16 years and a steady increase in provider participation will help to maximize the impact. The COVID-19 ECHO exemplifies the power of learning communities to quickly disseminate information, facilitate agile decision making and to respond to urgent needs reflective of the pandemic. Show-Me ECHO acts as a catalyst to shift professional development moving learning from learning in isolation *about* a complex medical problem to learning as part of a multidisciplinary team and learning *how to* provide comprehensive care for real patients.[7] This in turn promotes real changes to clinical practice and improved patient outcomes.

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Disclosure

None reported.   **MM**