

ECHO: A Model for Professional Development in Nursing Through Learning Networks

Mary E. Burman, PhD, RN, FAAN, FAANP; Nancy McGee, DNP, RN, PMHNP;
J'Laine Proctor, DNP, RN, FNP, PMHNP; Ann Marie Hart, PhD, RN, FNP-BC, FAANP;
Eric J. Moody, PhD; and Canyon Hardesty, MS

abstract

Health research is published at a breathtaking pace and quantity; however, even when research is systematically developed into best practices and/or clinical guidelines, it often is not implemented into practice. Project ECHO (Extension for Community Healthcare Outcomes) is an evidence-based professional development approach that can help nurses to stay current and apply new knowledge to practice. The purpose of this article is to describe ECHO as a model for professional development and capacity building through learning networks. This article describes the ECHO model, evidence supporting its use, the infrastructure needed to implement an ECHO network, and two nursing ECHO learning networks. [*J Contin Educ Nurs*. 2021;52(4):198-204.]

Although progress has occurred since the Institute of Medicine (2001) published its concerning report *Crossing the Quality Chasm: A New Health System for the 21st Century*, the research-practice gap is still wide (Westerlund et al., 2019). For example, many children and adults do not receive recommended immunizations (Hill et al., 2018; Hung et al., 2019), antibiotics are often inappropriately prescribed for viral respiratory infections (Durkin et al., 2018; Shaver et al., 2019), many adolescents and adults are not routinely screened for depression (Akincigil & Matthews, 2017; Stein et al., 2016), individuals with hypertension and/or diabetes are often not achieving recommended disease management goals (Kazemian et al., 2019; Milman et al., 2018), many older adults experience poor outcomes from polypharmacy

(Lalic et al., 2016; Wimmer et al., 2017), and benzodiazepines and sleep hypnotics are often inappropriately prescribed for individuals with anxiety and insomnia (Agarwal & Landon, 2019; Kaufmann et al., 2016). As Arora et al. (2014) bluntly noted, “We are not practicing what we know” (p. 30).

Research is not translated into clinical practice in a timely manner for a variety of reasons. Health research is published at a breathtaking pace and quantity; however, even when research is systematically developed into best practices and/or clinical guidelines, it often is not implemented into practice (Joint Commission International, 2016). Individual clinician factors such as lack of time, desire for autonomy, an assumption that experience is superior to research, and organizational factors such as a lack of infrastructure and mentors to coordinate the implementation of best practices all contribute to reliance on outdated practices (Kristensen et al., 2016; McNett et al., 2019). Additionally, there is a 17-year delay between initial research on the new interventions and practices and its widespread adoption (Glasgow et al., 2003).

Nurses, like all health care professionals, need to update their knowledge and skills regularly and rapidly to

Dr. Burman is Professor Emeritus, Dr. McGee is Clinical Associate Professor, Dr. Proctor is Clinical Associate Professor, Dr. Hart is Professor, Fay W. Whitney School of Nursing, Dr. Moody is Research Professor and Director of Research and Evaluation, and Ms. Hardesty is Director of Community Education and Training, Wyoming Institute for Disabilities, University of Wyoming, Laramie, Wyoming.

The authors have disclosed no potential conflicts of interest, financial or otherwise.

Address correspondence to Mary E. Burman, PhD, RN, FAAN, FAANP, Professor Emeritus, Fay W. Whitney School of Nursing, University of Wyoming, 1000 East University Avenue, Department 3065, Laramie, WY 82071; email: mburman@uwyo.edu.

*Received: July 24, 2020; Accepted: October 22, 2020
doi:10.3928/00220124-20210315-09*

provide competent nursing care. Current approaches to professional development in health care, such as conferences and articles, have mixed results that they improve clinical practice (Forsetlund et al., 2009). Project ECHO (Extension for Community Healthcare Outcomes) is an evidence-based professional development approach that can help nurses, especially rural nurses, stay up to date and apply new knowledge to practice. ECHO was developed by Arora et al. (2017), focusing on professional development of primary care providers about care of chronic hepatitis C (HCV) using multipoint videoconferencing. It has now been extended to a variety of other illness and conditions and to health care professionals beyond just primary care providers. This article describes ECHO as a model for professional development and capacity building. This article describes the ECHO model, evidence supporting its use, the infrastructure needed to implement an ECHO network, and two nursing ECHO learning networks.

ECHO OVERVIEW

The ECHO model consists of four primary components: (a) use of technology, such as remote video conferencing, to leverage scarce resources; (b) didactic training on best-practice professional development topics; (c) cases presented by spoke participants to allow for case-based learning and ongoing disease comanagement facilitated by the interdisciplinary hub experts; and (d) continual program evaluation to determine effectiveness (Arora et al., 2007) (Table 1). These components are critical to the “multilevel ‘learning loop’ [that] allows primary care providers [and other clinicians] to learn by doing, to learn from each other, and to learn from specialists” (Arora, Kallishman, et al., 2011, p. 1179).

ECHO uses multipoint videoconferencing and is designed to be scalable and adaptable to a variety of topics, professions, and geographic and sociocultural contexts. ECHO uses a “hub and spoke” approach to establish a bidirectional learning loop (Figure 1). Each network is led by a core team of subject matter experts, referred to as the hub team, which is interdisciplinary, including nurses, primary care providers, public health experts, social workers, health care administrators, and family members. The hub team provides a short didactic training session on best practices. Other network participants and professionals working directly with the target population, such as students, families, or patients, join from local spoke sites. The presentation of a case or problem of practice is key to the ECHO model. Each session includes at least one case presented by spoke participants. The cases are focused either on individuals or on practices/communities, and they address issues such as medication adherence, treatment/intervention support, or school-based health protocols.

TABLE 1
COMPONENTS OF ECHO LEARNING NETWORKS
WITH EXAMPLES OF SPECIFIC APPROACHES

ECHO Component	Specific Approaches
Technology to leverage scarce resources	Videoconferencing technology (Zoom™) Real-time captioning Recorded sessions Learning management system (Canvas™)
Didactic training on core professional development topics	High incidence and timely topics Incentivized with professional credits Research and evidence based
Case presentations and ongoing comanagement	Family Educational Rights and Privacy Act/Health Insurance Portability and Accountability Act (HIPAA) HIPAA compliance Standardized case presentation format Strengths-based and problem-solving focused Access to ongoing mentorship by content by expert teams
Outcome measurement	Model fidelity measures Network pre- and posttests Weekly session evaluation Qualitative learner outcomes Individual progress toward goals Standardization of recommendation

Each case is deidentified; during the session, all participants are invited to brainstorm and identify practice- and evidence-based solutions that are then documented and distributed to the participants and housed in the central materials repository for future access. This model and the mix of didactic and case learning allows for real-time applications of current and promising practices, decreasing the time to implementation and the confidence in implementing these practices.

ECHO was developed by Sanjeev Arora, a gastroenterologist in New Mexico who faced growing demands for care as HCV cases increased across the country. He envisioned ECHO learning networks to demonopolize medical knowledge (Arora, 2019). Since then, ECHO has expanded worldwide, with programs in 158 countries, reaching almost 123,000 learners as of June 2020 (Project ECHO, n.d.). Although the first ECHO network focused on HCV, the model has been expanded to address a va-

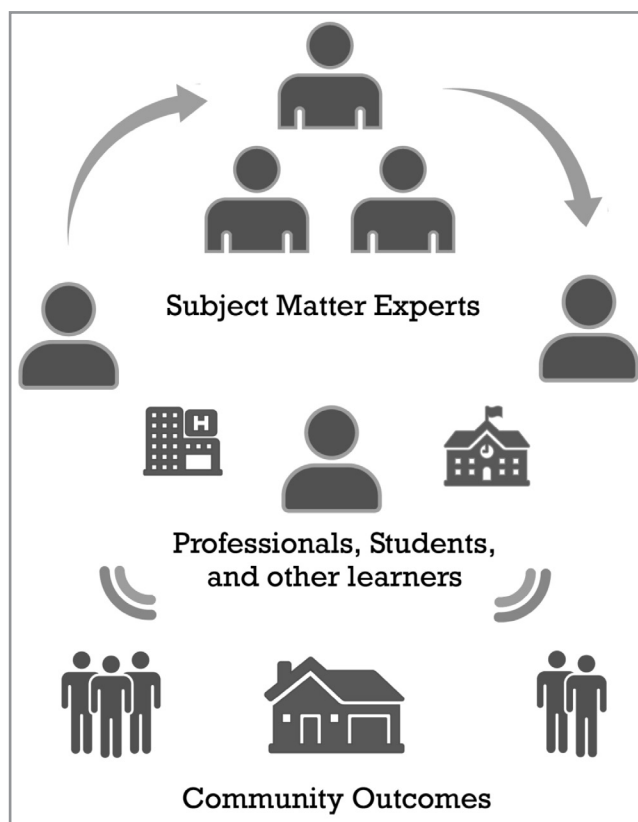


Figure 1. Hub and spokes of an ECHO (Extension for Community Healthcare Outcomes) network. Note. Subject matter experts meet virtually with a community of learners representing interdisciplinary teams of nurse practitioners, social workers, case managers, primary care providers, mental health providers, and other participants to share knowledge and improve implementation of best practices.

riety of conditions, with the most common being mental health (autism spectrum disorder, opioid use disorder, and other substance use disorders), as well as chronic pain management, cancer, palliative care, HIV/AIDS, and diabetes (Arora, Kalishman, et al., 2011; Fischer et al., 2019). Furthermore, in the spring of 2020, several ECHO networks developed to assist health professionals responding to the COVID-19 pandemic.

THEORETICAL FOUNDATIONS OF ECHO

ECHO is rooted in social learning, situated learning, and community of practice theories (Socolovsky et al., 2013; Zhou et al., 2016). Social learning theory proposes that for effective learning to occur, individuals must believe that the benefits of undertaking a new behavior outweigh the costs and have confidence in their ability to perform the new behavior. The new behavior must also be reinforced by other significant individuals (Bandura, 1977; Rotter, 1954). Situated learning theory asserts that learners should be provided with opportunities to develop, extend, and even

simplify their skills and knowledge. Communities of practice, also referred to as professional communities, learning communities, and professional learning networks, are social structures where members continuously update knowledge with an emphasis on member-to-member interaction that provide opportunities for professional development and networking across geographical or organizational boundaries (Brooks, 2010; Wenger et al., 2002).

ECHO is designed to create a learning community by balancing sharing of expertise with ongoing virtual interactions with spoke participants. Case presentations are based in current problems of practice ranging from individual patient to clinic and hospital issues. Over time, ECHO learning networks create a community of practice in which all teach and learn, and new insights emerge to address system barriers for implementation of best practices. Regular ECHO sessions provide a platform for professionals to collaboratively engage in case-based, applied learning wherein clinicians apply best practices to the care of individual patients and discuss ways to remove barriers to system improvement.

EVALUATION OF ECHO

As noted earlier, evaluation is a core component of ECHO. Given the goal to influence patient care, it is important to evaluate whether ECHO ultimately changes patient care through a variety of mechanisms, from including patients in health care decision making to changes in care standards and clinic policies and procedures. Provider outcomes have been examined the most; however, the influence of ECHO on patient outcomes is a growing priority. Additionally, barriers and facilitators to participation in ECHO have been examined.

Provider Outcomes

Several systematic reviews of ECHO have shown positive provider outcomes, such as self-reported satisfaction, knowledge, confidence and self-efficacy, and provider behavior (Fischer et al., 2019; McBain et al., 2019; Zhou et al., 2016). For example, in an ECHO model focused on pain management, participants reported increased knowledge, confidence, and improved communication between specialty and primary care providers (Ball et al., 2018). Additionally, for an ECHO model focused on mental health, knowledge and self-efficacy improved, satisfaction was high, attrition was low, and participants reported feeling less isolated (Sockalingam et al., 2018).

The development of communities of learners who gather to focus on the challenges of clinical practice is another provider outcome that has been examined. Carlin et al. (2018) conducted focus groups with family physicians participating in an ECHO on pain management and found that

ECHO participation generated a sense of community. Similarly, Dubin et al. (2015) identified several themes based on focus groups of primary care providers (PCPs) involved in an ECHO, including developing a sense of community of practice and identifying learning needs.

Finally, the effect of ECHO learning networks on clinical practice has been examined. For example, Katzman et al. (2018) found that PCPs who participated in an ECHO on the management of chronic pain, relative to a comparison group that did not participate, had a greater percentage decline in opioid prescriptions per patient, fewer morphine milligram equivalents prescribed per patient per year, fewer days of coprescribed opioid and benzodiazepine per opioid user per year, and a decrease in the overall number of opioid users. Komaromy et al. (2016) also found an increase in the number of physicians who had obtained waivers to prescribe buprenorphine after participating in the chronic pain ECHO.

Patient Outcomes

In their systematic reviews, Fischer et al. (2019), McBain et al. (2019), and Zhou et al. (2016) found that a much smaller set of studies focused on patient-related outcomes, such as blood glucose levels for diabetics. As noted above, several studies on outcomes for HCV, including those by Arora, Thornton, et al. (2011), found that care by PCPs participating in an ECHO network were equivalent to the care provided by specialists and that patient outcomes were equivalent. Farris et al. (2017) examined the outcomes of an ECHO learning network focused on transitions to postacute care for older adults. They found decreases in lengths of hospital stays, hospital readmission rates, and health care costs for patients of providers participating in ECHO.

Barriers and Facilitators

Participants in ECHO have identified a variety of barriers and facilitators to their participation. Salvador et al. (2019) found that although PCP participants valued the didactic content and the interaction with other PCPs, they experienced system-level constraints, such as competing demands of patient care and lack of support from clinic leadership. Consequently, participation was variable and overall low in their ECHO network. Similarly, in another study, participants valued the expertise of the team, the collegial environmental, and the value of a community of providers (Shea et al., 2019). However, participants also reported that the value of the ECHO to patient care was not clear, and the timing and length of the sessions were deterrents to participation. Finally, Shimasaki et al. (2019) reported that a relevant and practical curriculum, supportive relationships among participants and ECHO faculty,

active participation through technology, and a strong curriculum design facilitated participation.

NURSING ECHO LEARNING NETWORK EXAMPLES

ECHO can be used for nurses and nurse educators to develop educational and practice competencies and can benefit nurses worldwide, no matter where they live and work. The University of Wyoming is an ECHO hub and offers several nursing and health-focused ECHO learning networks (Wyoming Institute for Disabilities, n.d.).

One of the first nursing-focused ECHO networks began in 2017 as a result of a national leadership project to identify and deliver best practices in school nursing (Wyoming Institute for Disabilities, n.d.). The University of Wyoming ECHO in the student health learning network focuses on providing ongoing support for school nurses and other professionals working in schools. Sessions are held biweekly, and topics range from seizures, adverse childhood experiences, suicide, healthy eating, obesity, and eating disorders.

From 2017 to 2020, 1,084 attendees (440 distinct attendees) participated in 39 student health sessions. Most participants identified as RNs, with others identifying as coordinators, program managers, educators, case managers, specialists, paraprofessionals, advocates, or other professions. Participants averaged an increase of 0.7 on a 5-point Likert scale (1 = *not at all knowledgeable* and 5 = *extremely knowledgeable*) in knowledge as measured by pre- and postsession evaluations. Annually, at least 90% ($n = 732$) of participants reported satisfaction with the usefulness and relevance of the didactic presentations, and more than 80% ($n = 651$) of participants indicated satisfaction with the usefulness and relevance of case presentations. Additionally, most participants reported that they (82.5%, $n = 671$) are implementing practicing that they had learned.

More recently, the School of Nursing, with funding from the McMurry Foundation, started a new ECHO focused on integrative care with the aim to increase the knowledge and implementation of integrative care. The University of Wyoming ECHO in Integrative Care: Primary Care and Mental Health is one of only a handful working to improve outcomes in primary care and behavioral and mental health (Project ECHO, n.d.). Sessions are held biweekly, and topics range from models of integrative care, use of antipsychotics in primary care, suicide prevention and treatment, and telehealth.

The Integrative Care learning network was delivered between February and May 2020, with eight sessions, 266 participants ($N = 74$ distinct participants), and an average of 33.3 attendees per session. Most participants identified as nurse practitioners and RNs, with other participants identifying as case managers, social workers, and other primary care providers. Participants increased their

knowledge of integrative care by an average of 0.7 points on a 5-point Likert scale (1 = *not at all knowledgeable* and 5 = *extremely knowledgeable*). Participants reported satisfaction with the relevance and usefulness of the session presentations and case presentations. Additionally, 95% ($n = 202$) of participants indicated that the skills and knowledge they learned will improve professional practice with 69% ($n = 146$) of participants planning to use practices a moderate or great deal. Finally, over 92% ($n = 196$) of attendees reported an increase in inclusion in a professional network, a key success measure.

The outcomes continue to support the positive experiences of spoke participants. Moreover, the outcomes also indicate that learning is immediately relevant and presented in a way that participants feel that they can be successful in their use of new learning.

ECHO IMPLEMENTATION

Nurses interested in establishing an ECHO learning network should keep several considerations in mind. First, it is most important to connect with an existing ECHO hub site (visit <https://echo.unm.edu/locations> for hub sites across the world). Establishing a network independently can be costly and the ECHO hub should have the infrastructure to support the network including staff with the following expertise: (a) overall operation of the ECHO hub site and the associated ECHO learning networks; (b) recruitment of participants, marketing, outreach and the process for obtaining continuing education credits; (c) facilitation of the real-time ECHO networks and support for the hub teams of experts; and (d) evaluation processes, including creating and analyzing the outcomes of the ECHO through pre- and posttests, weekly session evaluations, and other outcome metrics.

Second, it is critical to ensure that the ECHO hub has the necessary technology. For participants, the technology requirements are minimal; all that is needed to access the sessions is a smartphone, tablet, or computer with WiFi access. However, ECHO uses multipoint technology. To maintain fidelity to the model, it is critical that the hub site have the technology available to host the sessions. This includes email, website and recruiting platforms, computers, cameras, video-editing software, a learning management system, community accessible information repository, and analytic software.

Third, for nurses developing an ECHO network in collaboration with an ECHO hub, a facilitator is needed to work with hub staff to assess learning needs, outline didactic topics for the ECHO sessions, facilitate the ECHO sessions, identify clinical experts to participate in the case discussions, and work with the evaluators on evaluation. An advisory group for the ECHO network with a variety

of key stakeholders may also be helpful in identifying topics and experts for the ECHO sessions.

Finally, at the University of Wyoming, most of the ECHO sessions run from September through May, last 1 to 2 hours, and occur one to four times per month. Sessions are offered at convenient times (e.g., at noon or at the end of the workday) depending on the focus of the network and the target audience. Sessions need to start on time and end on time, respecting the schedules of all participants while still prioritizing networking and community building over information dissemination. Finally, sessions are designed to meet the needs of spoke participants and flexibility is critical. Facilitators should focus on making the content relevant and immediately actionable while considering the contextual factors impacting implementation at spoke sites.

CONCLUSION

The Student Health and Integrative Care learning networks highlighted above are examples of ECHO learning networks focused on nursing practice. These results provide support that the ECHO model can and should be applied to professional development for nursing and the interdisciplinary teams in which they are involved. The possibilities for use of ECHO learning networks in nursing are unlimited and could benefit nurses across the globe, especially those in rural and underserved areas who have greater challenges accessing professional development opportunities. Learning networks can focus on specific diseases (e.g., diabetes or Alzheimer's disease). Alternatively, learning networks can focus on different approaches to care (e.g., integrative care or palliative care). In nursing, learning networks focused on key nursing responsibilities (e.g., quality and patient safety) are possible. ECHO learning networks can also be useful in situations such as the coronavirus pandemic to get information and problem solving out to many health care professionals quickly.

REFERENCES

- Agarwal, S. D., & Landon, B. E. (2019). Patterns in outpatient benzodiazepine prescribing in the United States. *JAMA Network Open*, 2(1), e187399. <https://doi.org/10.1001/jamanetworkopen.2018.7399> PMID:30681713
- Akincigil, A., & Matthews, E. B. (2017). National rates and patterns of depression screening in primary care: Results from 2012 and 2013. *Psychiatric Services*, 68(7), 660–666. <https://doi.org/10.1176/appi.ps.201600096> PMID:28196461
- Arora, S. (2019). Project ECHO: Democratising knowledge for the elimination of viral hepatitis. *Lancet*, 4(2), 91–93. [https://doi.org/10.1016/S2468-1253\(18\)30390-X](https://doi.org/10.1016/S2468-1253(18)30390-X) PMID:30647014
- Arora, S., Kalishman, S., Dion, D., Som, D., Thornton, K., Bankhurst, A., Boyle, J., Harkins, M., Moseley, K., Murata, G., Komaramy, M., Katzman, J., Collieran, K., Deming, P., & Yutzy, S. (2011). Partnering urban academic medical centers and rural primary care clinicians to provide complex chronic disease care. *Health Affairs*, 30(6), 1176–1184. <https://doi.org/10.1377/hlthaff.2011.0278> PMID:21596757

- Arora, S., Kalishman, S. G., Thornton, K. A., Komaromy, M. S., Katzman, J. G., Struminger, B. B., Rayburn, W. F., & Bradford, A. M. (2017). Project ECHO: A telementoring network model for continuing professional development. *The Journal of Continuing Education in the Health Professions*, 37(4), 239–244. <https://doi.org/10.1097/CEH.000000000000172> PMID:29189491
- Arora, S., Thornton, K., Jenkusky, S. M., Parish, B., & Scaletti, J. V. (2007). Project ECHO: Linking university specialists with rural and prison-based clinicians to improve care for people with chronic hepatitis C in New Mexico. *Public Health Reports*, 122(2), 74–77. <https://doi.org/10.1177/00333549071220S214> PMID:17542458
- Arora, S., Thornton, K., Komaromy, M., Kalishman, S., Katzman, J., & Duhigg, D. (2014). Demonopolizing medical knowledge. *Academic Medicine*, 89(1), 30–32. <https://doi.org/10.1097/ACM.000000000000051> PMID:24280860
- Arora, S., Thornton, K., Murata, G., Deming, P., Kalishman, S., Dion, D., Parish, B., Burke, T., Pak, W., Dunkelberg, J., Kistin, M., Brown, J., Jenkusky, S., Komaromy, M., & Qualls, C. (2011). Outcomes of treatment for hepatitis C virus infection by primary care providers. *The New England Journal of Medicine*, 364(23), 2199–2207. <https://doi.org/10.1056/NEJMoa1009370> PMID:21631316
- Ball, S., Wilson, B., Ober, S., & Mchaourab, A. (2018). SCAN-ECHO for pain management: Implementing a regional telementoring training for primary care providers. *Pain Medicine*, 19(2), 262–268. <https://doi.org/10.1093/pm/pnx122> PMID:28525633
- Bandura, A. (1977). *Social learning theory*. Prentice Hall.
- Brooks, C. F. (2010). Toward “hybridized” faculty development for the twenty-first century: Blending online communities of practice and face-to-face meetings in instructional and professional support programmes. *Innovations in Education and Teaching International*, 47(3), 261–270. <https://doi.org/10.1080/14703297.2010.498177>
- Carlin, L., Zhao, J., Dubin, R., Taenzer, P., Sidrak, H., & Furlan, A. (2018). Project ECHO telementoring intervention for managing chronic pain in primary care: Insights from a qualitative study. *Pain Medicine*, 19(6), 1140–1146. <https://doi.org/10.1093/pm/pnx233> PMID:29036381
- Dubin, R. E., Flannery, J., Taenzer, P., Smith, A., Smith, K., Fabico, R., Zhao, J., Cameron, L., Chmelnitsky, D., Williams, R., Carlin, L., Sidrak, H., Arora, S., & Furlan, A. D. (2015). ECHO Ontario chronic pain & opioid stewardship: Providing access and building capacity for primary care providers in underserved, rural, and remote communities. *Global Telehealth*, 209, 15–22. <https://doi.org/10.3233/978-1-61499-505-0-15> PMID:25980700
- Durkin, M. J., Jafarzadeh, S. R., Hsueh, K., Sallah, Y. H., Munshi, K. D., Henderson, R. R., & Fraser, V. J. (2018). Outpatient antibiotic prescription trends in the United States: A national cohort study. *Infection Control and Hospital Epidemiology*, 39(5), 584–589. <https://doi.org/10.1017/ice.2018.26> PMID:29485018
- Farris, G., Sircar, M., Bortinger, J., Moore, A., Krupp, J. E., Marshall, J., Abrams, A., Lipsitz, L., & Mattison, M. (2017). Extension for community healthcare outcomes—care transitions: Enhancing geriatric care transitions through a multidisciplinary videoconference. *Journal of the American Geriatrics Society*, 65(3), 598–602. <https://doi.org/10.1111/jgs.14690> PMID:28032896
- Fischer, S. H., Rose, A. J., McBain, R. K., Faherty, L. J., Sousa, J., & Martineau, M. (2019). *Evaluation of technology-enabled collaborative learning and capacity building models: Materials for a report to congress*. Rand Corporation. https://www.rand.org/pubs/research_reports/RR2934.html
- Forsyth, L., Bjørndal, A., Rashidian, A., Jamtvedt, G., O'Brien, M. A., Wolf, F., Davis, D., Odgaard-Jensen, J., & Oxman, A. D. (2009). Continuing education meetings and workshops: Effects on professional practice and health care outcomes. *Cochrane Database of Systematic Reviews*, 2. Advance online publication. <https://doi.org/10.1002/14651858.CD003030.pub2> PMID:19370580
- Glasgow, R. E., Lichtenstein, E., & Marcus, A. C. (2003). Why don't we see more translation of health promotion research to practice? Rethinking the efficacy-to-effectiveness transition. *American Journal of Public Health*, 93(8), 1261–1267. <https://doi.org/10.2105/AJPH.93.8.1261> PMID:12893608
- Hill, H. A., Elam-Evans, L. D., Yankey, D., Singleton, J. A., & Kang, Y. (2018). Vaccination coverage among children aged 19–35 months—United States, 2017. *Morbidity and Mortality Weekly Report*, 67(40), 1123–1128. <https://doi.org/10.15585/mmwr.mm6740a4> PMID:30307907
- Hung, M., Williams, W. W., Lu, P., Woods, L. O., Koppaka, R., & Lindley, M. C. (2019). *Vaccination coverage among adults in the United States, national health interview survey, 2017*. Centers for Disease Control and Prevention. <https://www.cdc.gov/vaccines/imz-managers/coverage/adultvaxview/pubs-resources/NHIS-2017.html#:~:text=In%20addition%2C%20vaccination%20coverage%20generally,those%20with%204%2D9%20physician>
- Institute of Medicine. (2001). *Crossing the quality chasm: A new health system for the 21st Century*. National Academies Press. <https://doi.org/10.17226/10027>
- Joint Commission International. (2016). *Clinical practice guidelines: Closing the gap between theory and practice*. Joint Commission Resources, Inc. https://www.elsevier.com/_data/assets/pdf_file/0007/190177/JCI-Whitepaper_cpigs-closing-the-gap.pdf
- Katzman, J. G., Qualls, C. R., Satterfield, W. A., Kistin, M., Hofmann, K., Greenberg, N., Swift, R., Comerchi, G. D., Jr., Fowler, R., & Arora, S. (2018). Army and Navy ECHO pain telementoring improves clinician prescribing for military patients: An observational cohort study. *Journal of General Internal Medicine*, 34, 387–395. <https://doi.org/10.1007/s11606-018-4710-5> PMID:30382471
- Kaufmann, C. N., Spira, A. P., Depp, C. A., & Mojtabai, R. (2016). Continuing versus new prescriptions for sedative-hypnotic medications: United States, 2005–2012. *American Journal of Public Health*, 106(11), 2019–2025. <https://doi.org/10.2105/AJPH.2016.303382> PMID:27631754
- Kazemian, P., Shebl, F. M., McCann, N., Walensky, R. P., & Wexler, D. J. (2019). Evaluation of the cascade of diabetes care in the United States, 2005–2016. *JAMA Internal Medicine*, 179(10), 1376–1385. <https://doi.org/10.1001/jamainternmed.2019.2396> PMID:31403657
- Komaromy, M., Duhigg, D., Metcalf, A., Carlson, C., Kalishman, S., Hayes, L., Burke, T., Thornton, K., & Arora, S. (2016). Project ECHO (Extension for Community Healthcare Outcomes): A new model for educating primary care providers about treatment of substance use disorders. *Substance Abuse*, 37(1), 20–24. <https://doi.org/10.1080/08897077.2015.1129388> PMID:26848803
- Kristensen, N., Nymann, C., & Konradsen, H. (2016). Implementing research results in clinical practice—the experiences of healthcare professionals. *BMC Health Services Research*, 16(48), 48. Advance online publication. <https://doi.org/10.1186/s12913-016-1292-y> PMID:26860594
- Lalic, S., Sluggert, J. K., Ilomäki, J., Wimmer, B. C., Tan, E. C. K., Robson, L., Emery, T., & Bell, J. S. (2016). Polypharmacy and medication regimen complexity as risk factors for hospitalization among residents of long-term care facilities: A prospective cohort study. *Journal of the American Medical Directors Association*, 17(11), 1067.e1–1067.e6. <https://doi.org/10.1016/j.jamda.2016.08.019> PMID:27780570
- McBain, R. K., Sousa, J. L., Rose, A. J., Baxi, S. M., Faherty, L. J., Taplin, C., Chappel, A., & Fischer, S. H. (2019). Impact of Project ECHO models of medical tele-education: A systematic review. *Journal of Gen-*

- eral Internal Medicine*, 34(12), 2842–2857. <https://doi.org/10.1007/s11606-019-05291-1> PMID:31485970
- McNett, M., Tucker, S., & Melnyk, B. M. (2019). Implementation science: A critical strategy necessary to advance and sustain evidence-based practice. *Worldviews on Evidence-Based Nursing*, 16(3), 174–175. <https://doi.org/10.1111/wvn.12368> PMID:31166091
- Milman, T., Joundi, R. A., Alotaibi, N. M., & Saposnik, G. (2018). Clinical inertia in the pharmacological management of hypertension: A systematic review and meta-analysis. *Medicine*, 97(25), e11121. <https://doi.org/10.1097/MD.00000000000011121> PMID:29924011
- Project ECHO. (n.d.). *ECHO institute TeleECHO programs*. <https://echo.unm.edu/data/movement>
- Rotter, J. B. (1954). *Social learning and clinical psychology*. Prentice Hall. <https://doi.org/10.1037/10788-000>
- Salvador, J., Bhatt, S., Fowler, R., Ritz, J., James, R., Jacobsohn, V., Brakey, H. R., & Sussman, A. L. (2019). Engagement with Project ECHO to increase medication-assisted treatment in rural primary care. *Psychiatric Services*, 70(12), 1157–1160. <https://doi.org/10.1176/appi.ps.201900142> PMID:31434561
- Shaver, A. L., Jacobs, D. M., LaMonte, M. J., & Noyes, K. (2019). Antibiotic prescribing for acute respiratory tract infections in the United States outpatient setting. *BMC Family Practice*, 20(1), 91. Advance online publication. <https://doi.org/10.1186/s12875-019-0980-1> PMID:31266449
- Shea, C. M., Gertner, A. K., & Green, S. L. (2019). Barriers and perceived usefulness of an ECHO intervention for office-based buprenorphine treatment for opioid use disorder in North Carolina: A qualitative study. *Substance Abuse*, 42(1), 54–64. Advance online publication. <https://doi.org/10.1080/08897077.2019.1694617> PMID:31809679
- Shimasaki, S., Bishop, E., Guthrie, M., & Thomas, J. F. F. (2019). Strengthening the health workforce through the ECHO stages of participation: Participants' perspectives on key facilitators and barriers. *Journal of Medical Education and Curricular Development*, 6(1), 1–8. <https://doi.org/10.1177/2382120518820922> PMID:30729170
- Sockalingam, S., Arena, A., Serhal, E., Mohri, L., Alloo, J., & Crawford, A. (2018). Building provincial mental health capacity in primary care: An evaluation of a Project ECHO mental health program. *Academic Psychiatry*, 42(4), 451–457. <https://doi.org/10.1007/s40596-017-0735-z> PMID:28593537
- Socolovsky, C., Masi, C., Hamlish, T., Aduana, G., Arora, S., Bakris, G., & Johnson, D. (2013). Evaluating the role of key learning theories in ECHO: A telehealth educational program for primary care providers. *Progress in Community Health Partnerships*, 7(4), 361–368. <https://doi.org/10.1353/cpr.2013.0043> PMID:24375176
- Stein, R. E., Storfer-Isser, A., Kerker, B. D., Garner, A., Szilagyi, M., Hoagwood, K. E., O'Connor, K. G., & McCue Horwitz, S. (2016). Beyond ADHD: How well are we doing? *Academic Pediatrics*, 16(2), 115–121. <https://doi.org/10.1016/j.acap.2015.08.012> PMID:26514649
- Wenger, E. C., McDermott, R. A., & Snyder, W. (2002). *Cultivating communities of practice: A guide to managing knowledge*. Harvard Business School Press.
- Westerlund, A., Sundberg, L., & Nilsson, P. (2019). Implementation of implementation science knowledge: The research-practice gap paradox. *Worldviews on Evidence-Based Nursing*, 16(5), 332–334. <https://doi.org/10.1111/wvn.12403> PMID:31603625
- Wimmer, B. C., Cross, A. J., Jokanovic, N., Wiese, M. D., George, J., Johnell, K., Diug, B., & Bell, J. S. (2017). Clinical outcomes associated with medication regimen complexity in older people: A systematic review. *Journal of the American Geriatrics Society*, 65(4), 747–753. <https://doi.org/10.1111/jgs.14682> PMID:27991653
- Wyoming Institute for Disabilities. (n.d.). *University of Wyoming ECHO project*. <http://www.uwyo.edu/wind/echo/index.html>
- Zhou, C., Crawford, A., Serhal, E., Kurdyak, P., & Sockalingam, S. (2016). The impact of Project ECHO on participant and patient outcomes: A systematic review. *Academic Medicine*, 91(10), 1439–1461. <https://doi.org/10.1097/ACM.0000000000001328> PMID:27489018