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Enhancing Collaborative Learning for Quality Improvement: Evidence from the Improving Clinical Flow Project, a Breakthrough Series Collaborative with Project ECHO

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Background: This project engaged teams from Federally Qualified Health Centers (FQHCs) in a quality improvement (QI) collaborative to improve clinical flow (increase quality and efficiency of operations), using a novel combination of Breakthrough Series Collaborative tools with Project ECHO's telementoring model. This mixed methods study describes the collaborative and evaluates its success in generating improvement and developing QI capacity at participating FQHCs.

Methods: The 18-month collaborative used three in-person/virtual learning session workshops and weekly telementoring sessions with brief lectures and case-based learning. Participants engaged in QI work (for example, PDSAs [Plan-Do-Study-Act]) and tracked data for 10 care system measures to evaluate progress. These data were averaged across consistently reporting sites for standard run chart analysis. Semistructured interviews assessed the effectiveness and value of the approach for participants.

Results: Fifteen sites across the United States participated for one year (Cohort 1); 10 sites continued to 18 months (Cohort 2). Cohort 2 evidenced improvement for 6 measures: *Patient/Family Experience*, *Patient Time Valued*, *Empanelment*, *Cycle Time*, *Colorectal Cancer Screening Rate*, and *Third Next Available Appointment*. Progress varied across sites and measures. Participant interviews indicated value from both in-person and virtual activities, increased QI knowledge, and professional growth, as well as challenges when participants lacked time, engagement, leadership support, and consistent and committed staff.

Conclusion: This novel collaborative structure is promising. Evidence indicates progress in building QI capacity and improving processes and patient experience across participating FQHCs. Future iterations should address barriers to improvement identified here. Additional work is needed to compare the efficacy of this approach to other collaborative modes.

There is an urgent need for new methods of building quality imnprovement (QI) capacity at Federally Qualified Health Centers (FQHCs) in the United States. To meet federal funding requirements, FQHCs must demonstrate QI capacity at the point of care, including data collection and reporting processes.[1] This is often time- and energy-intensive. QI training often occurs in face-to-face settings, can be prohibitively expensive, and often lacks opportunities for ongoing mentorship. For many FQHCs this challenge is magnified by frequent staff turnover and the large size or geographic dispersal of clinic sites, even when organizations have dedicated QI professionals on staff.

This study describes the experience of the Improving Clinical Flow (ICF) Collaborative, a QI capacity-building initiative that used a novel pairing of two models for professional training—the Breakthrough Series Collaborative (BTSC) and Project ECHO—to develop QI capability and increase the quality and efficiency of operations at FQHC sites across the country. Both models emphasize the adaptation of expert knowledge and best practices across multiple contexts (institutional, geographical, topical).

The BTSC is a popular QI collaborative model developed by the Institute for Healthcare Improvement[2,3] that combines in-person and virtual elements to bring together a large number of teams from hospitals or clinics to seek improvement in a focused topic area.[4–6] A solely virtual BTSC had some success but required additional modifications to preserve specific collaborative elements.[7]

Project ECHO uses simple videoconference technology to connect health care providers with each other and with teams of specialists for ongoing telementoring, case-based learning, and collaborative solutions to common, complex conditions and health challenges. It has been adopted by more than 370 organizations in 38 countries.[8] The ECHO model has been applied in a variety of contexts to improve participant knowledge, efficacy, and practice[9] and

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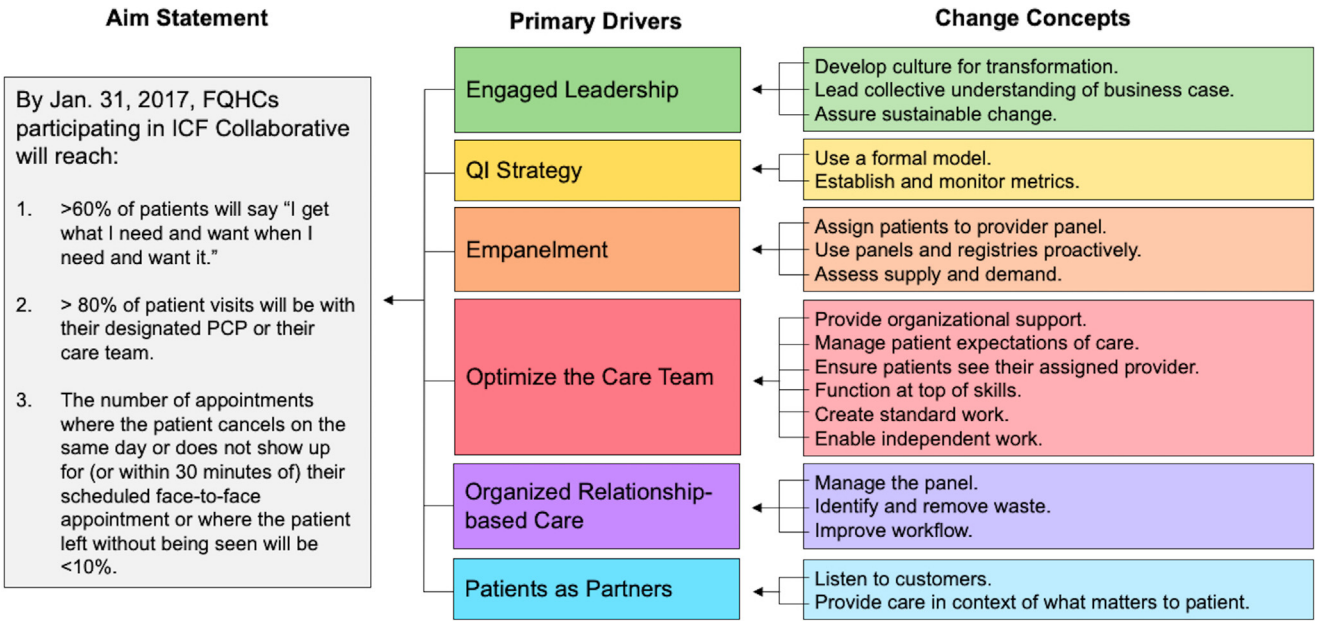

Figure 1: Primary drivers are areas for which change needs to occur to sustain improvements (that is, goals). Each driver has specific change concepts for teams to test (subgoals). The changes contribute to the drivers, which then contribute to the overall aim of improving clinical flow. FQHC, Federally Qualified Health Center; PCP, primary care physician; QI, quality improvement.

has demonstrated effectiveness for collaborative learning as well as improving processes at the individual provider and clinical-outcomes levels.[10]

For the ICF Collaborative, the ECHO model of regular, interactive videoconferencing sessions was combined with the traditional QI content and structure of the BTSC. The study has three aims: (1) assess the impact of the Collaborative on 10 care system measures to improve clinical flow; (2) evaluate the effectiveness of combining the two models, based on participant experience; and (3) examine the impact of the Collaborative on participant self-assessed QI capability.

METHODS

Change Package

Faculty with QI and content expertise developed an evidence-based change package (Figure 1) that provided key content for the Collaborative and defined interventions participants might test to improve clinical flow.[11] Drivers were based on evidence-based changes documented in the Chronic Care Model,[12] as well as on faculty members' prior field work experience with improving clinical flow in primary care practices. Faculty developed a sequence of changes: empanel patients; organize a well-defined care team for each panel; drive continuity of care; and manage the panel of patients, including patients as partners. However, Collaborative participants could opt to test changes in a different order, if appropriate.

Collaborative Process

The ICF Collaborative began as a 12-month initiative that was extended to 18 months. Table 1 lists Collaborative activities for the entire 18 months. During a 3-month prework period FQHCs were recruited via informational calls, and a prospectus was sent to interested parties. Memoranda of understanding were signed by participating sites. Participation was voluntary for FQHCs, some of whom had prior relationships with Project ECHO, and sites were not compensated for participation. Institutional Review Board approval was obtained from the home institution of the ECHO team.

As prework, participating sites conducted a self-assessment, attended videoconference planning calls with faculty, and formed their QI teams (one team per site). Teleconference calls ensured that QI teams (hereafter, "teams") understood care system measure definitions and had strategies for collecting and reporting data. The prework period included the first learning session workshop—a face-to-face, two-day event with core team members from each site, faculty, and ECHO program leads—that provided the foundation for teams' improvement work, developed basic QI skills, and introduced QI concepts specific to the ICF Collaborative, including the driver diagram, measures, and concepts of clinical flow and efficiency. A simultaneous leadership training bolstered executive sponsors' capacity to lead QI work at their organizations. At the end of the first workshop, each team had a concrete project plan and identified their first tests of change using Plan-Do-Study-Act (PDSA) cycles.

Table 1. Time Line of Improving Clinical Flow (ICF) Collaborative Activities*

Activities	Aug 2015	Sep 2015	Oct 2015	Nov 2015	Dec 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	May 2016	Jun 2016	Jul 2016	Aug 2016	Sep 2016	Oct 2016	Nov 2016	Dec 2016	Jan 2017
	Prework			Action Periods/PDSAs									Extension to 18 months					
Planning calls	2	3																
Data calls		1	1															
Learning session workshops			1†			1			1									
TeleECHO sessions				4	3	3	3	4	4	3	4	3	4	4	4	4	3	3
Leadership in-person trainings			1															
Leadership videoconferences				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Participating sites	Cohort 1 (15 sites)	Cohort 2 (10 sites)																

* Numbers within the cells indicate the number of times an activity occurred each month; empty cells indicate no activity. The Collaborative began as a 12-month initiative with 15 sites (Cohort 1) and was extended to 18 months with 10 sites (Cohort 2). Action periods/Plan-Do-Study-Act (PDSA) cycles continued during the extension, indicated by the arrow.

† Face-to-face learning session (otherwise virtual).

Two subsequent 1.5-day learning session workshops were held via videoconference, enabling additional staff from each site to attend. During these sessions, site teams presented their progress with testing changes and attended breakout sessions for various topics on clinical flow and QI methods.

Throughout the 18-month Collaborative, two-hour videoconference teleECHO sessions occurred weekly. During each session, two teams presented a 10-minute "quality improvement case" based on a current QI challenge using a case presentation template (see Appendix A, available in online article) that standardized the information presented and reinforced understanding of the evidence-based change package (Figure 1). Approximately 20 minutes of coaching and group discussion followed each presentation. Faculty provided written recommendations to presenting teams after sessions. Examples of PDSA cycles teams tested include implementing purpose-of-visit reminder scripts at the front desk, reminder calls for patients, reimagining the division of labor among medical assistants to improve cycle time, and encouraging attendance of no-show patients with communication campaigns. The case template evolved over time as teams became more sophisticated in their ability to report.

TeleECHO sessions included a brief lecture (< 30 minutes) by faculty on a key QI skill or a clinical flow intervention (Appendix A) relevant to the driver diagram and proposed sequence of testing changes. A separate, monthly videoconference provided FQHC leadership the opportunity to engage in case-based learning relevant to their roles in supporting system-level improvement. Operational leaders (and occasionally CEOs) joined these sessions over the 18-month period.

Care System Measures

ICF Collaborative teams reported monthly data for 10 care system measures (Table 2) using an online, password-protected tool (extranet), for which they received training. (Teams reported weekly data for *Third Next Available Appointment*.) A report form in the extranet captured each team's data for each measure (displayed over time in run charts), specific changes tested, challenges faced, and lessons learned. Faculty reviewed reports monthly to identify issues with data reporting and provided feedback directly to teams. The reports facilitated a collective understanding between teams and faculty of the changes being tested and whether the data suggested improvement over time. Teams also had access to these reports to make comparisons if desired.

Three of the four balancing measures are from the Uniform Data System, which FQHCs are required to report to the US Health Resources and Services Administration.[13] The Collaborative focused on improving clinical flow, increasing the quality and efficiency of operations *at the site*; therefore, teams measured site-level data (as opposed to care team level data). For evidence of positive changes to appear

Table 2. Improving Clinical Flow (ICF) Collaborative Care System Measures and Definitions[1]

Outcome Measures	**1) Patient/Family Experience**: % returned patient surveys reporting "Strongly agree" to statement "I get what I need/want when I need/want it."
	2) Continuity to Care Team/PCP: % of patient visits to designated care team or primary care physician (PCP) out of total PCP visits per month.
	3) No Shows: % of appointments where patient cancels on same day, does not show up (within at least 30 minutes), or leaves without being seen.
Process Measures	**4) Patient Time Valued:** % of returned patient surveys reporting "Strongly agree" to statement "Most of the time, when I visit my doctor's office, it is well organized and does not waste my time."
	5) Empanelment: % of distinct patients in electronic health record system seen in the last 36 months who have a designated PCP or care team.
	6) Cycle Time: Average cycle time in minutes for office visits in the last month.
Balancing Measures	**7) Colorectal Cancer Screening Rate:** % of patients ages 50 to 74 years who had appropriate screening for colorectal cancer (includes colonoscopy, flexible sigmoidoscopy, or annual fecal occult blood test).
	8) Diabetes Not in Control: % of adult patients (out of all patients ages 18 to 75 years with type 1 or 2 diabetes seen at least twice during reporting year) whose most recent hemoglobin A1c level during the measurement year is > 9.
	9) Persistent Asthma on Controller: % patients (out of all patients ages 5 to 40 years who had at least one visit during reporting year and at least two visits at practice with an active persistent asthma diagnosis) who received a prescription for/were provided inhaled corticosteroid or accepted alternative medication.
	10) Third Next Available Appointment: Number of days to the third next available appointment (including weekends and holidays) per 1,000 emergency department visits by patients age 18 years and older.

Reference

1. Institute for Healthcare Improvement. Science of Improvement: Establishing Measures. Accessed May 18, 2020. http://www.ihi.org/resources/Pages/HowtoImprove/ScienceofImprovementEstablishingMeasures.aspx.

in the data, most teams needed to spread improvements to multiple care teams throughout the site. This study uses these site-level data, aggregated over *consistently reporting* Cohort 2 sites, defined as those sites with fewer than three consecutive missing data points. Faculty established this operational definition prior to data collection.

Collaborative faculty used standard run chart rules to decide whether nonrandom variation existed for each measure, which, if present, indicated an unstable system and could indicate improvement depending on the change in performance.[14,15] Faculty interpreted positive change for six of the care system measures as indicative of improved care systems at participating sites. Run charts were used in lieu of statistical process control or Shewhart charts because teams were engaged in ongoing improvement work and we lacked historical data to establish baseline control limits.[16] Data were transformed to address issues related to nonindependence of observations (for example, serial autocorrelation in *Colorectal Cancer Screening Rate*).

Semistructured Interviews with Participants and Faculty

To ensure diverse perspectives, leaders, teams, and frontline staff were interviewed from all 15 FQHCs that participated in the Collaborative for at least 12 months. Qualitative research professionals from the ECHO teams' home institution conducted 30- to 60-minute videoconference interviews using an interview guide (see Appendix B in online article), with license to probe for clarification, elaboration, and examples. Interviews were transcribed using audio recordings. The professionals analyzed transcripts and identified recurring themes using inductive content analysis, established a coding structure and rules, and coded transcripts using NVivo (QSR International [Americas] Inc., Burlington, Massachusetts) qualitative analysis software.

RESULTS

Participation and Demographics of FQHC Sites

After the prework period, 15 FQHC sites joined the 12-month Collaborative (Cohort 1). The Collaborative was extended to 18 months to allow more time for nascent changes to take hold; the Collaborative structure and process was not altered during the extension period. Five sites did not participate beyond the initial 12 months, citing staff time or availability and lack of leadership support as barriers. The remaining 10 sites (Cohort 2) completed the entire 18-month Collaborative. This study reports quantitative data for Cohort 2 only. Qualitative data from semistructured interviews are included for both Cohorts 1 and 2.

Cohort 2 FQHC sites represented five organizations in different locations throughout the United States, including five US Department of Health and Human Services regions. The sites also ranged in size—one FQHC was the sole site of an organization, while others represented organizations with up to 14 sites. The number of patients at each site with three or more chronic conditions ranged from just over 500 patients to more than 13,000 patients. Care team composition varied to suit the population at each site. The most common payer sources were Medicaid, Medicare, and self-pay.

Composition and Attendance of FQHC QI Teams

QI teams included a QI lead, a provider, and their associated care team, which generally included a nurse (RN, LPN), a medical assistant, and an administrative lead. Team attendance was near 100% for the learning sessions and approximately 94% for teleECHO sessions for the 10 sites. Leadership call attendance varied, ranging from approximately 38% to 100%. Most teams had prior experience with QI, but the depth and extent of this experience varied widely. Some easily employed formal QI methods, having gained experience from past participation in BTSCs, while some with less experience focused on quality monitoring.

Care System Measures: Evidence of Quality Improvement at FQHC Sites

Figure 2 contains aggregate run charts. Six of the 10 care system measures provide evidence of improved care systems at Cohort 2 sites. The number of FQHCs consistently reporting data varies by measure, as does the number of individual sites with indications of improvement.

One outcome measure (*Patient/Family Experience*) displays a significant, positive shift in the corresponding run chart: In August 2016, the average value of this measure jumped above the median (from 39.5% to 47.1%) and remained above it for six data points. All three process measures show improvement based on run chart rules. Two balancing measures show improvement (*Third Next Available Appointment* and *Colorectal Cancer Screening Rate)*, while the other two remain relatively constant.

Improvement progress was not uniform across Cohort 2 sites, as seen in the number of consistent reporters with improvement signals in Figure 2. We also examined variation across sites as shown in Table 3. Six sites consistently reported all 10 care system measures; these sites saw improvement in at least 4 or 5 measures and met their goals on these metrics at least 50% of the time. Two sites were consistent reporters for only two measures, *Patient/Family Experience* and *Patient Time Valued*; one of these sites featured nonrandom improvement signals for both measures, though not to goal level. One site consistently reported data for four measures, but only saw improvement in *Third Next Available Appointment*, though not to goal level. The last site consistently reported data for six measures, but only improved *Empanelment*, though not to goal level. Appendix C (available in online article) contains additional information on variation in FQHC site improvement progress.

Table 3. Variation Across Cohort 2 FQHC Sites*

Site	CR (%)	IS (%)	Goal (%)
1	10 (100)	5 (50.0)	4 (80.0)
2	10 (100)	5 (50.0)	4 (80.0)
3	10 (100)	5 (50.0)	3 (60.0)
4	10 (100)	5 (50.0)	3 (60.0)
5	10 (100)	4 (40.0)	4 (100)
6	10 (100)	4 (40.0)	2 (50.0)
7	6 (60.0)	1 (16.7)	0 (0)
8	4 (40.0)	1 (25.0)	0 (0)
9	2 (20.0)	2 (100)	0 (0)
10	2 (20.0)	0 (0)	0 (0)

FQHC, Federally Qualified Health Center.

* The consistent reporter (CR) column contains a count of measures for which a site consistently reported data and the percentage of the 10 care system measures. The nonrandom improvement signal (IS) column contains a count of measures for which a site saw improvement and the percentage of the CR column value. The goal column contains a count of the number of measures for which the site reached its target and percentage of the IS column value.

Semistructured Interview Results

Thirty-five individuals from 13 FQHC sites were interviewed. Themes emerging from the interviews generally fell into two categories: ICF Collaborative structure and value of participation, which correspond respectively to the study aims of evaluating the BTSC and ECHO model structure and assessing the impact of the ICF Collaborative on QI capability of participants. Results from the interviews are summarized below. Associated quotes from the interviews can be found in Appendix B.

ICF Collaborative Structure. Participants enjoyed the format of the weekly teleECHO sessions that featured two team QI case presentations coupled with brief faculty lectures. Most interviewees answered affirmatively that the weekly sessions were helpful to meet team goals.

Interviewees also cited challenges with the teleECHO sessions such as time commitment and workload. When asked what they would change about the Collaborative, many participants mentioned the frequency and length of teleECHO sessions. A hesitancy to speak during the teleECHO sessions was also noted by interviewees, which may have been a feature of the virtual venue or a lack of engagement. Faculty implemented a round robin technique to increase engagement, but this received mixed reviews in interviews. Participant suggestions to increase engagement included pairing up clinics, sites taking turns as session facilitators, and shortening the length of the two-hour sessions.

Another factor that surfaced was a possible disconnect between the QI content of the Collaborative and participant QI experience and knowledge. TeleECHO session brief lecture topics may not have been properly contextualized to the QI skill level of participants and prior work already done in some clinics. Repetitive presentations were noted by many participants, particularly after the six-month extension. Participants suggested focusing teleECHO sessions on a single topic each week, modifying and shortening the presentations and template, and encouraging faculty to spend more one-on-one time with teams that needed extra coaching in lieu of involving all participants.

The majority of participants found learning session workshops beneficial. Participants seemed to feel less

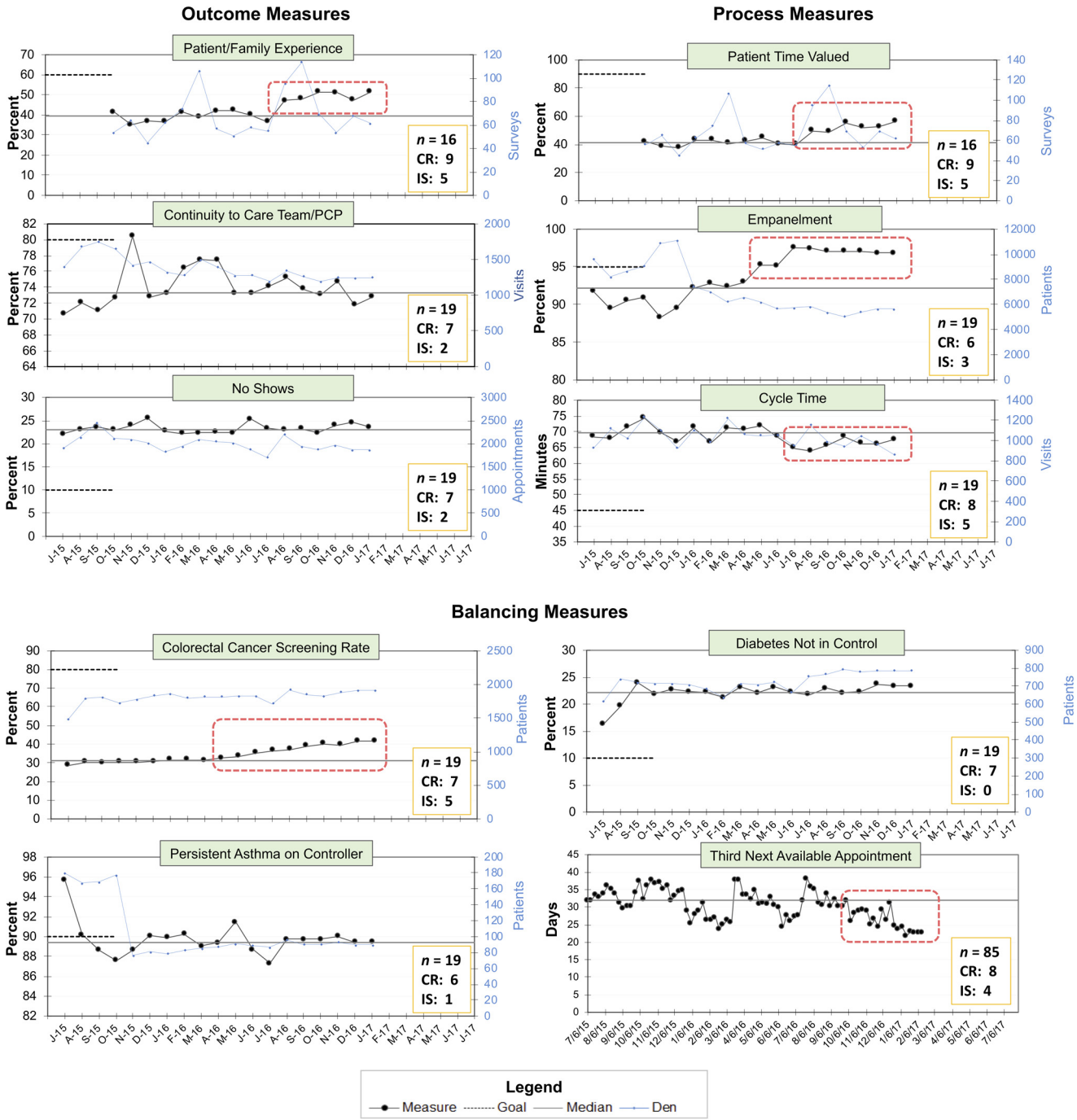

Figure 2: Run charts include aggregate, average monthly values for *consistently reporting* Federally Qualified Health Centers (FQHCs) in Cohort 2. Red boxes indicate nonrandom variation. Goal lines are truncated to avoid crowding charts. Boxes in the corner of each chart contain the number of data points in the run chart (*n*), the number of consistently reporting (CR) sites included in the data, and the number of sites that had nonrandom improvement signal (IS) in their individual run charts (not pictured). PCP, primary care physician.

strongly about the two virtual learning sessions—they were beneficial overall, but teams noted logistical constraints with breakout activities and spending full days on videoconference as barriers to engagement. The breakout session format, however, was constructive work time for some teams.

The Zoom videoconference platform played a large role in this Collaborative, for both teleECHO sessions and the two virtual learning session workshops. Most participants felt positively about using Zoom and used the video feature most of the time. Numerous participants discussed how videoconferencing strengthened relationships. Participants expressed frustrations with videoconferencing as well, when they could not (or would not) use the video feature or used the video feature but created distractions for others. Partic-

ipants not using the video feature mentioned a desire for privacy and connection issues while traveling (for example, when joining sessions from the car) or when bandwidth became a barrier at the clinic.

ICF Collaborative Value of Participation. When asked about the value of participation in the Collaborative, most interviewees responded positively that the Collaborative contributed to both their knowledge and their professional growth. Participants expressed value in both expert QI knowledge from faculty and implementation knowledge from other participants. They widely discussed the usefulness of the PDSA technique. Some used PDSAs to generate buy-in for change among staff, and some expressed that using PDSAs has become the norm for their clinics. Hearing from other clinics' experiences and learning from others' successes was particularly valuable for many participants.

Participants also shared specific examples of success from the Collaborative, in areas such as improved communication, redefined staff roles, appropriate empanelment, implementing creative ways of reducing provider burden, and decreasing no-show rates. Many of the aforementioned successes contributed to improved cycle time for several clinics. Some clinics reported benefiting simply from acquiring more tools for improvement and the knowledge/skill to use those tools. Some clinics also reported clinical improvements, such as increasing their diabetes screening rate.

Interviews also identified barriers to building QI capacity in participating sites. Lack of strong leadership support and accountability was identified by participants at all levels as a barrier, as was staff turnover and the resulting need to start over with new teams. Insufficient buy-in for change initiatives across clinic staff more generally, due to lack of clear communication about the Collaborative and its aims, was also identified as a barrier.

DISCUSSION

The 10 sites that participated throughout the entire 18 months (Cohort 2) demonstrated improvement in 6 of 10 care system measures, including all 3 process measures and 1 outcome measure, without any decline in balancing measures. Results were variable across sites, however, with consistently reporting sites more likely to demonstrate improvement. Semistructured interviews revealed that participants found the combination of BTSC and ECHO models valuable and provided evidence of QI capability among participating team members. Participants also noted challenges: the time-intensive nature of Collaborative activities, engaging staff in improvement work with varying levels of both QI knowledge and experience, and the need for support from leadership. These results are similar to past evaluations of BTSC and teleECHO programs.[6,9]

We attribute the successes of the ICF Collaborative to key elements from both the BTSC (the evidence-based change package, PDSA cycles, and the extranet for monthly data collection) and ECHO models (case-based learning, ongoing/frequent telementoring, and peer-to-peer problem solving). Both learning session workshops and teleECHO sessions required teams to tie their tests of change to the evidence-based change package, which grounded teams' work in a larger improvement effort. In semistructured interviews teams emphasized the utility of PDSA cycles for both testing changes and fostering staff buy-in for change. Data collection also aided teams in decision making and increased efficacy and engagement among participants. Teams developed their own data collection systems to test the smaller-scale changes that PDSAs require and used run charts for care system measures to gauge site-level improvement progress. Participants in previous BTSCs cited the change package, PDSA cycles, and extranet among the most helpful components as well.[6,17]

In addition to the traditional BTSC tools used by the ICF Collaborative, our results suggest that the ECHO model's case-based learning may be a useful tool for future collaboratives. Case-based learning for QI work, with health systems as the focus instead of patients, is rare outside of educational settings.[3,18] Case presentations during teleECHO sessions tie QI knowledge to participant experiences and encourage contextual problem solving and repetitive exposure to information, key components of adult learning processes.[19,20]

In requiring teams to be explicit about what they needed help with and what feedback they wanted, the case presentation template for teleECHO sessions also facilitated group discussion. Participants reported the value of learning from the successes and mistakes of other teams while testing changes. Peer-to-peer sharing of implementation knowledge is a core aim of the ECHO model and a noted driver of learning in non-BTSC QI collaboratives as well.[21,22]

Although structured comparisons between collaboratives are difficult to make due to their complexity and diversity of interventions,[23] studies indicate the importance of interorganizational learning activities and collaboration among faculty and interactions with peers as key ingredients for success in past virtual collaboratives and traditional BTSCs.[5,17,24,25]

The regularity and frequency of teleECHO sessions gave faculty more time for mentorship. For example, coaching teams to incorporate a patient-centered perspective in their improvement work was a theme throughout the Collaborative, particularly regarding *No Shows*. Over time, faculty were able to encourage most teams to adopt the Patients as Partners concept alongside policy changes to reduce no-show rates. In addition, the improvements observed in *Patient Time Valued* and *Patient/Family Experience*, speak to the success of faculty efforts and the importance of frequent interactions via teleECHO sessions.

Our results also suggest areas for improvement, such as decreasing the frequency or length of teleECHO sessions. To bolster teams' improvement efforts and potentially de-

crease site attrition, a formal needs assessment and opportunities for teams to receive more tailored coaching outside of the group sessions might be effective. Leadership engagement needs to be a higher priority early in the Collaborative, as high-level support is key to implementing site-specific successful improvements and garnering more support for change.[26,27] It would have also been beneficial to engage faculty in FQHC site recruitment and in identifying baseline capacity needs to identify organizations not well suited for the Collaborative. Heterogeneity of sites is typical in QI work and may drive between-unit variation found in this study and others.[28,29]

Improvements to the measurement strategy may also have facilitated a more successful collaborative. Some measures, such as *Cycle Time* and *Patient Time Valued*, were more likely to see improvement than others, such as *Empanelment* and *Continuity to Care Team/PCP.* We attribute this to the relative ease of implementing changes in the former two areas, which are under direct control of care teams, while broader changes across the organization are needed to improve the latter two. Also, based on faculty experience, the *No Shows* measure typically takes more time to demonstrate improvement because other critical barriers to patients keeping appointments need to be addressed first. Some teams focused on the *No Shows* measure early in the Collaborative and adopted practices unsupportive to patient-centered care, to the detriment of improvement in other areas. Encouraging teams to focus on this measure later in their improvement work may facilitate more success. Finally, clinical outcome measures were not included to keep teams focused on processes and avoid overburdening clinical staff with data collection and measurement. However, teams showed interest in clinical outcomes used as balancing measures (for example, *Colorectal Cancer Screening Rate*), particularly during the extension period as process changes accelerated, suggesting that including relevant clinical outcome measures may boost participant engagement.

Limitations

The study has several limitations. We limited our results to consistently reporting sites, thus potentially selecting for those with good performance. Because we measured at the site level (not the care team level) we were unable to discern whether improvements were sitewide or driven by a subset of high-performing teams. However, interview results suggest that some participants were able to test changes beyond their care team.

Without comparison groups, we are unable to make claims about the impact of the ECHO model relative to the traditional or virtual BTSC models on the improvement progress of participating sites, or rule out the possibility of improvement in the absence of our intervention. We are also unable to isolate the relative impact of case presentations versus brief lectures in developing QI knowledge. Our interviews suggest that participants found both cases and lectures helpful in developing QI skill sets and conducting tests of change. However, heterogeneity of operating contexts for participating sites and multifaceted interventions are noted issues for studies of BTSCs[3,4,6] and ECHO programs.[9,10]

Attrition of sites reflects on project feasibility. Five sites did not continue participation after the first year. We are not able to critically examine attrition given the content and structure of our data. We cannot distinguish the responses from Cohort 1 and Cohort 2 sites, and no interview questions addressed the issue of attrition. An informal review of aggregate run charts at the 12-month mark for Cohort 1 reveals only small changes across measures and across sites from the results reported above. The run charts also indicate that progress made by Cohort 2 sites occurred mostly during the last six to eight months of the Collaborative. That sites were not seeing signs of improvement, combined with the heavy time commitment, likely contributed to attrition and suggests a bias in our results toward more capable sites. We are aware that staff time required for the work and turnover in key leadership roles at sites made continued participation in the Collaborative difficult. This is consistent with constraints that many participants face during BTSCs,[6] and while we argue that what is seen here is a particularly acute combination of these constraints, the attrition rate for the ICF Collaborative, while slightly higher, is not excessive based on QI researcher estimates.[27]

CONCLUSION

FQHCs operate in low-resource settings, making efficient clinical flow and a patient-centered approach invaluable. The Improving Clinical Flow Collaborative combined the BTSC and ECHO models to provide a novel intervention for building QI capability at the front lines of care in FQHCs. Results demonstrate that the combination of in-person and virtual delivery was effective, and participants noted that it removed barriers to participation. However, acute resource constraints (particularly time and staff turnover) were noted barriers that are likely to continue to hamper QI work in FQHCs. More work is needed to understand the necessary components for producing improvement in this context while minimizing the adverse impacts of participation on QI teams' administrative and clinical responsibilities.

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SUPPLEMENTARY MATERIALS

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jcjq.2020.04.013.

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