Title: A PBRN Research Roadmap for Evaluating COVID-19 in Community Health Centers

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Abstract:

Background. Primary care Practice-based Research Networks (PBRNs) are critical laboratories for generating evidence from real-world settings, including studying natural experiments. Primary care's response to the novel coronavirus-19 (COVID-19) pandemic is arguably the most impactful natural experiment in our lifetime.

The OCHIN PBRN and the BRIDGE-C2 Center: Evaluating the Impact of COVID-19. We briefly describe the OCHIN PBRN of community health centers (CHCs), its partnership with implementation scientists, and how we are leveraging this infrastructure and expertise to create a rapid research response evaluating how CHCs across the country responded to the COVID-19 pandemic.

COVID-19 Research Roadmap. Our research agenda focuses on asking: How has care delivery in CHCs changed due to COVID-19? What impact has COVID-19 had on the delivery of preventive services in CHCs? What PBRN services (e.g., data surveillance, training, evidence synthesis) are most impactful to real-world practices? What decision-making strategies were used in the PBRN and its practices to make real-time changes in response to the pandemic? What critical factors in successfully and sustainably transforming primary care are illuminated by pandemic-driven changes?

Discussion & Conclusions. PBRNs enable real-world evaluation of practice change and natural experiments, and thus are ideal laboratories for implementation science research. We present a real-time example of how a PBRN 'Implementation Laboratory' activated a response to study an historic natural experiment, to help other PBRNs charting a course through this pandemic.

Background

Primary care Practice-based Research Networks (PBRNs) are critical laboratories for studying the implementation of evidence-based practices in real-world settings. Close partnerships have developed between some PBRNs and academic institutions to facilitate ongoing bidirectional learning, and leverage emerging opportunities to conduct research that is both grounded in and relevant to primary care.

Their infrastructure makes PBRNs well positioned to conduct transformative dissemination and implementation (D&I) research. D&I research is, in many ways, an extension of practice-based research. For more than 40 years, PBRNs have produced "practice-based evidence"[1] and built the infrastructure needed to gather data on best practices for implementing change. PBRN research evolved from descriptive studies to intervention research, and then to innovative ideas about tailoring interventions, the need for practice facilitation, and using mixed methods to understand what worked, what did not, and why. This relates directly to D&I research, which is the study of approaches to promote the adoption and integration of evidence-based practices, interventions and policies into routine health care settings.[2,3]

Recently, the National Cancer Institute funded six Implementation Science Centers in Cancer Control (ISC3)[4] to develop and evaluate innovations supporting the adoption of evidence-based cancer control interventions. One of the funded Centers, the Building Research in Implementation and Dissemination to close Gaps and achieve Equity in Cancer Control (BRIDGE-C2) Center, was launched in September 2019 with the overarching goal of advancing implementation science to improve rates of cancer screening and prevention and reduce disparities in such care experiences by underserved populations. The BRIDGE-C2 Center builds on a twelve-year partnership between the Oregon Health & Science University (OHSU) Department of Family Medicine and the OCHIN [not an acronym] PBRN (formerly known as the Safety Net West PBRN).[5]

This partnership between a newly emerging implementation science center and a PBRN with a history of conducting D&I research has the potential to accelerate the science of how to quickly implement practice changes in response to an urgent need, such as the novel coronavirus-19 (COVID-19) pandemic. In this commentary, we use the lens of the COVID-19 pandemic to describe the research response that occurred in parallel with and in response to a rapid clinical response that took place in the OCHIN PBRN's member clinics. We outline the roadmap we used to harness our PBRN laboratory and the BRIDGE-C2 Center's implementation science expertise to learn how community-based practices transformed care in response to the pandemic.

The OCHIN PBRN and the BRIDGE-C2 Center: evaluating the impact of COVID-19

The OCHIN PBRN, registered with the Agency for Healthcare Research and Quality in 2012, aims to "improve the health of underserved populations, enhance their quality of care, and inform health policy through research."[6] It began supporting pragmatic implementation science studies at its inception and since has grown a portfolio of 18 D&I research studies over eight years.[7-15]

OCHIN hosts a central Epic© electronic health record for its >600 community health center (CHC) members, as well as numerous other population health data and analytics tools (e.g., Epic's Healthy Planet). (The term CHC encompasses many types of community-based health care, including Federally Qualified Health Centers and look-alikes, rural health centers, school-based health centers, and behavioral and dental clinics co-located with primary care.) OCHIN provides central support to help its member practices implement practice changes, including coaches, trainers, an online training library, and "site specialists" who are employees of the practices and trained by OCHIN as technical assistance experts. Characteristics of the OCHIN PBRN are highlighted in Table 1. [Insert Table 1]

The BRIDGE-C2 Center built on a long-standing partnership between OHSU Family Medicine and the OCHIN PBRN.[5,16,17] The PBRN is the Implementation Laboratory for the BRIDGE-C2 Center. We leveraged this existing infrastructure and expertise to create a rapid research response to evaluate how CHCs across the country responded and adapted to the COVID-19 pandemic. This response focused on the impact of COVID-19-driven changes on preventive care, with the understanding that from a D&I perspective, learnings based on preventive care may have relevance for many health and healthcare outcomes. Two key elements of our PBRN were critical for this rapid launch of our COVID-19 research: 1) data surveillance capabilities, and 2) centralized support for practice change.[1,18-22]

The need for this rapid response was clear. The National Association of Community Health Centers (NACHC) reported on May 1, 2020 that CHCs faced "extreme challenges to operations, staffing, and budgets" due to COVID-19. Specifically, since the start of the pandemic, weekly visits were reduced by about half; 54% of visits occurred virtually; 12% of health center staff were unable to report to work, and 1,810 of approximately 14,000 CHC sites were temporarily closed (some may be closed permanently).[23] This presented a unique opportunity to study change in CHCs.

PBRN Rapid Response and COVID-19 Research Roadmap:

In the first two months of the pandemic, we began using real-time surveillance data to observe primary care changes across the PBRN. For example, in March 2020, we saw that CHCs in our PBRN increased telemedicine visits by over 2000%, while in-person office visits and lab/imaging encounters declined by 80% and 70%, respectively (see Table 2). [Insert Table 2]

This information allowed us to quickly develop research questions designed to build knowledge about successful practice change by studying the COVID-19-driven changes occurring in the PBRN, informed by a conceptual framework that blends the practice change model and the Strategic Implementation

Framework:[24,25] How has care delivery in CHCs changed due to COVID-19? What impact has COVID-19 had on the delivery of preventive services in CHCs? What PBRN services (e.g., data surveillance, training, evidence synthesis) are most impactful to real-world practices? What decision-making strategies were used in the PBRN and its practices to make real-time changes in response to the pandemic? What critical factors in successfully and sustainably transforming primary care are illuminated by pandemic-driven changes? [Insert Figure 1]

To track and understand how our PBRN's CHCs implemented change in their care delivery processes and priorities, we are using EHR data to identify and monitor changes in care delivery and characterize trends across practices: visit types, personal portal use, COVID-19 testing, and services delivered over time. Additionally, because the OCHIN PBRN has CHCs in >20 states, we are assessing within- and across-state variations in how CHCs are responding. We are also considering that multi-level factors will be associated with practice variations in the response to COVID-19 and how they resume delivery of care. These include patient panel socio-demographic characteristics (e.g., race, ethnicity, insurance coverage); practice characteristics (e.g., state, number of patients); provider characteristics (e.g., number of clinicians); healthcare utilization (e.g., number of visits by types); and concurrent policy changes (e.g., payment for telehealth visits).

To understand the external support and assistance that our PBRN's CHCs received to implement practice changes in response to the COVID-19 context, we are identifying, tracking, and documenting all actions taken to respond to the practices' needs, including EHR modifications, telemedicine trainings, and requests from individual practices for centralized support and assistance. We will also interview practice members repeatedly over a 12-month period to identify how CHCs adapted (and continue to adapt) to maintain or resume the delivery of care. To do so, we are recruiting PBRN CHCs that: (1) had high performance on care quality indicators pre-COVID-19; and (2) are still actively delivering care, using in-

person and / or telemedicine strategies, which suggests resilience and adaptive capacity.

CHCs are not representative of all primary care practices; there will be differences between the pandemic's impacts on CHCs – and the changes they implemented in response – and those in other primary care practices. Thus, we created a matrix that stratifies the 600 CHCs in our PBRN by region, system / service organization, rurality, practice patient characteristics (e.g., rate of Hispanic, uninsured, complex patient). This stratification will help assess the extent to which findings of our assessments of implementation learnings from the COVID natural experiment may apply to other healthcare systems.

This mixed-methods research roadmap is designed to assess the implementation of practice changes made as a result of the COVID-19 pandemic, including multi-level barriers and facilitators; the development and use of documentation, training, and health information technology tools for this purpose; and the impacts of these changes on the quality of cancer prevention in the PRBN. This roadmap will inform developing interventions that aim to improve the delivery of primary care in general, and cancer preventive services in specific, in underserved populations. In future transformative events such as pandemics, earthquakes, etc, primary care will need to know how to expeditiously reconfigure itself for effectiveness, including: which visits can safely be done with telemedicine, what implementation strategies are most successful to assist with practice change, and what training is needed to support adoption of needed changes. These questions and more can be answered and accelerated by PBRNs partnering with D&I science centers.

Discussion & Conclusions:

The pandemic and primary care's response to it are arguably among the most impactful natural experiments in our lifetime, presenting an unprecedented opportunity to demonstrate PBRNs' power and value in supporting cutting-edge D&I science. PBRNs allow for real-world, real-time evaluation to generate practice-based evidence; here, we demonstrate how one PBRN's structure supported learning

from historic natural experiments. Pairing emerging implementation science centers with PBRNs with expertise in D&I research will accelerate and expand on this scientific work. As COVID-19-driven 'natural experiments' impact our society, we propose to harness the power and value of PBRNs to understand what primary care is doing now that we learn from to positively impact tomorrow. At the same time, we recognize that we are at risk of losing primary care practices and providers within our PBRNs. These losses will be devastating for the health of communities, but also the loss of valuable community laboratories for conducting research to inform primary care's future. Thus, as COVID-19 uncovers the holes in our fragmented healthcare system and the inequities in our society, PBRNs and the primary care practices within these laboratories are needed now more than ever. The real-time example of how the BRIDGE-C2 Center is partnering with the OCHIN PBRN to rapidly respond to the need to study what is happening in this historic moment is presented to help other PBRNs chart a course through this pandemic.

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Table 1: Characteristics of the OCHIN PBRN, Serving as the BRIDGE-C2 Center Implementation Laboratory

Total number of practices, #	518	**Patients seen ever, #**	2,556,652
Rural practices, #	69	**Patients seen in 2017, #**	1,109,201
Practice type / services provided*, #		**Total number of providers, #**	2,926
Primary care / FQHC / FQHC look-alike	438	**Provider training, #**	
School-based health center	120	Physicians (MD/DO)	1,719
Dental	139	Nurse Practitioners	915
Behavioral health	213	Certified Nurse Midwifes	43
Specialty	68	Physician's Assistants	247

*Note that if a practice site has more than one type of department, they are counted in each category.

Table 2: Total number of encounters by type, in >500 CHCs in the OCHIN PBRN between November 2019 and April 2020

	Nov 2019	Dec 2019	Jan 2020	Feb 2020	Mar 2020	Apr 2020
Lab and Imaging	30,172	28,702	32,862	30,391	**25,021**	**7,421**
Telemedicine Visit	1,990	1,934	2,070	1,922	**50,135**	**54,817**
Office Visit	374,650	384,313	451,714	442,156	**349,556**	**70,640**

Figure 1: OCHIN PBRN's COVID-19 Evaluation Building Blocks