Supporting Better Science in Primary Care: A Description of Practice-based Research Networks (PBRNs) in 2011

Kevin A. Peterson, MD, MPH, Paula Darby Lipman, PhD, Carol J. Lange, MPH, Rachel A. Cohen, MPH, and Steve Durako, BA

Background: **Bound by a shared commitment to improving medical care through systematic inquiry, practice-based research networks (PBRNs) provide a basic laboratory for primary care research and dissemination.**

Methods: **Data from US primary care PBRNs were collected as part of the 2011 Agency for Healthcare Research and Quality PBRN registration process. Data addressed PBRN characteristics, research activities, and perceived strengths and weaknesses.**

Results: **One hundred forty-three primary care PBRNs were registered with the resource center in 2011, including 131 that were identified as either eligible for Agency for Healthcare Research and Quality recognition (n = 121) or as developing (n = 10). These PBRNs included 12,981 practices with more than 63,000 individual members providing care to approximately 47.5 million people. PBRNs had an average of 482 individual members (median, 170) from 101 practices (median, 32).**

Conclusions: **PBRNs are growing in experience and research capacity. With member practices serving approximately 15% of the US population, PBRNs are adopting more advanced study designs, disseminating and implementing practice change, and participating in clinical trials. PBRNs provide valuable capacity for investigating questions of importance to clinical practice, disseminating results, and implementing evidence-based strategies. PBRNs are well positioned to support the emerging public health role of primary care providers and provide an essential component of a learning health care system. (J Am Board Fam Med 2012;25:565–571.)**

Keywords: **Family Medicine Research, Practice-based Research, Practice-based Research Networks**

Primary care practice-based research networks (PBRNs) enhance the performance of clinical research in community settings and speed the dissemination of new knowledge into practice.[1,2] Bound by a shared commitment to improving medical care through systematic inquiry, PBRNs provide a basic laboratory for primary care research and dissemination involving every state and territory in the United States.[3,4] The ability of PBRNs to involve "real-world" practices in clinical research provides new opportunities to engage understudied populations, to study a range of health problems, and to accelerate community adoption of new knowledge and best practices.[5,6]

The Agency for Healthcare Research and Quality (AHRQ) has a long history of supporting primary care research networks. In 2002, the AHRQ created the National PBRN Resource Center to identify existing networks and promote growth in their capacity for clinical research. Led initially by the University of Indiana and National Opinion Research Center at the University of Chicago, in late 2007 the PBRN Resource Center was awarded

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From the Department of Family Medicine and Community Health, University of Minnesota Medical School, Minneapolis (KAP, CJL); and Westat, Rockville, MD (PDL, RAC, SD).

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Corresponding author: Kevin A. Peterson, MD, MPH, Department of Family Medicine and Community Health, University of Minnesota Medical School, 717 Delaware Street SE, Ste. 425, Minneapolis, MN 55414 (E-mail: peter223@umn.edu).

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to the University of Minnesota and Westat. The Resource Center has supported a wide variety of learning opportunities to foster new PBRNs and promote collaboration, including an annual research conference, peer learning groups, technical assistance, and development of a range of electronic tools and collaborative resources.

An important role of the Resource Center is the maintenance of a PBRN registry. To maintain AHRQ recognition, PBRNs provide annual updates of administrative information and research activities. These data are summarized on the public PBRN website (pbrn.ahrq.gov) and inform learning activities planned by the Resource Center. Data on characteristics and productivity of primary care PBRNs from 2003 to 2004 were last published in 2007.[7] This article updates the status of PBRNs from the 2011 registration data, explores the relationship between key characteristics of PBRNs and general indicators of research capacity, and provides a perspective on changes over time.

Methods

PBRN Criteria

To be eligible for AHRQ certification, a network must have a minimum of 5 practices (15 providers) devoted principally to the care of patients, and be united by a shared commitment to expand the science base of clinical care and better understand the health care events that unfold daily in their practice settings.[8] PBRNs must be located in the United States or a US territory and have at least 50% of their membership in family medicine, pediatrics, general internal medicine, nursing, physician assisting, osteopathy, or chiropractic. In addition to PBRNs, the AHRQ registry records two other types of networks: "Developing networks" are in the early stages of PBRN formation or have not conducted at least one study, and "affiliate networks" do not meet requirements for membership as a primary care PBRN. Affiliate membership is generally provided to non–primary care PBRNs (eg, pharmacy and dentistry) and PBRNs based outside of the United States. Although registration is voluntary, annual registration is required to receive support from the Resource Center. The AHRQ intermittently re-examines and refines the registration form to identify needs and plan support activities.

2011 Registration

The 2011 registration form contained 39 items addressing PBRN characteristics, productivity, and research interests. Self-reported strengths and challenges were used to identify peer learning group topics, consultation service needs, and important topics for the annual PBRN research conference.

Registry data were collected electronically using 2010 Checkbox software (Checkbox Survey Solutions, Inc, Watertown, MA). Personalized E-mails were sent to all previously registered PBRN directors and coordinators with an embedded link to a prepopulated form from the previous year. Technical assistance was provided to PBRNs to facilitate completion. Reminder E-mails were sent monthly from December 2010 through March 2011, with follow-up telephone calls beginning in mid-February 2011. Telephone follow-up included determining the status of nonregistered PBRNs. New networks interested in registration completed a screening questionnaire. If eligible, new networks were provided with a secure Internet account and an invitation to register using a blank registration form.

Registry data addressed the number and scope of PBRN research studies during the previous year (2010). Respondents also were asked to report on the strengths and challenges that impact governance, membership, operations, conduct of research, or use of information technology. These variables were chosen for their relevance to PBRN operations/functioning and to allow comparison with previous registry data.

Statistical Methods

Self-reported data from each PBRN regarding the number of practices, health care providers, and patients served were aggregated to generate overall estimates. Analyses were conducted to identify potential relationships between specific PBRN characteristics and research productivity. Three categorical PBRN characteristics were identified: (1) whether the specialty area of network members was primarily family medicine; (2) whether the network was affiliated with a funded Clinical Translational Science Award (CTSA); and (3) geographic coverage (national vs not national). These were compared using 3 measures of productivity/capacity: (1) number of studies conducted in 2010, (2) type of study designs used, and (3) use of electronic health record (EHR) data for research. Analyses of differences in the continuous variable (mean number of studies in 2010) by PBRN characteristics were conducted using analysis of variance. Associations between categorical characteristics (type of study design, use of EHR for research) were made using Fischer exact test. $P < .05$ was considered statistically significant. Analyses were conducted using SAS 1 software, version 9.1 (SAS Institute, Cary, NC).

Results

Description of PBRNs

As of May 2011, 143 PBRNs were registered with the PBRN Resource Center, an increase in 30 from the prior registration year. These included 121 primary care PBRNs, 10 developing networks, and 12 affiliate networks. The 131 established and developing PBRNs included 12,981 practices with more than 63,000 individual members providing care to approximately 47.5 million people. The following PBRN descriptive data are based on these 131 US primary care PBRNs.

PBRN Organizational and Member Characteristics

In 2011, PBRNs had been functioning for an average of 8.6 years (median, 8 years; range, <1–39 years). Sixty-two PBRNs have been registered continuously since 2008. A total of 133 different registered PBRNs were recorded by the AHRQ between 2008 and 2011. Three of these had previously reported disbanding and one disbanded during the 2011 registration process. Two PBRNs had merged with other PBRNs, one no longer met primary care eligibility requirements, and 5 reported being active but did not complete 2011 registration.

All PBRNs have a director, 89% (116 of 131) have a coordinator or associate director, and 73% (95 of 131) have a public website. PBRNs reported an average of 482 individual members (median, 170 members; range, 0–14,952 members) and a mean of 101 member practices (median, 32 practices; range, 0–1600 practices). PBRN member practices serve a mean of more than 415,000 patients (median, 169,000 patients; range, 0–7,000,000 patients) receiving care from a mean of 219 physicians per PBRN (median, 118 physicians; range, 0–1848 physicians).

As shown in Table 1, 41.5% of PBRNs identify their membership as “mixed,” with some combination of family medicine, general internal medicine, pediatrics, nursing, or other specialty. Most PBRNs report that at least 75% of their clinicians belong to a single specialty, with approximately one third of networks indicating they were predominately family medicine. Approximately half (49%) of current PBRNs report that the majority of their member practices have an EHR, with 19% (25 of 131) reporting that less than one fourth of member practices have an EHR.

More than 80% of PBRNs report that they are local, state-based, or regional. The 25 PBRNs that identify as national PBRNs have members or practices in at least 10 states. The national PBRNs fall into 2 major categories: (1) networks sponsored by national professional organizations or EHR companies, and (2) networks focused on a specific subject such as a patient population (ie, homeless) or innovation (ie, collaborative care).

Most PBRNs (65%) reported primary affiliation with a university, and most of the remainder (30%) reported affiliation primarily with a non-profit or professional organization. The most common primary funding source is federal grants (63%); however, a variety of additional funding sources were identified. Half of all PBRNs report affiliation with a funded CTSA.

Approximately one third of PBRNs (n = 39) reported membership in an organized “network of networks,” and 36% participated in a multinetwork project in 2010. Half of the PBRNs that did not participate in such a project have plans to do so.

PBRN Research Scope

The research focus for more than 60% of PBRNs is underserved, low-income, and minority populations. Smaller percentages targeted inner-city or rural populations. Only one third (32%) report that the network does not focus on a specific population group. Diabetes was the most commonly studied health condition (50%), whereas obesity was a current focus for more than one third of PBRNs (42%). The specific study designs used in the past 5 years are reported in Table 2 in descending order of frequency. The most common research designs were observational epidemiology, health systems/outcomes research, and best practice modeling. More than one fourth (28%) have conducted a clinical trial.

Table 1. Practice-based Research Network (PBRN) Characteristics (N = 131)

Primary specialty of PBRN	
Mixed	53 (40.5)
Family medicine	42 (32.1)
Pediatrics	16 (12.2)
General internal medicine	8 (6.1)
Nursing	4 (3.1)
Other	8 (6.1)
Presence of members by clinical discipline	
Physicians	122 (93.1)
Nurse practitioners	93 (71.0)
Physician assistants	76 (58.0)
Other clinician types	67 (51.2)
Members with an EHR (%)	
51–100	64 (48.9)
26–50	35 (26.7)
1–25	22 (16.8)
None or unknown	10 (7.6)
Geographic coverage	
Regional	40 (30.5)
State	36 (27.5)
Local or citywide	30 (22.9)
National	25 (19.1)
Primary affiliation	
University	85 (64.9)
Not-for-profit	38 (29.0)
Professional organization	5 (3.8)
For-profit	1 (0.8)
None	0 (0)
Other	2 (1.5)
Funding sources (during past 5 years)*	
US government	83 (63.4)
Academia	63 (48.1)
Nonprofit	51 (38.9)
State/local government	32 (24.4)
Professional organization	31 (23.7)
For-profit/commercial	23 (17.6)
Government outside United States	1 (0.8)
Other sources	14 (10.7)
Target populations*	
Underserved	79 (60.3)
Low income	71 (54.2)
Minority	71 (54.2)
Inner city	51 (38.9)
Rural	49 (37.4)
No target population	42 (32.1)
Other (unspecified)	16 (12.2)
Relationship to CTSA	
None	53 (40.5)
Funded with CTSA	66 (50.4)
Planning with CTSA	12 (9.2)
Multinetwork project/study (during past year)	
None	36 (27.5)
None yet, but planning	38 (29.0)
No, but have in the past	10 (7.6)
Yes	47 (35.9)

Data provided as n (%).
*Multiple responses permitted.
EHR, electronic health record; CTSA, Clinical Translational Science Award.

The number of studies conducted by the 121 registered PBRNs ranged from 1 to more than 40. Most PBRNs (56%) had conducted ≥8 studies, whereas 36% had conducted more than twice that number. On average, PBRNs conducted 4 studies per year (range, 2–6 studies). In the majority of networks (94%), members and practices decide independently whether to participate in PBRN studies. Almost 70% of the PBRNs have used an EHR for research.

PBRN Strengths and Challenges

Table 3 lists areas that many (≥40%) of the 131 registered PBRNs report as either a strength or a challenge. Generally, PBRNs identify areas related to the conduct of practice-based research (eg, agenda setting, study development, study management) as strengths. Most PBRNs continue to be challenged by member compensation and provider training, community involvement, and infrastructure support.

Comparison by PBRN Characteristics

No significant differences in research productivity/capacity were identified by the categorical PBRN characteristics of specialty, CTSA affiliation, or geographic coverage. Although 63 registered PBRNs (52%) reported a formal affiliation with a CTSA, in 2011 these PBRNs conducted the same number of studies as PBRNs not affiliated with a CTSA (mean, 4 studies; $P = .32$). In addition, no significant differences in the type of study designs used or in the use of EHRs were found between PBRN specialty designations or geographic coverage.

Discussion

A description of the current state of AHRQ-registered PBRNs provides a framework for recognizing

Table 2. Scope of Practice-based Research Network (PBRN) Research Studies (N = 121)

Studies ever conducted, n	
1–3	29 (24.0)
4–7	24 (19.8)
8–16	25 (20.7)
17–39	21 (17.4)
≥40	22 (18.2)
Used EHR for research	83 (68.6)
AHRQ priority health conditions studied (during past 5 years)*	
Diabetes mellitus	60 (49.6)
Obesity	51 (42.1)
Pulmonary disease/asthma	44 (36.4)
Cardiovascular disease	42 (34.7)
Mental health disorders	34 (28.1)
Cancer	32 (26.4)
Substance abuse	18 (14.9)
Development delays	14 (11.6)
Infectious disease (including HIV/AIDs, sexually transmitted diseases)	13 (10.7)
Dementia	11 (9.1)
Arthritis and joint disease	10 (8.3)
Pregnancy and childbirth	10 (8.3)
Study designs used (during past 5 years)*	
Observational epidemiology	66 (54.5)
Health systems/outcome research	63 (52.1)
Best practice research/modeling	61 (50.4)
Implementation research	39 (32.2)
Clinical trials	34 (28.1)
Comparative effectiveness research	31 (25.6)
Methodological research	22 (18.2)
Nonpractice-based community health intervention	18 (14.9)
Pharmaceutical clinical trials	12 (9.9)

Data provided as n (%). Ten developing PBRNs that had not completed a research project were excluded from the description of PBRN research.
*Multiple responses permitted.
EHR, electronic health record; AHRQ, Agency for Health care Research and Quality.

changes in PBRNs over time. Comparing the results of the 2011 registry data with data from a 2003 to 2004 cohort of PBRNs demonstrates considerable growth in PBRN research capacity during the past decade. This includes sustained and continued growth in the number of PBRNs, from 28 networks in 1994 and 86 in 2003 to 131 in 2011. As the number of networks has increased, the number of member practices and the number of patients that potentially could be involved in or impacted by practice-based research also has increased. In 2003, the 86 networks that met AHRQ criteria had a total of 1871 practices. The 131 PBRNs in 2011 included nearly 13,000 practices, a growth of nearly 6-fold. The current estimate suggests that approximately 15% of the US population currently receives health care from a PBRN-member practice. Of the 45 PBRNs reporting one ongoing or completed research project in 2004, only 20 had conducted >7 studies. In contrast, in 2011, 68 PBRNs (56%) reported having completed ≥8 studies, and 22 report having completed >40 studies. With increasing experience, PBRNs also are using more advanced study designs. Half of the registered PBRNs now report using designs for modeling best practices, and 30% are performing implementation research or clinical trials.

From 2008 to 2011, a total of 141 unique primary care PBRNs were registered. Although not all PBRNs re-register every year, only 4 are known to have disbanded. The growth in number of PBRNs seems to be largely because of new PBRNs forming in nontraditional primary care disciplines, new PBRNs associated with CTSA community engage-

Table 3. Most Commonly Reported Practice-based Research Network (PBRN) Strengths and Challenges*

Strengths	
Leadership	86 (65.6)
Study development	79 (60.3)
Study management	76 (58.0)
Data management	71 (54.2)
Network staff	70 (53.4)
Diversity of patient population	68 (51.9)
Capacity to conduct research	60 (45.8)
Geographic distribution	59 (45.0)
Access to patient data	58 (44.3)
IRB/HIPAA	58 (44.3)
Recruitment	54 (41.2)
Computer access at practices	53 (40.5)
Research agenda setting	52 (39.7)
Challenges	
Infrastructure funding	89 (67.9)
Infrastructure support	69 (52.7)
Compensation strategies	64 (48.9)
EMR availability/interface	57 (43.5)
Community participation	55 (42.0)
Provider training	52 (39.7)
Member involvement	52 (39.7)

Data provided as n (%).
*Reported by ≥40% of the practice-based research networks (N = 131).
IRB, institutional review board; HIPAA, Health Insurance Privacy and Accountability Act; EMR, electronic medical record.

ment activities, and more comprehensive identification of PBRNs across all states and territories. Although some PBRNs have merged, no evidence of PBRN fragmentation was seen.

The current data demonstrated no significant association between selected PBRN characteristics and research productivity over the prior year as measured by number of studies, study designs, or use of EHR data. This confirms findings from other investigators, and the association between effective PBRN infrastructure characteristics and research productivity remains unclear.[8]

PBRNs frequently participate in multinetwork research projects. This is consistent with observations from other investigators that PBRNs are increasingly engaging in formal relationships with other research organizations, including CTSAs.[9] The current analysis suggests, however, that formal relationships with CTSAs are still in preliminary stages and have not yet resulted in more research projects per year, nor has CTSA affiliation resulted in a significant difference in self-reported research capacity, as explored in this article.

Many of the self-reported challenges of PBRNs remain the same as those reported 8 years ago. The ability to coordinate a study in the community, geographic distribution of members' practices, and diversity all remain identified as PBRN strengths. Infrastructure funding, support, and compensation strategies remain the biggest challenges. Although in 2004, 40% (of 83 networks) reported that community involvement was a strength; in 2011 only 28% found community participation a strength, and 42% found it a challenge. PBRNs are continuing to address ways to improve community participation, and this may reflect both increased awareness and increased pressure to promote meaningful participation of communities in research. The ability to secure funding continues to be a challenge (for 65% in 2004 and 68% in 2011). Although computer access at the practice was a strength, EHR interfaces were identified as a challenge.

Study Limitations

The current analysis of AHRQ PBRN registration data has a number of limitations. Given the AHRQ's focus on primary care, PBRNs with non–primary care specialties (affiliate members) were excluded. The data set also relies on the interest of PBRNs to join the community of AHRQ-registered networks and may exclude other functional primary care research organizations. These data are self-reported and are not validated. In addition, practices or providers belonging to multiple PBRNs would be duplicated in aggregate estimates. Another important limitation is that the purpose of the data collection was for supporting the administrative and technical assistance roles of the Resource Center in meeting the needs of the PBRN community, rather than explicitly addressing research questions pertaining to the strategic value or impact of PBRNs in advancing research in primary care settings. Finally, the registry does not address the number of member practices within the PBRN that are active participants in the research process, so estimates based on the overall number of practices may overemphasize actual research capacity.

Assessing the Future of PBRNs and Practice-based Research

Despite the limitations of the findings, the opportunity to describe PBRNs in 2011 and consider factors associated with their sustainability and research capacity can provide insights that are valuable for policymakers, PBRN participants, and the broader primary care community. In the current health care environment, PBRNs are positioned to address the emerging public health role of primary care providers and provide an essential component of a learning health care system.[10] PBRNs can draw on the experience and insight of practicing clinicians to identify and frame research questions so that new findings can be applied directly to clinical practice. The 2012 PBRN registration form includes information about how networks engage member practices in research and how they disseminate evidence-based approaches to care and best practices to their members in the community.

The role of PBRNs continues to evolve in the direction of a stronger focus on health improvement, primary care transitions, and providing continuing education and maintenance of certification.[11,12] PBRNs are continuing to increase their capacity to investigate questions of importance to clinical practice, to disseminate results, and to implement evidence-based strategies. By blending research design and community practice experience, PBRNs provide research findings that are recognized as relevant by primary care clinicians. A better understanding of how challenges such as member compensation, provider training, and community involvement affect the capacity of practices to participate would advance the ability of PBRNs to fulfill the promise of supporting better science in primary care.[4]

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