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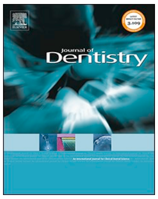

Review article

Leadership in practice-based research: The National Dental PBRN

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ABSTRACT

Practice-based research networks with strong leadership can be effective venues for the translation of research findings. Coordinating all the efforts across a Network composed of individuals with a broad range of expertise, goals, and expectations can, however, be cumbersome, posing many different leadership challenges.

1. Introduction

There can be a substantial delay between the generation of new knowledge and its application into clinical practice [1]. This delay may be caused, in part, by practitioners not considering research results applicable to the patients they see in everyday clinical care [1]. A major limitation of traditional institutional-based clinical studies can be a lack of generalisability and external validity [2], inhibiting clinicians' decision-making abilities [3]. It is estimated that as little as 8% of medical clinical practice is based on peer-reviewed and critically appraised evidence [4,5]. The practice-based research network (PBRN) context addresses these limitations in two ways: 1) It generates evidence-based knowledge with good external validity as the research is conducted with patients seen in daily clinical practice; and 2) It facilitates the adoption of the research findings by involving practitioners in all phases of the research process [6]. PBRNs conduct clinical studies and other activities that can close the research-to-practice gap [1,3] and optimize patient care, while promoting the notion that all stakeholders directly or indirectly involved in the process have a platform for collaboration (Fig. 1).

To achieve the above-mentioned objectives, the United States National Institute of Dental and Craniofacial Research (NIDCR) began funding PBRNs in 2005. In 2012, NIDCR funded a single, integrated national network, the National Dental Practice-Based Research Network [7,8] Fig. 1. The Network's overall goals are to do science that is immediately applicable to clinical practice and to foster movement of its findings into everyday clinical practice and thereby improve the health of the population. To accomplish these goals, the Network functions as a highly collaborative environment where practitioners in clinical practice, researchers, patient representatives and community partners

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[1] The National Dental PBRN Collaborative Group includes practitioner, faculty, and staff investigators who contributed to this activity. A list is available at http://nationaldentalpbrn.org/collaborative-group.php

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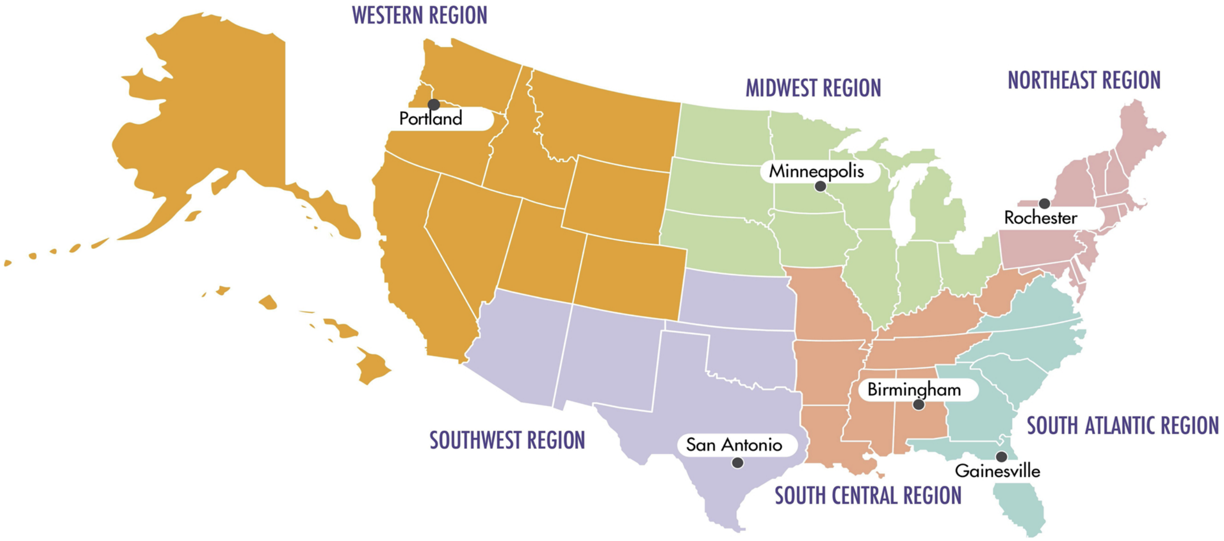

Fig. 1. Illustrates The Network regions in the United States of America.
*Not shown on the map American Samoa, Guam, and the Northern Mariana Islands are part of the Western Region, and Puerto Rico and the US Virgin Islands are part of the Northeast Region.

in "win-win" activities that each group sees as mutually beneficial and which improve health.

The Network embraces the concept of a "learning health system", that is, an organisation where science, informatics, incentives, and culture are aligned for continuous quality improvement and innovation [9–12]. A key component of the Network's success is that it makes a point of listening to end-users – listening closely and listening often. And it is not just listening but acting based on the information provided by practitioners as well as engaging stakeholders at each step of the research process, from study topic selection to results dissemination, and to implementation of relevant practice changes. Acquiring new information is necessary but not enough for healthcare providers to change their behavior [13]. Passive dissemination of knowledge, guidelines, and attendance at meetings are alone not necessarily effective for the translation of research into practice [14]. Actively engaging the practitioner in the dissemination of study results through webinars, publications, presentations, round-table discussions, and meetings can assist with the translation of the research into everyday clinical care [6,13].

2. Recruitment and engagement strategies

Practitioner recruitment and engagement strategies are essential to the success and sustainability of PBRNs. Because of the busyness of dental offices, recruiting practitioners to participate in PBRN studies can be a challenge for for the research process. To overcome this challenge and to be as inclusive as possible in the invitation to all practitioners, the Network works closely with various national and local professional dental organisations to keep clinicians engaged and raise awareness of the research process. We learned that enrollees who have a positive research experience can also work as advocates by influencing their colleagues to participate in the research process, and thereby facilitate the recruitment of future participants.

Communication and dissemination of study results to practitioners, beside aiding in practitioner engagement, assist with recruitment and retention, which are vital to the success of a PBRN [15]. Consistent with the vision that practitioners are at the centre of the Network, practitioner representatives have a majority vote on the Executive Committee, which makes decisions about research topics to be studied. Similarly, practitioners are the driving force of the Network, not only for gathering and disseminating the data, but also generating the research ideas that aim to answer relevant clinical questions immediately applicable to daily clinical care. Equally important and challenging is the engagement of patients in PBRNs. Strategies to engage patients include seeking their assistance and feedback on designing patient recruitment brochures; patients approving patient's brochures that explain study results [16]; as well as having focus groups for designing a patient satisfaction questionnaire [17]. To date, we have had nine data briefs (another two are currently being prepared), which are one-page summaries of Network studies that are easy for patients to comprehend. These are publicly available on the website [18] and practitioners can download, print, and distribute them to their patients.

Additionally, the Network established a Patient Engagement Task Force, tasked with developing ways to gain patient input when Network studies are developed, in order to gain patient buy-in to the research process and the results generated. Our experience with patients is consistent with the literature on patient engagement [18–23] demonstrating that patient input is important to the success of PBRNs.

3. Challenges

A crucial part of the infrastructure of the Network is having a coordinating centre (CC) to centralise and harmonise study operations, data management, and biostatistical support to facilitate rapid development and implementation of multisite clinical studies. The CC also provides scientific, implementation, technological, and administrative support for successful study design, data collection, implementation, and analysis to researchers whose Network research experience ranges from expert to uninitiated. Two primary challenges faced by the Network are the tension between optimal experimental design and those feasible in a PBRN setting that rely on practitioner and patient volunteers, as well as the need to bridge gaps such as limited research experience and knowledge of a PBRN setting. The time constraints encountered in everyday practice can also be a hurdle to the research process. The study design must be carefully crafted to not interrupt or be perceived as an obstruction to the natural course of the clinical practice. These challenges create a healthy tension between the need to provide sound scientific study designs, and the need to feasibly conduct these studies in the PBRN context. The composition of the CC is designed to meet these challenges. Specifically, the Network pairs scientific and technological leadership, resulting in elevated attention to these essential components of studies within the Network. These two perspectives provide insight that informs feasible and appropriate approaches, including trade-offs between technical solutions, participant burden relative to reward or intrinsic motivation, and impact on study analytic considerations.

Among the challenges of conducting PBRN research is the education of those unfamiliar with the process, especially the investigators, about the types of studies that are appropriate for the PBRN context. In our experience, researchers unfamiliar with the PBRN setting require substantial orientation and mentoring as they take on responsibilities as a Network Study Principal Investigator (SPI). We learned that it is important to have an orientation handbook dedicated for this purpose, and the assignment of individuals familiar with PBRNs as part of the Study Team (such as regional directors, research coordinators, study/data managers, statisticians, Network practitioners, etc.). These persons can provide substantial input during the study development process about how best to design the study to address the research questions and to conduct research in the PBRN context. The mentoring continues throughout the research process, including the implementation phase of the study, as well as publication and dissemination of the study findings.

Once the study has been fully developed and approved by the governing bodies (in this case, NIDCR, Institutional Review Boards, Executive Committee, etc.), the next phase is the implementation of the study. The implementation step has its own set of challenges and research coordinators are crucial to this research step. The research coordinators are the ones in direct communication with the practitioners and the dental staff, either virtually or face to face. They are also the ones who are actively involved in the training portion of the study. Research coordinators work closely with the SPI and the study team developing a training manual, to reinforce that the research taking place in each and every office is gathering the information in exactly the same manner. The language involved in this step is curated and carefully developed by the study team, as the success of the research process hinges on the understanding of the practitioners and their staff on the various steps involved in the research protocol. This is of outmost importance in PBRNs as large amounts of data are gathered and analysed from a diverse pool of participants with various backgrounds and cultures. Therefore, assuring a good communication between end-users (practitioner and patients) and the study team is vital to the research process.

The Network makes a point of engaging practitioners at every step of the research process, and this includes the publication process [24]. In addition, all regions involved in data collection are given the opportunity to have at least one author from the region, in accordance with established authorship guidelines. An effective PBRN understands that this level of engagement is essential to its success. This expanded model of team science often creates challenges for SPIs accustomed to academic models where the core study team has sole responsibility for these activities. The challenge of linking academic institutions and faculty (that traditionally compete with each other) with large health institutions can also be an opportunity. As the team strives for collaboration and efficiency, PBRNs allow for institutions, practitioners and patients to work together, promoting timely dialogue and allowing the team to find solutions for routine clinical problems faced in of everyday clinical care.

As discussed above, coordinating all the efforts across a Network composed of individuals with a broad range of expertise, goals, and expectations can be cumbersome. Managing these linkages requires a fully functional virtual platform and infra-structure to streamline communication across a large and diverse network. We learned early-on that we had to elaborate a system for efficient communication by forming target committees, developing norms of interaction and establishing efficiency of virtual meetings.

4. International collaboration

PBRNs also allow the opportunity to expand studies globally to take advantage of the diversity of study populations encountered. The initial funding period 2005–2012 included a fully participating Scandinavian region. Subsequently, the Network has also used existing studies to collaborate with investigators in Japan, Sao Paulo, Brazil and Scotland to produce 14 peer-reviewed publications and 13 peer-reviewed abstracts [24]. Furthermore, the Network has provided guidance to other international institutions when developing PBRNs in their countries. Additional plans to form PBRNs are in development in England, Ireland, Brazil, France, The Netherlands and South Africa.

5. Concluding remarks

Not all methods of translating research results have equal success with incorporating research findings into clinical practice. The importance of developing connections between researchers and practitioners in the dissemination of information has been reported [25]. Increasing personal contacts and relationships between researchers, practitioners, and policy leaders is an important step towards using evidence in making policy decisions [26].

Traditional federal or corporate-funded research conducted in academic settings has significant value that complements the studies that are conducted in PBRNs. Academic research usually addresses other questions, such as those having to do with treatment efficacy rather than treatment effectiveness. In a controlled academic setting, narrowing the selection of study populations, maintaining fidelity of the intervention and calibration of measurement are feasible. Results from efficacy studies should be followed by effectiveness studies conducted in real world settings such as a PBRN, which requires leaders with specific skill sets. Effectiveness studies are more generalisable to the public at large. This facilitates the application of the findings for policy changes and the establishment of standard of care. Additionally, PBRNs with strong leadership can be effective venues for the translation of research findings, because practitioner participants can serve as effective change agents [6,27].

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References

[1] D.G. Contopoulos-Ioannidis, G.A. Alexiou, T.C. Gouvias, J.P. Ioannidis, Life cycle of translational research for medical interventions, Science 321 (2008) 1298–1299.
[2] M. Myers, Qualitative Research and the Generalizability Question: Standing Firm With Proteus, March [30 paragraphs]. The Qualitative Report [On-line serial], 4(3/4). Available: (2000) http://www.nova.edu/ssss/QR/QR4-1/myers.html.
[3] R. Niederman, J. Clarkson, D. Richards, Guest Editorial: the affordable care act and evidence-based care, JADA 142 (2011) 364–367.
[4] J.P. Ioannidis, Contradicted and initially stronger effects in highly cited clinical research, JAMA 294 (2005) 218–228 ant.
[5] A. Antczak-Bouckoms, Quality and effectiveness issues related to oral health, Med. Care 33 (11 Suppl) (1995) NS123-142.
[6] D.B. Rindal, T.J. Flottemesch, E.U. Durand, O.V. Godlevsky, A.M. Schmidt, G.H. Gilbert, National Dental PBRN Collaborative Group, Practice change toward better adherence to evidence-based treatment of early dental decay in the National Dental PBRN, Implement. Sci. 2 (December (9)) (2014) 177, https://doi.org/10.1186/s13012-014-0177-x.
[7] Gilbert GH1, O.D. Williams, J.J. Korelitz, J.L. Fellows, V.V. Gordan, S.K. Makhija, C. Meyerowitz, T.W. Oates, D.B. Rindal, P.L. Benjamin, P.J. Foy, National Dental PBRN Collaborative Group, Purpose, structure, and function of the United States national dental practice-based research network, J. Dent. 41 (November (11)) (2013) 1051–1059, https://doi.org/10.1016/j.jdent.2013.04.002 Epub 2013 Apr 15..
[8] The Network, http://www.nationaldentalpbrn.org/, accessed on 10/11/2018.
[9] Institute of Medicine (IOM), Best Care at Lower Cost: the Path to Continuously Learning Health Care in America, Accessible at The National Academies Press,

Washington, DC, 2010http://www.nationalacademies.org/hmd/Reports/2012/Best-Care-at-Lower-Cost-The-Path-to-Continuously-Learning-Health-Care-in-America.aspx.

[10] S.M. Greene, R.J. Reid, E.B. Larson, Implementing the Learning Health System: from concept to action, Ann. Intern. Med. 157 (2012) 207–210 PubMed PMID: 22868839.

[11] C. Friedman, J. Rubin, J. Brown, M. Buntin, M. Corn, L. Etheredge, C. Gunter, M. Musen, R. Platt, W. Stead, K. Sullivan, D. Van Houweling, Toward a science of learning systems: a research agenda for the high-functioning learning health system, J. Am. Med. Inform. Assoc. 22 (2015) 43–50 PMID: 25342177; PMCID: PMC4433378.

[12] J.L. Fellows, D.J. Pihlstrom, L. Waiwaiole, S. Hodge, C. Baltuck, N. Tommasi, G.H. Gilbert, National Dental PBRN Collaborative Group, The National Dental PBRN as a learning health system, Presentation at Annual Meeting of the American Association for Dental Research (2016).

[13] L.A. Rohrbach, R. Grana, S. Sussman, T.W. Valente, Type II translation: transporting prevention interventions from research to real-world settings, Eval. Health Prof. 29 (3) (2006) 302–333.

[14] A.P. Farmer, F. Legare, L. Turcot, J. Grimshaw, E. Harvey, J.L. McGowan, F. Wolf, Printed educational materials: effects on professional practice and health care outcomes, Cochrane Database Syst. Rev. 16 (July (3)) (2008) CD004398.

[15] R. Mungia, E. Funkhouser, M.K. Buchberg, R. Cohen, S. Reyes, D. Cochran, S.K. Makhija, C. Meyerowitz, D.B. Rindal, V.V. Gordan, J.L. Fellows, J.D. McCargar, P.A. McMahon, G.H. Gilbert, National Dental PBRN Collaborative Group, Practitioner participation in national dental PBRN studies: 12-year results, J. Am. Board Fam. Med. 31 (6) (2018) 844–856 2018.

[16] National Dental PBRN web site, “Research Updates” Page. This Page Shows Patient Brochures Used to Explain Study Results to Patients, Network practitioners place these in their offices, 2018 Publicly available at Accessed August 29, 2018 http://nationaldentalpbrn.org/research-updates.php.

[17] National Dental PBRN web site, “Patient Satisfaction With Dental Restorations” Page. This Page Shows a Patient Questionnaire Developed to Measure Patient Satisfaction, Publicly available at Accessed August 29, 2018 http://nationaldentalpbrn.org/study-results/patient-satisfaction-with-dental-restorations.php.

[18] J.P. Domecq, G. Prutsky, T. Elraiyah, Z. Wang, M. Nabhan, N. Shippee, J.P. Brito, K. Boehmer, R. Hasan, B. Firwana, P. Erwin, D. Eton, J. Sloan, V. Montori, N. Asi, A.M. Dabrh, M.H. Murad, Patient engagement in research: a systematic review, BMC Health Serv. Res. 14 (89) (2014) PubMed PMID:24568690; PubMed Central PMCID: PMC3938901.

[19] D. Cukor, L.M. Cohen, E.L. Cope, N. Ghahramani, S.S. Hedayati, D.M. Hynes, V.O. Shah, F. Tentori, M. Unruh, J. Bobelu, S. Cohen, L.M. Dember, T. Faber, M.J. Fischer, R. Gallardo, M.J. Germain, D. Ghahate, N. Grote, L. Hartwell, P. Heagerty, P.L. Kimmel, N. Kutner, S. Lawson, L. Marr, R.G. Nelson, A.C. Porter, P. Sandy, B.B. Struminger, L. Subramanian, S. Weisbord, B. Young, R. Mehrotra, Patient and other stakeholder engagement in Patient-Centered Outcomes Research Institute funded studies of patients with kidney diseases, Clin. J. Am. Soc. Nephrol. 11 (9) (2016) 1703–1712 PubMed PMID: 27197911; PubMed Central PMCID: PMC5012486.

[20] J. Arkind, S. Likumahuwa-Ackman, N. Warren, K. Dickerson, L. Robbins, K. Norman, J.E. DeVoe, Lessons learned from developing a patient engagement panel: an OCHIN report, J. Am. Board Fam. Med. 28 (5) (2015) 632–638 PubMed PMID: 26355135; PubMed Central PMCID: PMC4904782.

[21] J.S. Feine, Injecting ‘patient power’ into research and policy, JDR Clin. Trans. Res. 2 (4) (2017) 328–329.

[22] PCORI engagement rubric, PCORI (Patient-Centered Outcomes Research Institute) Website, (2014) Published February 4, Accessed July 1, 2018 http://www.pcori.org/sites/default/files/Engagement-Rubric.pdf.

[23] D.A. Chambers, W.G. Feero, M.J. Khoury, Convergence of implementation science, precision medicine, and the learning health care system: a new model for biomedical research, JAMA 315 (May (18)) (2016) 1941–1942 PubMed PMID: 27163980; PubMed Central PMCID: PMC5624312..

[24] National Dental PBRN web site, “List of Peer Reviewed Publications” Page, (2018) Available at Accessed on October 11, 2018 http://nationaldentalpbrn.org/publications/peer-reviewed).

[25] A.D. Naik, L.A. Petersen, The neglected purpose of comparative-effectiveness research, N. Engl. J. Med. 360 (19) (2009) 1929–1931.

[26] S. Innvaer, G. Vist, M. Trommald, A. Oxman, Health policy-makers’ perceptions of their use of evidence: a systematic review, J. Health Serv. Res. Policy 7 (4) (2002) 239–244.

[27] G.H. Gilbert, V. Qvist, D.J. Pihlstrom, P.J. Foy, V.V. Gordan, Change in stated clinical practice associated with participation in the DPBRN, Gen. Dent. (2010) 520–528.