Three national mandates call for accelerating development of family medicine faculty as scholars and researchers. The Future of Family Medicine project advocates enhancement of the science of family medicine through generation of new knowledge and research.\(^1\) The National Institutes of Health Roadmap recognizes that “disease burden has shifted from acute conditions to chronic conditions primarily seen in community centers.”\(^2\) The Accreditation Council for Graduate Medical Education requires continual academic development for residency faculty that results in scholarly publications and invited presentations.\(^3\) One strategy to address these mandates in a complementary manner is to integrate practice-based research (PBR) into the values, structures, and processes of academic family medicine practices.\(^4\)

In the Wayne State University Department of Family Medicine, over several years we conducted an intradepartmental faculty development program oriented...
toward an evidence-based and scholarly approach to clinical teaching and patient care.\textsuperscript{5,9} Topics included teaching methodology, evidence-based clinical practice, patient-centered medicine, critical appraisal, research study methods, and scholarly writing. Following this developmental series, residency faculty who had never done so began publishing case studies and clinical inquiries and advising residents on scholarly projects. Our next goal was to engage these faculty in conducting research within our practices.

In this paper, we present the recommendations of a sample of national PBR leaders who advised us about methods of training to prepare family physicians to participate in and teach PBR. These experts also suggested knowledge, attitudes, and skills that promote PBR along with organizational strategies for clinical practices to increase the likelihood of PBR success.

**Methods**

**Defining PBR Knowledge, Attitudes, and Skills**

We conducted a qualitative literature review to inform our approach to identifying knowledge, attitudes, and skills to promote PBR. Using family medicine literature,\textsuperscript{9,15} as well as that from other disciplines such as management\textsuperscript{16} and occupational therapy,\textsuperscript{17} we developed a table of knowledge, attitudes, and skills for developing physician faculty as scholars through engaging them in PBR. During our study, we solicited feedback from PBR experts on this table.

**Study Sample**

Initially, 23 nationally prominent practice-based researchers were identified by two of the authors through a literature review and through the authors' knowledge of leaders in PBR. Eleven of these individuals were chosen to participate in structured telephone interviews, taking care to select both males and females from various geographic regions and those with a variety of PBR experiences. All of the 11 selected experts agreed to participate in the study (10 from the United States and one from England).

**Interviews With PBR Experts**

The study procedures were approved by the Wayne State University Human Investigation Committee. A written copy of the oral informed consent form was sent to participants prior to the interview. We also sent a draft of our table of PBR knowledge, attitudes, and skills, along with the survey questions. During the interview, respondents were asked to provide feedback on the table and to answer several open-ended questions relating to their experience with, and opinions about, PBR. Questions included the following: What knowledge, attitudes, and skills support PBR? What types of training will prepare family physicians to participate in and conduct PBR? What factors in the ambulatory clinical setting facilitate the success of PBR? What are the most important barriers to conducting PBR? Interviews were conducted and audiotaped by one individual.

**Data Analysis**

Verbatim transcripts were made from each of the audiotapes from the telephone interviews. We used the framework approach\textsuperscript{18} to analyze the data. Transcripts were read thoroughly by two individuals, different than the person who conducted the interviews, for basic content analysis. Each individual first independently reviewed the transcripts and identified recurrent themes. With consensus, they identified a thematic framework that was used to index, chart, and map the patient and physician responses into emergent themes.\textsuperscript{18} Each time a respondent shifted to a new topic in answering the question, the new topic was recorded as a theme and highlighted in the text. The resulting theme list provided a detailed analysis of interview content.

We determined a classification system by grouping similar themes together under umbrella categories using a coding method described by Crabtree and Miller.\textsuperscript{19} Once the data analysis reached saturation, with no new codes emerging from the text, the material was read once more to assign each highlighted phrase a code number. Frequency of code numbers revealed the most widely agreed-upon issues among interviewees. The transcripts were also reviewed by all authors to identify respondent quotes illuminating the coding scheme.

**Results**

**Sample**

We interviewed 11 PBR experts who were identified through literature review and national reputation. Their self-reported experience in PBR ranged from 4 to 20 years, with a mean of 12 years. Nine worked in university settings, one in a residency program, and one in private practice. They reported having reached their current level of competence through experience (9/11), graduate education (5/11), networking (4/11), and attending conferences (2/11). Their answers to our study questions follow.

**What Knowledge, Attitudes, and Skills Support Practice-based Research?** Table 1 incorporates the recommendations from the experts who reviewed and provided feedback for the proposed table of PBR knowledge, attitudes, and skills. There was agreement that family medicine faculty should value building the evidence base of primary care. To fulfill their roles as scholars, they can suggest or formulate research questions relevant to improving the health of their patients, establish study feasibility with input of clinic colleagues and staff, consult with experienced researchers as needed, ensure human subjects’ protection, enroll eligible subjects, and disseminate study findings through professional presentations and publications.
What Types of Training Will Prepare Family Physicians to Participate in and Conduct PBR? PBR experts’ recommendations for educational strategies to prepare physicians to participate in PBR fell within the topic areas of scope of training, teaching methods, essential knowledge, and organizational environment (Table 2).

Scope of Training

Experts recommended that family medicine implement and sustain comprehensive multi-level training in PBR. We should (1) introduce medical students to PBR during their family medicine rotations and electives, (2) build on that foundation during family medicine residency training by emphasizing opportunities for residents to conduct PBR studies that fulfill their research requirement, and (3) continue PBR professional development throughout the careers of family physicians who are practicing and teaching primary care. Clinical practice and teaching settings should offer research training and experience on an ongoing basis. While all experts recommended strategies that begin with individuals within a department or clinic, many additionally suggested that family medicine needs to increase the number of highly trained researchers within our specialty who can lead and develop PBR with students and trainees.

Teaching Strategies

Strategies to teach PBR should emphasize participation that includes both practitioners and other members of interdisciplinary patient-care teams. Collaborative and mentoring relationships were identified as key by several experts. While most agreed that residency programs should require training in research, they recommended that didactics for both residents and faculty be minimized in favor of real-time experience in brainstorming about, implementing, and disseminating the results of meaningful PBR investigations: “The main thing is that the skills and perspectives of clinicians need to be emphasized and included. We can’t think in isolation; we have to value the perspective of clinicians.” Family medicine culture must embrace the utility of research and the need for everyone to participate in research at some level. As one expert stated, “Part of what is required is physician leadership and role modeling. [Participation] is also needed at the level of clinic management. Whoever is the clinic manager needs to say, ‘We want our clinic to be active in this; research is part of the job.’”

Essential Knowledge

Experts told us that the knowledge most fundamental to effective participation in PBR is an understanding of critical appraisal of medical literature, which itself

<table>
<thead>
<tr>
<th>Knowledge</th>
<th>Attitudes</th>
<th>Skills</th>
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<tbody>
<tr>
<td>Understands basic research design concepts and differences between qualitative and quantitative research designs</td>
<td>Desires to implement valid and reliable research in the practice setting</td>
<td>Develops well-defined research questions of relevance to the practice</td>
</tr>
<tr>
<td>Understands the challenges of research in the clinical practice setting</td>
<td>Values the perspectives of all site personnel when determining the feasibility of PBR projects and their potential benefits for patients</td>
<td>Reviews the practicality and feasibility of research ideas with colleagues and staff</td>
</tr>
<tr>
<td>Understands the importance of adhering to research protocols</td>
<td>Desires to contribute to a valid data set</td>
<td>Assesses and plans for constraints of the practice setting; streamlines protocols to minimize impact on clinic operations and teaching</td>
</tr>
<tr>
<td>Understands the need for expert consultation in technical areas for research projects</td>
<td>Desires to be mentored by peers with PBR experience</td>
<td>Discusses and modifies study elements with experienced consultants and conveys any changes to clinic staff</td>
</tr>
<tr>
<td>Understands the need to have IRB approval for research projects</td>
<td>Appreciates the need for human subjects’ protection</td>
<td>Assures eligible patients are enrolled in studies according to IRB-approved criteria</td>
</tr>
<tr>
<td>Understands the importance of building the evidence of primary care</td>
<td>Seeks to advance the science of family medicine</td>
<td>Uses study findings to provide evidence-based patient care</td>
</tr>
</tbody>
</table>

IRB—Institutional Review Board

Table 1

Suggested Practice-based Research (PBR) Knowledge, Attitudes, and Skills for Family Medicine Faculty
lends knowledge of research paradigms, methodology, and study design. They recommended that physicians become skillful at searching MEDLINE-type databases. Correspondingly, “Knowing how to ask and develop the clinical research question is where most people hit roadblocks. They have questions that are poorly defined or too broad in scope to be answered in one project. Lots of studies answer a question we already know the answer to. Research is a long process; before you understand the basic process, you have to understand the basic research question.” Finally, interviewees advised that physicians remain aware of the distinct perspectives that primary care practitioners bring to PBR, such as the feasibility of a study’s implementation and its relevance to patient-centered care.

Supportive Organizational Environment

Several experts emphasized that leaders in clinical practice settings should focus on creating an administrative infrastructure that provides opportunities for clinic personnel to support PBR, stating that PBR opportunities should not be offered exclusively to physicians but should “also involve other people inside the clinic—nurses, receptionists, and others—who show interest in the research, and in issues of organizational culture and environment.” Respondents emphasized that throughout the organization, there should be a mindset that research is important and useful to family medicine and is a good use of physicians’ time. To assist in creating such a culture, some experts advised that leaders host experienced researchers from model programs to relate their success strategies.

What Factors in the Ambulatory Clinical Setting Facilitate the Success of PBR? How have experts succeeded in getting busy practices to commit to and sustain PBR? Success often begins with an enthusiastic PBR champion, usually a physician, who has a “personal burning research interest.” Characteristics of effective champions include enthusiasm, passion, initiative, and reflectiveness. These champions guide their colleagues in developing research questions with clinical relevance to the patient population and of interest to the practice group. This promotes a group understanding that research is useful to patient care.

Through organizational development, PBR champions can foster enthusiasm and commitment on the part of colleagues, administrators, and staff. As one expert told us, “Every practice contains a mix of people. Sometimes it is the doctor or the nurse who is most excited, sometimes it is ancillary staff. But if there is not a team effort, the project won’t work.” A talent for working collegially is important. Said another expert, “Part of the skill we need is working in a truly collaborative way with other people. You have to be open to feedback, modifications, and trusting multiple perspectives. Being inclusive is critical [for success].” Working together as a team, successful PBR practices develop efficient methods to implement research components such as collecting data and protecting patient confidentiality. They focus on streamlining protocols to minimize the research workload and disruption of the flow of patient care. In some cases, a research assistant or designated staff member assumes much of the daily responsibility for the progress of projects within the practice, making the process quick and simple for the other members of the practice community.

What Are the Most Important Barriers to Conducting PBR? There was unanimous agreement among our experts that lack of funding and scarcity of time are the greatest impediments to conducting PBR (Table 3). Clinic personnel are faced with multiple pressures and the primary responsibilities of providing high-quality and cost-effective patient care. PBR can be seen as an added, unfamiliar, and unwelcome chore with little

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### Table 2

<table>
<thead>
<tr>
<th>Major Themes</th>
<th>Definition</th>
<th>Bottom Line</th>
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<tbody>
<tr>
<td>Scope of training</td>
<td>Timing and settings for teaching PBR</td>
<td>PBR training needs to be offered continuously across all levels of the family medicine experience.</td>
</tr>
<tr>
<td>Teaching methods</td>
<td>Strategies for teaching clinicians and staff how to do PBR</td>
<td>The ideal training is participatory and collaborative.</td>
</tr>
<tr>
<td>Essential knowledge</td>
<td>Concepts and theories essential to conducting PBR</td>
<td>Participants must understand critical appraisal of the literature and study design.</td>
</tr>
<tr>
<td>Supportive organizational environment</td>
<td>Presence of expectations for participating in PBR; support for day-to-day priority to conduct PBR.</td>
<td>Foster opportunities to conduct PBR, eg, time, funding, leadership, and a supportive research culture.</td>
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</table>
tangible reward. In addition to lack of financial support and lack of time, additional barriers to PBR include lack of interest, lack of motivation, and lack of PBR knowledge and skills.

Discussion

National mandates call for accelerated scholarly development of family medicine faculty. To contribute to this, our specialty can actively nurture a culture of ongoing inquiry that offers opportunities for continual development of enthusiastic, informed, and skilled physicians who can lead interdisciplinary teams. These teams can both conduct PBR and develop physicians in training as future practice-based researchers. PBR experts recommend comprehensive multi-level training for faculty and for trainees and staff. PBR is in the purview of every person who works in an ambulatory clinic because of the connection between research that takes place in the practice and optimal care for patients and teaching of trainees.

Overall, experts told us that practices that have succeeded in integrating PBR into their daily work have purposively facilitated cultural change in all segments of the practice’s community (including medical students and residents, clinicians, staff, administrators, and researchers). Elements that make for good practice also make for good research. PBR succeeds in clinical settings in which positive relationships are fostered among employees and where there is an atmosphere of moral support and encouragement. Employee stability is encouraged so that turnover is minimal. Personnel work together to understand their practice routines to integrate research within them, targeting time and other resources for most efficient use.

The Future of Family Medicine project calls upon family physicians to acquire competence in skills related to teamwork, collaboration, organizational management, and leadership.1 With these skills, physicians can effectively facilitate interdisciplinary collaborations that encompass patient care, teaching, and research. Clinics engaged in PBR can offer opportunities for trainees (including medical students on clerkships or rotations) to experience pursuit of new knowledge as a central feature of their training, as recommended by Stange et al.20 In a fully integrated PBR clinic, training experiences and discussions about PBR can be offered as developmental opportunities for everyone. Teaching clinics that designate a research director can purposefully integrate that person into their overall organizational structure to maximize opportunities to emphasize the clinic’s research culture.21

Beyond the local practice setting, it is important to continue to enhance PBR skill development opportunities at national meetings and to foster dissemination of PBR findings through publications. Researchers can establish linkages and partnerships, beginning with local colleagues and building toward regional and national connections. It is also important to especially nurture some highly trained researchers as leaders through advocating both skill enhancement and protected time as they develop. In a recent study of outcomes of a primary care research fellowship, family medicine graduates did not achieve academic success comparable to their peers in other primary care disciplines. This disparity was attributed to the lack of protected time for conducting research and sustained scholarship.22

A limitation of this study is that although our table of PBR knowledge, attitudes, and skills was developed with input from our sample of PBR experts, the utility of promoting these attributes to affect PBR still needs to be evaluated. Also, as the nature of research changes, the table will need to be updated to include new information. For example, knowledge, attitudes, and skills related to technology, such as with the electronic

<table>
<thead>
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<th>Major Themes</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Championing PBR</td>
<td>Developing strategies to build clinician and staff interest</td>
<td>Persons in the practice setting must demonstrate passion and enthusiasm for research and choose research questions that are clinically relevant</td>
</tr>
<tr>
<td>Organizational development</td>
<td>Methods for overcoming barriers to PBR in the clinical setting</td>
<td>Promote collegiality and teamwork among clinicians, learners, and staff; recruit, train, and retain staff interested in participating in PBR; streamline PBR protocols</td>
</tr>
<tr>
<td>Barriers to PBR</td>
<td>Problems with the current system that hamper participating in PBR in the clinical environment</td>
<td>Lack of funding and time are the biggest barriers to participating in PBR</td>
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</tbody>
</table>
transmission of data to study coordinating centers, will assume greater importance over time.23

Conclusions
As agreed upon across the specialty and reinforced in residency accreditation guidelines, family physicians must purposefully commit to making a substantial contribution to medical and health systems knowledge through the growth of research and a greater dedication to a culture of ongoing inquiry in family medicine.1 We can accomplish this through the continued development of enthusiastic, informed, and skilled physicians who guide interdisciplinary teams to conduct PBR in primary care clinics conducive to research. These efforts can improve patient care and develop physicians in training as future practice-based researchers. Such an approach has the potential to truly build the science that must underlie and infuse family medicine practice.

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REFERENCES