Essays and Commentaries

Resident Research in Family Medicine: Where Are We Now?

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Increasing the amount and quality of family medicine research has long been a goal of the specialty. The Future of Family Medicine project endorses the generation of new knowledge and promotes scholarship during residency training. Formal training in the principles of research needs to be initiated early to create the cadre of highly trained researchers that will be required to accomplish this goal. Every family medicine residency graduate should have a working understanding of study design, study conduct, presentation of results, and critical analysis of the medical literature. Teaching these research skills in residency is challenging due to time constraints, funding limitations, varying resident interest, and a relative lack of experienced faculty mentors. This paper reviews the existing literature on teaching research to family medicine residents. Program features consistently associated with successfully promoting resident research include faculty mentors, a formal research curriculum, a forum to present projects, technical assistance, dedicated research time, and funding support.

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Since nearly the birth of the specialty, there have been calls to expand the role of research in family medicine. More recently, the Future of Family Medicine project brought renewed focus to family medicine research including endorsement of scholarship training during residency.[1] Still, few family physicians are career researchers, including those with formal research training. Indeed, only 1.4% of medical students graduating from MD/PhD programs from 2000–2006 chose family medicine as their career path—by far the lowest of any specialty.[2] Family medicine graduates of the National Research Service Award (NRSA) Program for Research in Primary Medical Care from 1988–1997 were significantly less likely to be researchers or to teach research than were NRSA awardees from other specialties. Only 12.5% of the family medicine NRSA graduates were publishing one or more paper per year compared to 43.1% of general internal medicine graduates. Almost one third of the family physician graduates had not published at all.[3]

Recent years have seen efforts to expand the specialty's research capacity and encourage more family physicians to participate in the generation of new knowledge.[4-6] A consensus has grown that to achieve these goals, residents need to be exposed to the principles of research early in their training. Recently, Carek and Mainous called on all training programs to mandate completion of research or a quality improvement project leading to a presentation or publication as a requirement for graduation.[7]

The Accreditation Council for Graduate Medical Education (ACGME) requires that scholarship occur in all training programs and recognizes research as an effective way to demonstrate core competencies such as practice-based learning and improvement. The Residency Review Committee for Family Medicine now states that every resident must participate in scientific inquiry.[8] The Review Committee does not mandate the level of participation that is required, nor specify in detail the skill set graduating residents should possess. Whether or not scientific inquiry should be interpreted narrowly as original research generates considerable debate among family medicine educators.

Some educators maintain that requiring anything less than participation in research waters down the educational experience in scholarship. These educators emphasize the importance of tacit research experience to develop better clinicians, educators, and researchers within the specialty. Others allow

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quality improvement projects as well, which often use the same scientific methods as research.

Those favoring a broad range of possible activities point out that some residents are very resistant to, even intimidated by, the idea of research. These educators emphasize that few graduates will become professional researchers and question the value of forcing all residents to be involved with ongoing research. Ryan et al raised the concern that requiring research of residents is unjust because of a lack of faculty mentorship and training.[9] As of 2005, only 31.4% of US family medicine residency programs had a resident research requirement.[10]

There has also been concern that a research requirement may negatively affect recruiting into the specialty because students with an interest in research are less likely to go into family medicine.[11] In a study of 1997–1999 graduating medical students, one of the strongest predictors of an interest in family medicine was a lack of interest in research.[12] On the other hand, Carek et al found no evidence that a research requirement had a negative effect on family medicine programs' Match rates.[10]

There is some evidence that mentoring students in research may actually attract students to the specialty. The University of Utah Department of Family Medicine has an optional paid research experience for students. From 1994 to 2001, 33% of students going through this program matched into family medicine, compared to 22% of all University of Utah graduates.[13] Similar results were noted at the University of New Mexico, where student research is required. Those students involved in women's health research projects were more likely to match into specialties with a women's health component.[14] Of course, these observations may represent a student's predisposition toward a given specialty.

Types of Scholarship

One way of approaching the question of what scholarship to teach residents uses Boyer's paradigm. Boyer described four distinct types of scholarship: the scholarships of discovery, application, integration, and education.[15] The scholarship of discovery is producing new knowledge through traditional research. The scholarship of integration is taking knowledge from varied sources and viewpoints and connecting them in new and meaningful ways. The scholarship of application is translating knowledge into practical uses. Finally, the scholarship of teaching involves successfully communicating knowledge to learners.[16]

Clearly, each of these four types of scholarship is important to family medicine and each is an area worthy of pursuit by residents. However, it is important to recognize that the scholarship of discovery remains primary and is a prerequisite for the other three types of scholarship. Without the knowledge gained through the scholarship of discovery, there is nothing to apply, integrate, or teach. Graduating family medicine residents need to understand the fundamentals of the scholarship of discovery (ie, research) if they are to critically read the medical literature, make sound judgments about the relevance of new knowledge, and to use that knowledge appropriately. If there is consensus that all family physicians should be involved in some form of scholarship, then all graduates need to have a strong educational foundation in research.

Teaching Residents Research

Once it is understood that the principles of research need to be taught to family medicine residents, educators must ask themselves what needs to be taught and how. There is considerable variation between programs in how research is taught to residents, both in quantity and in method. The American Academy of Family Physicians (AAFP) has a comprehensive guide to what residents should be taught about research and scholarship.[17] This curriculum guide encompasses or surpasses the breadth of skills and knowledge contained in the research curricula that have been published in family medicine and other specialties.[18] The AAFP recommended curriculum is broken up into several sections: attitudes, knowledge, skills, and advanced skills. Most components related to the scholarship of discovery fall under the advanced skills section. These include: formulate a research question, design a study, collect and analyze data, evaluate and discuss findings, write a research paper, and make a presentation.

Direct involvement in research gives residents the greatest tacit understanding of the process. The more aspects of the research process in which they are involved, the greater the educational experience. The resident that collects a small amount of data in a large multicenter trial clearly ends up understanding the realities of research better than the resident whose scholarly education is centered only on reading and critiquing articles in journal club. Those residents who, alone or in collaboration, decided to design and conduct their own research projects will get the best educational experience.[19]

While it is desirable for residents to conduct original research, the pitfalls of this route need to be acknowledged and avoided. One of the most common mistakes residents make when undertaking their own research is to tackle a project that is too large.[20] It is important to balance the educational benefits of residents conducting their own research against the realities of residency training: limited time, resources, and inexperience. A positive experience for a novice researcher starts with a well thought out, focused research question. The FINER criteria are often used to

analyze the merit of potential research questions.[21] Table 1 suggests further modification to the FINER criteria when applied to potential resident research.

Facilitating Resident Research

Some published studies have looked at educational outcomes related to teaching residents how to do research. Much more work has been done trying to identify features associated with successfully promoting family medicine resident research. Until sufficient research with educational outcomes is produced, resident productivity and level of research program development can be used as reasonable surrogate outcome measures. When this literature is reviewed, several common features of programs that are more successful at teaching residents research have been found.[7]

Faculty Mentoring and Support

A strong local proponent for research is perhaps the most important factor for promoting resident research and for ensuring a satisfying experience. Support and role modeling send the message that research is valued within the program. Program director support is needed and a notable feature of departments with highly developed research programs.[22]

Residency programs with experienced research mentors are more likely to have high overall research productivity.[23] One-on-one mentoring is instrumental in bringing resident research to completion.[24] Grzybowski showed that additional faculty mentoring can increase the number of resident research projects accepted for publication, even projects that were previously abandoned.[25] Unfortunately, community-based programs often lack research mentors within their institutions.[26]

Lack of local mentoring is one of the most-often cited, and most legitimate, arguments against requiring all residents to participate in research.[9] Attempting to conduct research without proper mentoring is frustrating and likely to be unsuccessful. Programs without qualified faculty should strongly consider developing collaborative relationships with programs where expertise is available. These programs may also choose to tap into an existing pool of expertise by joining a practice-based research network (PBRN). The Association of Family Medicine Residency Directors and the North American Primary Care Research Group have recognized lack of local mentoring as a barrier to resident research and

Table 1

The FINER Criteria as Applied to Resident Scholarship

	Considerations	*Resident Scholarship*
Feasible	• Population. Will you be able to recruit enough subjects to fulfill the sample size analysis? • Time. Can the project be completed in a reasonable time frame? • Funding. Can you obtain enough funding to support the project? • Expertise. Is special knowledge or skill needed and available? • Resources. Do you need to purchase or rent special equipment or facilities?	• Simple study designs are preferable for educational purposes. • Studies requiring less time, less resources, and less money are more likely to be completed. • The population should be one regularly encountered by the resident. • Collaboration with other learners or faculty will lessen the workload, spread the educational experience, and increase the chances of completion.
Interesting	• Is the investigator interested in the question? • Would others be interested in the research question? • Will the results be publishable?	• The resident's interest in the question is much more important than the interest of the wider medical community if the project is to be completed.
Novel	• Has this question been answered before? • How will this study be different from previous studies?	• Novelty is less important. • Simply validating a previous study, within the resident's patient population, may be acceptable if it teaches the principles research.
Ethical	• Does the benefit of answering the research question outweigh any risks to the subjects? • Can an adequate plan be made for minimizing risk?	• Any potential risk to patients must be properly balanced against the educational needs of the learner. • Grossly under-powered or under-funded projects should not be conducted if it involves risk.
Relevant	• Will the results be a valuable addition to medical science? • Will the results be generalizable? • Will the results be patient-oriented evidence that matters?	• The educational experience is the most relevant part of the project. • It is less important for the results to be generalizable or to add to medical science. For example, a PI project may not be applicable outside the department. • Ideally, the results will still be patient-oriented evidence that matters.

The left column presents some questions that need to be answered when determining the strength of a research question. The right column lists some additional considerations when applying the FINER criteria to resident scholarship.

are committed to partnering with programs to help provide access to research mentors.[27]

The Society of Teachers of Family Medicine Research Committee is currently focused on how to support residency faculty who are teaching research, especially those based in community programs with little research infrastructure. This focus resulted in the formation of the Group on Teaching Research in Residency, a group that has expanded to more than 200 members in less than a year and is building a large database of research resource materials contained on the the Family Medicine Digital Resources Library Web site.[28]

Formal Research Curricula

Almost all programs with highly developed research programs have formal curricula.[22] Most published curricula are longitudinal in nature and include lectures, seminars, and dedicated mentors.[18] The literature suggests a mixed picture of the long-term outcomes of a formal curriculum. Canadian graduates from programs with formal research curricula were more likely to report that their residency research project was a positive learning experience.[29] Smith found evidence that graduates of programs with formal curricula had a greater appreciation for research and were more likely to conduct Medline searches. Graduates of programs with formal curricula were no more likely to publish or conduct research after graduation.[30]

Improving critical appraisal skills is one of the most commonly named objectives of research curricula,[18] and most curricula have a mechanism to teach critical appraisal skills.[30] These skills are often taught through journal clubs or didactic lectures. Yet, more than 60% of University of Toronto family medicine graduates reported not being well trained in critical appraisal of the medical literature despite a curriculum that included this subject within its requirements.[31]

Required involvement in research is one of the most common features of published curricula.[18] DeHaven and Wilson wisely point out that participation in a research project must not be the curriculum. Instead, it should be the culmination of a diverse educational process.[32] Canadian graduates who successfully completed a research project during residency felt more confident with their ability to conduct research in the future. These graduates also participated in more research projects after graduation.[29]

Forum to Present Projects

Residencies with a highly developed research program make sure residents have a forum at which to present their projects.[22] The venue is often in the form of a local research day. The South Carolina Area Health Education Consortium has furthered this concept by giving scholarly presentations at a retreat held at a vacation resort. This adds incentive for residents to have a quality project to present if they are to earn a spot at the retreat.[33] Many programs post evidence of success such as published papers or posters in highly visible locations. Presenting at any level of professional meeting represents a tremendous opportunity to network, build confidence, and stimulate continuing engagement in research. Many regional, national, and international conferences, such as the AAFP National Conference of Family Medicine Residents and Medical Students, reserve spots for resident research to be presented.

Technical Support

Statistical expertise, administrative assistance, editorial assistance, and other forms of technical support are important for all researchers, especially for the success of novice investigators. Among 11 research infrastructure characteristics, employment of a research professional was the only item found to be positively associated with productivity in both large and small residency programs.[34] DeHaven found professional technical support to be a nearly universal feature of highly developed research programs.[22] Unfortunately, community-based programs are less likely to have access to this professional help.[26]

Dedicated Time for Residents and Faculty

Having at least some faculty involved in research is important to act as role models and mentors and to generate an atmosphere conducive to scholarship. The existing literature suggests that individual faculty members need 40% or more protected time for successful research productivity.[35] Unfortunately, few family medicine faculty have protected research time. A mean of only 1.5 faculty members per medical school-based residency program have more than 50% of their time protected for research. Almost no faculty members in community-based programs have this amount of dedicated research time.[36]

Similarly, dedicated research time for residents is an indispensable factor in developing a productive resident research program.[18,22] Lack of time is often cited as a reason for not participating in or completing research. The University of British Columbia (UBC) family medicine residency program has long had a broadly defined research requirement. A survey of graduates from 1990–1997 found that a perceived lack of time was the most common reason why residents did not attempt to publish their projects.[25] In a separate survey of UBC internal medicine residents, lack of time was listed as a factor in 68% of incomplete projects.[37] Less than half of the residents of Wisconsin family medicine programs reported being given time to conduct research in 1992.[38]

Funding

Family medicine research is under-funded relative to other specialties.[39] Mills found that less than half of family medicine residencies had active grant funding, and less than 20% had active federal grants.[23] Lack of funding limits the amount and type of projects that residents will be able to pursue. Financial considerations are one of the most frequently cited barriers to implementing a research curriculum.[18] Only 11% of residents of Wisconsin programs in 1992 reported the availability of funds for research.[38] Only 32% of Ohio family medicine residents surveyed in 1998 reported having funding available for research. Some successful programs have assigned personnel to help procure funding for resident research.[40]

Create a Culture of Inquiry

In 2001, Stange et al called for the creation of a culture of inquiry within family medicine.[41] The introduction to this culture should begin early in residency, when research interest is greatest.[39, 42] Making research a routine, expected, manageable part of the daily life of a family physician is vital to creating such a culture. This requires faculty to discuss research in front of, and with, residents regularly. Integrating research discussions into all educational forums is a feature of residency programs with positive research cultures.[22]

Conclusions

Family medicine graduates should be well versed in the principles of scholarship. This will allow them to critically evaluate the medical literature, provide better quality care to patients, and participate in the production of scientific knowledge. The best way to fulfill this vision is to have every family medicine resident participate in the scholarship of discovery. This goal will not be easy to achieve since there are several significant hurdles to resident research participation.

The great majority of the investigation on teaching residents research has been conducted through survey methodology or reports describing implementation of various interventions at one residency program. Rigorously designed, prospective studies with true educational outcomes will need to be done to more definitively conclude the best methods of teaching family medicine resident research knowledge, attitudes, and skills. In the meantime, educators should strive to include those features that are positively associated with resident research productivity into their own programs.

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