ACCP COMMENTARY

The Importance of Research and Scholarly Activity in Pharmacy Training

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Regardless of practice setting, it is imperative that pharmacists be able to either participate in generating new knowledge or use the ever-expanding body of literature to guide patient care. However, competing priorities in Pharm.D. curricula and residency training programs have resulted in limited emphasis on acquiring research and scholarly skills. Factors likely contributing to this reduced focus include the lack of curricular and postgraduate training standards emphasizing the development of research skills, time to commit to scholarly activity, and accessibility to experienced mentors. Strategies for increasing scholarly activity for pharmacy students and residents should therefore continue to be a focus of professional degree and residency training programs. Several resources are available for academic planners, program directors, and institutions to augment scholarly experience for pharmacy trainees and clinicians. This commentary highlights the importance of providing research opportunities for students and residents, describes the potential barriers to these activities, and provides recommendations on how to increase the instruction and mentoring of trainees to generate and use research.
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Creating and disseminating new knowledge to guide patient pharmacotherapy and optimize medication use are key elements of clinical pharmacy.[1] The importance of clinical pharmacists' engagement in both practice-based and extramurally funded research has been well described.[2–8] Clinical pharmacists begin learning fundamental skills during school and continue to develop these skills through postgraduate training programs, continuing education, and professional organization involvement. However, competing priorities in Pharm.D. curricula and residency training programs have resulted in standards that potentially reduce the time and focus on developing research and scholarly skills. The result is a growing interest in developing strategies for professional degree and residency training programs to enhance pharmacists' interest and engagement in high-quality research and scholarship.[9]

This commentary highlights the importance of providing research opportunities for students and residents, describes the potential barriers to these activities, and provides recommendations on how to increase the instruction and mentoring of trainees to generate and use research.

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Background

The complexities of contemporary clinical practice increasingly require clinical pharmacists to interpret, use, and communicate published research findings.[2, 10, 11] Moreover, regardless of practice setting, it is crucial that clinical pharmacists participate in generating new knowledge to guide patient care.[12, 13] Thus, our profession strongly needs to promote involvement in high-quality, practice-based research.

The Accreditation Council for Pharmacy Education (ACPE) recognizes the importance of faculty conducting research and encourages electives that engage students in faculty research programs. However, although ACPE emphasizes the importance of literature evaluation skills, its standards provide no other direction on research training for students.[14] Similarly, the American Society of Health-System Pharmacists' (ASHP's) residency training standards for postgraduate year one (PGY1) programs provide wide latitude for achieving goals related to improving patient care or the medication use system through a quality improvement or research project, but they have no requirements for offering research training or disseminating resident project findings through peer-reviewed publications.[15, 16] Both resident research quality[22] and publication rates[9] have been described as low. Although a resident's research confidence and self-reported abilities improve after residency, objective measurements of research knowledge and skills are poor.[17–20] The opportunity to enhance the research and scholarly skills of both pharmacy students and residents is tremendous. Students and residents are trained in areas that are foundational to research such as literature evaluation and clinical trial design, yet not all individuals have opportunities for formal research training, mentoring, or application of these skills through developing and completing research projects.

Research Training Benefits

The 2016 ACCP Research Affairs Committee believes that research and scholarly training and experience provide important benefits to trainees, mentors, and their institutions. These benefits are summarized in Table 1.

Trainees gain many immediate benefits when meaningful research projects are incorporated into their training. For example, students and residents can support their mentors' research projects by completing tasks, implementing protocols, or studying interventions or current processes. Indeed, depending on their experience, skill level, and training, students and residents can conduct or assist in most parts of the research process, including literature searches, project design, institutional review board (IRB) applications, project management, data collection, manuscript drafting, and implementation of the practice changes acquired from study results. These activities promote the immediate development of critical thinking skills, time and research project management abilities, and proficiency in collaboration and teamwork. A research project (including quality improvement projects or drug use evaluations) that is intentionally formulated to provide trainees the opportunity to develop a systematic, scientifically sound approach to testing a hypothesis, evaluating data, and disseminating findings promotes research and scholarly training and interest.

Trainees also gain many long-term benefits from incorporating meaningful research experiences during training. Participation in research experiences offers trainees an opportunity for professional growth, differentiation, and competitiveness as candidates for postgraduate programs. Moreover, participation fosters trainees' future commitment to advancing the profession through research. As these well-trained individuals advance in their careers, the expanded critical mass of researchers who can in turn cultivate these skills in other trainees and peers leads to exponential growth of this valuable skill set (Figure 1).

The benefits of research participation also translate to mutual benefit for the mentors and the respective programs and institutions when such research is aligned with the mission and goals of their institution. A culture of research thereby promotes growth among practicing clinical pharmacists. This culture then expands the amount of research performed at their institutions, which in turn expands research networks, promotes collaboration, and enhances institutional marketing as the work is disseminated. When trainees are fostered to appreciate this culture of research, researchers are provided an opportunity to develop mentoring skills and share knowledge. As the culture of research builds the institution's reputation, programs and institutions attract more highly qualified individuals, further advancing researchers' reputations both inside and outside the profession.

Table 1. Benefits of Research Experiences in Pharm.D. Curricula and Residency Training Programs

1. Improve Critical Thinking Skills
Research can improve a trainee's ability to search, interpret, and communicate published research findings. It can also assist with identifying gaps in the current body of knowledge, generating research questions to investigate, and solving complex problems encountered in clinical care.
2. Build Foundational Research Knowledge and Experience
Research requires many practice hours to become an expert. Early research experiences can help trainees develop habits and a foundation that will help them during future research projects.
3. Increase Interest in Future Research
Successful completion of a research project may profoundly affect a trainee's career path and future pursuit of research training and experiences. Research completed while in training may create a desire and avenue for future scholarship.
4. Develop Time and Research Project Management Skills
Trainees must be required to balance research responsibilities with other projects while in a supervised environment in order to successfully balance projects independently. Trainees are provided working examples of how to achieve this balance through preceptors and mentors.
5. Increase Collaboration and Teamwork Skills
Research is a practice that is rarely completed alone. Experiences as a student or resident introduce the trainee to collaboration with others on research as a primary investigator or coinvestigator.
6. Increase Opportunities to Interact with Inspirational Mentors and Experts
Opportunities for research-related oversight, feedback, and mentorship during training are likely greater than at any other time during the clinical pharmacist's career and provide an opportunity for developing mutually beneficial relationships.
7. Build and Develop an Appreciation for the Importance of a Research Network
Engaging in research may help trainees learn how to identify individuals from other disciplines, including statisticians, basic scientists, outcomes researchers, and experts in grant writing and budget development, who will be instrumental in future research success.
8. Create Effective Research Mentors for Future Students and Residents
Research experience during pharmacy training helps break the vicious cycle of clinicians who are inadequately equipped to train and mentor future generations of practice-based researchers.
9. Provide a Supervised Experience with the Publication Process
Publication can be an intimidating process, and it has many unwritten rules. Guided practice will help a trainee gain a true appreciation for the etiquette, process, and time required to move a research project from idea to publication.
10. Help Schools and Pharmacy Departments Fulfill Their Research Mission and Goals
Trainees can help fulfill research goals for their institution while gaining a valuable skill set from the experience.
11. Increase Marketability
Scholarly activity increases the marketability of the trainee, mentor, department, and institution.
12. Benefit the Profession and Medical Community
Clinical advances resulting from research help improve the care of patients and assist in developing new roles and practice models for clinical pharmacists.

Factors Affecting Scholarly Activity Among Pharmacy Trainees

Despite the many benefits of being involved in research, several factors likely contribute to the limited emphasis on research and scholarly training for clinical pharmacists. These items are summarized in Table 2. Of note, many of these barriers can be overcome by taking the actions outlined in the table.

Collectively, the potential barriers are likely important factors in the low rates (4–17%) of peer-reviewed publication for pharmacy resident projects.[21–27] These data can in turn be extrapolated to students, with the assumption that the same barriers are present for students' involvement in research. Time constraints, particularly with obtaining IRB approval, as well as lack of understanding of the publication process, limited mentorship, and lack of interest in a residency project are cited as common barriers to successful publication for pharmacy residents.[27, 28]

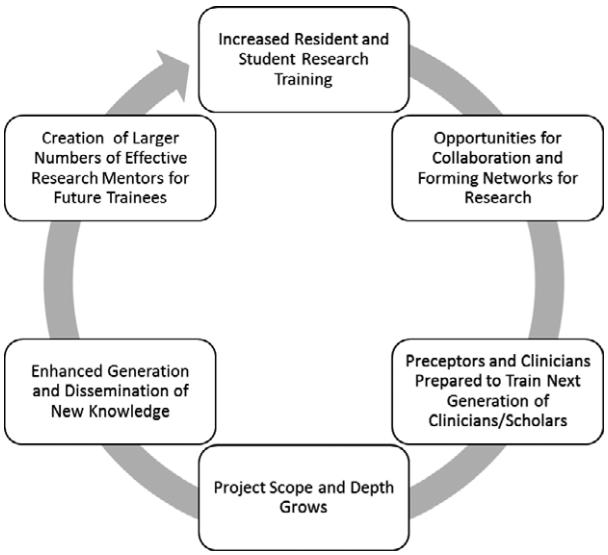

Figure 1. Cycle of benefits in promoting research and scholarly activity for pharmacy learners.

Table 2. Limiting Factors and Proposed Solutions for Research Experiences in Pharm.D. Curricula and Residency Training Programs

Limiting Factors	Proposed Solutions
Time constraints (particularly with obtaining IRB approval)	Perform a feasibility assessment before initiating the project. Ensure that the project scope is doable during an academic year or residency program and that the data needed are accessible.
Lack of knowledge of the publication process	Seek an experienced collaborator and mentor at your institution or another institution, when appropriate. Use resources provided by professional organizations.
Limited mentorship for the trainee	Adopt a culture and commitment to student and resident projects. Develop a timeline, and schedule for meetings that provide the trainee with adequate mentoring.
Lack of trainee interest in a project	Provide a list of projects that trainees may select from so that they may choose one that meets their interests. Solicit opinions from trainees about their specialty areas of interest, and jointly develop project ideas that align with their interests.
Lack of perceived benefit associated with publishing	Reference this document, which highlights the benefits of performing and publishing research for the trainee, mentor, and institution.
Selection of a project unsuitable for publication	Select a project that is a unique contribution to the literature or that addresses a current patient care issue. Design the study with sufficient scientific rigor, including an adequate sample size, to address the hypothesis. Collaborate with more experienced researchers to ensure sufficient scientific rigor.
Financial constraints for statistical support or publication fees	Seek an experienced collaborator at your institution or another institution with this skill set who would not charge a fee. Investigate free university resources. Select journals that do not charge publication fees. Work with your institution to budget for a specified number of projects per year.
Trainee departs without completing manuscript development	Establish project completion and manuscript submission as necessary criteria to complete the residency program. Develop an agreement and timeline to complete the project post-training. Design the project timeline to be completed by the mentor or the next resident or student.
Manuscript rejection	Provide adequate mentoring for the trainee to work through the manuscript rejection process. Modify the manuscript, and submit it to another journal. Select a journal with an appropriate audience for the theme of the research.

IRB = international review board.

Moreover, in non-academic medical centers or community pharmacy residency programs, less emphasis or perceived benefit may be placed on publishing research, further supporting the need to promote the culture of research outlined in the previous section.[29]

Enhancing Research Involvement

Establishing formal research training within pharmacy curricula and residency programs can facilitate trainees' successful completion of meaningful research experiences.[7, 29] Colleges of pharmacy and residency programs might consider implementing varied strategies to provide research training. Research electives, summer camps, field experiences, internships, active learning–based projects, capstone experiences, and research tracks have all been implemented in pharmacy curricula to offer research training to student pharmacists.[2, 6, 8, 30] For example, faculty at the University of Tennessee designed a 2-credit elective class that provided early clinical research exposure to second-year pharmacy students. This course emphasized study design, ethical and regulatory considerations, clinical research protocol development, data analysis, and manuscript preparation and submission. Each student was required to deliver a 15-minute platform presentation. This course generated positive student comments such as "should be a requirement for anyone planning to do a residency after graduation."[31]

For residents, both PGY1 and PGY2 programs have implemented strategies such as longitudinal research experiences and residency research advisory boards to enhance training, knowledge, and attitudes and to improve rates of research completion, publication, and presentation at meetings.[3, 7, 17] A unique practice-based research training network in the Ohio State University's

multisite community and ambulatory pharmacy residency program doubled its resident publication rates by coordinating and using the combined expertise and experience of the faculty members and preceptors.[29] Similarly, the University of Georgia College of Pharmacy reported an increase in resident authorship rates with the development of a writing program that stimulated collaboration with residents and translational research faculty.[4] Authors noted that resident participation in this program cultivated scientific manuscript writing, improved time management skills, and fostered new collaborative efforts with doctoral graduate students. Development of a residency research advisory board at a VA hospital resulted in an increased number of published manuscripts and abstract presentations at professional meetings.[3] The main components of these published programs are mentor oversight and development of a research training curriculum that can be replicated.[17, 29] Smaller programs without rich research resources have successfully partnered with larger institutions, and national organizations have plans to offer such experiences on a broader scale in the future.[32]

Many avenues are available for disseminating the findings from trainees' research. Of note, the peer-reviewed journal *AJHP Residents Edition* represents a new option for publishing the findings from residency research or rigorous quality improvement projects.[33] *INNOVATIONS in Pharmacy* is a peer-reviewed, web-based journal that regularly publishes research conducted by student pharmacists, residents, and graduate students.[34] Regional residency research programs, state and national meetings, and virtual events (e.g., ACCP Virtual Poster Symposium) also provide trainees the opportunity to present their research results through poster and podium presentations.

Developing well-trained mentors is important in expanding research opportunities for trainees. Several resources are already in place within pharmacy organizations to enhance investigator research skills and implement research training programs. ACCP offers several training programs to develop the research skills of clinical pharmacists, including the Focused Investigator Training (FIT) Program, Mentored Research Investigator Training (MeRIT) Program, and Research and Scholarship Certificate Program.[35, 36] The ASHP Foundation's Research Boot Camp also helps new pharmacist-researchers develop their research skills.[37] The National Association of Chain Drug Stores Foundation's Faculty Scholars Program educates junior faculty about effective and meaningful community pharmacy–based patient care research.[38] These programs make access to research mentoring attainable for most clinical pharmacists.

Grant and scholarship programs are also available through national and state pharmacy associations to support mentor and trainee efforts, including the ACCP Research Institute Futures Grants and the American Pharmacists Association Foundation's community pharmacy residency incentive grant program.[39, 40] The ASHP Foundation offers several annual opportunities such as grants in New Investigator Research, Practice Advancement Demonstration, Pharmacy Resident Practice-Based Research, and Master's Residency Practice-Based Research to foster young investigator research.[41] In addition, travel grants such as those offered by the ACCP Student Travel and PRN Travel Awards programs provide funding to support trainee travel to present research at the ACCP Annual Meeting.

Conclusion

Securing the involvement of clinical pharmacists in creating and disseminating new knowledge to improve patient care and advance practice is a key obligation to our future as a profession. To meet this obligation, it is crucial that greater numbers of clinical pharmacists actively engage in this process. ACCP continues to advocate for the involvement of students and residents in high-quality research training programs that encourage a rigorous scientific approach and a commitment to disseminating results. Residency program directors and pharmacy leaders should engage other pharmacy organizations, accrediting bodies, and institutions to continue developing strategies to train students and residents in scholarly and research activities.

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