**Integrating Learners into Research & Quality Improvement Projects**

***A Joint Opinion of the Adult Medicine and Education and Training Practice Research Networks of the American College of Clinical Pharmacy***

**Running Title (<40 characters):** Integrating Learners into Research

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**Category:** PRN Opinion Paper

**Acknowledgements:** N/A

**Conflict of Interest Statement:** TDS, JG, ANI, KK, SAN, JAS, LH, MLH have no conflicts of interest to declare.

**Key Words:** research, quality improvement, pharmacy student, pharmacy resident, pharmacy learner

This paper represents the opinion of the Adult Medicine and Education and Training Practice and Research Networks of the American College of Clinical Pharmacy. It does not necessarily represent an official ACCP commentary, guideline, or statement of policy or position.

**Abstract (300 Word Limit; currently: 158 words)**

Research plays a vital role in advancing the pharmacy profession and improving patient care. It is a fundamental skill for learners to develop during their training under guided mentorship. Incorporating learners into research and quality improvement (QI) projects can yield countless benefits for the learner, mentor, and institution. Despite this, there are barriers to integrating learners into research and QI projects which may stem from institutions and individuals. To ensure success when engaging in the research process, strategies centered around clear communication and illustrating the value should be implemented. Successful research programs require strategic planning, setting clear expectations, providing mentorship, and remaining adaptable to overcome barriers encountered during the process. The purpose of this paper is to provide both mentors and learners a blueprint for success in research endeavors, including resources to effectively navigate planning and execution, as incorporating learners into research offers mutual benefits and should be embraced as a valuable learning opportunity for all parties involved.

**1. Prevalence and Scope of Learners in Research (3,500 Word Limit; currently: 3,256 words)**

Research is vital to the evolution of the pharmacy profession, including but not limited to advancement of evidence-based medicine, pharmacy services, and the education and training of pharmacy students and postgraduate trainees.1-6 In training future pharmacy researchers, pharmacists must be intentional with incorporating learners into the research and scholarship process. The infusion of learners into the research process can positively impact not only the learners, but also their mentors, patients, institutions, and the pharmacy profession.7-9 However, we often do not prepare our learners to be research-ready due to challenges incorporating learners into the research process.6-8,10-15

Barriers impacting integration of learners into research stem from the academy, mentors, and learners themselves. Systemically, integrating learners into research is a lower priority for many schools or colleges of pharmacy and postgraduate programs, as the primary emphasis is training practitioners to deliver patient care.1,2,6,12,13 With evaluation of curricular hoarding, priorities are being evaluated and some institutions are putting less of an emphasis on learner engagement in research.

As pharmacists and mentors see the prioritization of patient care, this can impact motivation to provide research opportunities.6,11-14 Additionally, without research requirements in their roles, the lack of time, resources, or incentives may inhibit research mentorship participation.8,11-16 Other potential mentors may not be confident in their own mentorship, research, and publishing abilities, impacting their participation or the success of a project.11,12,14

For learners, the motivation to participate in research can be impacted by institutional support, but also by real or perceived barriers before or during the research process. Many learners may not feel prepared in research design, data analysis, or medical writing. While these skills can be developed within their research experience, the challenge may impact motivation to seek or maintain research involvement.6,11-15 Another barrier to the incorporation of learners, specifically student pharmacists interested in research, can be familiarity with new practice sites, which would require additional training on the electronic health record, policies, formulary, or practice approaches, prior to integration into a research project.9 While these are not inhibitors of engagement, these extra requirements may result in larger barriers for entry into research experiences. Furthermore, completion of research or scholarly dissemination may be impacted when learners complete their education and training or transition to new roles.12-14 A final barrier for practicing pharmacists and trainees may be rejection of submitted scholarly projects to peer-reviewed journals.12-14Cumulatively, these individual and system barriers prohibit ready access of learners and mentors to shared research experiences that will build skills and ultimately advance patient care and pharmacy practice.

A lack of structured research requirements in PharmD and residency programs, alongside barriers outlined above, results in varied research opportunities and exposure for pharmacists newly entering the workforce. The Accreditation Council for Pharmacy Education (ACPE) 2016 standards include research design as a component of the core curriculum; however, few schools require students to formally participate in research projects.1,13,17 Additionally, the American Society of Health-System Pharmacists (ASHP) accreditation standards state residency programs must provide the opportunity to “demonstrate the ability to evaluate and investigate practice, review data, and assimilate scientific evidence to improve patient care and/or the medication-use system.”18 The standards do not dictate that all residents complete a research project, nor do they provide programs the framework for a research curriculum. The lack of robust, formalized research programs in residency training is highlighted by low levels of publication rates for pharmacy resident projects.14,19-22 Variability in experiences likely contributes to low levels of participation and lack of structured research opportunities and development for pharmacy learners and mentors.

**2. Utility and Benefits of Participation in Research**

Pharmacy learners face enormous complexities with contemporary pharmacy practice. Thus, it is imperative that learners are equipped with the tools and skills necessary to identify, evaluate, communicate, and contribute to research findings as part of an evolving knowledge base.6 Participating as a student can provide a foundation to refine these skills during postgraduate training. Certainly, pharmacy organizations and accrediting bodies consider research a valuable means to advance clinical pharmacy practice and education and, although strict guidance is not provided, it is a requirement in accreditation standards.1,2,23,24 Research training can provide immense value and incentives to not only the learner, but the mentor leading the process as well as the institution (Table 1).

From a learner perspective, engaging in research and quality improvement (QI) projects helps build foundational research knowledge and skills early in their training. This develops and improves critical thinking and clinical reasoning skills.6,7 Highlighting the importance of evidence-based practice is beneficial regardless of future practice setting.7 Furthermore, learners may benefit from the modeling and refinement of essential skills including time and project management, collaboration and teamwork, and future mentorship.6 Finally, learner involvement in the research process can develop interest and comfort in future research participation.6 Devoting the necessary time, critical thought, and resources required from project conception to deliverables (e.g., poster and/or publication) is critical as many of the intricacies and etiquette during the process can be unclear or unknown.

Aside from the skillset and interest gained by learners participating in research or QI projects, many tangible benefits may also manifest. Learners may obtain credit hours for research electives or activities offered by their school or college of pharmacy, while others recruit student researchers via paid internship programs that involve research skill development.25 Research experience has also been shown to provide benefits for students seeking postgraduate training, including increased likelihood of obtaining invitations for pharmacy residency interviews.7 Furthermore, participation in robust research experiences and programs has been associated with improved residency match rates as well as attainment of other postgraduate training programs.17,26

The ASHP Competency Areas, Goals, and Objectives (CAGO) require that residents participate in a practice-related project or research project, which serves as a mechanism to begin or expand the development of research skills in residents; however, the guidance to achieving this goal is not clear and programs offer varying levels of support and training.18,27 Although there is less literature to support the influence of research training on professional development following residency, participation in research helps advance patient care and the profession.6 Formal research training during residency programs has been linked to increased confidence in statistical analysis and critique of the literature, which are essential skills for practicing pharmacists.28,29 A strong residency research experience may increase future publications, expand the pool of experienced pharmacists who can train future researchers and create a larger network of pharmacists involved in research.6,30 For residents pursuing opportunities in academia, strong training in clinical research or scholarship of teaching and learning (SoTL) may better prepare new faculty members to successfully meet the expectations for all pillars of their role.31

Unfortunately, benefits afforded to research mentors and sponsoring institutions are less rigorously studied in pharmacy literature. Limited studies published in peer-reviewed journals directly address absolute differences in scholarly output between pharmacists working with or without learners. Furthermore, such an assessment may not be feasible given the nature of pharmacy practice or academia and the ability to network and collaborate with researchers of varying levels of expertise. However, a systematic review of mentoring in academic medicine indicates that mentorship, in general, is associated with improved research productivity and receipt of grants.32 Formal mentorship with experienced pharmacists is not always necessary to improve access to research experience and scholarly output for trainees. A near-peer research mentoring program yielded multiple co-authored posters at national conferences with nearly 30% leading to peer-reviewed publications, in addition to $58,000 of grants disbursed over the study period.33 In the near-peer mentoring model, senior learners could develop their communication, facilitation, and management skills through the near-peer research relationship. Similarly, perceived research and communication competence were highly correlated in a survey of pharmacy mentors and trainees, proposing a strong link between these professional skills.34

While complex relationships exist between burnout and professional activities, research and mentorship may provide an opportunity for clinicians to address burnout.35 Specifically, if research and mentorship align with the interests of the mentor, these activities that promote autonomy, self-efficacy, self-actualization, and recognition have been shown to safeguard against professional burnout.36,37 On the other hand, having to balance multiple additional responsibilities may contribute to burnout.36 Mentorship in research can be a beneficial experience but requires the mentor to have resources and bandwidth to commit towards this and other responsibilities.

Finally, support of pharmacy research may extend benefits to partner healthcare institutions, as many student projects and accredited pharmacy resident projects may incorporate a quality improvement model, thus providing clinical or administrative return-on-investment for the institution.1,2,38,39 Medication use evaluations, QI projects, and clinical service research projects all have the potential to justify services expansion, formulary changes, or other investment into pharmacy services. Local institutional and health-system impacts can be realized without the need for a formal peer-reviewed publication, addressing concerns of low student and resident research publication rates cited by some studies.17 Furthermore, schools or colleges of pharmacy may benefit from learners completing SoTL or QI projects as this may spark pedagogical innovation, transform institutional policy, facilitate advances in curricula and assessment, and provide supporting evidence to share during the accreditation process.40 Overall, multiple benefits may exist to not only the learner, but the mentor and institution when incorporating learners into research and QI projects.

**3. How-to Steps and Tips**

*3.1 Setting up a successful research program*

“Beginning with the end in mind” is important in everything we do. Research is no different; planning and setting up for success can yield a steady pipeline of scholarship and provide valuable experience for trainees at a formative stage in their career. In this section, strategies to overcome common barriers to integrating learners into research and QI projects are discussed.

Research can be intimidating for any beginner. A concatenation of pressure to excel, other commitments, and limited research experience can create a stressful experience and prohibit interest in research.15 This can be mitigated by developing formalized research training programs, setting clear research plans and expectations, instituting research contracts, and having detailed project onboarding processes.13,41 Training programs, such as the 12-week summer program described by Brandl, et al., yielded more published full text manuscripts and abstracts.41 Other considerations in setting up a learner research program include setting standards for what they should have completed prior to engaging in the research process. Examples include having completed human subjects research training, describing prior research or project experience, or submitting a writing sample. Additional accountability can be built in through the development of a formalized research contract, including outlining the roles and responsibilities of the mentor(s) and learner(s), authorship order, objectives, expectations for drafts, deadlines, and more, all to be mutually agreed upon by the study investigators.

Investing the time and energy up front can prevent countless errors downstream. However, it is also important to engage in all steps of the research process. Regular check-ins set up an investment in their development and diminish the power dynamic between you and the learner. Importantly, a shared mutual respect for all team members’ time and energy is key. Learners should be expected to produce high-quality drafts, be prepared for meetings, and be held accountable for their work. Likewise, the mentors should spend sufficient time reviewing drafts, provide detailed feedback, review research status prior to meetings, and lead by example in deadline adherence and high-quality work. As mentors lead research efforts, especially if longitudinal, it is important to consider setting deadlines and milestones in conjunction with learners which work well for everyone’s schedule. For example, if mentors have a clear weekend boundary that prevents them from reviewing a document at that time, set a deadline for a Monday instead of a Friday.

As some learners may still be building time management and research skills, there are a few techniques to further build a successful project. Regarding timeline, working backwards from the end goal, such as manuscript submission, and setting time for check-ins and smaller goals can be a time saver. Learners can be given the responsibility (with mentorship) to craft their own smaller goals to feed into the larger project milestones. Consideration as to how deadlines fall in the academic calendar or residency year should also be addressed. This may mean avoiding due dates around heavy exam weeks, finals, Midyear Clinical Meeting (MCM), job interviews, other periods of high workload, or the end of rotations.42 An additional, often overlooked component of a research experience includes feedback. Similar to a rotation experience, longitudinal research experiences warrant timely and high-quality feedback. Eliciting how the learner best receives and responds to feedback, the time and frequency that feedback will be given, and how different pieces contribute to the big picture of the project will help support learner and project progression.13 Lastly, providing examples of work in the various stages of improvement can showcase expected progress over time, provide a frame of reference, and allow for the learner to see a near-peer trajectory.

*3.2 Layering learners to expand research reach and build a model for productivity*

For larger projects or ongoing research programs, layering learners and optimizing near-peer training in research may yield enhanced productivity and research continuity.13 Layering can include integrating residents or fellows along with Advanced Pharmacy Practice Experience (APPE) students and pre-APPE students or any combination of various levels of learners. While commonly described in the experiential practice setting, this model has potential transferability and benefit in research.43 Use of layered learning and near-peer mentorship provides the opportunity for more advanced learners, such as residents, to train in the role of research mentor, while other learners achieve research experience in a safe and controlled environment. This model may also help lessen the burden on a mentor being solely responsible for a project. If approached strategically, this model also has the potential to build in research continuity for larger multi-year or multi-arm projects, allowing for younger trainees to grow with the project from year to year instead of only being with the project for one year of residency or as an APPE student. Finally, this model has demonstrated the potential to produce more scholarly outputs if implemented.33

*3.3 Adapting to research challenges*

As discussed previously, numerous challenges may be encountered by incorporating learners into research and QI projects, even when a streamlined research plan is put into place. However, adaptation is possible, and several strategies may be employed to safeguard against these challenges (Table 2). One such safeguard is the flipped research model which is becoming more popular amongst residency program research endeavors.44 The flipped research model is structured in which residents starting a program pick up an already started and IRB-approved research project by beginning with the data collection phase. Residents move through the year finishing the project about mid-year then the residents plan and attain IRB approval for a new project for the following resident to begin the next residency year.44 This model allows for a more forgiving timeline given that the planning and IRB approval process may be a challenge related to research timelines.44 It may also better align with presenting data at key meetings or conferences, such as MCM, and allow for more dedicated time to the manuscript writing process for residents.44 This model can also be implemented for more structured or longitudinal student research experiences. Multi-arm projects could also be considered if a comparative analysis is desired for larger studies and if feasible. In this approach, one or more learners focus on data collection for one arm of a project while others would collect data for another arm of a project. This could be done under one IRB submission. This process may help manage workload, lead to multiple scholarly outputs, and be combined and analyzed later when considering publication.

Robust planning should be completed, and safeguards implemented to keep research on track. There are several considerations to salvaging research quality and productivity. A research contract as discussed above is critical; however, it is also important to consider a path for exiting the research experience. For example, if a learner changes priorities or has a personal conflict arise that is preventing them from being successful, consider providing a low stakes exit, if the research experience is not mandatory.13 Through use of planning tools and required learner documentation, changeover from one student exit could be passed onto another learner easily without sacrificing the overall project or leaving data collection or other components suspended. If research project exit is not desired, incorporation of additional learners or splitting a larger project into smaller arms may also be a feasible option. Finally, if statistical analysis plans go awry, opportunities to learn this new skill may be undertaken by the mentor or learner via available resources. If the mentor is well versed in statistical analysis, it may be an opportunity to utilize more direct instruction, modeling, and coaching to teach the learner more about analyses. When engaging with external statistical support, safeguarding against statistical challenges may mean early initial meetings with statisticians during the project design phase and clear communication regarding timelines, data collection, and overall needs.

**4. Defining Research Success**

Various measures of success may be used when integrating learners into research. Of primary importance are the outcomes for the learner. Considering overall research objectives and learner goals may help guide how to define successful research. For example, for a PGY1 resident, educational objectives and pre-specified deliverables by the residency program may define success as verbal or poster presentations and manuscript preparation or may also be targeted at building independent research skills.2 On the flip side, success for a student engaged in a project may include smaller targets, such as completion of data collection or beginning to understand basic statistics but may also include poster presentation and manuscript participation. Success may also look like being considered competitive for postgraduate positions or jobs based on robust research experiences.42 How ever success is defined, learner objectives should be included in a research contract, as described above, to ensure objective and measurable research success on the learner end.

From a mentor standpoint, research success should take a more holistic approach following several considerations. For faculty, important measures are what counts for promotion and tenure. Posters versus manuscripts, authorship order, and grants versus publications may all help to define success.45 For non-faculty, full-time clinicians, higher priority may be placed on completing required medication reviews or follow up on quality improvement initiatives that must be completed for the institution. An additional consideration for mentors is obtaining the most potential outputs for each research project to enhance dissemination. As mentioned previously, if a multi-arm project is feasible, one project could potentially be disseminated as multiple posters, a platform presentation, and multiple peer reviewed manuscripts. It is important to consider the stages of the research process and where there are opportunities for dissemination, including timing of local or national meetings, alongside crafting the manuscript. These targets can also help frame timelines for learners if seeking publication prior to residency or job application cycles.

**5. Conclusion**

Incorporating learners into research and QI projects can provide immense, simultaneous benefits to the learner, the research mentor, and the institution. Several barriers or challenges may exist initially or surface during the research process. This opinion paper addresses these benefits and barriers that both learners and mentors should be aware of, as well as strategies to overcome them. To expand on this, a toolkit for both mentors and learners with possible timelines to help with research planning, as well as case vignettes is provided to help apply some of the information covered in the paper (Appendix 1). Embracing the research process as a learning opportunity can be a fruitful experience for all involved.

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**Table 1. Summary of Potential Benefits to Key Stakeholders of Incorporating Learners into Research and Quality Improvement Projects46**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Benefit** | **Student** | **Residents** | **Mentors** | **Institutions** |
| Develop critical thinking and clinical reasoning skills | X | X | X |  |
| Highlight the importance of evidence-based practice | X | X | X |  |
| Expand professional skills including time and project management, teamwork and collaboration, and mentorship | X | X | X |  |
| Develop interest and comfort in participating and leading research endeavors in the future | X | X | X |  |
| Increase likelihood of postgraduate training or job placement | X | X |  |  |
| Improve confidence in biostatistical analysis and literature evaluation skills | X | X |  |  |
| Create pool of collaborators for future research projects |  |  | X | X |
| Network with other researchers in a similar field | X | X | X |  |
| Increase research deliverables, productivity and funding received |  |  | X | X |
| Provide sense of purpose to help reduce burnout and improve wellbeing through mentorship |  |  | X | X |
| Provide monetary and professional return on investment |  |  |  | X |

**Table 2. Summary of Possible Barriers to Incorporating Learners into Research, Strategies to Overcome, and Outcomes47**

|  |  |  |  |
| --- | --- | --- | --- |
| **Barrier** | **How to Overcome** | **Learner Outcomes** | **Mentor Outcomes** |
| Lack of familiarity with the research process | Provide learners with training on the research process, including topics such as research design, data collection, statistical analysis, and dissemination. | Develop the skills and knowledge necessary to conduct research and disseminate findings. | Gain access to a pool of trained researchers who can collaborate with them in the future.  Increase proficiency and knowledge in the research process |
| Changes in motivation to work on research | Set clear expectations for learners and provide regular feedback.  Select project that aligns with learner interest or identify another mentor for learner to work with.  Create and sign research contract that outlines expectations from both the learner and mentor. | Increase likelihood of sustained motivation and engagement in their research projects.  Have clear expectations but also the option for compassionate exit from the project. | Create more productive research team and understand what the learner hopes to gain from the experience. |
| Poor time management skills when balancing multiple responsibilities | Help learners develop time management skills and determine deadlines and milestones with them.  Provide learners with a general sense of how long a certain task or part of the project might take to develop a formalized research plan accordingly.  If data collection is taking significantly longer than expected, observe the learner’s strategy and model tips for identifying information in the electronic medical record. | Increased probability of staying on track with research projects, meeting deadlines, and balancing other commitments. | Development of a more efficient, reliable research team and stay on track themselves. |
| Project holdups in the IRB approval phase or in execution of statistical analysis | Develop contingency plans for delays in the IRB approval process or in the execution of statistical analysis.  Consider “flipped” research models. For short experiences such as a single APPE rotation, consider a project where all necessary approvals are complete and patient lists or initial data are already available.  Incorporate statistician early in research planning. | Reduce frustration from delays in their research projects. | Increase probability of forward progress of projects. |
| Lack of research experience | Pair learners with experienced researchers who can provide guidance and support.  Provide a “layered” or near-peer research model where students and residents work together on research projects. | Learn the ropes of research and get their projects off the ground.  Higher level learners gain research mentorship experience if working with students in a layered learning setting. | Create a strong research team with members having a variety of experience. |
| System issues or lack of support | Develop contingency plans such as certain types of projects supported by the institution (e.g., quality improvements) or other types of research endeavors (e.g., systematic reviews, meta-analysis, etc.) | Reduce frustration from delays in their research projects.  Have the flexibility to pivot to alternative projects to complete. | Feel more energized or productive through alignment and an open-minded approach to personal goals as well as research goals at their institution. |