Research

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Introduction

Research is an important part of being a physician and an integral part of being an academic physician. Whether you have a lot of past experience or you are interested in starting for the first time, there is no wrong time to start.

Goals of conducting research in pediatrics:

1. Provide the resident or student with an understanding of key concepts in research methodology and biostatistics.
2. Develop an appreciation for academic medicine while learning the proper methods for conducting research.
3. Improve chances of success in receiving grants, academic promotions, etc.

The first step in conducting research is coming up with an idea for a study. There are many types of research projects, including basic/bench research, questionnaires, educational

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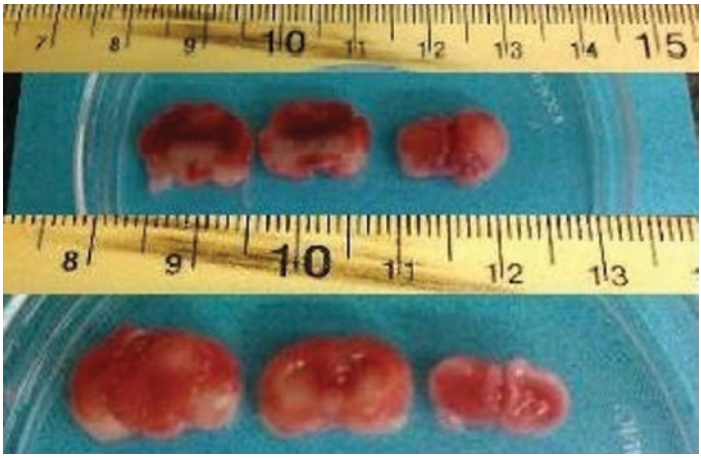
research, reviews and case reports, quality and process improvement (QI/PI), and clinical research (retrospective or prospective).

Once you decide on the question you want to ask, select the best type of study design that will "answer" this question. I am using the word research for both quality improvement and hypothesis type studies, with the understanding that QI/PI is not truly research but may have overlapping qualities. After choosing the type of research that you will need to conduct, it is important to consider who you need as members of your team. Do you have students, residents, fellows, or nurses who are interested in participating, and are you able and willing to supervise them? Having others participate in your research can be very helpful in accomplishing the work but can also be more time consuming and require patience and teaching on your side.

Let's briefly explore each type of research, with some of the pros and cons and various considerations for each.

Basic or Bench Research

Basic research can be performed in conjunction with faculty from medical school and basic scientists from undergraduate colleges and is often collaborative between clinicians and basic researchers. The main downside of this type of research is that it can be much more time consuming and more challenging to do at the "random hours" that many practicing physicians have for research. Time is usually the biggest hurdle to participating in research for a practicing clinician. With basic research or animal research, the experiments are more likely to have very specific timelines that may be less flexible.



Staining slides: these are an example of basic research outcomes

Questionnaire and Qualitative Research

In order to conduct questionnaire or qualitative research, you will need an audience of subjects. Many researchers use their AAP membership or society memberships for contacts or emails of subjects to whom they send surveys. You can also conduct surveys within your staff or patient population, depending on the question you are trying to answer. This type of research can be in almost any field. If you decide to conduct surveys or send out questionnaires, make an effort to use previously validated questions whenever possible. Qualitative studies are sometimes more difficult to get accepted for publication.

Educational

Educational research may evaluate resident or medical school education practices and address multiple different aspects of educational approaches and curriculum.

Reviews or Case Study

Reviews and case studies are more focused on prior literature evaluation, with more time spent writing as compared to collecting data. This type of research is much more conducive to being done on "your own" time and is relatively quick to complete. It allows you to focus on one patient or topic in which you are interested and can be an outlet to share information on a unique case that you may have encountered.

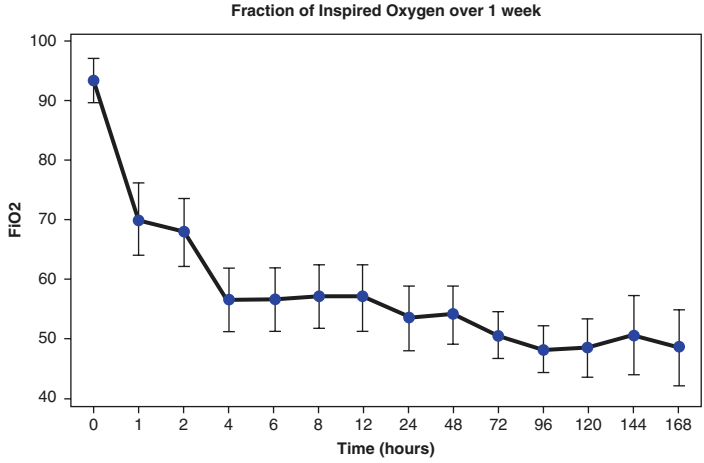
Quality Improvement (QI/PI)

This type of study is not technically research since it is not based on a hypothesis. When performing QI, there is usually no need to go through the institutional review board (IRB) since you are not assigning patients to different arms of a study, you are using standard of care processes or interventions, and you are working on improving a small aspect of an established system. Because it is not an intervention-type research and IRB approval is not required, the project can often be initiated more quickly. However, it can take a *LONG* time to finish due to the complexity of most systems and the need to address small aspects with each PDSA (plan, do, study, act) cycle. This type of work can be presented at conferences and published. And one of its most rewarding aspects is that it allows the team working on the project to "fix" a system problem.

Clinical Research

(a) Retrospective Research – This is the most commonly performed type of clinical research, especially by students and residents. It includes data or chart review and can often be completed more quickly than other forms of clinical research. IRB approval for these projects is often expedited and does not require consents. Another positive aspect is that you can work at your own pace and conduct different retrospective studies on a variety of topics, thus allowing you to potentially find your niche.

(b) Prospective Research – This is the most stringent and most reliable type of research and includes the blinded, randomized trials. These trials take extensive time to prepare, receive IRB approval, to enroll and fully complete the study. These projects often take years, making it more difficult to involve students, residents, and fellows. Additionally, for most clinicians, a research assistant or coordinator would be needed to design and execute this type of study, due time commitment and inflexibility in scheduling patients for enrollment and follow-up.



Oxygen use graph as an example of clinical research data representation

Now that you are familiar with different types of research and have decided on a topic, what are the next steps? If you haven't spoken to someone with more extensive research experience, now is a good time. They may be able to help you fine-tune your topic, question, or just assist with the available resources in your institution. If you have access to a medical librarian, he or she may be able to help with a literature search. At this stage, you should also investigate whether your study will need IRB approval and if so, what type of IRB submission this will be. Most IRBs

require certification in Human Research that you can receive by completing an NIH or CITI course (https://www.citiprogram.org/Default.asp) [1]. If you plan on conducting a QI/PI project, most institutions require specific approval, and most journals will request a letter from your institution stating that the project was deemed QI/PI and did not require IRB approval. A Human Research Protection course is a good idea for anyone who is considering conducting research. It is very informative and only needs to be renewed every few years to maintain certification (Table 37.1).

Writing a solid, well thought-out and developed protocol is one of the most important initial steps. It will help with further writing of abstracts, presentations, and manuscript and will keep you on track during the study, even after a year or more. By involving a statistician in the development stage, you avoid having to learn that there was a problem with a variable or a number of patients recruited at the end of the study. Going to national and international conferences will not only allow you to exhibit your work but also to get feedback on your study from others in the

Table 37.1 Steps to successfully starting and completing research

1. Have a rough idea of a question.
2. Literature search for background (librarians can recommend databases and search strategies).
3. Refine the question.
4. Write a protocol.
5. Create your research/study team; involve those that have interests and skills that can improve or add to the project; remember to collaborate with other specialties if that will be helpful.
6. Reference managing software (EndNote, RefWorks, etc.).
7. Create a timeline (especially important when you are trying to add a project to an already busy clinical schedule).
8. Data analysis involves a statistician if you have access to one while still writing the protocol.
9. Write an abstract (use your protocol for a large portion of it) and submit to conferences.
10. Decide on the best journal for submission and write the paper.
11. Enjoy the satisfaction of being published.

field. This will assist in preparing a manuscript and may make you a better clinician and researcher.

Resources for guidelines or standardized formats for preparing a manuscript are below:

1. IMRAD (introduction, methods, results, and discussion) – Most common general structure for all scientific papers [2].
2. CARE Case Report guidelines: http://www.care-statement.org/about [3].
3. SQUIRE 2.0 Quality and Process Improvement guidelines [4]: http://squire-statement.org/index.cfm?fuseaction=Page.ViewPage&PageID=471

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