

AΩA Guide to Research

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AΩA Guide to Research

Research Considerations at a Glance

I. Timeline

-Assess time available for research

II. Project types

-Select project types that fit your schedule

III. Departments

-Choose department

-Search projects on AΩA Research Projects webpage

-Look up Research Contact for department on AΩA Research Contacts webpage

IV. Requirements

-Find out status of IRB approval for your project

-Complete your IRB training

V. Planning a project

-Literature review: keyword searches on Ovid MEDLINE®, PubMed, etc., build reference list

-Data collection: stay organized, build a master spreadsheet

-Data analysis: determine type of statistical analysis needed

-Writing the paper: start early, create blank tables for results, check journal website for instructions

VI. Presenting research

-Draft abstract with research findings

-Campus opportunities: AΩA Research Symposium, Sigma Xi Research Day

-National conferences: discuss with your research team

-Podium presentations: create Powerpoint presentation

-Poster presentation: create poster

VII. Funding

-Consider Federal Work-Study Program, Summer Research Programs at Jefferson, AΩA Student Research Fellowship, and extramural funding sources listed on Jeffline to support your research

AΩA Guide to Research

While it may take years before you are diagnosing mitral regurgitation in your patients or performing laparoscopic cholecystectomies, you can make an impact in patient care at any point in your education or career by getting involved with medical research. There are many reasons for making research a part of your medical school experience, but the path from finding the right project to seeing results from your hard work can be wrought with obstacles. The AΩA Guide to Research provides an overview of different approaches to research at Jefferson and practical advice on how to succeed in achieving your goals. With the right information and a little planning, research can be one of the most important learning experiences of your medical education and enable you to make an impact on patient care from the day you put on your white coat.

I. Timeline

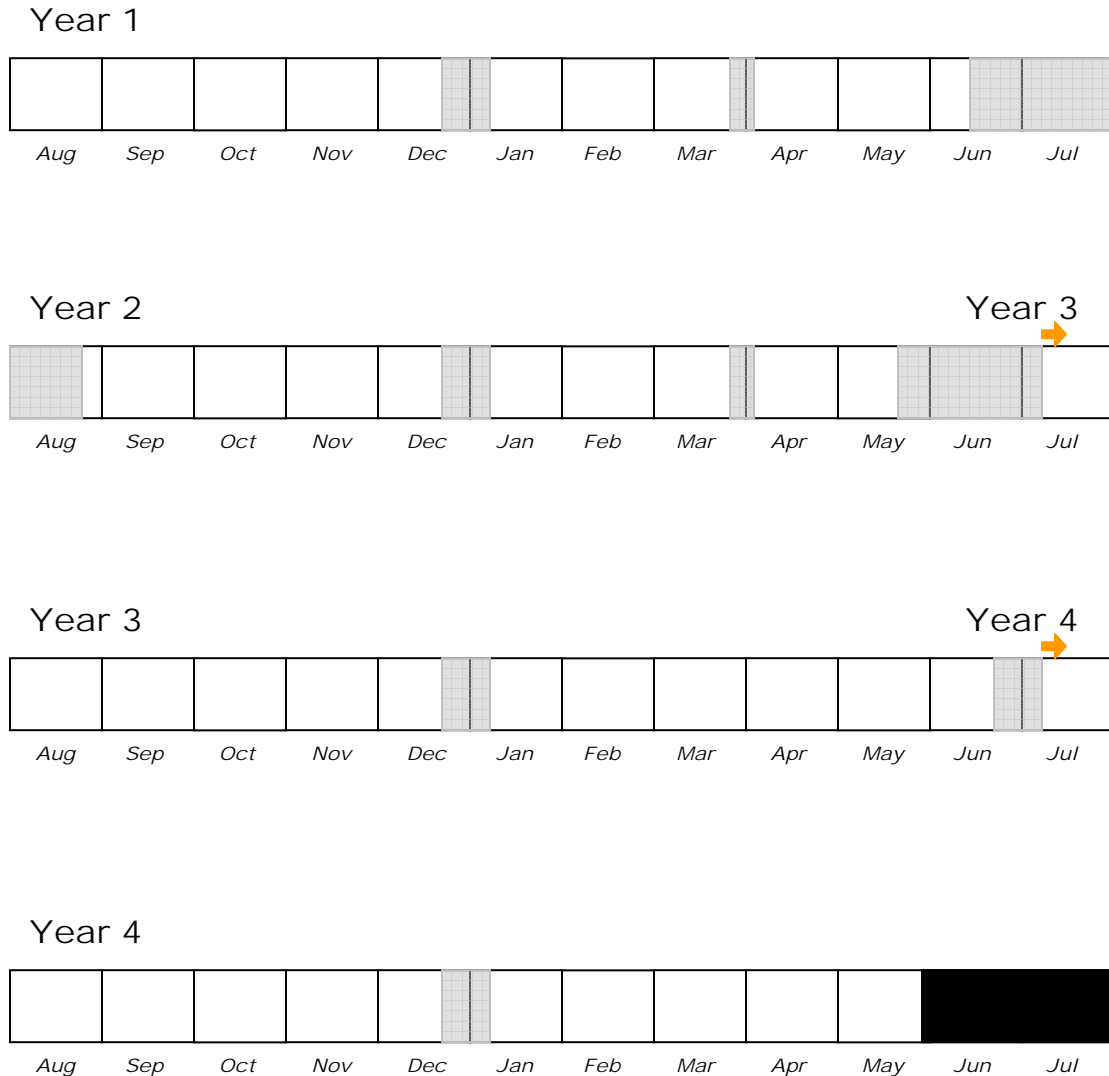
The first step in figuring out how to make research a part of your medical school experience is deciding how much time you are able and willing to dedicate to it. Research should not detract from any study time that you need to do well in your classes or rotations. It's equally important not to overextend yourself and sacrifice too much of your precious free time. However, if you are comfortable with your time management skills, allotting time for research can be a welcome addition to your schedule.

Depending upon the department you choose to work with, research time can be very flexible. If you choose to work on research during the academic year, investigators may be willing to negotiate hours that suit your schedule, e.g. after classes, different times for different days of the week, or reduced hours around exam times. As long as you set realistic goals and follow through on the commitments you make, most physicians are very understanding of your priorities as a student. During the first two years, the amount of time you dedicate to research should be determined by your honest assessment of how much time you need to study and how much extracurricular time you would like to invest in research. Maintaining this schedule for research during Year 3 may be possible at some times, but generally cannot be counted on due to the demands of clinical rotations. During the clinical years, you often do not have control over your own schedule, making it difficult to commit to work hours and deadlines. Fourth year affords more flexibility, but clinical schedules are still a concern.

Throughout the four years of medical school, there are a few periods during which you have the option to focus exclusively on a research project. The only curricular time devoted to student research is a four week long Basic Science Research requirement during Year 4. During the fourth year it is also possible to schedule a research elective, also four weeks long. The remaining time available for research coincides with vacation time on the academic calendar. There are 10 weeks between first and second years, 7 weeks between second and third years, and two weeks between third and fourth years. You also have a week-long spring break during first and second years,

and a two week vacation at the end of December every year. An overview of these times is represented in the figure below.

Figure 1: Medical school timeline



*Shaded areas represent vacations during medical school. Note that the 7 week “vacation” between Years 2 and 3 includes the time you allot to studying for Step 1 of the board exams.

II. Project types

The type of project you choose should be determined by the time you are able to devote to research. A case report can be written in a weekend, whereas a prospective, randomized, controlled trial can take years to complete. A basic overview of different types of studies is provided below to

familiarize you with the descriptions you will see when you begin to seek out projects:

Figure 2: Study design overview

Study design	Study population	Estimated time spent
<i>Observational</i>		
-Case report	1 subject	Days
-Case series	>1 subject	Days-Weeks (Depending on your schedule)
-Cross-sectional	Exposure and outcome at same time	Weeks-Months (Depending on your schedule)
-Case-control	Identified by outcome, exposures analyzed	Weeks-Months (Depending on your schedule)
-Cohort	Identified by exposure, outcomes analyzed	Weeks-Years (Depending on retrospective vs prospective)
<i>Experimental</i>		
-Non-randomized controlled trial	Subject allocated to exposure	Months-Years (Depending on # subjects and length of time to outcome)
-Randomized controlled trial	Subject randomized, then allocated to exposure	Months-Years (Depending on # subjects and length of time to outcome)

In some cases, such as prospective cohort and experimental studies, the study design can limit your choice of projects. If you are on a 4 week research elective during your fourth year and want to have a paper written by the end of the rotation, a randomized controlled trial is not the best project to achieve your goal. However, if you are working on research between your 1st and 2nd years and would like to have a paper written by the end of medical school, working on such a project might be more reasonable.

Your schedule is the other important consideration when selecting the right type of project. If you have a few weeks to devote exclusively to research, you may be able to acquire and analyze all of the data you need to write up a case series, cross-sectional, or case-control study. However, these are also projects that can easily be worked on over the course of a few months if you only have a few hours each week to devote to research.

Making an informed decision about the type of project you work on increases your chances of achieving your research goals. Be sure you have made a realistic estimate of the time you are willing to devote to research and choose the types of projects you become involved with accordingly.

III. Basic Science Research

Working on a basic science research project as a medical student is a great way to gain research experience and exposure to a specific field of medicine. There are a large number of such research opportunities at Jefferson, in both the clinical and the basic science departments. These projects encompass a wide range of basic science approaches from in vitro molecular biology experiments to behavioral pharmacology paradigms using laboratory animals. However, there are a number of considerations one must take into account before about embarking on such a project.

When looking into basic research opportunities as a medical student one of the first things to think about is when will you have time to spend working on a basic science research project. Basic science research projects often require more time and a more rigid schedule than clinical research projects. Often students have time for such projects during the first year, between the first and second years and during fourth year elective research rotations and advanced basic science courses. Please note that for your research to count as your advance basic science rotation you will need to get approval far in advance. Most students do not have the time during the second and third years due to the heavy course workload during those years.

Finding a research mentor is also an important step. As stated above there are numerous basic science research opportunities available at Jefferson. There are detailed instructions for identifying such opportunities in the Departments section of the AOA guide to research (<http://jeffline.jefferson.edu/Students/AOAresearch/departments.html>). Additional ways of identifying research mentors include speaking with basic science faculty who lecture during the pre-clinical curriculum, searching PubMed to look at the publications from a given laboratory and speaking to upper year students about their research projects.

Once you have identified an opportunity that you would like to pursue schedule a meeting with the faculty member who would be serving as your research mentor. During the meeting you need to discuss the specific aims of the project, your role in achieving those aims, the technical skills required to generate such data, training requirements (i.e. if you need to complete animal or radiation training sessions) and the time estimated to complete your portion of the project. You should also inquire about funding sources for reagents, supplies, meeting presentations and salary (if working on the project during summer break) as well as the publication strategy for the project (i.e. will you have the opportunity to be the first author on publications or will the post-doc or graduate student you are working with be the primary author).

In order to be productive in a basic science laboratory one must have the technical skills to accomplish the research objectives. Some students may have developed such skills during their undergraduate education while others

may have had very little training in this area. It is very important to figure out which technical skills will be required for your project, how you will learn those skills if you do not already possess them, whether the technique is commonly used in the laboratory you will be joining as well as the level of difficulty for the specific technique. Many techniques such as basic PCR, Western Blotting, cell culture, ELISA and nucleic acid isolation are standard and most laboratories have established protocols. Others experimental approaches such as behavioral neuroscience animal assays, recombinant DNA techniques, gene chip experiments and complex enzyme assays require a higher degree of technical skill and require more time to optimize.

When working on a basic science research project it is also important to realize that publications often take more time to generate. Such papers often require multiple experiments and approaches to investigate a particular research question. As a result, it may take more time to gain authorship on a basic research publication than it would for a clinical research project. That being said, basic science publications show a solid commitment to research and look great on your residency application!

As stated above, there are a tremendous number of basic research opportunities for medical students at Jefferson. If you are interested in pursuing one of those opportunities, make sure that you fully understand the expectations your mentor has for your project.

IV. Departments

Research is a great way to learn more about a particular specialty. If you are just beginning your medical education, a research project enables you to spend more time learning about a specialty and meeting physicians in that department. If you have already chosen a specialty, research helps you engage in current discussions about treatment options and outcomes and demonstrates your active participation in the field.

However, being undecided about your career choice should not prevent you from getting involved with research. Some students participate in research projects that are tangentially related to their field of interest, and some do research in a field that ends up being entirely different than the specialty they ultimately choose. Numerous residency program directors have emphasized that at this stage in your medical career, research demonstrates your ability to ask relevant clinical questions and think analytically about solutions regardless of the field in which it is performed. While some academic residency programs and competitive specialties might like to see that you have demonstrated a specific interest in the field by working on a research project, becoming involved with research will never be a wasted effort.

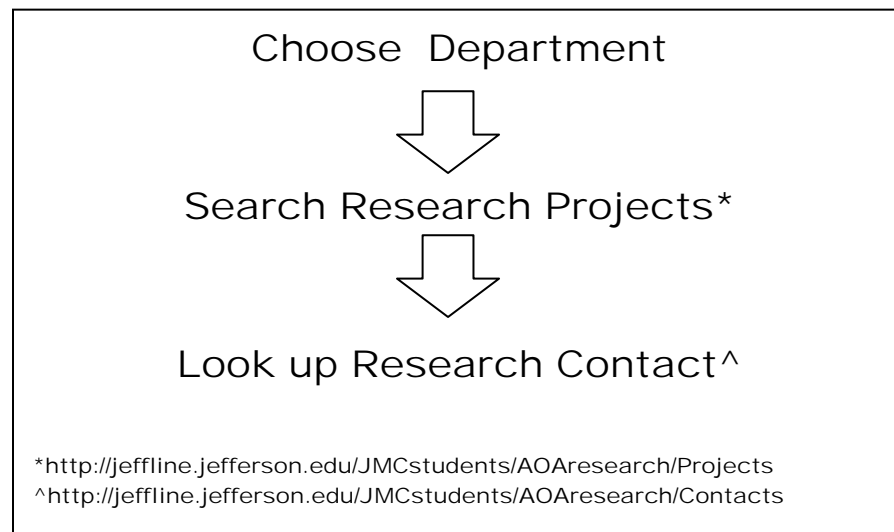
The physician you work with on a research project will be an important part of your research experience. There are several faculty members at

Jefferson who are enthusiastic about welcoming student participation in research projects year after year. These physician-researchers are a tremendous asset to Jefferson, and are often some of the best-liked faculty members. Research can be a unique opportunity to spend individual time with these physicians and to develop mentoring relationships that will be important throughout your education.

AΩA has developed a Research Website to help you initiate contact with a department or find specific projects. Each department at Jefferson has provided the name and contact information for a Research Contact for medical students, which is listed on the Research Contacts page of the AΩA website (<http://jeffline.jefferson.edu/JMCstudents/AOAresearch/Contacts>). The Research Contacts regularly provide information about ongoing projects in their department, which is posted on the searchable database on the Research Projects page of the AΩA website (<http://jeffline.jefferson.edu/JMCstudents/AOAresearch/Projects>).

Once you have decided which department you would like to work with, search the Research Projects database to see if there are any ongoing projects that are suitable for the time you have available and your specific interest. You can then get in touch with the Research Contact to inquire about a specific project or discuss other options. Some departments may have specific instructions for medical students interested in research. If so, the necessary requirements are listed on the Research Contacts page of the AΩA website.

Figure 3: Steps for initiating contact with a department



V. Requirements

Once you have communicated with the Research Contact, you should have a better idea about the specific plans for your project. You may be joining an ongoing project or initiating an entirely new project, so where you go from here will be determined by the principle investigator of your project.

An important part of every research project at Jefferson is the Institutional Review Board or IRB. Jefferson's IRB is a board comprised of members of the hospital's faculty, staff, and administrators, as well as members of the Philadelphia community. All research projects that are conducted at Jefferson have been approved by the hospital's IRB to ensure they are consistent with standards for patient care, patient safety, and the protection of personal health information. The IRB's Policy and Procedure Manual details the scope of the IRB and its requirements and can be found at

<http://www.jefferson.edu/ohr/irb/documents/PolicyandProcdureManual2008.pdf>. For new projects, several forms are submitted to the IRB for approval of the research study. A list of the required forms for each type of study is found at:

<http://www.jefferson.edu/ohr/irb/forms/documents/OVERVIEWOFIRBSUBMISSIONS.doc>. Studies cannot begin until approval has been given by the IRB. While someone else may be responsible for completing the paperwork for the IRB approval process and/or renewal process (approval for studies must be renewed every year), it is important to understand these requirements because all research must be conducted within the guidelines set by the IRB.

There is one requirement that universally applies for every project: Institutional Review Board (IRB) training. Whether you are joining an ongoing project or starting a new project, you will either be listed as a member of the investigatory team or as a supporting member of the research team. The bottom line is that, in order to be involved with the project, you must be listed on the study. **You may be listed on a study only if you have completed IRB training.** IRB training consists of several modules with questions at the end, and you are certified to participate in research projects upon passing the modules. The training can be found online at: http://www.jefferson.edu/ohr/irb_training/.

VI. Planning a project

As you begin your project, you will likely receive a lot of guidance from the principle investigator and other co-investigators. The following will be a brief overview of the steps you will go through.

Literature Review

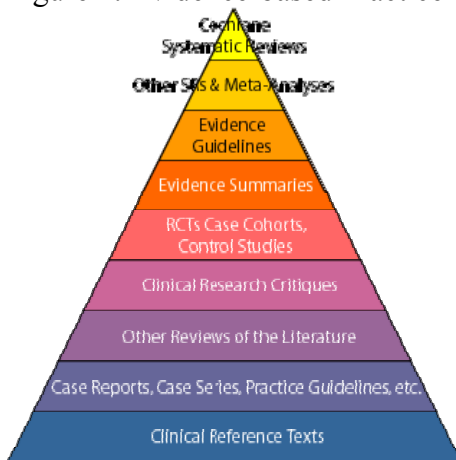
This is an important starting point for any research project.

Here are a few tips for getting started:

1. Be sure to use appropriate search terms as you try to find articles relevant to your research project. Most people use a search engine such as Ovid MEDLINE® or PubMed to get started.

2. Ask one of your co-investigators what the most respected journals are in their field. Most times, studies published in these journals will have made more of an impact on clinical practice than those published in less reputable journals.
3. Pay attention to the study design and scope of the papers you are using as the foundation for your project. The following figure is a schematic representation of the various tools for practicing evidence-based medicine. The pyramid can give you an idea of the impact the papers you are reading might have made on clinical practice.
4. Tools such as the Write-N-Cite program available through Jeffline can be used to maintain a working reference list throughout the project. If you start adding articles during this phase, it will be much easier to write the paper with appropriate citations later on.

Figure 4: Evidence-based Practice Tools Summary (<http://healthlinks.washington.edu/ebp/ebptools.html>)



Data collection

The source of your data depends on your study design. You may be working from a departmental database, electronic medical records, patient charts from the archives, surveys, questionnaires, data collection sheets, or experimental data. The most important part of this phase is staying organized. Master spreadsheets are often used to compile data and can be created on a program such as Microsoft® Excel.

Data analysis

This can be a challenging phase depending on the level of analysis your project requires and your background in statistics. There are statisticians available to principle investigators at Jefferson, but the decision about whether or not they will be hired is up to the physician you are working with. It may be that one of your co-investigators has prior experience with the type of analysis your project requires. If you are responsible for data analysis, there are several resources available to help. Simple calculations can be made using Microsoft® Excel. If you are looking for significance and doing regression

analysis, there are a number of computer programs available. Some of the most user-friendly statistics programs interface with the spreadsheets you may have created using Microsoft® Excel and can be very helpful for crunching numbers and generating good graphs and charts. Some programs are:

SPSS®
STATA®
JMP®

Writing the paper

Believe it or not, this may not be the last step in the project. It is often possible to write the introduction to a paper based on the background literature search you perform as you are getting started. This makes sense: the introduction often presents the argument for doing the study, and this is something you should be able to articulate from the very beginning. Likewise, the methodology for your research should be clear from the beginning of the project.

An effective strategy for staying focused during data analysis is outlining your Results section at the beginning of the project. For example, creating tables with the variables you are studying and the outcome measures you wish to report can help you think through the information your readers will want to know. When it comes time to write the paper, you will just plug in the results you get.

While you probably can't get much of the Discussion part of the paper written ahead of time, keeping track of the references you collected in the Literature Review phase, described above, means that you already have a working bibliography. In other words, it's probably possible to have about 65% of the paper written at the beginning of your project. Knowing this, if you have a period of a few days or weeks when you can focus more exclusively on your research project, you can place yourself at a huge advantage when your schedule gets busier.

When you are working on the finished product of your paper, be sure to check the website of the journal to which you plan to submit. Many journals post a guide for authors on their website that provides specific instructions for presenting results and formatting a paper for publication. Journals are often very particular about the items they require during the submission process, and there will be specific documents you need to prepare in addition to the paper itself.

VII. Presenting Research

One of the most exciting aspects of working on a research project is the opportunity to present your work to colleagues in the field. There are many different forums in which discussions about research occur, and they can enhance your medical education and professional career in different ways. For example, there are opportunities on Jefferson's campus to present research to classmates and faculty members. Sigma Xi Research Day (<http://www.sigmaxi.org/chapters/lists/chapters.php>) in the Spring and the

AΩA Research Symposium

(<http://jeffline.jefferson.edu/JMCstudents/AOAresearch/Symposium>) in the Fall are both venues in which you can share your work and see what your classmates have been working on. A number of Jefferson faculty members usually attend such events, and this is an opportunity to demonstrate to them your extracurricular interests and accomplishments.

Another option is to submit an abstract summarizing the results of your research project to the meeting of a relevant medical society or professional group (for example, the American College of Obstetrics and Gynecology's Annual Clinical Meeting or the American Academy of Pediatrics' National Conference and Exhibition). Presenting your work at such a conference is a potential goal for a research project that you can discuss with the Principle Investigator of your project. Such meetings can be an opportunity to discuss your research findings with other physicians in the field, which may be very helpful as you write your paper. You may hear critiques of your reported results or be asked questions you will need to address in your discussion. Often, discussing research ahead of time makes you think more critically about your work and helps you write a better paper.

There are usually two formats for presenting work at these conferences: podium presentation and poster presentation. Podium presentations are usually Powerpoint based presentations of variable length that cover an Introduction, Background, Methodology, Results, and Conclusions. Many departments have a specific format for the Powerpoints they present at conferences. If you are responsible for preparing such a presentation, ask if someone can send you a template to work from. Examples of past presentations given by members of the department can also help you prepare your own in the way best suited to the department.

Poster presentations are usually 3 ½ feet tall by 5 feet long posters that display all of the relevant information about your study along with illustrative tables, graphs, and/or pictures. A poster will often include the abstract from the study, Background, Methodology, Results, and Conclusions. At most meetings, there is an assigned time when the primary author of a project is expected to stand next to the poster to answer questions as attendees of the meeting browse around the posters displayed. Again, examples of posters from past meetings are an excellent starting point for planning this stage of a research project. Departments also may have templates available for you. When it comes time to print the poster, ask if the department has a process they use for printing posters. Many departments have an account with JeffGraphics, located in Jefferson Alumni Hall. More information can be found on the JeffGraphics website at <http://www.jeffgraphics.com/about.htm>. Similar services are provided by FedEx Kinko's ®: an electronic file can be emailed to the store, and the poster can be picked up from one of their locations.

VIII. Funding

There are a number of funding resources available for students interested in research. The Federal Work-Study program is an excellent option if the department you are working with agrees to participate. A description of the Federal Work-Study Program is available in the Financial Aid Handbook, which is found on Pulse at

<http://www.jefferson.edu/financialaid/JMCFABook2008-2009.pdf>.

AΩA also offers an AΩA Student Research Fellowship each year. The fellowship provides \$5000 to the student for support of the proposed research and \$1000 reimbursement to support travel to a national meeting to support presentation of the research. The project is selected by the AΩA chapter councilor. Details can be found at:

<http://alphaomegalpha.org/programs/StudentResearchPrize.htm>.

If you are looking for a summer research opportunity, be sure to check the Jeffline Student Research website:

http://jeffline.jefferson.edu/Researchers/student_research/jmc.html. Some of

these programs have been in place for a number of years and are run by faculty who are interested in promoting student research.

There are also extramural sources of funding, each of which has different criteria for the applications they accept. Some stipends or grants may be designated for students working with a particular patient population, while others are given for projects that address a certain disease, like diabetes. An extensive list is posted on Jeffline at:

http://jeffline.jefferson.edu/Researchers/student_research/extramural.html. As

you sort through this list, you will notice that some funding options listed are only available at a particular University where research is being conducted.

However, there are also some that would allow you to do your research with an investigator at Jefferson.

IX. Additional Resources

Some resources that students have found helpful in the past are:

The Lancet Handbook of Essential Concepts in Clinical Research by Kenneth F Schulz and David A Grimes. Elsevier 2006. 223 pgs

This is a very readable book that covers study design, methodology, and gives a basic overview of statistical analysis.

Guide prepared by: Leslie Moroz (2008)

Updated 1/2009 by Jake Dahl, Leslie Moroz and Robin Horak, Class of 2009