

Research Advice

For Medical Students



**From Yale Medical
Students to Yale Medical
Students**

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The Mentoring Relationship

General Ethics and Etiquette

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Assessing Your Needs

Picking the right mentor might be one of the most important things you can do when embarking on a research project, as they can determine whether your experience is a positive or negative one. To find a good mentor, first you must determine both your priorities and your goals for the research. Also keep in mind that your goals might evolve over time as you progress in your training. Here are some things to think about:

- What skills do you want to gain during the course of the project? Will they help you learn, practice, and hone these skills? Do they have the expertise in the lab that you are looking for?
- Do you want to learn to do animal work? Any certain lab techniques?
- Do you want to work on your scientific writing or presenting skills?
- If you want to work on something the lab hasn't already explored, is the mentor open to having you do that? Will there be someone to help you troubleshoot problems?
- Do they have the resources to support you? How is the lab's funding?
- What is your expected timeline for your project? You should make your expectations clear to your mentor from the beginning so that you are both on the same page, otherwise you might end up spending an entire summer doing a part of the project that you thought would only take a few weeks.
- Is the mentor open to forming collaborations with other labs? Are they open to doing this?
- Does the mentor take her/his students to conferences? Do they allow their students to present their own work?
- Are you expecting to publish? In what timeline? How will authorship be assigned? You should make sure you have this discussion with your potential mentor to make sure you are both on the same page.
- Do you want to gain experience in applying for grants? Will the

mentor allow you to do this, and within the time frame you are expecting?

- Do you care about the size of the lab? Keep in mind that a larger lab might mean less face-time with the mentor.
- What mentoring style are you looking for? Do you want someone hands-off or more hands-on? How often will the mentor meet with you, and how hard are they to get in contact with? Think about what balance you want, and how much hands-on time you need to be well trained. Don't be afraid to openly ask them about what they think their style is. Always be sure to confirm this by speaking with students in the lab, as the mentor may not always be realistic about how they mentor.
- Do you want a mentor that will encourage you to do things outside of the lab like teaching, shadowing future career personnel, extracurricular activities etc.?
- Do you want to continue research after medical school? Do you want to go into industry? Does the mentor know this and is on board with helping you achieve these goals?

Finding the Right Mentor

Once you have realized what you are looking for, try to do the following to get the answers you are following for:

- Spend a lot of time with this potential mentor—meet with them more than once! Do not be afraid to ask the honest and hard questions! If you choose to work with this mentor, you will be spending a lot of time together, and mentors often “follow” you for life!
- Be sure to speak to as many members of the lab as possible in order to get a feel for what the mentor and lab is “really” like. Remember, the mentor might be trying to sell themselves to you as much as you were originally trying to sell yourself to them (free labor!).
- When meeting with lab members, try to meet with them 1:1 and in a setting outside of the lab (coffee, lunch, etc.) in order to try to create an atmosphere of confidentiality to ensure more honest answers.
- Try to also ask people that work in the lab next door for their

opinions, as they often make good observations and will be less inhibited in sharing any concerns.

- Ask other students if they have heard anything about the mentor.
- Ask the PI or lab members for contact information for alumni of the lab. You can also find this info on lab websites, publication records, university websites, ResearchGate, or LinkedIn. People often like talking about their past research experiences and would be willing to answer questions. Try to speak with them on the phone rather than by email if you can.
- Observe the lab in person. Do a small rotation, attend a few lab meetings, or hang out with the lab members. Try to see if the lab is a good fit for you! If the PI does not seem open to you spending time around the lab, this is probably a warning sign.
- Don't ignore warning signs. Listen to both what people say and what they don't say. Those that love the lab will likely readily say so, while those that are not having a good experience may tiptoe around some questions. Be on the look-out for cynicism, or lack of respect for the PI.
- See if their personality fits what you are looking for. Think about their:

- ENTHUSIASM, SENSITIVITY, OPEN-MINDEDNESS, PATIENCE
- ABILITY TO RESPECT DIFFERENCES IN THEIR MENTEES
- RESPECT FOR THEIR STUDENTS
- BALANCE BETWEEN AVAILABILITY AND MICROMANAGING
- LEVEL OF SUPPORT AND FEEDBACK, BOTH IN RESPONSE TO SUCCESS AND FAILURE
- ABILITY TO INSPIRE AND OFFER IDEAS
- ABILITY TO LISTEN AND ASK GOOD QUESTIONS



It is completely ok to ask your mentor what he/she expects from their students to gauge what they are expecting from you, and if their expectations align with your goals.

What is It?

Basic research is driven by a scientist's curiosity or interest in a scientific question. The main motivation is to expand man's knowledge, not to create or invent something. There is no obvious commercial value to the discoveries that result from basic research.



Example: Understanding the underlying mechanism that Pseudomonas aeruginosa becomes highly prevalence in lungs of cystic fibrosis patients

Structure**Size**

Can vary in size from just a few people to over a 100; a medium, average-sized group might be 10-15

The People

Consists of principal investigator, researchers, technical staff, administrative staff, and others

Principal Investigator

- Often a professor if at an academic institution but not always the case
- Analogous to the CEO of a company, generally considered the “boss”
- Dictates the overall research direction of the lab, writes grants and other proposals to obtain funding, mentors everyone else
- If a professor, three main activities: research, “service” (essentially academic administrative duties, e.g. committees), teaching

Researchers*Postdoctoral fellows*

- Post-Ph.D. roles, often a stepping stone in academia to a professorship
- Generally considered to be the next line of command under the principal investigator (along with research scientists)

- Can collaborate with and mentor graduate students

Research scientists

- Very often though not always have Ph.D., serving as a permanent scientist within the lab
- Fairly independent like postdoctoral fellows but ultimately still answers to the principal investigator
- Difference with postdoctoral fellows is subtle, but this tends to be a more terminal role; sometimes transition to professorships or other roles within science

Graduate students (e.g. Yale medical students)

- Essentially training to become professional researchers with a degree attached (Master's or Ph.D.), which requires a thesis
- Likely had previous experience performing research as an undergraduate or otherwise, now transitioning to become truly independent in experiment/study design, academic writing
- Very often also involved in teaching as a teaching assistant, grant writing (fellowships to secure independent funding, NIH trainee grants, assisting the principal investigator, etc.)

*Undergraduate students***Technical Staff**

- Lab manager (can also serve administrative function)
- Research technician: perform technical roles assigned to them; not required to exert direction on experiments or lab activities

Administrative Staff (e.g. secretary)

- For some PIs, you will rely on the administrative staff to schedule your meetings with them

How the Labs Function

The PI sets the direction of the lab: earns money via grants (from NIH, NSF, foundations, etc.), recruits and hires research staff (e.g. post-doctoral researchers, research scientists, technicians), takes on graduate students (and often undergraduate students), determines research threads, etc.; other duties include mentorship, directing lab meetings, administrative (e.g. university and departmental committees) and teaching duties, etc.

Research staff and graduate students perform the hands-on work of research: experiments (both design and implementation), simulations (if the work is computational), calculations, data analysis, etc.; together with the PI, they generally devise projects (one or several) based on the research themes of the lab (set by the PI) and write abstracts, manuscripts, posters, etc. to communicate their results to the rest of the scientific community and the public.

Results as disseminated via manuscripts, posters, etc. are generally used to support a lab's record and the case for additional grants

Etiquette in the Lab

Basic research lab space at Yale is a high commodity, specifically bench spaces. Resources are shared, bench spaces are often shared, and you need to be mindful of your role in the lab and be a valued lab member. Here are some tips for lab etiquette:

- <https://bitesizebio.com/27062/top-three-tips-lab-etiquette/>
- <http://www.benchfly.com/blog/lab-etiquette-dont-make-us-call-supernanny/>

Grant-Writing

The process of grant-writing

1. A number of different grants become available yearly with release and submission deadline dates; upon release, PIs take them on and fill out biosketch information, proposals (including objectives, research methodologies, etc.), and other related sections, sometimes with the assistance of research staff and students



2. Decisions are released and funds are dispensed to research accounts handled through the university/college/department; the university/college/department may often take a proportion of the grant
3. Principal investigators write proposals to NIH, NSF, foundations, etc.
4. Other staff, including postdocs, research scientists, graduate students, medical students, and undergraduates may apply for their own individual funding as well to support themselves in the lab; notable examples include the NSF Graduate Research Fellowship for graduate students, HHMI medical fellowship for medical students, university-supported undergraduate research fellowships for undergraduates, foundation fellowships, and at Yale School of Medicine specifically the research stipend provided by the Office of Student Research for students performing research in the summer between MS1 and MS2
5. Also notable are the year-long fellowships Yale students often receive to perform research during their 5th year (HHMI medical student fellowship, foundation-specific fellowships, etc.)

General process for applying for individual funding/grants as a student:

1. Discuss with PI on whether or not to apply or not; and which project (if student is involved in multiple). Ask PI if he/she can work with you to complete the application and recommendation letters by deadline. Discuss with the PI who else to ask for recommendation letters
2. Student compose draft of personal statement and research statement (with detailed specific aims and preliminary data)
3. PI review statements (specifically the research statement) and edit statement with student

Timeline Expectations

Basic research can take a very long time. So it's important that your research project is relatively "safe." Take on a research question that is most likely to be productive and will get results in the timeframe that you have. Talk to other medical students or previous medical students in the lab. If you're the first medical student, talk with your PI and be very clear about the time that you have. It is also very likely that you will work on a subcomponent of a larger project by a post-doctoral fellow or graduate student, and that is completely normal!



You don't have to be primarily basic research if you're in a basic research lab. Many research labs at Yale have a clinical research component that complements their basic research, and often their findings from clinical research inform their basic research questions (which is an amazing model). So if you're interested in this model, try to seek out a lab that does this!



Why Clinical?



I'd done basic science research in college and wasn't super passionate about it. Instead I wanted some more flexibility in my work and something that would be more productive. I had some stats and coding skills from my engineering major in undergrad and wanted to put it to good use as well. Also an upperclassmen recommended this lab which ended up being the deciding factor between a couple of labs which both sounded similar. In addition, I wanted a closer relationship with a mentor as well. Also my particular lab uses national databases for most projects so data collection (which slows most projects down) is not a factor and something to think about when choosing a lab. So in recap, you can choose to learn new skills so use some of previously acquired skills to make your life easier. Also, definitely consider your potential PI's responsiveness and demeanor in choosing labs. Ideally you should talk to med students that have worked in the lab in the past to get their perspective as they have probably been in your situation and will be able to advise you better. If you are very set on your future area of specialty you can choose labs in that field. Sam's answers above on how to select a mentor are great and definitely use those tips.

Structure and Function

(Clinical Outcomes) We have weekly lab meeting and structure of the lab is loose but the following: most of the initial training will be after you've been placed under one of the more senior lab members

to learn from them. You work for them and write for their papers; in 1-2 months you get your own project to start. For coding and stats help, you talk to those senior members and present your week at lab meeting every week (everyone does a brief presentation). And you decide the direction of your future work based on feedback given by the PI and other lab members. Once the project is at paper writing stage, you contract out sections of the paper to other lab members. Conference presentations and abstract deadlines are regularly emailed out by the PI and you are encouraged to submit something to those. The PI is heavily involved with editing any sort of submissions and I love that about the lab- the fact that there is this layer of security to ensure quality of the project. I would say that is an important metric to seek out while looking for a lab- to fish out the level of involvement the PI has in overseeing each project. Which might be good for people in my situation where they were starting out doing clinical research

Other factors I like about clinical outcomes research:

- If you work on any database, you are not constrained by time in any way- you dictate when and where you do research. This is very important, especially over the summer
- You gain familiarity with different analysis techniques which I feel are more generalizable than other types of research
- Productivity- there is no denying completing projects is definitely easier in this sort of work
- You can work continuing being semi-involved in research during the school year. Since you are not working with any samples or human subjects, you can continue working in research to the tune of maybe only a couple of hours a week. And still get some meaningful work done eventually.

What is It?



“Global health is an attitude. It is a way of looking at the world. It is about the universal nature of our human predicament. It is a statement about our commitment to health as a fundamental quality of liberty and equity.”



—Richard Horton
qtd. in Reimagining Global Health

Research Mentor Specifics

- Principles in looking for a good mentor will be similar to the search for a mentor in other types of research (see Basic Research)
- Generally desirable to seek a mentor with established connections, particularly if looking to go abroad
- Generally desirable to seek a mentor who can support you; important to note that global health research may incur additional costs/barriers not generally encountered in other types of research performed in one's home country (travel and accommodation costs, language barriers, etc.)

- Know that global medicine can take a long time to do, and if you're completely new to the field, finding a research mentor who can help you with barriers along the way you might not anticipate will be very important.
- Start early in finding a mentor and finding funding for your research/travels. Make sure you have a research question that is manageable within the time you are there.
- Consider whether you need IRB approval from both Yale and another institution at your global site.
- Depending on the research you conduct, hiring translators/research assistants locally can be something very valuable for you to conduct your research.
- While you are conducting research, consider the culture of the location you are conducting your research and be prepared that you may need to be flexible with the work they do.
- Do research early about holidays and work culture so you know what to expect when you get there.
- Have a backup plan and a backup plan to your backup plan in case your research doesn't pan out the way you're hoping it to pan out- this will be largely done with the help of your mentor.
- While you're conducting your research, it may be helpful to learn important key vocabulary words in the language of that location.
- You can always do data analysis and write up when you are not abroad-- focus on gaining your cultural experience abroad and completing your field research!

Example and Definition

I did my project on the reflective writing workshop which we were able to implement in the 3rd year curriculum at the end of each clerkship. It was a combination of qualitative text analysis and survey data that came together to make new conclusions about the way a community is formed in the medical profession, highlight the known (and reproduced) challenges of hierarchy etc. in medicine, and attempt to find ways to change this culture moving forward. I also had a small clinical review project I was working on with a pediatric surgeon at the time, revolving around pediatric papillary thyroid cancer.

Structure and Function

I worked with mainly 4 other people who had been involved in the project before I came on, and who helped with surveys and data analysis. I was generally the point person for organizing meetings, assigning tasks, and compiling data.



Grant-Writing

We had a small grant that we used to incentivize questionnaire responses from the office of student research.

Research Mentor Specifics

Find someone who is invested in your project, and knows enough about the field to guide you in the right direction. A project, especially in humanities, can very quickly get way out of scope without proper guidance. Make sure this person has time to meet with you (weekly or every other week), will respond to emails, and help you out with the paperwork and deadlines for thesis.

Timeline Expectations

I am hoping to start a reflective writing workshop during residency, but there are still 6 years left, so we will see what happens.



