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Lessons From an MD PhD – From SLC13A5 to Neurology

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Abstract

The journey towards becoming a physician scientist is a long, arduous, and uncertain journey. Few medical students pursue a career as a physician scientist. Even those that do, the path towards maintaining a robust research career and clinical training can be difficult given the personal and social pressures to focus solely on research or clinical work. Despite the long history of science and medicine, there is question concerning the role that physician scientist in modern medicine. As a recent physician scientist graduate, physician scientists are greatly needed in the medical profession. The ability to overlap science, medicine, and the humanities together is an essential part of the producing a well-rounded and effective physician for a rapidly changing profession and world. Through my journey as a physician scientist in training, the lessons I've learned through my training in both the basic science and clinical portions can be helpful for medical students traversing both sides of the divide.

Keywords: SLC13A5, Physician scientist, Training, Medical school

1. Introduction

The journey towards becoming a physician scientist is a long, arduous, and uncertain journey. Few medical students pursue a career as a physician scientist. Even those that do, the path towards maintaining a robust research career and clinical training can be difficult given the personal and social pressures to focus solely on research or clinical work. Despite the long history of science and medicine, there is question concerning the role that physician scientist in modern medicine.¹⁻⁴ As a recent physician scientist graduate, I feel that physician scientists are greatly needed in the medical profession. The ability to overlap science, medicine, and the humanities together is an essential part of the producing a well-rounded and effective physician for a rapidly changing profession and world. Through my journey as a physician scientist in training, the lessons I've learned through my training in both the basic science and clinical portions can be helpful for medical students traversing both sides of the divide.

2. Doctoral training

My doctoral training allowed me to witness the importance of translational research on clinical outcomes, which reaffirmed my desire to become a physician-scientist. I experienced this working with one attending psychiatrist, Dr Jeffrey Clothier, who was managing a patient suffering from intractable seizures and psychosis. This patient also carried a mutation in one gene encoding the plasma membrane transporter, SLC13A5. Dr Clothier contacted me for advice after reading a paper I published on SLC13A5. Reviewing the patient's chart, I noticed that the patient was taking metformin. I recently showed that metformin reduced the expression and activity of SLC13A5. I suggested that Dr Clothier's patient with a single functional SLC13A5 gene could exhibit symptoms analogous to a patient with a complete loss of SLC13A5 using metformin. Based on this, Dr Clothier removed metformin and observed a remarkable improvement in the patient's symptoms. My initial discovery required long hours of experimentation and failure. In fact, it was a mistake in one of my experiments that led to this

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very discovery. Despite these hardships, I found great satisfaction knowing my tenacity and diligence helped this patient.

Reflecting on my doctoral training, I learned a great deal that helped me grow personally and professionally. First, mentorship is key for long-term success. It is tempting to network only within your research area. However, the more networking and collaboration you do with scientists and physicians of all backgrounds, the more opportunities that open to publish and learn. Furthermore, networking accumulates social capital the more relationships and collaborations you acquire. It's an investment that opens more opportunities.

Second, fail early and fail often. In medicine, failure is often socialized as something bad. Physicians deal with human lives with real life consequences. However, failure is the only way that we grow in our scientific knowledge to help patients. In basic science, it matters not if you fail. It matters more that you fail early and often to learn what does and doesn't work. Your mentor can make more decisions on guiding your research if you work diligently to finish a project that fails than obsessing about having the "perfect" project. In truth, science is an exercise of intentionally trying to break our models of understanding the world.

Third, don't lose touch with the clinical side of your training. A common belief is that one should be rotating in their doctoral training to keep touch with their clinical background. However, this itself can be challenging. In my experience, using my research time and skills to help clinicians research, write, and publish made me learn and understand more about different fields of medicine than simply shadowing. You provide a service and skill that physicians and other healthcare staff need. In my experience, these moments helped guide my career development.

Lastly, never forget the human element of your research. Working with clinicians opened up opportunities to apply my initial research to help clinicians with managing difficult patients. But more importantly, it reminded me of the motives I had pursuing a career as a physician scientist. What makes science fun isn't the discoveries alone; it's the relationships we have with others and the people we help that make it a wonderful career to pursue.

3. Clinical rotations

After completing my doctoral research, I came back into the clinic hitting the ground running. My clinical and research experiences solidified my

passion for neurology, where both the human and scientific perspectives overlap seamlessly. I found working with neurology patients and their families further deepened my passion for this specialty. In the clinic, I worked closely with a post-polio syndrome patient who struggled with progressive loss of his lower extremity function. His appreciation for my willingness to listen and help him with his mobility left an indelible mark on my life. In the Neuro ICU, I helped families who lost relatives to brain trauma navigate the organ donation process. In one case, a patient's brother disclosed recently losing his first brother from head trauma. He felt overwhelmed losing his second brother. I helped him view the organ donation as honoring his brother's last wish to help someone and answered as many questions as possible. Afterwards, he thanked me for listening and addressing his spiritual needs. I had a similar experience working with neonatal neurologists engage in family discussions on prognosis and goals of care for several neonates with brain damage. Observing their skill in communication and compassion showed me a unique perspective on the role neurologists perform for their patients. I also learned the joy of being a source of hope and compassion while working with a neuro-oncology patient who suffered multiple neurological deficits after removal of a recurrent meningioma. In our discussion, he acknowledged his physical limitations but wanted someone help him improve his independence. Before the surgery, he had been a prolific research professor and loved his work. Now, he struggled even to speak clearly. His face brightened with excitement when I mentioned my doctoral training. I discussed ways to satisfy his intellectual curiosity and improve his mobility. I see now that our interaction rekindled a part of himself that he believed had long disappeared. Despite medical advancements, multiple neurological conditions leave patients permanently impaired. This sudden loss of independence can be demoralizing. However, even small acts of love and kindness can make all the difference. Over time, I found myself fascinated and inspired by their resilience.

Reflecting on my clinical training, I believe there are several important lessons for physician scientists in training to consider. First, there is much more to learn in medicine outside of the diagnosis and pathophysiology of disease. The sociological, historical, and humanities aspect of medicine matter even more. When it comes to understanding illness and patient populations, the sociological perspectives provides a powerful lens to understand our

own biases and the several factors that influence patient outcomes outside of our control. There is more to medicine than what we do in the hospital. It embodies our religious, social, and political beliefs in ways that we often don't fathom. Be willing to spend extra effort into reading more about these topics and discussing them with faculty, residents, and friends.

Second, what you say matters more than what you do. What you say to a patient can do as much harm as any treatment you prescribe. It is important to elicit patient's their perspective on their illness and how it affects their life. It's important to understand what a patient values and perceives of their condition. We all worry about knowing how to diagnose and treat. However, a great doctor is one that learns to remain curious in people more than simply the disease they have. The patient's story is not simply a narrative device. It provides a window into treating a patient that helps not only heal the body, but also the soul.

Third, be the type of doctor you want to be now. Even if you see a physician do or say something, does not make it right. In many cases, physicians are creatures of habit and bias as much as anyone else. Be willing to challenge your perceptions and beliefs. We all have biases that are built on a lack of information than a personal willingness to remain ignorant. Be a great listener as well as a great speaker. Most misunderstandings or confusion occurs from our lack of listening than our ability to speak.

Fourth, always be willing to teach. Despite the hectic nature of medicine, teaching is important for teaching the next generation of medicine. Unfortunately, the nature of medicine can often make teaching be something that is put on the shoulders of the medical student and/or resident. However, I've found that teaching younger medical students helps us to clarify our own experiences and distill the essentials to the upcoming class that faculty may not be aware of. Furthermore, teaching requires us to learn and master topics. We become better scientists and clinicians the more we take teaching as a part of our professional growth. More so, teaching forces us to embody the standards and quality of clinicians we want in ourselves and others. Being a role model provides students inspiration to be all they can be and become the best version of themselves as clinicians.

4. Barriers to understanding and maintaining a physician-scientist career

Despite the many lessons I've acquired during my physician-scientist training, there are notable

barriers and challenges to pursuing this path.^{5,6} As Dr Karuna Ganesh aptly summarized:

“Blending clinical care with laboratory research offers the possibility of a stimulating and fulfilling career, but there is a growing shortage of trainees following this path. The protracted training period required to master both a medical specialty and investigative skills is underscored by the increasing average age of receiving a first independent NIH R01 grant, now 45 years for MDs and MD–PhDs. Much attrition occurs at the transition from residency or fellowship to independent faculty positions, when the precarity of grant funding, competing family responsibilities and more stable job alternatives force many aspirants off the research ladder. However, the challenges do not end once a faculty position has been secured. The demands of academic publication and tenure can be at odds with responsive patient care. Colleagues and trainees in the lab might not appreciate the need to abruptly leave a complicated experiment to answer the needs of a patient. On the other hand, keeping up with increasingly complex clinical skills, licensing requirements and documentation can lead to burnout, prompting some established physician–scientists to focus exclusively on the lab. Carefully negotiated protected time and clinical coverage agreements, critical to research success, can fall apart in the face of a crisis such as the COVID-19 pandemic, and might never be fully restored. Women, minorities and immigrants face particular barriers to entry, mentorship, visibility and promotion, and are severely under-represented in leadership positions. Various initiatives have been proposed to address these challenges, but much more needs to be done to recruit and retain a diverse cohort of physician–scientists”.⁴

Despite these barriers, mentorship remains essential for the career development of the physician-scientist trainee. It is essential for trainees and junior physician-scientists to seek mentoring from a variety of supporting sources. Forging and maintaining a good mentoring relationship requires learning to recognize, consider, engage with, and learn from varied perspectives. Most accomplished physician-scientists can list one or more clinical and scientific role models who helped them early in their careers. In addition, the enormous body of knowledge necessary for top-notch patient care and cutting-edge research must be kept up to date, which is a big burden for physician scientists. A work environment that encourages open

cooperation and the free flow of ideas, resources, and information substantially facilitates this. Outstanding patient care and research are facilitated by choosing a workplace that promotes seeking advice from other professionals at any time. Lastly, when seeking career guidance from anyone, it's important to listen to people that inspire and are optimistic and to remember not to undervalue one's ability.

5. Conclusion

For those about to enter or are in the middle of their physician scientist training, you are embarking on a path that few people understand. Clinicians may view you as anomaly for being interested in research rather than the clinical world. In contrast, scientists can see your approach as impeding on their own territory. Both sides, it appears, rarely seem satisfied by your presence. However, your desire to be authentic in your various pursuits and desire to bring the research and clinical work in a way that embodies your goals and dreams is something that is admirable and inspiring. The courage to be yourself and embody this path with grace despite being misunderstood is something that will make you into a great physician and scientist. After completing my training, I see now that all the territorial disputes and misunderstanding from colleagues doesn't matter as much as I thought. I look back and appreciate the

enormous growth I had in myself personally and professionally. Unlike your colleagues, you have been given the opportunity to reflect, grow, and become someone that stands out. But more importantly, you are investing your life into becoming a great physician to change the lives of your patients and, hopefully, the world. You are not alone on your path. Others have travelled it. You will overcome the challenges you face and be a great service to humanity.

Conflict of interest

The authors have no conflicts of interest to report.

References

1. Kosik RO, Tran DT, Fan AP, et al. Physician scientist training in the United States: a survey of the current literature. *Eval Health Prof.* 2016;39(1):3–20.
2. Balestrini CS. Physician-Scientist trainees: a "call to action" to confront future career challenges. *Clin Invest Med.* 2020;43(3): E25–E26.
3. Williams CS, Rathmell WK, Carethers JM, et al. A global view of the aspiring physician-scientist. *Elife.* 2022;11.
4. Ganesh K. The joys and challenges of being a physician-scientist. *Nat Rev Gastroenterol Hepatol.* 2021;18(6):365.
5. Omer I, Khan G, Bahalaq A, et al. Cultural and academic barriers toward physician-scientist (MD-PhD) careers: a mixed methods study. *Cogent Edu.* 2023;10(1), 2161189.
6. Cox AL. Balancing research, teaching, clinical care, and family: can physician-scientists have it all? *J Infect Dis.* 2018;218(suppl_1). S32–s35.