

REFLECTIONS ON MY EXPERIENCES SHADOWING IN AN INTERNAL MEDICINE RESIDENT
CLINIC

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A CAPSTONE REPORT

Presented to the Faculty of Miami University in partial
fulfillment of the requirements
for the degree of

Master of Medical Science

Department of Biomedical Science

The College of Arts & Science
The Graduate School
Miami University
Oxford, Ohio

2024

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2024

INTRODUCTION

Since matriculating in the Master of Medical Science in Biomedical Sciences program I have gained a vast array of knowledge both in the clinic and in the classroom. In my graduate classes I have learned a lot about the procedures and techniques that go into conducting research and how to properly write a grant application. Additionally, I have become much more confident in my ability to present both research of my own and research performed by other scientists in front of a group. Furthermore, I improved my technological literacy of different programs, such as PyMol, commonly used in all areas of research.

I have gained considerable insight into physician residency training and the demands of medical school from shadowing different residents in the clinic. I have also been exposed to a variety of unique careers including, but not limited to, the practice of primary healthcare. I have shadowed physicians, nurses, physician assistants, and pharmacists and learned a great deal about the different careers available to me upon graduation. Shadowing different physicians has eased my worries about the difficulty of attending medical school. It also shown me that medicine is an art and more than just the regurgitation of what has been learned in the classroom. It takes strong interpersonal and communication skills to become an effective healthcare provider.

In this report I will discuss how my time in the MMSc. in Biomedical Sciences program has helped me create connections between what I have learned in classroom and what I have observed in the clinic. Furthermore, I will review knowledge I have gained about how to develop specific questions in order to interrogate the medical literature effectively and answer the questions that arise in the clinical setting. Finally, I will

discuss how communication and the psychosocial determinants of health impact healthcare outcomes in the United States.

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Dedication

This report is dedicated to my parents and sister in recognition of their limitless love and support.

Acknowledgements

I would first like to acknowledge Dr. David DeLaet for the countless hours he has spent helping me and my peers prepare our reports, as well as providing guidance, and help coordinate shadowing hours over the past year. He has significantly reduced many of the burdens of graduate school as a result of his tireless dedication.

Lastly, I would also like to thank my roommates, both current and past, friends, and trivia teammates who have provided hours of support in the form of editing help, brainstorming sessions, and much needed distraction.

From the Classroom to the Clinic

In my molecular physiology course, we focused on the molecular physiology of transport across the cell membrane. One class of transporters that was covered is called sodium-glucose cotransporters (SGLTs). There are two primary forms of SGLTs. The first type 1, which is found in the intestine, and type 2, which is located in the kidney (Poulsen *et al.*, 2015). SGLT2 is responsible for reabsorbing 90% of glucose found in the glomerular filtrate (Poulsen *et al.*, 2015). While shadowing in the internal medicine clinic at the Hoxworth center in Cincinnati, OH, many of the patients present with diabetes mellitus (DM). The primary symptom of DM is hyperglycemia which is caused by problems with insulin secretion (Type 1) and/or problems with how the body responds to insulin (Type 2) (American Diabetes Association, 2010). According to a report published by the National Institute of Diabetes and Digestive and Kidney diseases (NIDDK) in 2023, it was estimated that more than 1 in 10 Americans have diabetes affecting a total of 38.4% of Americans in 2021 (USDHSS, 2024). The NIDDK also states that one-third of adult Americans have been diagnosed with prediabetes, which is a condition in which an individual experiences a blood sugar that is higher than average but has not reached the levels necessary to be diagnosed with DM. Previous research suggests that the prevalence of both Type 1 and Type 2 DM will continue to increase in the upcoming years (Rowley *et al.*, 2017). It is estimated that more than 10% of the global adult population will have diabetes by 2030 (Saeedi *et al.*, 2023). This ranks diabetes as one of the ten most common diseases and one of the deadliest diseases worldwide (WHO, 2020)

Before being diagnosed with DM, most individuals are diagnosed with prediabetes. Prediabetes is a preventable and reversible condition characterized by abnormal blood glucose homeostasis, insulin resistance, and β -cell dysfunction (Lawal *et al.*, 2020). The primary treatment

for prediabetes entails diet and lifestyle changes. If the patient does not make the changes recommended, prediabetes could develop further into full-fledged DM (Lawal *et al.*, 2020). In some patients with DM, strict diet and lifestyle changes may be enough to control the condition, but in most cases medication coupled with lifestyle changes are needed for effective blood glucose maintenance.

After multiple shadowing experiences, I started to recognize different medications that are routinely prescribed to the patients struggling to manage their diabetes with lifestyle changes. One of the medications I found that was often prescribed is Jardiance (empagliflozin), an SGLT2 inhibitor. When I learned this, I questioned how Jardiance works to effectively combat hyperglycemia.

SGLTs are different from standard GLUT transporters in that they do not operate using facilitated diffusion but rather they transport glucose into cells utilizing the favorable sodium concentration gradient (Sano *et al.*, 2020). SGLT2 is located in the S1 and S2 segments of the proximal tubules and has a higher selectivity for glucose than SGLT1 (Sano *et al.*, 2020).

In patients with hyperglycemia, the SGLT2 receptor reabsorbs glucose that has been filtered through the glomerulus. This prevents the body from getting rid of the excess glucose leading to chronic hyperglycemia. A class of medicines called SGLT2 inhibitors (“flozins”), specifically empagliflozin due to its high specificity for SGLT2, are often utilized for the treatment of DM (Jasleen *et al.*, 2023). When ingested orally empagliflozin binds to and blocks SGLT2 transporters thereby preventing the reabsorption of glucose from the blood. Previous research has indicated that a dose of 10mg/day increases glucose excretion via the urine by 64 grams/day and that higher doses result in higher excretion of glucose (Sizar *et al.*, 2023).

Patients struggling with diabetes also often present with other comorbidities such as chronic kidney disease (CKD), hypertension, obesity, and neuropathy (Nowakowska *et al.*, 2019). This was indeed the case for many patients I saw while shadowing at Hoxworth. Previous research into the effects of empagliflozin (Jardiance) on these comorbidities also yielded positive results. It was found that in addition to a reduction in blood glucose levels, patients also experienced a reduction in blood pressure and body weight (Forycka *et al.*, 2022). Patients with CKD also showed improvement when treated with empagliflozin, notably seeing a reduction in the progression of CKD and a decrease in the number of kidney-related health events that required hospitalization (Forycka *et al.*, 2022). Empagliflozin is also believed to elicit a general protective effect on the renal system through increasing the amount of sodium that is delivered to the distal tubule by suppressing the absorption of sodium in the proximal tubule (Sano *et al.*, 2020). The increase in sodium is believed to then activate the tubuloglomerular feedback loop through the macula densa which normalizes the glomerular filtration rate (Sano *et al.*, 2020).

The effects of empagliflozin are not strictly positive as some adverse effects of the drug have been reported. Patients taking empagliflozin are at risk of urinary tract infections (UTIs) as a result of frequent urination and an increase in glucosuria, as well as dyslipidemia (Sizar *et al.*, 2023). If taken in addition to insulin, patients taking empagliflozin are at an increased risk of hypoglycemia (Sizar *et al.*, 2023). Lastly and most significantly, patients taking SGLT2 inhibitors are at an increased risk of developing Fournier's gangrene which is a potentially fatal condition (Ellegård & Prytz, 2020).

The 2023 review article helped augment what I learned about SGLT in molecular physiology and while shadowing at Hoxworth by clearly explaining the benefits and risks associated with SGLT2 inhibition on each body system (Jalseen *et al.*, 2023). The review, which

looked at a total of 35 articles from no earlier than 2017, included randomized controlled trials, systematic reviews, meta-analyses, and traditional reviews. While in class we learned a considerable amount about the structure and function of the transporter. This review article helped supplement my lack of clinical knowledge and improve my overall understanding of how SGLT2 inhibitors work to treat diabetes mellitus.

Framing a Clinical Question and Interrogating the Literature

While shadowing in the internal medicine resident clinic at the Hoxworth Center in Cincinnati, I came to realize that there were often questions that arise for which even the resident physicians I shadowed did not readily know the answer to. They were often encouraged by their attending physicians to interrogate the medical literature in order to identify the best-available evidence to answer these questions. In our Capstone course, we were introduced to the PICO format for framing clinical questions. PICO is a tool used to help develop a clinical question. PICO stands for “Population, Intervention, Comparison, and Outcome” and was first introduced in 1995 to help guide physicians when searching through literature for a specific answer (Eriksen & Frandsen, 2018).

I found many of the patients I saw at the Hoxworth Center to be struggling with anxiety. A number of these patients were prescribed selective serotonin reuptake inhibitors (SSRIs) to help treat their symptoms. As I was unsure of what SSRIs were and their mechanism of action, I decided to further explore this class of medications and their role in the treatment of anxiety. I also attempted to better understand the epidemiology of anxiety given how frequently I saw adults with anxiety in clinic. Anxiety is one of the most common mental disorders in the world and affects roughly 4% of the global population according to the World Health Organization (WHO, 2023).

While several treatment options are available for the treatment of anxiety, SSRIs are often considered first line as a pharmacotherapeutic class. As seen in Figure 1, SSRIs are comprised of 7 specific agents, each of which has been specifically approved by the FDA for the treatment of anxiety disorders (Garakani *et al.*, 2020)

Medication class	Mechanism of action	FDA approvals for anxiety disorder	Off-label uses	Therapeutic dose ranges (mg/day)
SSRIs:				
Fluoxetine	Selective 5-HT reuptake inhibitor	PD	GAD, SAD	20–60
Sertraline		PD, SAD	GAD	50–200
Citalopram		None	GAD, PD, SAD	20–40
Escitalopram		GAD	PD, SAD	10–20
Paroxetine		PD, SAD, GAD	None	20–60
Paroxetine ER		PD, SAD	GAD	27–75
Fluvoxamine		None	GAD, PD, SAD	100–300

Figure 1. A list of all FDA approved medications, their approved uses, and recommended doses. PD = Panic Disorder, SAD = Social Anxiety Disorder, GAD= Generalized Anxiety Disorder. Adapted from Garakani *et al.*, 2020.

To better understand how SSRIs work in treating anxiety disorders, I next reviewed the role of the neurotransmitter serotonin in normal human neurophysiology. Serotonin (5-hydroxytryptamine) is a neurotransmitter that regulates almost all human behaviors including anger, aggression, reward, appetite, memory, and attention (Berger *et al.*, 2009). These behaviors are each regulated by a specific set of serotonin receptors (Berger *et al.*, 2009). Previous research has shown that anxiety behaviors are regulated by two different isoforms of the SERT receptor 5-HT_{1A} and 5-HT_{2C} (Berger *et al.*, 2009). 5-HT_{2C} has also been shown to regulate appetite, reward processing, and energy levels (Berger *et al.*, 2009). When serotonin is released into the synaptic cleft, SERT reabsorbs the serotonin transporting it back into the presynaptic neuron. When ingested orally and once inside the brain, SSRIs bind to the serotonin transporter (SERT) and cause the receptor to undergo an allosteric conformational change preventing serotonin from being transported back into the

presynaptic neuron. As a result, the amount of free serotonin inside the brain increases which is believed to improve neuronal communication and reduce feelings of anxiety and depression.

My specific clinical question looked at whether SSRIs could be effectively used in adolescents with generalized anxiety disorder. Using the PICO format, my question was “in adolescents with generalized anxiety disorder (“P”), does the use of SSRIs (“I”) compared to placebo (“C”) improve symptoms of anxiety (“O”)?”

To answer my question, I performed a database search using these terms to answer this specific question. I identified an article published by Strawn *et al.*, 2020 that I believed answered my question. In this article researchers performed a clinical double-blind, randomized, placebo-controlled, forced titration study to test the efficacy of escitalopram treatment when compared to a placebo in adolescent patients with anxiety.

The study was conducted over an 8-week period in which the subjects moved through increasing doses together and received 5 mg/day for the first two days before the dose was titrated to 10 mg/day for 7 days (Strawn *et al.*, 2020). Following this the patients received 15 mg/day until weeks 4 and 6 when 20 mg/day could be given (Strawn *et al.*, 2020). Patients admitted into the study had been previously diagnosed with GAD and ranked greater than 15 on the Pediatric Anxiety Rating Scale (PARS) (Strawn *et al.*, 2020). Participants were randomly assigned to an experimental group ($n=26$, mean age: 14.8 ± 1.7 y/o) and a placebo group ($n=25$ mean age: 14.9 ± 1.6 y/o) while patients, caregivers, and staff were blind to the treatment being administered. (Strawn *et al.*, 2020) The patients’ PARS scores were evaluated over the course of the study at weeks 1,2,4,6, and 8, and the outcome of the treatment was measured by changes in this value when compared to the baseline (Strawn *et al.*, 2020).

The PARS measures the severity of anxiety and the presence of symptoms in an individual over the course of the previous seven days (Johnco *et al.*, 2020). Questions found in the PARS focus on identification of 50 anxiety symptoms before using seven global items to assess symptom presence, avoidance, interference, and physiological symptom severity (Johnco *et al.*, 2020). These global items are then ranked on a scale of 0-5 with 5 corresponding to extreme symptoms, and 0 corresponding to no symptoms (Johnco *et al.*, 2020). The study also reported on the adverse effects reported by patients and found no significant difference between the experimental and placebo groups (Strawn *et al.*, 2020). However, one patient receiving escitalopram treatment experienced an aborted suicide attempt (Strawn *et al.*, 2020).

Upon conclusion of the study, the researchers reported a significant ($p < 0.001$) reduction in the reported PARS score of patients treated with escitalopram when compared to the placebo group. Patients who received the SSRI treatment saw an average decrease of -8.65 ± 1.2 points in their PARS score, whereas patients who received a placebo treatment saw an average reduction of only -3.52 ± 1.1 points (Strawn *et al.*, 2020).

From a clinical perspective, this article answers many of my questions regarding the efficacy of SSRI treatment in adolescents suffering from GAD. The article discusses the impact of SSRI treatment on anxiety symptoms while also reporting the effects on pulse and blood pressure, as well as adverse effects, efficacy and reasons for discontinuation (Strawn *et al.*, 2020). It is my opinion that the authors could have better explained the tests that were used to measure anxiety symptoms such as PARS. This article has provided me with information to the point where I am confident that as a healthcare provider, I would be able to help my patient decide if SSRI therapy is best for them. Ensuring that they are aware not only of the efficacy of the treatment but would also be aware of any adverse side effects as well.

Reflection on Effective Communication in Healthcare

At the Hoxworth Center in Cincinnati I shadowed a resident physician who did an excellent job helping her patients take accountability for their own care as well as helping them set achievable goals. Shadowing this physician was a unique experience because she had such a positive and uplifting attitude that is lacking in several of the physicians whom I have observed. As I followed her, I noticed that she always maintained eye contact with her patients, very rarely did she have her back to them while she was speaking. In a post-COVID era where many hospitals are requiring providers to wear masks, I think eye contact is especially important as a mask is a physical barrier between the provider and the patient. The physician also spent time typing up the after-visit summary outside of the room so that she would not have to spend time on the computer in front of the patient. While in the room with the patient the physician had excellent recall of her patients' previous visits and always thanked the patient for coming in to see her. At first, I found myself confused about why she was doing this, but then I recalled what I learned about the tactic of motivational interviewing. Motivational interviewing is a strategy used by clinicians to motivate behavior change in their patients (Bischoff *et al.*, 2021). It is rooted in both social and cognitive psychology and is an effective tool because each patient has different motivations for behavior change (Bischoff *et al.*, 2021). I specifically noticed this method when the physician was talking to her patient about his smoking habits, but it can also be used to address other behavior-related factors such as lack of medication adherence, lack of exercise, and/or and unhealthy diet (Bischoff *et al.*, 2021). The patient admitted that it was normal for him to smoke two packs of cigarettes per day, but he was trying to improve and had cut the amount he was smoking by half since his last

appointment. When I heard this, I was dismissive of his accomplishment. I thought to myself: “Ok? The patient is still smoking a pack of cigarettes a day; that is no accomplishment.” However, the physician I was shadowing gave a response that I did not expect. She praised him and made sure that the patient understood what an achievement that was. This interaction really made me appreciate the skill of motivational interviewing. It is my opinion that if the physician had dismissed this achievement as I initially had, the appointment would have gone much differently.

She then offered the patient help further reducing his cigarette usage and was understanding when he refused. She did not press him further which was another action that I believe helped maintain a positive relationship between the patient and the physician. Previous research has shown that shared decision-making practices similar to those performed by the physician can improve patient understanding and satisfaction and reduce the amount of unwanted or unneeded care received by the patient (Smith & Martini, 2023). I also noticed how the physician spoke about her patients when she was not in the room with them. In my shadowing experiences, I have noticed that some physicians experience a shift in behavior when speaking about the patient at the conclusion of the visit. Upon exiting the room, many physicians will immediately comment on the visit and more often than not the comment they make is one they would not make in front of the patient. However the physician I was shadowing always had something positive to say to me. I was surprised to hear her say things like: “I am so psyched for this appointment; I have been trying to get this patient in to see me for weeks; and I am so happy that this patient came in to see me today.” Hearing these comments from the physician really altered the way I think about medicine. As someone who can struggle with compassion at times, I have found myself using this physician as a role model for being sympathetic and empathetic in my everyday interactions.

There was one particular interaction I felt went poorly also occurred when I was shadowing at the Hoxworth center. The physician I was shadowing had a full schedule and as a result seemed to be very rushed. The patient we were seeing was suffering from chronic kidney disease (CKD) and was struggling with urinary symptoms. The patient was struggling with addiction and, financial difficulties. Due to her financial troubles the patient was struggling to purchase medical supplies necessary to perform an at-home medical treatment. The patient was using household kitchen items instead of sterile tools. When the physician learned about this, she made no effort to hide her disbelief. The patient could perceive that the physician was unhappy with her and started crying. The physician immediately had to perform damage control by assuring the patient that the patient was not at fault for doing what she felt was necessary. To the physician's credit she was able to quickly defuse the situation. However, the patient remained upset and when we re-entered the room after speaking with one of the proctors, it was obvious that she had resumed crying while we were gone. In this case I believe that the physician should have been more empathetic before reacting in that manner. Had she done so and focused on patient-centered care I believe, she may have saved the patient a lot of distress and improved her relationship with the patient as well. Patient-centered care (PCC) has been shown by previous research to improve the quality of care received by the patients and enhance the patients' trust of their physician (Fix *et al.*, 2017). The PCC model focuses on viewing the patient as a person rather than a disease and emphasizes the importance of involving the patient in their own care plan (Fix *et al.*, 2017). A more successful interaction may have involved the physician asking the patient why she felt the need to perform this treatment at home and offering more resources before focusing on the unhygienic practices of the patient.

While shadowing I have noticed that even though a provider performs poorly in one area of the visit does not mean that they won't excel in another. For example, when the above-referenced patient expressed the desire for help with her addiction, the physician did an excellent job utilizing motivational interviewing techniques and praising the patient for the changes she was willing to make. At the end of that visit, the physician provided the patient with supplies that she could use to help perform her at-home treatment. She also arranged a meeting with the social work team so that she would be able to get financial help with her bills. The patient appreciated the help that the physician was able to provide and I believe that the relationship between the physician and the patient improved.

Reflection on Psychosocial Determinants of Health

While shadowing at the Hoxworth Center in Cincinnati, I have observed many patients whose health has been negatively affected by one or many different social factors. Many of these patients are direct descendants of first-generation immigrants or first-generation immigrants themselves. Immigrants accounted for 13.7% of the United States' population in 2018, with no other country holding more migrants (Bustamante *et al.*, 2021). First-generation immigrants usually have better health outcomes than Americans (Bustamante *et al.*, 2021). However, as acculturation occurs migrant health outcomes show similarity to that of U.S.-born individuals. (Bustamante *et al.*, 2021). One major factor that impacts the health outcomes of immigrants in the U.S is a lack of insurance. In 2018, 23% of authorized immigrants living in the U.S did not have insurance additionally, 45% of undocumented immigrants also lacked insurance (Hill *et al.*, 2021). A vast amount of previous research into the impact of lack of insurance on health outcomes in the U.S. suggests that major policy changes must be implemented to prevent an unnecessary burden on the U.S. healthcare system (Bustamante *et al.*, 2021; Hill *et al.*, 2021). In this section I will

discuss the impact that immigrant status and socioeconomic status can have on the physical and mental health outcomes of individuals in the United States, and what can be done to combat this issue.

One morning the resident I was shadowing, who I will refer to anonymously as “Dr. Martin” was scheduled to see a young mother who had immigrated to the United States from Senegal within the last year. For me, the visit started when Dr. Martin and I were reviewing the patient’s chart prior to the visit. Dr. Martin very quickly noted two issues: the first being that the patient, who I will refer to anonymously as “Ms. Smith” had no insurance; and the second being that she spoke Wolof, a language for which the clinic had no interpreter. The lack of interpreters is a problem for many immigrants seeking healthcare in a new country. A study investigating how access to interpreters affects healthcare compared two different hospitals, one with access to interpreter services and one without. The study found that patients with access to interpreting services increased their office visits and prescriptions obtained (Jacobs *et al.*, 2001).

Fortunately, Ms. Smith did speak limited English, so she was able to communicate with Dr. Martin in a limited capacity. She made an appointment with the clinic because she was experiencing terrible nightmares and severe stomach and back pain. When asked about the nightmares, Ms. Smith was initially hesitant to speak, but she eventually opened up to Dr. Martin and me. Ms. Smith confessed to the two of us that she had illegally entered and was now living alone in United States. She, her partner and her children had left Senegal because she was fleeing an arranged marriage. Ms. Smith’s partner had, in her words, “rescued” her from her previously arranged marriage, but he had recently been deported back to Senegal. As the visit continued, “Ms. Smith told us that her partner had suffered a workplace-related injury for which he required medical treatment. This treatment was too expensive for him to receive in the United States so he

and Ms. Smith decided that they were going to attempt to seek healthcare in Canada. The lack of access to healthcare in the United States as a result of cost is a common problem for both citizens and immigrants alike. A cross-sectional study performed in 2023 of 1,101 Americans found that almost 40% of interviewees had delayed healthcare due to cost within the last year (Ratnapradipa *et al.*, 2023). Other factors such as lack of access to transportation that resulted in delaying care were also associated with low socioeconomic status (Ratnapradipa *et al.*, 2023).

Unfortunately for Ms. Smith, she was denied entry to Canada and her partner was unable to receive care. To make matters worse for Ms. Smith, her partner was detained and subsequently deported, leaving her and her three children alone in Kentucky. During the visit, Ms. Smith expressed a desire to treat only her physical pain and seemed unconcerned with her nightmares. Ms. Smith” told “Dr. Martin that every night she had the same nightmare of her partner being put into handcuffs. Dr. Martin was very concerned about this and offered to refer Ms. Smith to a counselor. The visit ended with Dr. Martin providing Ms. Smith with a psychiatry referral and a prescription for her pain. When the visit concluded, Dr. Martin expressed concern for Ms. Smith as he was certain she would be unable to afford treatment for her mental health.

The inability to afford mental health care is a disturbing trend in the United States. In a study published by the American Psychological Association in 2022, it was found that in 2008 that 45% of Americans who needed mental healthcare did not receive it because of cost (Conroy *et al.*, 2020). Unfortunately, the cost of mental healthcare continues to be a barrier for many Americans. According to a report published by The White House, 46% of Americans who needed to receive mental health care in the United States in 2020 were unable to do so because of cost while another 19% did not receive care due to lack of insurance coverage (U.S. Government, 2022).

After the appointment with Ms. Smith, Dr. Martin and I went in to see his next patient who I will refer to anonymously as “Mr. Rodgers.” Mr. Rodgers was presenting for a routine follow-up appointment for the management of his diabetes mellitus. At his previous visit he had been prescribed dulaglutide (Trulicity) and the medication was working well as evidenced by the fact that his glycosylated hemoglobin (H_gA_{1c}) had dropped to the target range of below 7.0% since he had initiated its use. Unfortunately for Mr. Rodgers, he was struggling to afford the medication and confessed that had not been taking it for a while as a result. When Dr. Martin ordered a new H_gA_{1c} for Mr. Rodgers, it was found to be elevated to 9.0%. This is a common trend for Americans with previous research reporting that in 2021 almost 1 in 10 interviewed Americans had to regularly skip taking their prescription medication due to cost considerations and as a result suffered worse health outcomes (Brown & Bussell, 2011). Individuals with disabilities were 20% more likely to skip a dose and uninsured individuals were also more likely to skip (Mykyta & Choen, 2021).

Patients with diabetes are especially at risk in the United States. Previous research has reported that diabetes medication accounted for an estimated 20% of U.S. prescription drug cost totaling \$57.6 billion dollars from 2015 through 2017 (Taylor, 2020). One way that drug costs can be reduced is through the purchasing of generic medications. It has been estimated that when a new generic drug enters the market, the price of the brand medication in competition with the generic competitor decreases by an average of 39% (Herman & Kuo, 2021). This decrease in price becomes more significant as more generic competitors enter the market. When as many as four competitors enter the market, the brand name price is estimated to drop by almost 80% (Herman & Kuo, 2021). Unfortunately for people suffering from diabetes, there are no generic insulin medications available, and they are forced to pay exponentially increasing insulin prices. Previous

research has reported that 30% of Americans with diabetes have reported underutilizing insulin due to cost, a trend that is only expected to increase as insulin prices continue to rise (Wilner *et al.*, 2020).

It is well known that the United States is the only developed country without access to universal healthcare (Zieff *et al.*, 2020). The current healthcare system allows for a gross inequity of care between individuals who can purchase private insurance and those who do not qualify for Medicare or Medicaid. Reforms aimed at increasing the coverage offered by both insurance programs would be a positive step toward addressing this problem and could help combat the prevalence of certain diseases such as diabetes, cardiovascular disease, hypertension, and obesity in the United States (Zieff *et al.*, 2020).

Concluding Section: Impact of the Program on Your Views Towards Healthcare

In my time as a student in the MMSc. in Biomedical Sciences program, I learned a great deal about clinical healthcare professions. I also gained insight into which direction I would like to proceed with my career following graduation. Over the course of my degree, I have shadowed many different healthcare professionals who have drawn on their own experiences to help provide me with advice and guidance with regard to my career. For example, I was considering a career in medical sales when I entered this program but after meeting a device sales representative and learning about his career, I very quickly realized that sales is not the career for me. Although this experience did not help me decide upon a career it did allow me to narrow my focus when searching for a career after graduation.

The program has allowed me to shadow many different healthcare providers such as resident physicians, physician assistants, and nurses. While shadowing these healthcare providers, I have done my best to ask all of them for any advice they can offer regarding my future career.

While shadowing physicians, I can confidently say I learned a great deal about the process of medical school and residency. Before starting this program, I was unsure about what medical school and residency entail. It was reassuring to learn how much support residents have while working and learning in a resident clinic and how many opportunities they have to explore the different fields of medicine.

While shadowing different residents, I found myself excited about the possibility of attending medical school, being a resident, and having patients of my own. I have given many presentations in my classes for this program, usually explaining recent research articles, and very much enjoyed helping my classmates learn new material. When shadowing the residents, I often found myself imagining that I was the treating physician planning out what I would say to the patient as if they were my own. When I found myself doing this, I was filled with excitement about the future. This program has shown me that I really enjoy teaching people about science and helping them understand how the body works, what diseases affect the body, and how different medicines help combat different diseases.

Taking courses at Miami University at the graduate level has also greatly increased my knowledge about different areas of science. In specialized classes such as molecular physiology, neurophysiology, and antibiotics & microbes, I was able to increase my literacy of different research techniques. I found this to be very helpful when performing research and database searches in other classes, as I was often more knowledgeable about these subjects than my peers. As someone who has taken a lot of data-centered science classes, I was surprised to find how much I have been able to apply what I have learned in classes such as the Qualitative Research Methods course I took last semester. When performing research for classes I took this semester such as

Public & Environmental Health, I found myself able to understand a wider variety of published research than what I was able to just a year prior.

The MMSc. in Biomedical Sciences program has provided me with knowledge that I will be able to use in my future career as a healthcare provider. It has also strengthened my resolve to continue to pursue a career as a healthcare professional while also increasing my self-confidence and my desire to enter medical school and be a successful physician.

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