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MMSc. in Biomedical Sciences

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

2025

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2025

Introduction

As a student in the MMSc. in Biomedical Science program at Miami University, I have had the opportunity to shadow providers in many different fields of medicine while learning about the science behind the medicine in practice. Seeing the day to day responsibilities and schedules of different providers has shown me what I am looking for in my future career in medicine. My experiences have driven me away from urgent care and towards other fields where I will be able to get to know my patients a little better. I thoroughly enjoyed seeing the patient-provider interaction when they were familiar with each other. I've also taken many courses during this program that relate to the medical field. Many of these classes deal with medications, how they work, and how the body uses them. Whether it be microbial drug resistance or medicinal chemistry, I will leave prepared with knowledge of common medications and how they will help my future patients.

This document aims to give a multifaceted explanation of the growth I've experienced through this program. The first section focuses on the relationship between curriculum and application to the clinic. The second portion of this paper investigates strategies when asking clinical questions. Next the importance of effective communication and the value of strong communication in regards to a patient's health. Followed by the drastic impacts of ineffective and unprofessional communication. The fifth section investigates the impact of psychosocial determinants on the health of patients. Understanding patients' environment and availability is incredibly important when building a treatment plan. The final section concludes the investigation and summarizes the impact of the MMSc. in Biomedical Science program on my future as a clinician.

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From classroom to clinic

The Centers for Disease Control and Prevention (CDC) estimate that over 230,000,000 prescriptions are written annually in the United States for antibiotic medications¹. They also estimate that around 28% of those prescriptions are unnecessary¹. This means that nearly 65,000,000 prescriptions are used each year by patients who are not infected with a compatible bacterial illness. In Microbial Drug Resistance, a class at Miami University, we learned about the most common mechanisms by which microbes gain resistance to antibiotics. Overprescribing by medical providers and incorrect use by patients are factors leading to an increase in the risk of antibiotic-resistant pathogens. During my time shadowing, I've seen many instances where antibiotics were misused. Patients are frequently given antibiotics when there is no evidence for bacterial infection and often do not finish the course of their prescription when needed².

One patient presented to the clinic with a high fever, cough, and fatigue. They had previously been given a course of antibiotics by a stand-alone urgent care based on the presence of cough and fever. No definitive tests were completed and results indicating a bacterial infection were not present. The patient tested positive for influenza in our urgent care. The outside urgent care had given this patient antibiotics when they likely showed no indication of such. These medications can cause side effects, be harmful to the gut microbiota, and can lead to resistance³. Antibiotic stewardship programs are important safety measures that most urgent care facilities do not have in place⁴.

A separate patient was seen early one week for bilateral acute otitis media. The child was given a 10-day course of amoxicillin. Later the next week, the child returned to the urgent care. The parents noted that the patient started feeling better after only 3 doses, so they stopped the medication. The supposed 10 day course had been cut short to only 3 doses.

This non-adherence is not uncommon in medicine worldwide and can lead to serious implications and a decrease in ideal clinical outcomes⁵. There is also a correlation between increasing levels of antibiotic non-adherence and decreasing income⁶. Providers must educate families and patients on the importance of using medications as instructed. Failure to do so can result in adverse outcomes and a failure in treating the ailment at hand.

With this background in mind, the main research question I propose is as follows: “How does improper use and overprescribing of antibiotic medication lead to risks of antimicrobial drug resistance in adults and children?” A 2009 study based on surveillance data from 35 European countries reviewed the risks of exposure to antibiotics⁷. One of the main claims in this article is that increased consumption of antibiotic medications is associated with higher levels of antimicrobial drug resistance. When these medications are given to patients who do not show definitive evidence of having a bacterial infection, providers are exposing them to an unnecessary risk. This article answers half of our main research question. Goossens talks about the overprescribing of antibiotics as a major risk. Further, they are placing the greater population at risk due to subsequent antimicrobial resistance that may develop. While this addresses the risks associated with overprescribing practices, it does not touch on non-adherence to the course length of antibiotic medications.

Framing a clinical question

During my time shadowing, I've been exposed to numerous patients with mental health conditions. When someone first encounters a mental health diagnosis, they are led to make a decision about their care. I've noticed two large decisions that often need to be made by the patient. "Would you like medication?" and "Would you like talk therapy?" These questions are often asked to someone who has a diagnosis like major depressive disorder (MDD) or generalized anxiety disorder (GAD). I've noticed a two sided view of medications for mental health disorders. Each opinion feels like a separate ideology. One side feels that talk therapy is sufficient for treatment and the other side feels that pharmacotherapy is the most efficient way to get relief. As a learner, I saw benefits to both sides. So I decided to research cognitive behavioral therapy (CBT) versus pharmacotherapy as treatment for reducing feelings of anxiety for patients struggling with depression. Is one treatment better than the other? What about both treatments? My question at hand was: In adolescence with major depressive disorder, is combination therapy using cognitive behavioral therapy (CBT) and pharmacological intervention more effective for reducing the intensity and frequency of anxiety than pharmacological therapy alone? During my investigation, I used the PICO method (Patient, Intervention, Control, and Outcome) to direct my clinical question towards relevant research. My investigation was conducted using PubMed. My search was "combination treatment depressive disorders adolescent behavior therapy medication alone". My results were filtered to meta-analysis and systematic review studies completed in the past five years.

My selected article was titled “Comparative efficacy and acceptability of antidepressants, psychotherapies, and their combination for acute treatment of children and adolescents with depressive disorder: a systematic review and network meta-analysis⁸” This article was selected based on the quality of databases searched, type of analysis (meta-analysis), the inclusion of placebo-controlled trials, the inclusion of multiple types of CBT and medications, the recent completion of the analysis, relevance of the data to the research question, and the size of the data analyzed (almost 10,000 participants). This article ultimately evaluated pharmacotherapy and CBT in combination and individually to treat adolescents with depression. The findings found that combination therapy is more effective than psychotherapy alone or medication intervention alone⁸. However, psychotherapy was also found to be more effective than medication intervention alone⁸. In summary, combination therapy was more effective than CBT which was more effective than pharmacological intervention alone. The study at hand did have multiple limitations which included the age of participants and the lack of demographic information available. The studies analyzed used patients aged 3-20 years old. However, the mean age was 14 years of age which is in our adolescent target age range. Also, information on ethnicity, race, and gender was not available for all of the studies that were analyzed. Overall, this study provides insight into the effectiveness of combination treatment and individual treatment options for near-adolescent-aged people who struggle with depression. The evidence shows that combination therapy is more effective than individual treatment methods for near-adolescent and adolescent patients. Using the PICO framework resulted in relevant and reliable research. I now have a better understanding of relevant treatment that I will be able to apply when in the clinical setting.

Communication in healthcare

A clear understanding of symptoms, needs, history, opportunities, and beliefs are some of the most important aspects of a medical plan. When a provider interacts with a patient or another provider, understanding is critical. A bond can be formed that supports shared decision making between the patient and the provider. Miscommunication can easily lead to problems with treatment, follow-up, or even with someone's opinion on medical providers. This being said, clear communication is the foundation of a successful interaction between providers and patients or other providers.

Effective communication in healthcare

Effective communication allows providers to gain an accurate understanding of the case before them. They're able to recommend related and helpful treatments in a way that can make a positive impact on patients' well-being. It also empowers patients to feel comfortable asking questions. Both parties will leave with a clear understanding of the plans they developed together.

I saw a fantastic patient and provider interaction in the addiction clinic at UC Health. One Friday morning, I observed someone who was struggling with substance use disorder. Their drugs of choice were cocaine and fentanyl. Recently, they had noticed negative outcomes in their life. Family members had shown concern for their well-being because of their substance use. Until then, they had been using both drugs every 2 or 3 days for over 11 years. The provider listened attentively and expressed empathy for the long road that the patient had been down. A few days prior, the patient had taken the substances as usual. However, this time, they had a much different experience. The patient talked about how they had been lightheaded, dizzy, and

passed out. Luckily, their mother was at home and was able to administer care quickly. After discussion, the provider concluded that the patient likely received their normal fentanyl that had been cut with a tranquilizer. This was a very impactful wake-up call for the patient. While the patient was talking, the provider was engaged and made a point to show empathy and understand the most impactful parts of this situation for the patient. He said, "I'm very sorry to hear about you having to go through this. It takes a lot of courage to seek help." This is very important, especially in clinics where the patients are in vulnerable states. The provider asked what the patient's goals were and what they wanted to accomplish that day. He focused the visit to best suit the patient's needs and wishes. It would have been easy for him to say, "You should never take any substances again." However, this approach was not paternalistic. His job is not to cast judgment. He is here to help the patient to reach their goals and live a healthier life. The patient began to talk about how they don't believe the cocaine use is a major problem at this point. Their main concern is their fentanyl use. They requested buprenorphine as a medication to help with opioid substance abuse recovery. At this time, the provider did not scold them on the dangers of cocaine use. He mentioned that this is a great first step. Down the line, it would be recommended to stop the use of cocaine. However, it is better to stop one than to continue both. Instead of casting shame, he asked, "On a scale of 1 to 10, how big of a problem do you think cocaine is in your life?" This question helped him to understand where the patient's goals aligned. This also brings up the idea of changing behavior without making the patient feel isolated for their actions. Next, specific steps were formed to help the patient reach their goals. Group therapy, like Narcotics Anonymous, was discussed. However, the patient felt that this would do more harm than good. So, the provider looked for another option. Working together, they made a plan with multiple steps that would fulfill the goals of the patient.

At the end of the visit, the provider summarized the visit and made sure there were no questions. They had made a realistic plan together. The patient left with a sense of hope and pride in their actions. This would not have been the case if the provider had acted in a different manner. Effective communication has been shown to increase rates of positive medical outcomes ^{9,10}.

Ineffective Communication in Healthcare

Throughout my time shadowing medical professionals, I've seen many interactions between providers and with providers and patients. I've seen patient handoffs, consults, exams, advice, and even conversations as friends. The majority of these interactions have all been professional and successful. However, this is not always the case. Occasionally, providers will communicate in ineffective ways or will be rude to others. This is not wholly unexpected given the high-stress environment that can be found in the medical field. However, these disrespectful interactions can lead to increased incidence of adverse events and can have negative implications on team morale¹¹.

From my experience, provider-to-provider unprofessional communication occurs most commonly in consults. The provider being contacted is often busy and has other patients to worry about. Also, they have very short interactions with the provider who is calling and do not always see the patient in question. One example of this occurred during my time at Cincinnati Children's. I was scribing there, and one of our patients had an unusual rash. The provider added photos in the patient's chart and talked to other providers in the urgent care about possible differential diagnoses. Everyone agreed that dermatology should be consulted because there was no clear diagnosis. The provider called and began telling the resident about the patient's current symptoms and history. The urgent care provider did not talk about possible diagnoses. However, they did mention a few differential diagnoses that were ruled out. Suddenly, the provider was cut off, and the resident asked in a rude tone if she had "even done her research" before calling. The resident talked about how busy they were and that this was a problem for the dermatology clinic. The provider handled the phone call well and explained once more that they had consulted the others working in the urgent care center and called for further investigation.

However, the provider said they would just refer the patient out to a dermatology visit. The attitude of the entire interaction changed because of the resident's tone. Instead of investigating this rash and potentially helping guide patient treatment, the plan changed and will now require more time and money from the patient. The resident's tone also created tension between the provider and dermatology. They are less likely to consult in the future for borderline cases, and they are more likely to have a negative attitude going into the interaction.

Unprofessional interactions do not always occur behind the scenes. As a shadow, I have also seen unprofessional interactions with healthcare providers and patients. During my time in this program, I had two encounters that stand out. I was shadowing a provider in an emergency room. We had a patient check in and triage determined that this patient needed to be seen quickly. They seemed to be in severe pain. In the room, the TV was playing SpongeBob, and the volume was fairly loud. The remote, however, did not work to adjust the volume. A nurse came in and started to take vitals. She noticed the TV and tried to ignore it at first. After a minute or two, she said, "I would probably kill myself if I had to listen to SpongeBob all day".

Immediately, I was caught off guard. She could've said it would be annoying or frustrating. However, the phrase she used was very insensitive and intense. Understanding what references or jokes you can make in front of your patients is a big part of professionalism. If I had a past or family history that had involved struggles with suicide, I would've been extremely upset.

Luckily, I was only mildly uncomfortable. I wondered, "If that nurse talks like this in front of patients and me, whom she does not know well, what does she say to her colleagues that she considers friends?" Afterwards, the nurse came in and told the patient they were going to radiology for a scan. The patient hesitated and asked what the reasoning was for the scan.

Come to find out, the patient had a long history with scans and was concerned about excess radiation exposure. Instead of helping the patient understand why the scan was needed or what we were looking for, she left without saying anything, and I heard her outside of the room saying that they were refusing to go to be scanned. The provider talked with them and made it clear what we were looking for on the scan. After the discussion, they agreed to the x-ray. The provider handled the situation well and was comforting towards the patient. However, if I were in that situation, I would likely feel like I had less voice in my medical decision-making because of the way the nurse acted. Questions should be welcomed in the healthcare setting and not treated poorly, even when the facility is busy.

The second interaction that stands out occurred at the beginning of last semester while I was shadowing at a doctor's office that specialized in primary care. It was a busy day, and there were a lot of patients who needed to be seen. There was a man presenting with concerns of high blood pressure. He had known about this problem for a while, but recently, his daughter told him he needed to be seen by a primary care physician. The doctor asked what he was currently doing to help with his high blood pressure. The patient replied that he was very busy at work and did not have much time to spend exercising or grocery shopping for healthy foods. Instead of trying to understand the patient's position and needs, the provider brushed off the patient and did not spend much time talking about the importance of those actions. There were very few open-ended questions. Almost every question asked was a "yes or no" question. He talked about changes the patient should be making, but did not give him a chance to elaborate on why he had not taken action. Had the provider talked about easy substitutions and the importance of incorporating exercise into your daily life, the patient probably would have been satisfied and left with actions in mind to lower his blood pressure.

However, the patient declined medication and left before the staff could deliver his discharge paperwork. Unfortunately, the patient probably felt like he had not been heard or valued. The provider did not have effective communication with the patient. The whole visit was based on treating high blood pressure. There was no emphasis on the patient's goals for the visit. He did not ask about the patient's beliefs or thoughts on medication. He also did not take the time to ask what the patient does for work. When someone leaves before the conclusion of their visit, I always feel like they have been done wrong by the healthcare system. I believe that they will then lose trust in healthcare providers and will stop taking action towards their health. Had this provider taken the time to understand what was important to the patient and what goals the patient had relating to his health, it's possible that the patient could have set goals to better himself. Instead, the patient left with a bitter taste in his mouth. Listening to the patient is one of the most important aspects of effective communication between the patient and the provider. Care must be adapted to the patient and their needs.

When you observe someone acting inappropriately, you have a choice to take action or to remain silent. There is not always a clear answer. In reference to the first encounter, the provider took action into her own hands. She finished the interaction in a professional manner. However, she reached out to the resident's attending and talked about the way that the resident had handled the interaction. From what I could tell, they were not trying to get the resident in trouble. However, they felt that this could be a very beneficial learning experience. I don't know who I would've reached out to if the provider had not taken the initiative. Likely, I would reach out to the provider whom I was assigned to see if this is something that should be reported.

At the end of the day, the patient had to take more time to go to the dermatology clinic for something that could have been resolved if the resident had taken a better approach.

Remembering to always keep the care patient-centric should guide all communications.

In the second encounter, I was responsible for taking action. At the time, I did not feel impelled to go and talk to the charge nurse. However, if I were to do this again, I think I would. I was unsure of how to handle the interaction. I was only mildly uncomfortable, so I did not feel that I needed to go out of my way to take action. The next day, I had more time to think. I realize that this was insensitive and unprofessional. After a quick search online, I found a phone number to give feedback. I did not use names, but I included the date of the encounter and described the incident. My goal was not to get anyone in trouble. However, I felt that this was important enough to alert the hospital. It was not easy to know the right course of action. Knowing what I know now, I think the most beneficial course of action would have been to share with the nurse that her comments were making me uncomfortable. Hopefully, she would have understood how her comments made me, and likely the patient, feel.

In the final encounter, I did not feel comfortable discussing this ineffective communication with the provider. I assumed I had misunderstood the strategies of the provider. It did not feel like the appropriate place for me to reach out and express concern for the patient as a shadow. Afterall, the provider did not have any obligation to allow me to shadow him. However, after learning about the importance of standing up for patients and bringing attention to opportunities to improve, I feel that I should have brought this encounter to the provider's attention. Asking questions about the encounter could have been a useful strategy to understand the visit better. Hopefully, this would have allowed the provider to see the frustration of the patient and I could have learned more about dealing with the stress of medicine.

Psychosocial determinants of health

Living in Oxford, it is easy to forget that there are large populations of people who do not have the same opportunities that I've been so fortunate to receive. I am usually surrounded by a well educated and financially stable population. As a provider, I will encounter patients from a wide range of socioeconomic positions. While you should not see patients differently based on these factors, I think it is important to acknowledge their exposures and living conditions. A patient who has a high income and lives in a safe neighborhood is more likely to eat healthy foods and go to the gym. Someone who lives in a dangerous neighborhood and does not have the pleasure of being able to afford a private gym is less likely to have regular exercise. How can you expect someone to go outside and be active when it is not safe to do so? How can you expect someone to eat healthy when there are few healthy options available? Income is positively correlated with exercise, and the use of public transportation is negatively correlated with exercise ¹². A workout may only take 45 minutes or one hour. However, if a bus ticket costs \$3 and takes one hour each way, the one-hour workout has turned into a three-hour endeavor. It is not always realistic to ask someone to carve out three hours of their time daily when they have other responsibilities. Many people have children or elderly parents who rely on care daily. These factors are important in determining which plans of action are best for each individual.

I've been fortunate to see diversity in my time shadowing. These experiences have shown me how to navigate healthy living for those with different living situations. Patients experiencing homelessness are especially impactful for me. One patient in particular came to the clinic for a sudden onset of symptoms, including tactile fever, cough, congestion, abdominal pain, rhinorrhea, and diarrhea.

Living in the community shelter, she frequently interacts with others. Individuals experiencing homelessness, both in the shelter and out of the shelter, are especially vulnerable to the spread of respiratory disease¹³. Given the time of year of the interaction, she was tested for influenza. To no surprise, her test was positive for influenza A. The provider asked about the timeline of her illness. Unfortunately, she had been ill for around 3 days and was thus out of the window of time for oseltamivir. Had she had more flexibility in her career, it's possible she would have been able to be seen more promptly and be eligible for oseltamivir. Towards the end of the appointment, the patient showed concern for the ability to rest. She was off of work for the weekend but had duties at the community shelter. When she talked about her “duties” at the shelter, I was confused. I had not been exposed to the normal operations of community shelters. The patient was asking for a written excuse from the provider for the ability to lie down and rest on her cot over the weekend. During the day, the cots are put away, and those staying in the shelter are required to do cleaning tasks or other duties. This was a major moment of realization for me. When I am sick, I am able to stay home from school and work and rest. I have a medicine cabinet with ibuprofen (Motrin) and acetaminophen (Tylenol) available at all times. I’m able to go to the grocery store and purchase electrolyte drinks and whatever else I need to stay hydrated. My focus is on resting and giving my body what it needs to recover. Everyone does not have the same privilege. This patient had to request a doctor's note for the ability to lie down and rest. I was shocked. Unfortunately, it is likely that this patient was not able to rest for as long as needed. They likely returned to their job and resumed participating in the daily duties at the shelter. Not only did this likely slow her recovery, but also potentially put others at risk. However, not all patients are able to drop their daily tasks or jobs when illness strikes. Personally, I have never experienced homelessness.

However, understanding how homeless shelters operate is critical for providing high-quality patient care. Had the provider not understood how community shelters operate, this patient may not have been able to have any time to rest during the day. It is likely that they would've been required to clean and perform other duties in the shelter. Other members of the community could have been put at risk and our patient's health would have been negatively affected.

Homelessness is just one example of disparities people face on a daily basis. There are departments that help with housing, financial aid, and other related topics. Government funding is also available for certain situations. Transportation, medication, and appointments are all things that qualify for assistance in certain scenarios. These departments and programs are making it easier for patients to receive access to healthcare no matter what their circumstances.

As a future clinician, reassuring patients and helping them to feel comfortable while talking about unfortunate circumstances will aid me in understanding how to adapt treatment plans to their specific needs. Each one of the experiences I've had will allow me to better understand the struggles patients endure. I am now able to understand a wider range of experiences and better understand how social positioning can impact someone's health.

Conclusion

The MMSc. in Biomedical Science at Miami University has provided many opportunities to grow. Emphasis on both classroom settings and clinic observation guides students towards understanding the science and the art of medicine. Without science, medicine would not exist. Gaps in knowledge can have life-threatening consequences. The classroom setting serves as the foundation for further learning and development. However, without the “art” of medicine, there would be no connection between patient and provider. Learning how to communicate effectively and how to use shared decision-making with the patient is critical. This program has given me the opportunity to grow in both aspects. I’ve been challenged in the classroom while observing providers put their knowledge into practice. My experiences growing during this program have prepared me to be a better physician in the future.

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