**Applied Experience:**

The Importance of Fit-Testing to Prevent the Spread of Tuberculosis

**ABSTRACT**

For my Applied Experience, I worked as a ‘fit-tester’ in Norwalk Hospital in Connecticut. As a ‘fit-tester’, it is my job to fit all 1,500 employees of Norwalk Hospital for a Tuberculosis (TB) mask. A TB mask, which is called an N-95 Particulate Respirator, comes in two sizes: small and regular. It is my job to fit each employee for one of these two sizes and make sure that they know how to properly put on this mask if they ever come into contact with a TB patient. This process, called ‘fit-testing’ is an important public health measure in preventing the spread of TB. Since TB can be transmitted through the air if a patient with active TB sneezes or coughs, it is crucial that all hospital employees are prepared, should they come into contact with a TB patient.

Through my Applied Experience, I had the opportunity to learn about certain health care professional’s outlooks on TB and their attitudes towards the prevention strategy of ‘fit-testing.’ Being a fit-tester sparked my interest in the disease, so I also had a chance to do some research on TB and examine its impact in the US and around the world. Through research and interacting with the employees at Norwalk Hospital it became clear how important public health prevention is in helping to decrease the rates of transmission of TB. While TB rates in the US are declining, TB continues to be a common cause of death in developing countries such as South Africa. With the help of public health prevention strategies such as ‘fit-testing’ we can make a difference to decrease the rates of TB around the world.
The Importance of Fit-Testing to Prevent the Spread of Tuberculosis

This summer, my Applied Experience opened my eyes to a public health problem that I never knew too much about: Tuberculosis. TB, one of the oldest diseases known to humankind, has continued to be a public health problem since it claims roughly 2 million lives each year.\textsuperscript{i} A TB report explains that “approximately one-third of the world’s population is infected with \textit{Mycobacterium tuberculosis}, the bacterium that causes TB” and that each year 9 million new cases of TB occur.\textsuperscript{ii} One of the most alarming statistics is that TB kills more youth and adults than any other single infectious agent in the world today.\textsuperscript{iii} From these statistics it is evident that TB is an important public health issue, particularly in the developing world.

For my Applied Experience, I worked as a ‘fit-tester’ in Norwalk Hospital. My job was to make sure that all 1,500 employees of Norwalk Hospital were properly fitted for TB masks. There is a specific routine and protocol involved with properly fitting an employee for a TB mask, which the fit tester must learn. The whole process takes less than ten minutes. The employee must first fill out a sheet of paper with their name and information, as well as answer a few basic questions about the condition of their health. Then the process of fitting the mask takes less than three minutes.

When I first started working as a fit-tester I didn’t understand why it was necessary for ALL the employees of the hospital to be fit-tested, including the cleaning staff and secretaries. And to be honest, the majority of the employees who didn’t work directly with patients didn’t understand why they needed to be fit-
tested either. What surprised me even more was that everyone needed to be fit-tested once a year. So every July it is required of every employee to be fit-tested, regardless of how long they have been working at the hospital or how many times they’ve been fit-tested in the past. My boss explained that everyone must be fit-tested each year because it is possible for the size of someone’s face to change over the course of a year. If they lose a considerable amount of weight, their face could get smaller and they would need a smaller-sized mask. The same idea applies if they gain weight as well.

One aspect of this Applied Experience that I am grateful for is that it sparked an interest in TB for me. I have become much more curious about TB—how it is transmitted, its incidence and prevalence around the world, and how/if it can be cured. From doing some research, I now have a better grasp on TB’s impact throughout the country and world, and why it is so important that everyone protects himself or herself from getting TB.

To begin, there are two types of TB: active and latent. Most TB infections in patients result in a latent infection, which shows no symptoms of TB, and about one in ten latent infections progress to active disease. TB is spread through the air, when an active TB patient coughs, sneezes, or somehow transmits their saliva through the air. For this reason, it is imperative that anyone who is in the same room as a person with active TB wears a TB mask that prevents particles in the air from being inhaled.

One of the main questions that arose as a result of my Applied Experience is how TB statistics in the United States compare to the TB statistics in the rest of
the world. According to the World Health Organization, 2 billion people throughout the world have latent TB and in 2009 the disease killed 1.7 million people.\textsuperscript{v} In the US, the Center for Disease Control reported 14,093 cases of active TB and estimated that 10 to 15 million people have latent TB.\textsuperscript{vi} According to Occupational Safety and Health Administration, 650 people in the US die each year from TB.\textsuperscript{vii} While 650 deaths didn’t seem like a lot to me compared to the entire population of the US, the fact that 10 to 15 million people in the US have latent TB surprised me a great deal. So how do these statistics compare to other parts of the world, particularly developing countries like South Africa? It has been proved that TB is the leading cause of natural death in South Africa. According to WHO’s Global TB report, South Africa had nearly 460,000 new cases of TB in 2007, with an incidence rate of an estimated 948 cases per 100,000.\textsuperscript{viii} India also has a high number of cases, with a reported 2 million cases in 2009, but a much lower incidence rate of 167 per 100,000 people.\textsuperscript{ix} China had 1,300,000 cases in 2009 but a rate of only 97 per 100,000.\textsuperscript{x}

So why does Africa have the highest number of cases per 100,000 as compared to other countries? One of the reasons why South Africa has such a high number of TB cases is because of the large number of Africans who also have HIV/AIDS. TB is the leading cause of death among HIV infected people in Africa and it is estimated that one-third of the 40 million people worldwide who are living with HIV/AIDS are co-infected with TB.\textsuperscript{x} An article explains that “people with latent TB are increasingly becoming infected with HIV, and many more are developing active TB because HIV is weakening their immune system.”\textsuperscript{xii} The
article also says that “people who are co-infected with both HIV and latent TB have an up to 50 times greater risk of developing active TB and becoming infectious compared to people not infected with HIV.”

This is one of the reasons why TB is such a problem in South Africa. Of the 33.3 million estimated cases of HIV worldwide, South Africa makes up 22.5 million of these cases. Due to the large number of people with HIV and the lack of appropriate health care and medicines that are available in developed countries, TB has become the #1 killer in South Africa.

Once I realized the extent of TB in the US and particularly around the world, I became curious about how TB is treated and whether or not it can be completely cured. According to the CDC’s website, there are two drugs that latent TB patients can take to kill the “sleeping” TB germs before they become active: Isoniazid or Rifampin. Isoniazid can be taken for 6 or 9 months depending upon what dosage a patient is given and Rifampin is taken for 4 months daily. To get rid of active TB, however, patients are required to take more than one drug at once. The most common medications used to treat active TB are Isoniazid, Rifampin, Ethambutol, and Pyrazinamide. Patients are also required to take these medications for six months or more, depending on the medication.

One problem with treating TB (particularly active TB) is that many patients do not always take their medications for the entire six months. Most of the time they will start feeling better after a few weeks and will therefore be tempted to stop taking the drugs. However, “stopping treatment too soon can allow the bacteria that are still alive to become resistant to those drugs, leading to TB that
is much more dangerous and difficult to treat.” Not taking the full six months of treatment is a major problem among TB patients in Africa. For some of those patients, they may feel nauseous when they take their TB medication because they do not have enough food in their stomachs. Therefore, they do not like taking their medication and will eventually stop taking it completely. In other cases, they cannot afford to go to a clinic each day (or it is too far for them to walk), so they are indirectly forced to stop taking their medication. To help prevent this problem in Africa, directly observed therapy (DOT) was created. Through the DOT program, patients are supervised while they take their medication to make sure that they are taking the proper dosages each day. This benefits the patient because in some cases a DOT representative can come to a patient’s home to administer their drugs each day or a patient can go to the clinic during a time that fits their schedule. While some TB patients in Africa still do not complete the entire six months of medication even with the help of DOT, DOT has proven to be highly efficient and cost effective.

The major public health problem of TB in Africa is directly linked to the countries lack of effective infection control. These poor infection control measures have put healthcare workers at risk. A 2003-2007 study at a specialized treatment center for drug-resistant TB in KwaZulu-Natal Province in South Africa found that 235 of the 3,639 patients referred to the center were healthcare workers. Of these, 23 had extensively drug-resistant (XDR) TB, which is resistant to most TB medicines. From this study, researchers calculated that the incidence of XDR-TB and multidrug-resistant (MDR) TB is “six
to seven times higher among healthcare workers than among non-health care worker patients. As a result of these findings, activists called for “the implementation of basic infection control measures, including an adequate supply of masks to health care workers and patients, to slow the spread of drug-resistant TB in the country.” This clearly portrays the difference in infection control measures between the US and Africa. The majority of hospitals in the US have TB masks for doctors or patients who need to be protected from TB. And many hospitals, including Norwalk Hospital, implement fit-testing each year as a requirement for each employee. These effective prevention control measures show why TB rates are significantly lower in the US than in Africa.

Aside from my TB research and learning specifics about the disease, this Applied Experience also taught me more about dynamics within the health care system, and how TB affects health care professionals. One observation I made as a fit-tester was how compliant Norwalk Hospital’s employees were towards getting fit-tested. Did they complain? Were they rude? Were they happy? One thing I observed was that the head of each department of the hospital was always the most helpful in making sure that their employees got fit-tested. The heads of the departments understood the importance of fit-testing and they understood the idea of a requirement. Many times throughout the summer I would come across a worker (usually a nurse) who would say “But I did that just last summer, do I seriously need to do it again? I know what size I am.” And when I would explain that it is a hospital requirement they would comply, but with
some attitude. In most circumstances when this happened, it gave me a negative outlook towards that specific professional. I didn’t understand why someone in the health care field would have such a problem with taking an important public health prevention measure. Interacting with the less-compliant professionals taught me that I would never act like that when I go into the medical field. On the opposite end of the spectrum are the employees who understand the importance of effective TB prevention. I remember being pleasantly surprised, and a little amazed, by a worker in the cancer center who had kept three TB masks from when she had been previously fit-tested. She explained that although TB patients rarely came to the cancer center, she thought that it would be a good idea to have some TB masks, just in case. She is the kind of health care professional that I would like to emulate when I’m older.

Another part of the Applied Experience that I found interesting was meeting three hospital employees who had TB. I was particularly intrigued by a male doctor who claimed to have gotten TB from being in contact with a TB patient without knowing the patient had TB. He said that he was on antibiotics for four months to get rid of his TB. This reminded me of the problem in Africa where health care professionals are at great risk of getting TB because they are continuously surrounded by TB patients without the proper protection. We are lucky that the US has such strong protection measures to make sure that our health care professionals are for the most part always protected from TB.
On my last day, the final fit testing statistics were 1,085 passes, 75 fails, 24 incompletes, and 306 pending. The 306 employees that still hadn't gotten fit-tested, along with the 75 employees who failed, are required to go to the off-site Occupational Health office to complete their fit-testing. Being a fit-tester was a worthwhile experience for me for many reasons. First of all, it was very interesting for me to learn more about TB through research and talking to employees at the hospital. It was also a beneficial experience because it enabled me to learn more about the dynamics of certain health care professionals and their attitudes towards public health prevention.

Through this Applied Experience, I learned just how large a public health problem TB truly is. And although TB is more prevalent in other countries besides the US, it is still a public health issue that must be taken seriously in every country. I hope that through better technology and prevention strategies in countries such as South Africa, the TB rate can begin to decline. It is the job of future health care professionals and researchers to be made more aware of how TB is transmitted, its symptoms, prevalence, and treatment in order to have an effective and long-lasting impact on this disease. I hope that I, along with other public health activists, can contribute to the decline in TB infections around the world when we enter the medical field.

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ii Ibid.
iii Ibid.
x Ibid.
x Ibid.
xii Ibid.
xiii Ibid.