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Point of Care Technology for Underserved Populations

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ABSTRACT

Point of Care (POC) Technology is a recent advance in biotechnology that has revolutionized healthcare. This technology allows for rapid, inexpensive, on-site testing for otherwise lengthy and costly laboratory tests. Leading infectious diseases can be tested immediately in non-invasive ways. This inexpensive, highly portable, and extremely accurate technology should be used for populations that have historically lacked access. Such access would result in immediate cost savings and life savings. Underserved populations in America such as migrant workers or people living in poverty rarely receive the testing they require. Although clinics for undocumented immigrants exist where they are protected and cannot be relocated due to their immigration status, many of these clinics do not conduct laboratory testing. When the laboratory tests are ordered for these people, they may not return for results due to lack of transportation, fear of debt, or fear of being deported. With Point of Care technology, testing for diseases that most affect these populations including Tuberculosis, Diabetes, Hepatitis, and sexually transmitted infection's (STI's) can be done on site under the protection of the clinics at free or reduced cost. Providing increased access to testing benefits the targeted populations' health as well as the government through reduced healthcare related costs. This initiative prevents these diseases from progressing to hospital required stages, or spreading to others. Point of Care technology is a cost-effective way to reduce healthcare costs and increase life expectancy.

INTRODUCTION

In 2015, 13.5 percent of America was living in poverty (e.g. a family of two adults and two children earning less than $24,339) (United States Census Bureau, 2017). In one study conducted in a neighborhood of low socioeconomic status (SES) it was found that only 81 percent of residents had a usual healthcare provider (Kirby, 2005). This is not unique as many people living in poverty neglect preventative care from their primary provider. Without a usual healthcare provider people are more likely to wait until the illness requires hospitalization. This results in large expenditure that the patient, being of low SES, typically cannot afford causing debt for the person and the government. It is estimated that the lack of health insurance for underserved populations, mainly undocumented immigrants, costs the United States between $65 billion and $130 billion annually (Ku, 2006). Aside from expenses, transportation is another problematic factor. According to a 2006 study on transportation for people living below the poverty line, people living in poverty, whether in the city, suburbs, or rural areas, have significantly lower rates of automobile access. In fact, 47 percent of inner city residents living below the poverty line live in a house without access to an automobile (Berube, 2006). Although this may seem irrelevant due to public transportation, it does not account for the unreliability of public transportation, the cost of public transportation, and the lack of access to public transportation in suburban neighborhoods. When transportation is this difficult to access people are less likely to take multiple trips. Introducing Point of Care technology to walk-in clinics and community health centers will allow on the spot testing for infections common among people of low SES such as tuberculosis, HIV, and sexually transmitted infections (STIs). This will result in a cost-effective way to test and treat greater populations for preventable diseases.

LITERATURE REVIEW AND INTERVENTION

Point of Care Technology (POC) is an emerging field of technology. The broad term umbrellas portable, accurate testing for a multitude of illnesses including STIs such as Gonorrhea, Chlamydia, Hepatitis C, or HIV, infectious diseases like tuberculosis, or even chronic diseases like diabetes. This testing is relatively new and has only recently begun to be introduced to the clinical world of medicine. However, there is a gap in the implementation of POC technology into the clinical setting. The goal of this paper is to inform people on the lack of laboratory testing in underserved populations and to identify how Point of Care (POC) technology can be used as an easy, cost effective, and timely alternative to laboratory testing.

POC technology is important for a multitude of reasons, the main one being that it is so easily portable. As previously stated underserved populations have little access to automobiles (Berube, 2006) so it is important to bring the laboratory technology to the population. This type of testing is conducted with a simple prick of the finger or a sputum sample, concluding results in as little as 20 minutes (Jewett 2013). The ease and simplicity of this testing allows patients to have testing and diagnoses in one location, increasing the likelihood of proper treatment for the disease. Proper treatment helps prevent future health issues such as advanced STIs, infertility, blindness, or advanced tuberculosis. Treating infections before they progress saves government money immediately and over time by preventing chronic disease from developing, and saves people's lives (Bassett 2014). However, these reductions in morbidity and mortality cannot be realized without the application of a highly reliable, easily portable, easily accessible testing technology.

Underserved populations, including people living below the poverty line, historically disadvantaged races, undocumented immigrants, and homeless people often do not have access to the healthcare the same way people of higher socioeconomic status (SES) do. Several factors account for the higher rates of infectious diseases progressing to serious

conditions in low SES communities compared to high SES communities. These factors include but are not limited to less education among low SES individuals leading to unhealthy behaviors (Kuntz, 2013), poor access to transportation (Berube, 2006), lack of preventative or usual care provider (Kirby, 2005), jobs where time off is not feasible (Perez, 2012), fear of debt (Kuruvilla, 2015), common jobs worked (Chamie 2015), or fear legal trouble with undocumented immigrants (Kuruvilla, 2015). Different diseases and illnesses are prevalent in different areas. For example, HIV rates are higher in urban areas where people below the poverty line live than in the suburbs or rural areas (Vaughan, 2015). Rural areas of poverty are characterized by high rates of Tuberculosis (TB) (Olson, 2012). These diseases are not as common in people of higher SES due to their ability to immediately access care for less serious reasons. Preventative care allows healthcare providers to diagnose and treat infections while they are still in latent stages or earlier stages. Although laboratory testing is required and the patient must return after testing, this is not a problem due to flexible work hours, transportation, and health insurance. People of underserved populations do not always have this privilege (Kuruvilla, 2015). Although studies have been done linking higher prevalence of chronic diseases to these populations, little work has been done to identify the prevalence of infectious diseases in these populations, and to treat them. That is why POC technology must be introduced to healthcare clinics in low SES areas.

Although people in underserved population categories have difficulty accessing healthcare, undocumented immigrants arguably have the most difficult time accessing these services. Despite laws and acts being passed in support of undocumented immigrants receiving healthcare, new laws are constantly being enacted that supersede existing laws and make it difficult for undocumented immigrants to access healthcare. A prime example is The Permanent Residents Under Color of Law (PRUCOL) which allows people who are living in the United States illegally but are not actively being deported, such as undocumented immigrants, to

access many public benefit programs such as healthcare (Kuruvilla, 2014). However, in 1996 the Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA) was passed and eliminated classifying undocumented immigrants under PRUCOL, taking away their ability to receive healthcare and other benefits (Kuruvilla, 2014). Despite improvements in health insurance access from the 2010 Patient Protection and Affordable Care Act, allowing people of low SES to access health insurance for a free or reduced cost, undocumented immigrants do not qualify for this insurance. To qualify, one must be a documented US citizen or a qualified non-citizen such as a lawful permanent resident (Medicaid, 2010). Medicaid covers 72.5 million Americans of all ages and backgrounds, but fails to recognize undocumented peoples (Medicaid, 2010). The majority of undocumented immigrants qualify for Medicaid under the financial portion of the application, but because of their impermanent status, they are unable to attain health insurance. Because of their inability to access public programs and their lack of health insurance they are forced to go to the emergency department when they are in a serious condition. One of their only alternatives is to wait until a protected clinic comes to their area to see patients. However, these clinics often lack on-site laboratory testing.

There are many types of POC devices, all of which allow on site testing with rapid responses. Devices can test for common infectious diseases among these populations such as HIV (Fang, 2008), Hepatitis C (Jewett, 2013), Chlamydia (Fang, 2008), Gonorrhea (Fang, 2008), and Tuberculosis (Olsen 2012). The devices work in different ways. One example is the Hepatitis C POC (HCV POC) test. This test is done through a finger stick of blood, similar to that of a diabetes test. The results return in minutes rather than the 1-2 weeks that laboratory testing typically requires (Jewett 2013). This means that patients can enter the clinic, be tested in a quick, easy way that is minimally invasive and will allow results at the time of the visit. Instead of not being able to track down patients to give them prescriptions for infections found weeks later from laboratory testing, the prescriptions can be prescribed right then allowing for a greater

chance of treating the infection and preventing it from progressing to a later stage. Several POC technology companies have been approved by the FDA to begin use in healthcare environments, specifically OraQuick® HIV (97.2% accuracy rate) or HCV (92% accuracy rate) Rapid Antibody testing was approved by the FDA July 3rd, 2012 (FDA, 2015). OraQuick® has been implemented in multiple studies from Denver, CO (Jewett, 2015) to Cape Town, South Africa (Bassett, 2014). This company focuses on creating portable software that is cost effective for rapid testing. The technology is simple to use and will require only one to two educational sessions for healthcare providers to learn to use the devices. Healthcare providers who have already been introduced to this technology describe it as, "a positive direct impact on the efficiency, effectiveness, and satisfaction of the nursing staff, and a positive indirect influence on other members of the healthcare team in their delivery of patient care" (Sweeney, 1993).

The cost-effectiveness of this technology is key. Since no health insurance is being paid due to the immigration status, undocumented immigrants are being treated for free. Care quality cannot and should not be negotiated or changed due to payment, but the way undocumented immigrants are treated for can be. There is a drastic difference in cost between care that is received in the emergency department compared to the potential for reduced cost offered by implementing the POC Technology. Clinics where people of underserved populations go for medical help at a free or reduced price currently exist. Most are run by medical schools, public health and local health clubs at schools, relief groups, or are federally funded. There are several laws that these clinics are protected under including the 1962 Migrant Health Act, Section 329 which allows federal grants to be spent on community health centers and migration health centers and the 1986 Emergency Medical Treatment and Labor Act (EMTALA) which claims any person who shows up to an Emergency Department, regardless of their immigration status, must be treated and stabilized before leaving. As a case study for feasibility of the use of POC technology, the UConn Migrant Farm Worker Clinics will be examined. The UConn Migrant

Farm Worker Clinics are run through the UConn medical school the UConn Migrant Farm Worker Clinics run through UConn Medical School in partner with the Connecticut River Valley Farm Worker Health Program (UConn Public Health, 2016).

Migrant farm workers, such as the people who are seen at the UConn Migrant Farm Worker Clinics, travel all throughout the US depending on the growing seasons of states. The US is mapped into different growing zones, making it easy to identify the best place and time for crops to grow best. From October to May, farm workers stay in the southern United States in zones 8-10, where oranges, lemons, avocados, blackberries, and more grow and farm owners need workers to harvest the crops. In the summer time, June to August, many farm workers travel north to the lower zones, indicating cooler climate, where farmers need help harvesting tobacco, strawberries, apples, and other crops depending on the region (USDA, 2014). Since workers and their families are constantly travelling, many farms have barracks for them to live in. These barracks often have open windows allowing bugs and animals in, are made of cement and covered in dirt and mud, are damp, unsanitary, and promote the spread of infectious disease. Having access to quality healthcare is invaluable due to the poor-quality living conditions of migrant farm workers.

The UConn Migrant Farm Worker Clinics run annually from June through October in the CT River Valley region. This time frame is when seasonal farm workers migrate to the lower zones (e.g. 6-7) in the CT region to work. Clinics are run at different farms throughout the region and often provide patients with the ability to see both primary care physicians and medical specialists depending on the specialists' availability, this sometimes included dental and optometry specialists. However, what is consistent each time is the mobile pharmacy, primary care physicians, physician assistants, nurses, and other healthcare providers to help diagnose and treat workers under the protection of the Migrant Health Act, the law providing free care and protection from immigration laws. Even though this law is in place, there is no phlebotomy or

laboratory testing at these clinics which is inherently problematic. Though patients can be referred out to labs for testing they often do not go due to the lack of transportation or fear of repercussions (Kuruvilla, 2014).

POC testing has the capacity to rapidly test for some of the most common infectious diseases among these populations on the spot including HIV, HCV, Gonorrhea, Chlamydia, and Tuberculosis. This on-site testing will allow patients to be tested at the clinic and be given medication for free from the mobile pharmacy depending on the result of the test. No extra transportation will need to be provided to get to and from the lab, then to and from the pharmacy. An additional benefit involves the convenience for the worker not having to take a day off for testing (Perez, 2012). This increases the likelihood of being tested, being identified as an infected person, and being medicated to treat the infection before it requires hospitalization. Additional benefits include an anticipated reduction in fear associated with seeking healthcare.

POC technology is cost effective. A great deal of research has been done to evaluate the cost-effectiveness of POC vs conventional laboratory testing. It is reported the cost per life saved with POC-CD4, designed for HIV testing, was $148.30 compared to $165.50 with conventional laboratory-based testing (Grundy, 2014) and that the time of HIV diagnosis is vital, so having POC-CD4 available for quick diagnoses could improve survival and be cost-effective compared to LAB-CD4 testing (Hyle, 2014). Each POC device varies in price depending on the disease it is designed to detect, but the technology as a whole is cost effective. A study in South Africa determined the cost-effectiveness of HIV POC using an incremental cost-effectiveness ratio (ICER). ICER's are considered to be cost effective if they are less than the country's per capita gross domestic product (GDP). In Bassett's 2014 study the ICER was $2,400 year of life saved (YLS) compared to South Africa's GDP of $8,200. The ICER was 3.4 times smaller than the GDP indicating the HIV POC is extremely cost effective while testing and treating more

persons than with stationary laboratories. This project has not yet been implemented therefore there is no ICER for POC for specific STIs or with underserved populations in the United States so it has yet to be determined how cost effective POC will be in this setting.

POC technology is a cost-effective way to implement testing that previously required an on-site laboratory at protective clinics for underserved populations. To evaluate the effectiveness of this project the ICER will need to be calculated for the POC devices being used and then must be compared to America's GDP. If the ICER is lower than the GDP, then it is cost effective. The prevalence rate of STIs and tuberculosis should also be monitored for underserved populations to see if they decrease. Lastly, patients could fill out surveys on their satisfaction with the devices after being tested with the POC devices. It is important to obtain feedback and evaluate the feelings of the patient along with the effectiveness of the treatment. It is also important for the healthcare provider to understand all pieces of this project, both financial and health related, and want to help. The health belief model will be used to evaluates patients perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy (NCI, 2005). For this project to be successful not only will the technology need to be implemented but the self-efficacy of the patients high for their recovery. When the patient understands the healthcare provider is vested in this project, their perceived barriers such as trust, confidentiality, or fear of deportation, will be eliminated and they will be more likely to be tested and continue taking medication if diagnosed. POC technology has the potential to reduce cost while simultaneously reducing the spread of infectious disease, thereby leading to a decrease in morbidity and mentality among marginalized populations. Best practices regarding proper implementation will require more research to ensure the use is acceptable to both the practitioners and patients.

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