Thesis Portfolio

Enhancement of the Intravenous Cannulation Catheter Process

(Technical Report)

The Intersection of the Health Gap and Language Barrier in the United States Health Care System and Its Impact on Afro-Latinas

(STS Research Paper)

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Table of Contents

Sociotechnical Synthesis

The United States (U.S.) has one of, if not, the most expensive health care systems in the world, but it is ranked as 37th globally ("New 11-Country Study," n.d.). One failure in the U.S. health care system is the administration of intravenous (IV) lines or cannulation. (Lund et al., 2012). Another pitfall in the U.S. health care system is the disparities in the health care certain groups of people receive compared to others. Therefore, this portfolio examines these two issues in the U.S. health care system in order to identify what is contributing to them and how to improve the respective issue.

Over 200 million Americans undergo the placement of IV lines, a technique in which a cannula, a thin tube, is placed inside a vein to provide venous access (Lund et al., 2012). IV lines enable common procedures such as catheter insertion, drug delivery, and blood drawing. IV cannulation is generally performed by nursing staff, phlebotomists, and medical doctors. This procedure is one that can be a painful experience for many patients. Hence, a successful first attempt is imperative in decreasing the pain experienced in this procedure and increasing patient comfort. The first successful attempt in most patients is over 70% but, for the remaining 30% they are regarded as "tough sticks" (Cooke et al., 2018). Moreover, some patients with healthy veins that "roll," a description some medical professionals use for a vein that does not easily yield to a needle-stick, or are difficult to envision are the ones labelled as "tough sticks" (Lund et al., 2012). Tough sticks create a necessity for the improvement of IV cannulation for the comfort of the patient and ease of the medical practitioner. Thus, the aim of this technical project is to study how to improve first pass rates of intravenous cannulation.

Black woman have faced a struggle to receive proper maternal health care for decades, a struggle, which is only intensified when they do not speak the same language as their doctor

("Maternal Health in the United States," 2015). Hence, this study focuses on the intersection of the health gap and language barrier. An intersection that hinders Afro-Latinas from receiving adequate medical care within the United States (U.S.) health care system. This topic is analyzed using historical case studies, wicked problem framing, and discourse analysis while imploring co-production as the STS framework. The research question that frames this study is: What are the barriers that inhibit Afro-Latinas from receiving adequate medical care? Through this research it is anticipated that the biggest factor that contributes to this health crisis are the social determinants of health which include economic stability, neighborhood and built environment, health and health care, education and social and community context. These social determinants are what health disparities are based on. This research is consequently because the health gap and language barrier are issues that have existed in the U.S. for centuries. Although, with the turn of the century these issues have been researched quite extensively, the intersection of them has not. Furthermore, this research contributes to the field of engineering because by pinpointing what is causing a barrier for Afro-Latinas to get adequate health care this research puts engineers one step closer to being able to create effective medical technologies for this marginalized group. The lack of research towards the health disparities affecting Afro-Latinas is causing avoidable deaths to occur around the country for a very specific and marginalized community and this injustice must end.

By completing these studies in conjunction, it allows for an examination of two very different, but still connected, issues in the U.S. health care system. Consequently, if this study only focused on one of these issues or the other it would be impossible to examine successful the intersection that these two issues hold. If the issue of tough sticks was the sole focus of this research it would not have been possible to also think about how race and body politics impacts

the IV insertion process. Conversely, if the struggles that Afro-Latinas face in the U.S. health care system was the sole focus of this study it would not be possible to examine how common medical procedures play a systemic role in the lack of access to quality medical care that Afro-Latinas face. The ability to have both of these issues be a part of this study has provided a richness to both components that would not be present otherwise. This richness will only further the contribution this study has in the field of engineering and science, technology and society by allowing engineers to ethical create technologies for Afro-Latinas.