

Thesis Portfolio

Enhancement of the Intravenous Cannulation Catheter Process

(Technical Report)

The Bioethics of Blood Donation by Men who have Sex with Men

(STS Research Paper)

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TABLE OF CONTENTS

SOCIOTECHNICAL SYNTHESIS

ENHANCEMENT OF THE INTRAVENOUS CANNULATION CATHETER PROCESS

with Nia Blibo, Lindsay Carlesi

Technical advisor: Dr. Nishaki Mehta, Division of Cardiovascular Medicine

THE BIOETHICS OF BLOOD DONATION BY MEN WHO HAVE SEX WITH MEN

STS advisor: Kent Wayland, Department of Engineering and Society

PROSPECTUS

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Intravenous (IV) cannulation is a difficult but important process for many patients in which a needle (or cannula) is inserted into the vein to provide venous access. Reinsertions can distress some patients and even complicate outcomes, even for those with healthy veins. It is necessary to improve this process not only for patient comfort, but for the ease and efficiency of those performing this procedure. This project is focused on the safe and efficient use of IV cannulation, which includes the social policies surrounding blood donation (in which IV cannulation is used). The Food and Drug Administrations' (FDA) current policy prevents any man who has had sex with another man within 12 months from donating blood. Originally, this policy was intended to prevent the spread of disease, although many currently consider it a discriminatory policy. This and other possible policies need to be weighed to ensure that the blood supply is safe and that there is no infringement on the rights of American citizens. In general, the physical and social impact of intravenous cannulation is important to overall patient care and treatment.

Peripheral intravenous cannulation catheter (IV) is a technology that delivers fluid directly into a localized vein. A successful first attempt, or first pass, is important to a patient's outcome, as reinsertion can cause distress and interfere with treatment. Current technologies, such as near infrared and ultrasound help to locate the vein. These technologies require more training and resources, and do not work for all patients, as with some 'hard sticks', the issue is not visualization. Some patients have rolling (or moving) veins, or small veins that are difficult to cannulate. Our project will address three major areas of difficulty: rolling veins, over advancement of the needle entirely through the vein, and the needles' angle of insertion. To prevent rolling veins and over advancement would improve the efficiency of this procedure, and mitigating over advancement and correcting angles of insertion could greatly increase patient

comfort. This project is intended to design a method to improve first pass rates in intravenous cannulation in patients with healthy veins. To do so, we created a vein stabilization device that pulls the skin taught, a bubble level to indicate the angle of insertion, and marked the catheter to better visualize advancement.

The social issues surrounding this technology mostly focus around blood donation. This project will study the ethicality of the required 12-month celibacy of men who have sex with men in order to donate blood. While the safety of the blood supply is an important public health issue, the rights of American citizens are important and need to be examined along with safety considerations. In order to analyze the ethicality of the 12-month deferral policy, I will use a set of basic bioethical principles, the bioethical matrix, to evaluate this and two other policies, a no-action policy (or allowing MSM to donate without restrictions) and an outright ban, suggested by the FDA. This matrix will evaluate the policies and how they relate to patient autonomy, non-maleficence, beneficence, and justice for each of the stakeholders involved: men who have sex with men, those receiving blood transfusions, and the governmental regulatory bodies. Comparing these policies using the fundamentals of bioethics, from the view of those affected will lead to a more well-rounded understanding of the ethicality of these policies. If we are able to fully understand the social consequences of these policies, we may be able to work through the FDA in a more efficient and effective manner without discriminating or sacrificing public health and safety.

Overall, the technological and social aspects of intravenous cannulation need to be studied further to understand patient needs and work toward more efficient procedures for patient comfort. More work needs to be done on the devices to improve first pass rates. However, by building on this technical work to improve first pass rates, it would be possible to improve

hospital efficiency and patient comfort. Socially, this research has shown that there is no ‘right’ answer to this problem, though further research is necessary to make a well-rounded and informed decision about the policy regarding the blood supply. However, this type of research is important to conduct even without every piece of information, as it relates to public safety. This type of analysis is a basic need for the FDA, but this research points out the need for any citizens to ‘check’ the government and its regulatory bodies in order to properly account for our nation’s values. Socially, it is important that we realize, as a country, that public health policy needs to be considered in the broader sense for not only the safety, but the good of the American public and all U.S. citizens. It is imperative that we remember that the public health system is intended to help patients and every step hospitals and regulatory bodies take should be toward that end.