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CHARACTERIZATION AND ASSESSMENT OF BARRIERS AND FACILITATORS TO THE DECISION-MAKING PROCESS FOR BLOOD AND BLOOD DONOR SAFETY IN THE UNITED STATES: A COLLECTIVE CASE STUDY

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A Dissertation Presented to
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In Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy in Translational Health Sciences

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by
Lauren A. Crowder, MPH, CPH
July 28th, 2022

Keywords: Policy Decision-Making, Blood Safety, Blood Policy, Public Health Policy

DEDICATION

This dissertation is dedicated to my parents, who from an early age taught me a love and appreciation of learning, encouraged me to be the best person I can be, and instilled in me the desire to make the world a better place.

ACKNOWLEDGEMENTS

Though my name is on the cover of this dissertation, this monumental feat would not have been possible without the love, support, and encouragement of many people. I would first like to thank my committee chair, Dr. Marcia Firmani, for her leadership and guidance throughout this process. Dr. Ronald Shope, thank you for your support as this quantitative researcher took a leap into the qualitative research world. Dr. Roger Dodd, thank you for being a mentor to me over the past 7 years and for joining me on this doctoral journey. I remain inspired by your dedication to continuous research and improvements to the transfusion medicine and blood banking industry; the U.S. blood system is stronger and safer as a direct result of you being a part of it. I also owe a debt of gratitude to my Readers, Karen Schlumpf and Dr. Shana Hughes, who were both incredibly generous with their time in carefully reviewing this dissertation and contributing to scholarly conversations with me to ensure it is a strong piece of academic writing.

To the GWU THS Cohort 3, you all have become wonderful friends and colleagues of mine over the past four years, and I am honored to be on this journey with each of you. Halley, AJ, Quentin, Lorna, Lisa and Donald – thank you for the individual contributions you have made to my personal, academic, and professional development over the past few years. I also owe a debt of gratitude to my American Red Cross colleagues and my supervisors, Drs. Whitney Steele and Susan Stramer, who graciously understood my need to work odd hours, talk non-stop about this project, and who have both remained supportive of my desire to further my education since Day 1.

Thank you to the anonymous participants who gave their invaluable time and energy to discuss with me the topic of decision-making within the US blood system. I am honored

and humbled that you would take the time to dedicate to this doctoral dissertation and provide me with your honest opinions and feedback on the topic. I am proud to be your colleague.

And finally, the biggest thank you goes to my family and friends who have supported me through this entire process. I would especially like to thank my husband, Prescott Heighton, and my daughter, Mackenzie, who have sacrificed as much as I have – financially, emotionally, and personally – in support of this journey. Prescott, thank you for holding down the fort while I was at residency weekends, putting up with long nights of writing papers and studying, my absences on weekends and evenings at the library while I finished writing this dissertation, and for supporting me every single step of the way. Mackenzie, I love you so much and I am proud to be able to give you another example of what strong women can accomplish. The two most important days of your life are the day you are born and the day you find out why: you are my why. You will do amazing things in your life, and I am already more proud of you than you will ever know.

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LIST OF ACRONYMS

AABB: Association for the Advancement of Blood and Biotherapies

ABO: Alliance of Blood Operators

ACBTSA: Advisory Committee for Blood and Tissue Safety and Availability

AHRQ: Agency for Healthcare Research and Quality

AIDS: Acquired Immunodeficiency Syndrome

ASH: Assistant Secretary for Health

ASPR: Administration for Strategic Preparedness and Response

BARDA: Biomedical Advanced Research and Development Authority

BPAC: Blood Products Advisory Committee

BOD: Board of Directors

BOTSEC: Blood, Organ, and Tissue Senior Executive Council

CAP: College of American Pathologists

CBER: Center for Biologics Evaluation and Research

CDC: U.S. Centers for Disease Control and Prevention

CMV: Cytomegalovirus

CMS: Centers for Medicare and Medicaid Services

COVID-19: Coronavirus disease

CSR: Clinical, Scientific, and Research Council

DOD: Department of Defense

EBDM: Evidence-Based Decision-Making

FDA: U.S. Food and Drug Administration

HCV: Hepatitis C Virus

HEV: Hepatitis E Virus

HHS: U.S. Department of Health and Human Services

HIV: Human Immunodeficiency Virus

HRSA: Health Resources and Services Administration

HTLV: Human T-lymphotropic Virus

IOM: Institute of Medicine

KTA: Knowledge to Action Framework

MSM: Men who have sex with men

MST: Multiple Streams Theory

NBCUS: National Blood Collection and Utilization Survey

NCATS: National Centers for Advancing Translational Sciences

NHSN: National Healthcare Safety Network

NIH: National Institutes of Health

OASH: Office of the Assistant Secretary for Health

OASPE: Office of the Assistant Secretary for Planning and Evaluation

PR: Pathogen Reduction/Reduced

RBDM: Risk-Based Decision-Making Framework

RE-AIM: Reach, Effectiveness, Adoption, Implementation, and Maintenance Framework

SAR: Standards, Accreditation, and Regulatory Council

SARS-CoV-2: Severe Acute Respiratory Syndrome Coronavirus 2

VA: Veterans Affairs

ABSTRACT

Background: Over 16 million blood components are transfused to patients in need every year in the United States (Jones et al., 2021). Because of the reliance on human blood donors, the donation and transfusion of blood will always be associated with some level of risk for both donors and recipients; the tolerability of these risks may vary from stakeholder to stakeholder. While the U.S. Food and Drug Administration (FDA) concedes that attaining a blood supply with zero risk for transmission of infectious diseases may be unattainable (U.S. Food and Drug Administration, 2019), they continue to strive for the lowest reasonable achievable risk while maintaining the availability of blood for recipients. Non-regulated safety and health decisions are left to individual blood centers and there is no congruency of thought between the various centers. In an effort to create an integrated, internationally recognized, risk-based tool for blood safety that can help the industry make decisions in a consistent way, the Risk-Based Decision-Making (RBDM) Framework was developed in 2010 by the Alliance of Blood Operators. While the RBDM Framework has been used successfully in other countries, its use has been limited in the US due to the structure and scope of decision-making authority within the US industry.

Objectives: This dissertation will seek to characterize the decision-making process for U.S. blood policy and to determine if a universal framework, such as the RBDM would be useful for the U.S. blood system. This study will also aim to identify barriers and facilitators to the current decision-making process. A deep understanding of the approach to decision-making and the barriers and facilitators to that process will elucidate opportunities for improvement.

Methods: A collective case study was conducted with a purposeful sample of policy and operational decision-makers representing five decision-making groups within the U.S. blood

system – federal, advisory, standards setting, blood centers, and hospitals. Semi-structured interviews allowed for insights and experiences to be gathered and the data were analyzed into overarching themes.

Results: Many of the decision-makers included in this study reported a similar process of decision-making – gathering and evaluating the best available data, listening to stakeholders, completing some sort of risk assessment and ultimately making a decision on how to maintain safety of blood and blood donors. As suggested by the literature, no formal decision-making framework or process was reported by any of the interviewed participants. Six barriers to decision-making were discovered: absence of collaboration and communication; insufficient leadership; the current regulatory process; lack of data; availability of resources; and the current structure of the U.S. blood system. Three facilitators were discovered: large-scale collaboration; strong leadership; and transparency and open communication.

Conclusion: Each decision-making body included in this study is responsible for a different focus area of transfusion medicine. While the U.S. blood system is piecemeal, siloed, and fractured in some ways, the general sentiment from participants is that "it may be broken, but it works" and safety of the US blood supply has never been higher. Due to these variances in focus areas, a one-size-fits-all decision-making framework does not seem appropriate for the U.S. context. However, there is opportunity for improvement in the processes used by each stakeholder group. Increased coordination, communication, and leadership within the U.S. blood system will improve its integrity – both in terms of safety and availability – for blood donors and recipients in need. Future work with individual decision-making groups will

allow for improvements to the efficiency of decision-making at each level of the U.S. blood system.

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CHAPTER 1: INTRODUCTION

Background & Overview

Over 16 million blood components are transfused to patients in need every year in the United States (U.S.) (Jones et al., 2021). These transfusions help patients suffering from trauma, burns, postpartum hemorrhage, cancer, sickle cell disease, hemophilia, and other chronic conditions. At the time of writing this dissertation, manufactured blood products are not available, so recipients of blood components must rely on the generous and quintessentially altruistic act of donation of blood from volunteer donors. Because of the reliance on human blood donors, the transfusion of blood will always be associated with some level of risk for recipients. According to the 2017 National Blood Collection and Utilization Survey (NBCUS), the most common risks from blood transfusions include fever, allergic reaction, transfusion-associated medical conditions, acute immune hemolytic reactions, and transfusion-transmitted infections (Savinkina et al., 2020). The tolerability of these risks among policy, regulatory, and patient-care decision-makers, as well as the transfusion recipients and their families may vary greatly and there is no policy in the United States related to an acceptable or tolerable level of risk. Blood donors also assume risk by potentially experiencing reactions to donation, including discomfort, pain, bruising, loss of consciousness, vomiting, and weakness, among others. The decision-making process and tolerability of donor and recipient risks are not well understood.

While the U.S. Food and Drug Administration (FDA) admits that attaining a blood supply with zero risk for transmission of infectious diseases may be unattainable (U.S. Food and Drug Administration, 2019a) they continue to strive for the lowest reasonable achievable

risk while maintaining the availability of blood for recipients. Non-regulated safety and donor health decisions are left to individual blood organizations and hospitals, and there is often little congruency of thought between the various centers. No standardized decision-making tool is currently used by all decision makers in the United States to make decisions about blood and blood donor safety for regulated or non-regulated issues. Historically, evidenced based medicine was the primary principle of decision-making until the lack of action, in an effort to wait for scientific evidence, caused harm to recipients. After it was discovered in the 1980s that tens of thousands of blood recipients were contracting Human Immunodeficiency Virus (HIV) and Hepatitis C Virus (HCV) through blood transfusion (U.S. Centers for Disease Control and Prevention, 1993), a new attitude was adopted: the precautionary principle. This approach, which was initially developed and promoted for use in the environmental regulation and policy industry, states that lack of certainty of damage should not preclude or postpone measures to prevent harm (United Nations, 1992). This was adapted by the blood industry to mean that a risk should be assumed present, even if it has not been proven.[1] Since the adoption of this principle, it has largely dominated decision-making within transfusion medicine (Alter, 2008; Wilson & Ricketts, 2004; Wilson, 2011). However, these frameworks are inconsistent and dangerous for donors, recipients, and the overall sustainability of the U.S. blood supply because these frameworks are either reactionary or overly conservative creating unsustainable financial burden on the blood industry (Klein, Hrouda, & Epstein, 2018) and result in the deferral of many healthy prospective blood donors.

[1] This modified definition of the precautionary principle will be used from this point forward in this dissertation.

In an effort to create an integrated, internationally recognized, risk-based tool for blood safety that can help the industry make decisions in a consistent way, the International Consensus Conference on Risk-Based Decision-Making for Blood Safety was convened in 2010 (Leach Bennett, Blajchman, Delage, Fearon, & Devine, 2011; Stein et al., 2011). From this conference, the ABO's Risk-Based Decision-Making (RBDM) Framework (Figure 1-1) was developed. While the RBDM Framework has been used in other countries, its use has been limited in the United States.

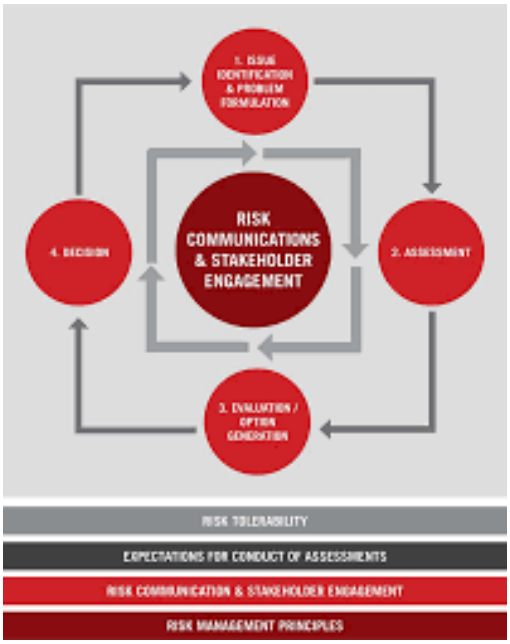

Figure 1-1. Risk-Based Decision-Making Framework for Blood Safety (Alliance of Blood Operators, 2014)

It is not clear which decision-making framework, if any, is used most frequently at present for U.S. blood policy or individual center-driven safety decisions and what factors or stakeholders influence these decisions. Given the limitations of the three frameworks mentioned above (evidence-based medicine, the Precautionary Principle, and the RBDM

Framework), it is possible that a new risk framework should be developed. This dissertation was designed to characterize the decision-making process for U.S. blood policy at the federal level as well as at the blood collection organization and other stakeholder level and aimed to identify barriers and facilitators to the current decision-making process. A deep understanding of the approach to decision-making and the barriers and facilitators to that process will help to elucidate opportunities for improvement.

Oversight of the Industry

Oversight for the safety and availability of blood products, as well as research that is federally funded by the FDA, the National Institutes of Health (NIH), and U.S. Centers for Disease Control and Preventions (CDC), falls under the Office of Infectious Disease and HIV/AIDS Policy located within the Office of the Assistant Secretary for Health (OASH), Office of the Secretary, U.S. Department of Health and Human Services. The regulation of blood products and their collections (including donor eligibility) is charged to the FDA's Center for Biologics Evaluation and Research (CBER) based on scientific reporting from scientists and academic researchers and is advised by the Blood Products Advisory Committee (BPAC) with input from the public. CBER provides regulations and guidance to ensure safety of the blood supply by regulating donor eligibility, blood product testing, donor deferral registries, quarantine control, and good manufacturing practices (Leach Bennett et al., 2011). Blood regulations are codified within the *Code of Federal Regulations* (CFR) Title 21 and guidance for the industry are provided through regular updates of guidance documents. The Association for the Advancement of Blood & Biotherapies (AABB) is the voluntary standards, accreditation, and educational body in the US and has extended its activities to over 50 other countries, with most blood centers adhering to their guidelines in

an effort to ensure safety in transfusion medicine (AABB, 2022). The safety of the U.S. blood supply rests in the hands of federal decision-makers, individual blood centers, industry technology developers, and the nonremunerated, volunteer donors who contribute to the U.S. blood supply. Blood donors are required to comply with acceptability criteria set by the FDA and blood centers; in addition, there are infectious disease testing, deferral, and screening strategies in place to ensure collected units are safe and free from transfusion transmissible agents prior to manufacturing and transfusion into a recipient. Existing infectious agents are screened for as testing becomes available and emerging threats are monitored through epidemiological inquiry and monitoring.

Statement of the Problem

There is currently no central framework being used by federal decision-makers or individual blood centers or hospitals to make operational or policy decisions surrounding blood and donor safety and operations. As emerging transfusion transmissible infectious agents are discovered, blood donor safety issues arise, and donor deferral criteria change, a standardized yet flexible framework may be recommended to provide guidance to create uniform decisions across the country and among blood centers. Until a deep understanding of the current decision-making process is achieved, and barriers and facilitators are used to inform improvements to the decision-making process, consistency, and uniformity in policy decisions in the U.S. blood system will be nearly impossible to achieve.

Purpose and Research Questions

The purpose of this collective case study was to understand the existing decision-making process regarding blood and donor safety policy within the United States. Using a qualitative approach, interviews with decision-makers at central agencies as well as key

stakeholders external to these agencies have informed an in-depth analysis of the current state of the decision-making process. The following research questions were addressed:

Research Question 1: How do decision-makers describe the factors that contribute to the current decision-making process related to U.S. blood and blood donor safety?

Sub-question: How do various decision-makers in the U.S. blood industry describe the process of making decisions with respect to blood and blood donor safety?

Research Question 2: How do decision-makers describe barriers and facilitators to the decision-making process surrounding blood and blood donor safety?

Statement of Potential Impact & Translational Nature of the Study

This study developed a rich and complete description of the U.S. blood decision-making process, described the barriers and facilitators to decision-making, and identified potential for improvement. The results will inform policy and practice decisions for U.S. blood centers, hospitals, and federal decision-makers on matters of infectious disease testing policy, operational decisions, and donor policies and practices. This study has also set the standard of incorporating all decision-maker input to determine if decisions, and processes to come to those decisions, require evolution over time.

The NIH National Center for Advancing Translational Sciences (NCATS) defines the purpose of translation as "the process of turning observations […] into interventions that improve the health of individuals and the public" (National Center for Advancing Translational Science, 2022). Translational research is multidirectional, nonlinear, and involves five core activities (Figure 1-2): Basic Research which reveals truths about fundamental mechanisms of biology and human behavior; Pre-Clinical Research where modeled interventions are applied to animals or computer simulations; Clinical Research

where interventions are carried out in humans; Clinical Implementation where adoption of interventions are applied on a larger scale and in routine practice; and finally Public Health where health outcomes are studied at the population level (National Center for Advancing Translational Science, 2022). Surrounding these five cores are the goals of developing new approaches, demonstrating their usefulness, and disseminating the findings. At the center of all these activities is the patient, who should inform each stage of research.

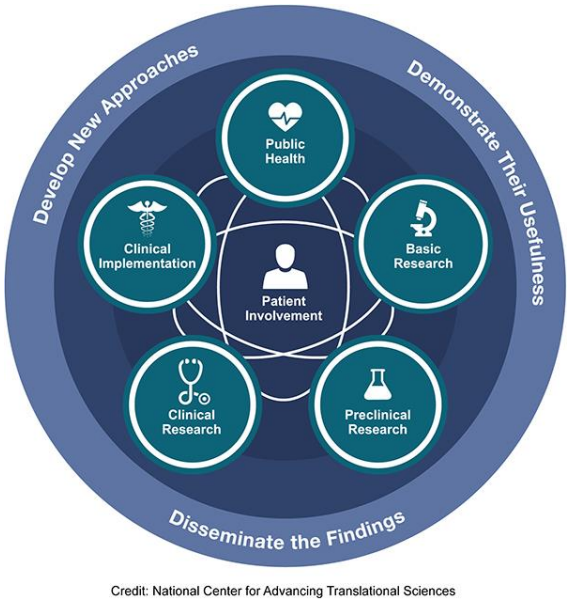

Figure 1-2. Translational Science Spectrum (National Center for Advancing Translational Science, 2022)

This project exists in the Public Health stage and surrounding circle of the spectrum of translational research with its aim to understand the process of decision-making for U.S. blood policy. The results have the potential to impact all other stages of the Translational Science Spectrum as it relates to the integrity of the U..S blood system.

Theoretical Foundation

Knowledge Translation is defined by the Canadian Institutes of Health Research as "a dynamic and iterative process that includes synthesis, dissemination, exchange and ethically-sound application of knowledge to improve [health], provide more effective health services and products and strengthen the health care system" (Canadian Institutes of Health Research, 2016). As such, knowledge moves beyond discovery and reporting and into a formalized and active process of integration into the scientific practice and policy decisions made to improve health. This dissertation focused on the inquiry, synthesis, and dissemination of knowledge related to blood policy within the United States. The conceptual framework driving this study is be a combination of the Knowledge to Action (KTA) Framework (Graham et al., 2006).

Knowledge to Action Framework

The KTA Framework was developed in 2006 by Graham and colleagues as a way to conceptualize the knowledge creation and knowledge application process (Graham et al., 2006). Figure 1-3 illustrates the KTA Framework. It shows the knowledge creation "funnel," in which knowledge is created and synthesized into a useable tool or product which can be used by researchers to address a problem and facilitate uptake of knowledge by various stakeholders. The funnel is surrounded by an action cycle which depicts the various activities that must happen to successfully apply the knowledge tool to address the identified problem. A key concept in the KTA Framework, and one that proved useful in this dissertation, is the concept that each phase of the framework is iterative and can influence other phases. This dynamic process is one that lends itself well to understanding the complex process of decision-making and will allow for a better global conceptualization of the study here proposed.

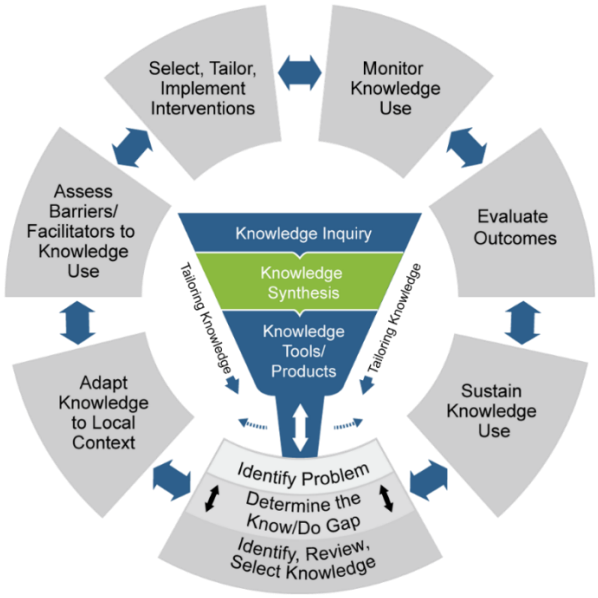

Figure 1-3. Knowledge to Action Framework (Graham et al., 2006)

The Multiple Streams Theory (MST) was developed in 1995 by Kingdon, who was attempting to make sense of policy surrounding transportation. His theory describes three "process streams" flowing independently of each other, then converging at some point into what he calls a "policy window". The three process streams include the "problem stream" which includes systematic monitoring of health and major focusing events, the "policy stream" which includes expert research and organized policy communities, and the "political stream" which includes the public mood, pressure groups or campaigns, election results and changes of administration, and the partisan or ideological distribution of Congress (Kingdon, 1995). When the policy window opens, an opportunity for action is available and policy entrepreneurs can push a new policy onto the political agenda and help it be passed. While the MST was developed to explain congressional action, the principles may also be useful in understanding blood policy at the federal or organizational level.

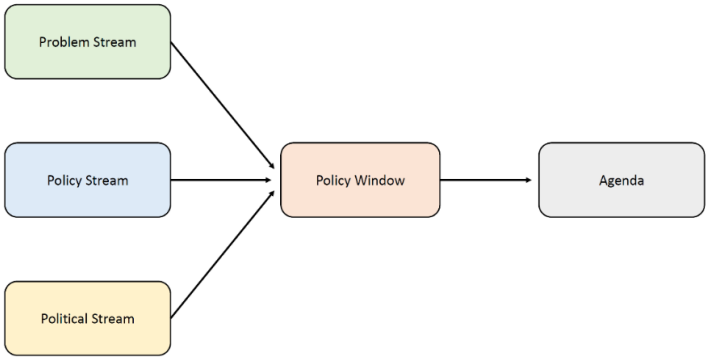

Figure 1-4. Multiple Streams Theory (Kingdon, 1995)

Together, the KTA framework, MST, and other frameworks presented previously have informed parts of this study. The MST, along with current decision-making frameworks used in blood policy guided the semi-structured interviews and the interpretation of the data received from those interviews. The KTA framework aided in the overall conceptualization of the study and has informed the process of knowledge generation, data analysis, and translational nature of the results. A focused conceptual framework is shown in Figure 1-5. Figure 1-6 highlights how the focused conceptual framework aligns with the research questions.

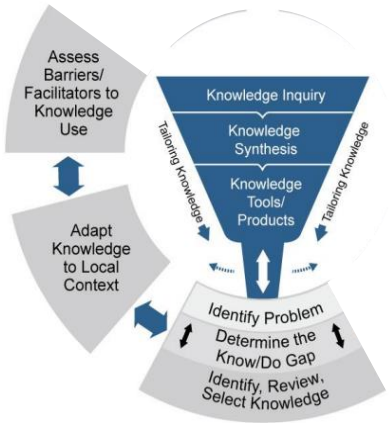

Figure 1-5. Focused Conceptual Model

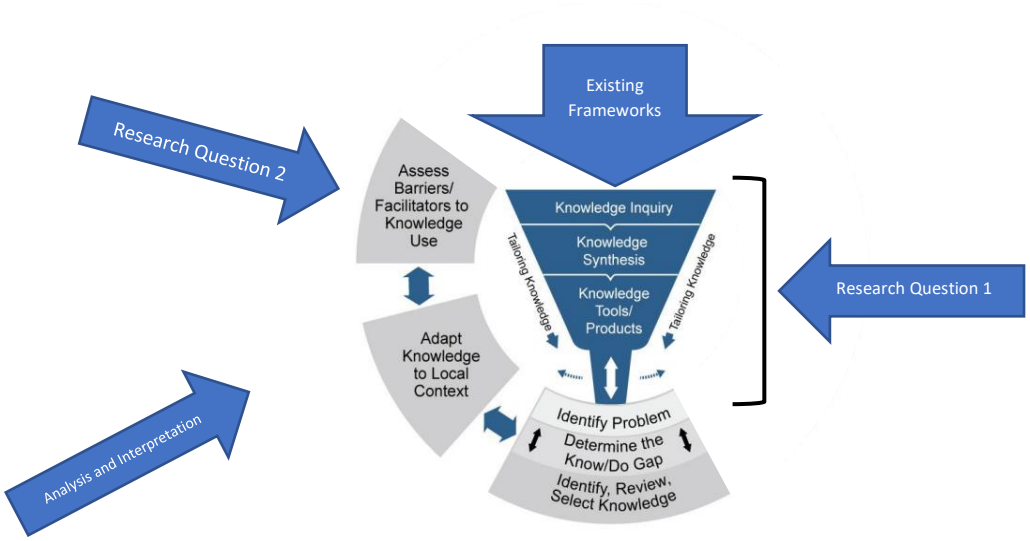

Figure 1-6. Alignment of Focused Conceptual Model to Research Questions

Given the aims of understanding and providing a description of the decision-making process, this study was conducted using a constructivist lens. Through this lens, each decisionmaker and stakeholder has the opportunity to contribute a distinct constructed reality and can contribute to multiple perspectives of the problem. To ensure alignment of the described study, Maxwell's Interactive Model of Research Design (Figure 1-7) was followed.

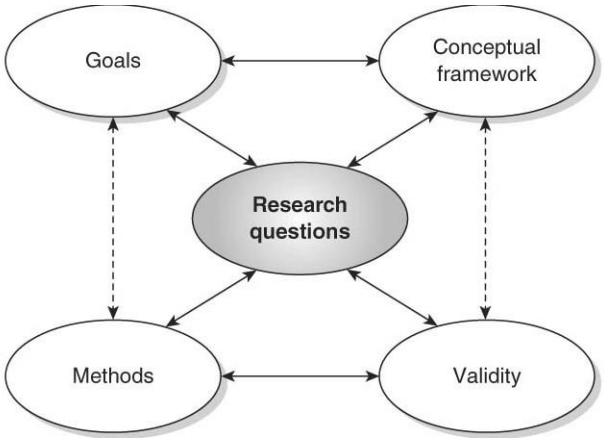

Figure 1-7. Maxwell's Interactive Model of Research Design

This model shows five components to qualitative research that must be in alignment – Goals, Conceptual Framework, Methods, and Validity, in addition to the central concept of Research Questions (Maxwell, 2013). Each concept is closely tied to several others and as one component of the study changes, so to must the others to remain in alignment.

Summary of the Methodology

The purpose of this dissertation was to understand the decision-making process within the U.S. blood industry. A collective case study approach was used to conduct a series of semi-structured interviews with a purposeful sample of policy and other decision-makers within the U.S. blood system. The interviews elicited conversations to inform the process of blood safety decision-making in the stakeholders' respective agencies or organizations (Research Question 1), as well as a probe into barriers and facilitators to the decision-making process (Research Question 2). It was estimated that 24-30 interviews would need to be conducted, however recruitment ceased when the researcher found no new emerging themes from the participants (i.e., at the point of saturation). Interviews were directly transcribed then used to describe the decision-making process, following the knowledge creation funnel of the focused conceptual model (Figure 1-5) and to address Research Question 1. Transcribed interviews were then coded using inductive and deductive coding to identify barriers and facilitators to the decision-making process, addressing Research Question 2.

Limitations and Delimitations

As with any research endeavor, this dissertation has limitations to consider. While some limitations were not seen until data collection and analysis commenced, some could be anticipated before the study began. Firstly, a significant limitation is the possible challenge of gathering complete and truthful information from federal employees or employees of other

blood centers due to the researcher's employment at the American Red Cross, which is a member of the greater blood industry and in some cases a competitor in blood collection and distribution. A second significant limitation is the challenges seen by any study in which qualitative interview data is collected. These challenges include building rapport with participants, controlling for biases introduced as part of the qualitative data collection process, and ensuring accurate interpretation of the collected data. As further discussed in Chapter 3, methods were taken to overcome these limitations (i.e., member checking).

Summary

Chapter 1 has provided an overview of the proposed qualitative research study exploring the process of decision-making for blood policy within the US context. A background of the problem along with the identified purpose and scope of the proposed research has been illustrated, along with a brief description of the conceptual framework, methods, and study limitations. Chapter 2 will provide an overview of the literature to-date on decision-making for blood safety and availability and will provide a more in-depth look at the conceptual framework guiding this research. Chapter 3 will provide a detailed description of the research design and study methodology. Chapter 4 will provide a detailed account of results from the qualitative methodology. Chapter 5 will discuss the findings, summarize strengths and weaknesses of the study, and provide recommendations for future research.

CHAPTER 2: LITERATURE REVIEW

Chapter 2 will provide background necessary to understand the context of the research questions for this study, including a description of commonly used decision-making frameworks in use by the United States and international blood industries as well as any barriers and facilitators mentioned by scholars to decision-making.

Methods of Literature Search

Articles for this review were searched using the Himmelfarb Health Science Library database, PubMed, Google Scholar, and the Alliance of Blood Operators (ABO), FDA, and AABB websites. References of key articles were also reviewed to ensure completeness of the search. All manuscripts, abstracts, dissertations, and other publications were included if they were published from 2000 to 2022 and are available in full-text and in the English language. Seminal articles from years prior to 2000 will also be included to provide attribution and to ensure completeness of the description and critique.

Description and Critique of Scholarly Literature

Evidence-Based Decision-Making

> ***"The science [of decision-making] is built on epidemiologic, behavioral, and policy research showing the size and scope of a public health problem and which interventions are likely to be effective in addressing the problem. The art of decision-making often involves knowing which information is important to a particular stakeholder at the right time."***
> *(Brownson, Fielding, & Maylahn, 2009)*

One of the primary decision-making models for health policy is evidence-based decision-making (EBDM). EBDM has been used to guide policy decisions ranging from smoking regulations, seatbelt laws, environmental exposures, food additives, and beyond, and stems from the practice of evidence-based medicine. Evidence-based medicine has been

defined as the use of best evidence in making decisions about the care of individual patients and is grounded in the integration of individual provider expertise with the best available research (Straus, Richardson, Glasziou, & Haynes, 2005). Until the 1980s, the blood industry relied heavily on evidence-based medicine to guide decisions on blood safety. However, the use of evidence-based medicine for decision-making affecting large populations can lead to challenges such as delays in observational data and the ethics of conducting randomized controlled trials on populations where a risk is assumed.

Similarly, evidence-based behavioral practice is a collaborative process involving all stakeholders including those affected by the decision at hand (Spring et al., 2008). The process includes: asking relevant questions; acquiring the best available evidence; determining the validity and applicability of existing evidence; applying the evidence by engaging in collaborative decision-making; analyzing the new health practice; and adjusting accordingly (See Figure 2-1).

Figure 2-1. Evidence-Based Behavioral Practice (Spring et al., 2008)

The blood supply is considered a public good (US Centers for Disease Control and Prevention, 2019) and public health principles can be applied to its policy and regulations. When applied specifically to public health, evidence-based decision-making is comprised of the key components of making decisions based on scientific evidence, using data systematically, applying program-planning frameworks, engaging the community in the decision-making process, conducting evaluations, and disseminating findings to stakeholders (Brownson, Chriqui, & Stamatakis, 2009). It features three domains: Process, Content, and Outcome (Brownson, Chriqui, & Stamatakis, 2009) in a consistent feedback loop. It is a continuous process of using the best available quantitative and qualitative evidence to inform decisions. In the Process domain, the objective is to enhance the likelihood of adoption of a specific policy by placing great importance on advocates and the role that advocacy plays in the development process. This domain can be improved by ensuring timely and practical data dissemination. The Content domain aims to identify effective policies and relies on the important contributions of both quantitative and qualitative data sources to identify the most critical elements that will lead to evidence-based policies. Finally, the Outcome domain identifies the potential impacts of a policy in terms of upstream, midstream, and downstream effects. This third domain also relies on the use of quantitative and qualitative data and can be appraised using an evaluation framework, such as the Reach, Effectiveness, Adoption, Implementation, and Maintenance Framework (RE-AIM) framework developed by Glasgow and colleagues (Glasgow, Vogt, & Boles, 1999). In addition to using an evaluation framework, developing systems of surveillance to monitor the effects post-implementation of a policy change, like the Transfusion-Transmissible Infections Monitoring System (TTIMS) program (Dodd et al., 2016), as well as other ways to track outcomes can be useful. Often

natural experiments, such as the implementation of a policy in one population and not in another, will inform the outcome domain; in the case of transfusion medicine, this could be an approved investigational blood collection practice that is implemented at one blood center but not at another. Other important approaches to evidence-based decision-making is the use of cost-benefit analysis (Brownson, Fielding, & Maylahn, 2009) to determine the likelihood of implementation and the impact on an already vulnerable industry (Klein, Hrouda, & Epstein, 2018), and well as participatory approaches (Brownson, Fielding, & Maylahn, 2009), yet these may not be as useful in the transfusion-medicine context except where donor motivation or other donor health and safety issues are concerned.

When applied specifically to transfusion medicine, evidence-based decision-making comprises five steps as detailed by Heddle (2006) and illustrated in Figure 2-2: The steps are as follows: 1) creation of a well-defined question; 2) effective search of the scientific literature; 3) critical appraisal for an article specific to the question at hand; 4) reliance on clinical expertise, patient values, clinical circumstances, and society's expectations in the decision-making process; and 5) continuous quality improvement of the process.

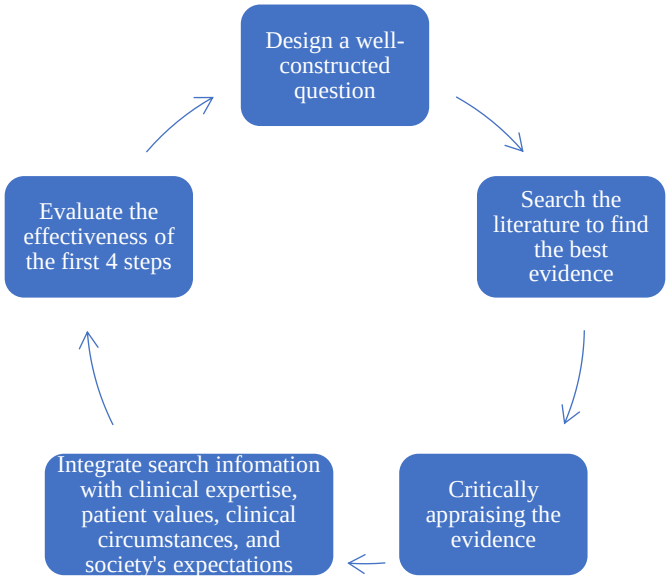

Figure 2-2. Evidence-Based Decision-Making Process (adapted from Heddle, 2006)

The challenge presented by relying on EBDM to govern transfusion medicine policy is that by the time enough high-quality evidence has been gathered to appraise the literature and make a policy decision, unfortunately much damage can have occurred to blood donors or blood recipients (Wilson, K., 2011). Evidence of this was seen in the early 1980s when HIV epidemic was being spread by blood transfusions to certain vulnerable populations, most notably over half of hemophiliacs and over 12,000 other blood transfusion recipients in the United States (US Centers for Disease Control and Prevention, 1993). Taking into account the advantages and disadvantages of EBDM (Table 2-1), the question remains: is EBDM the correct approach for transfusion-medicine policy decision-making, or is another method more appropriate?

Table 2-1. Advantages and Disadvantages of Using the Evidence Based Decision-Making for Blood Policy Decisions

Advantages	**Disadvantages**

- Reliance on data to guide decisions - Grounded in expertise	- Real-time data collection and publication is lacking in the United States, which will delay the availability of these data for decision-making - While waiting for data to be available, harmful outcomes may occur - Ethics of conducting randomized controlled trials on populations where risk may be present

Precautionary Principle

"For situations of scientific uncertainty, the possibility of risk should be taken into account in the absence of proof to the contrary … measures need to be taken to face potential serious risks." *(Alter, 2008)*

Due in large part to the events of the 1980s, when roughly half of hemophiliacs in the United States were unintentionally infected with HIV through blood transfusions, the blood industry has largely erred on the side of caution when it comes to regulations dealing with existing and emerging transfusion-transmitted infectious diseases. Even without scientific evidence to support prevention measures, the industry uses the precautionary principle to guide much of its decision-making. Designed originally for environmental policy (United Nations, 1992), the precautionary principle works well to prevent harm by erring on the side of caution and prevention, stating that the absence of proof of harm does not prove the absence of harm. Its use in blood policy was born from the need to build trust in the safety of the blood supply and to be overly cautious to prevent another experience like that in the 1980s with the spread of HIV to the hemophilia and other transfusion recipient communities (Wilson, K. & Ricketts, 2004) which left the impression of blood services and regulators one

of negligence (Kramer, Zaaijer, & Verweij, 2017). The principle has been used successfully in the prevention of variant Creutzfeldt-Jakob Disease (Wilson, K. & Ricketts, 2004) when in the 1990s it was discovered that prions were found in lymphatic tissues and the theoretical transmission through transfusion was suspected (Hill, Zeidler, Ironside, & Collinge, 1997) and later suggested in human transmission (Llewelyn et al., 2004).

In lieu of evidence to show the benefit of precautionary prevention measures, we must balance the benefits and challenges of using this decision-making framework, highlighted in Table 2-2.

Table 2-2. Advantages and Disadvantages of Using the Precautionary Principle for Blood Policy Decisions

Advantages	**Disadvantages**
- Decreased need for product recalls - Potential protection from a large-scale risk - Restoration of trust in the blood system	- Promoting fear of theoretical risks - Costs of precautionary measures - Reduction and potential inadequacy of the blood supply - Discouragement of blood donors - Open interpretation of the definition of the principle - Determination of evidence needed to introduce and/or overturn a regulation or precautionary measure - Unrealistically intolerant of risk

It may be most appropriate to implement decisions following the precautionary principle when the risk can result in a severe outcome for many blood donors or recipients and few alternatives to mitigate this risk exist.

It has been suggested that three constraints be placed on the use of the precautionary principle: consistency, avoidance of counterproductivity, and proportionality (Kramer et al., 2017). The precautionary principle is often inconsistent – there is always a risk that will be inherent with collecting blood from human donors. Often the deferrals placed on potential donors to protect recipients have inherent risk or harm to the donors as can be seen with deferral for men who have sex with men (MSM). The inconsistency is unavoidable, though, and often risks must be weighed against each other to determine which is a heavier burden on the greater blood system. One example of this is pathogen reduction technology and how implementing it would significantly increase safety to the blood supply, however its universal adoption has been slow to implement due to the upfront costs and added complexity (Alter, 2008). Using the precautionary principle can be seen as counterproductive, especially when significant costs are involved, however it often takes time for this conclusion to be made as the principle is typically employed during times of uncertainty and in an abundance of caution. Finally, proportionality is important to consider especially when deciding on testing procedures for donations – balancing sensitivity and specificity – and other measures to combat certain risks.

An unintended consequence of such safety decisions is the increasing cost of prevention methods, which is difficult, if not impossible to quantify based on the lack of scientific basis for true benefit. Showing impact must rely on modelling based on numbers of cases expected versus the actual number seen with the precautions in place. When it comes to theoretical risk, this is very challenging to show.

An algorithm for precautionary decision-making suggested by Wilson in 2011 promotes a series of questions for decisionmakers to answer about a theoretical exposure

regarding its severity and potential impact as well as the health effects and costs of removing said exposure. A recent study of Canadian policy- and decision makers found that there is a need for distinction between precaution and risk management, that removal of legacy deferral or precautionary policies can be challenging, there are harms associated with all precautionary policies, and there is a need for a balanced approach to precautionary policies in transfusion medicine (Wilson et al., 2019).

However inherent to the base of the Precautionary Principle is the unattainable goal of a zero-risk blood supply (Wilson, 2011). Not only is a zero-risk blood supply unrealistic, but it can produce more harm than good. There is no true risk-free human blood donor and deferring all but the least risky of an already low-risk population can deplete the blood supply and cause its integrity to be compromised. It is agreed by all stakeholders in the industry that this is not a viable solution. Is the precautionary principle, then, the ideal decision-making framework for transfusion medicine and donor and recipient health and safety decisions? Or is there another way to balance the risks of collecting from human blood donors while maintaining a donor base and the safety and availability of the blood supply.

Risk-Based Decision-Making

"The current blood safety decision-making process is complex, difficult to explain, and not obviously proportional to risk and leads to dissatisfaction among blood operators, reimbursement or funding agents, industry, patients and patient groups, governments, regulators, and others." *(Menitove, Leach Bennett, Tomasulo, & Katz, 2014)*

In 1987, during the time when HIV was being transmitted to hemophiliacs and others through blood transfusion and preceding the discovery of HCV transmission to blood recipients, an editorial was written in the journal *Transfusion* by the editor-in-chief who commented that a zero-risk blood supply will not work and is not sustainable (Zuck, 1987).

Despite this observation over three decades ago, and comments to the same effect in more recent years (Busch, Bloch, & Kleinman, 2019; Menitove, Leach Bennett, Tomasula, & Katz, 2014), there was a tendency for policy to be made in an "abundance of caution" mindset and with the goal of promoting zero-risk.

If zero-risk is unattainable or unrealistic, it is important that the industry and its decision-makers have an understanding of what level of risk might be acceptable or if there is a "safe enough" risk level; achieving this goal in a systematic way should be the ultimate objective. The level should be tolerable while promoting a balance of recipient safety with the integrity of the blood supply, costs, logistics and stakeholder concerns (Busch, Bloch, & Kleinman, 2019). Policy makers task researchers to prove the negative and show that a risk does not exist where one is assumed. The decision-making process should instead have a goal of improving recipient and donor outcomes while also taking into account safety, social values and ethics, cost-benefit analyses, expectations, and the historical and cultural context in which the industry is residing at the time. If a "safe-enough" level exists, it is important that when decisions are made the process is transparent and includes all relevant stakeholders (Menitove, Leach Bennett, Tomasula, & Katz, 2014).

In 2010, Canadian Blood Services in collaboration and with sponsorship from the ABO convened a consensus conference, the International Consensus Conference on Risk-Based Decision-Making for Blood Safety, gathering 12 panelists with experience in risk or healthcare or members of the public. These panelists were charged with developing a consensus statement about the importance of blood transfusion and the need for a safe and adequate blood supply, acknowledging that a zero-risk mindset was unrealistic. Five questions guided the discussion (Leach Bennett et al., 2011; Stein et al., 2011):

- What are the key aspects and limitations of current decision-making in blood safety?
- What are the best practices in decision-making to be leveraged and in what manner should they be applied?
- What benefits can be achieved in the development of a framework?
- What are the components to be incorporated in the design of a framework and what does the framework look like?
- What are the necessary next steps to agree upon and implement a risk-based decision-making framework for blood organizations?

Current decision-making is driven by achieving the lowest possible risk with little attention to costs, a focus on infectious diseases, use of the precautionary principle, emphases on product quality and convergence of standards while trying to engage the stakeholder community. Future decision-making should focus on a comprehensive, transparent, and ethical risk management approach that balances risks, benefits, and costs, while engaging with stakeholders throughout the process. Decision-makers should acknowledge that while blood services are a social good, they are subject to economic constraints and that responsibility for safety rests at many levels of the larger healthcare system. By developing a new framework for blood safety decision-making, operators will be able to reallocate resources which will improve intervention and testing efficiency and effectiveness, increase the transparency and consistency of decision-making, thereby positively impacting confidence and trust in the decision-making system.

The new framework should incorporate the use of reliable data on risk; data on or estimates of costs; ethical implications; qualitative, quantitative, or mixed methods data;

interim analyses and the ability to course correct and improve throughout the decision-making process; collaborative efforts for risk identification, assessment, and shared analysis and evaluation of data and outcomes; health economics; involving a diverse group of stakeholders throughout the process; a clear governance structure and accountability system; the use of best practices; and consideration and the historical perspective for those who have been harmed.

What resulted from this consensus conference was the RBDM Framework for Blood Safety (Figure 1-1) which can help blood service operators achieve safety of the blood supply by correctly allocating resources to eliminate the most serious risks (Alliance of Blood Operators, 2014). By identifying and prioritizing risks, compiling societal, economic, and ethical qualitative data with quantitative data from epidemiologic studies, and taking a holistic approach to risk mitigation and communication, the RBDM Framework can help operators improve safety of the blood supply (Leach Bennett & Devine, 2018). The RBDM Framework is built on the foundations of risk tolerability, expectations for conduct of assessments, risk communication and stakeholder engagement, and risk management principles (i.e., beneficence, fairness, transparency, consultation, practicality and proportionality, vigilance, and continuous improvement). These foundations support the risk-based decision-making process: 1) identification and characterization of the issue, 2) perform assessments to determine the nature and significance of risks, 3) evaluate assessments from Step 2 of the RBDM process, 4) select a risk management option that is appropriate for this issue characterized and assessed through the RBDM process. Once a risk management option has been decided, an implementation plan is developed. Core to the RBDM Framework are

the ideas of risk communication and stakeholder involvement and engagement throughout the entire process.

Since its inception and development, the RBDM Framework has been increasingly used internationally, but has not been implemented in its entirety in the US. A retrospective analysis of blood safety policy in five countries published in 2019 showed that many of the assessments used by countries to evaluate policies specific to Malaria testing and donor selection were consistent with the RBDM Framework (O'Brien et al., 2019). In Canada, the framework has been used for decision-making surrounding cytomegalovirus (CMV) and Hepatitis E Virus (HEV) testing. After following the Framework, it was decided that moving from universal CMV testing to antibody testing only for intrauterine transfusion made the most sense for risk management purposes (Devine, 2018). For HEV, three assessments were compared – estimation of transfusion-transmitted HEV and subsequent chronic infection and/or severe HEV disease, cumulative risk of chronic infection or severe disease for certain at-risk groups, and a cost-effectiveness analysis. A report of this assessment shows that screening is costly and results in little benefit to the safety of the blood supply (Delage et al., 2019). Like Canada, where the RBDM was used to evaluate current universal screening procedures, Australia used RBDM to evaluate its universal screening for Human T-cell Lymphotropic Virus (HTLV). The Framework was used to compare three possible testing scenarios: continued universal testing, new donor testing only, and the discontinuation of all HTLV testing. Despite the cost-effectiveness and risk assessments showing a cost- and risk-benefit only for discontinuation of all HTLV testing, the stakeholder, ethical, and regulatory perspectives resulted in the decision of testing for new donors only (Styles et al., 2017). Another way that the RBDM Framework has been used is to evaluate the potential

implementation of testing for HTLV, such as a study published out of South Africa. In a study published in 2019, researchers walked through a modified RBDM process for deciding whether to implement testing for HTLV and showed that testing would be cost-prohibitive (Vermeulen et al., 2019).

While the RBDM Framework has gained popularity for decision-making in the international blood community, it has not been fully implemented in the US blood industry for a variety of reasons (see Table 2-3). Certain elements of the Framework have been used for some US decision-making, however, and its popularity has risen since its development. An exercise in using the Framework by the AABB Ad Hoc Babesia Policy Working Group resulted in not only a recommendation from the committee for policy makers which was eventually implemented (US Food and Drug Administration, 2019b) but also a thorough report on the implementation of the Framework by AABB members and suggested modifications to improve its utility (AABB Ad Hoc Babesia Policy Working Group, 2017; Ward, Stramer, & Szczepiorkowski, 2018).

Similarly, a working group from AABB examined the problem of donor iron deficiency through the lens of the RBDM Framework. The working group referenced the Ad Hoc Iron-Deficiency Working Group's conclusion that the status quo of donor education and hemoglobin testing was not sufficient to combat the risk of iron deficiency and that instead, either iron supplementation or ferritin testing should be implemented by centers. In addition, donations would be limited by minors and increased inter-donation intervals should be implemented by other high-risk groups (i.e., premenopausal females, frequent donors, and those near the hemoglobin cutoff level) (AABB Ad Hoc Iron-Deficiency Working Group, 2018).

A challenge of the RBDM Framework is that in times of crisis and emergent need for policy and guidance to protect the blood supply, there may not be enough time to adequately assess the risk and conduct the full RBDM process. Such was the case in 2015 when the Zika Virus began its spread throughout the world, quickly becoming a pandemic and threatening vulnerable blood recipient populations. When a decision needed to be made immediately, the United States fell back on the precautionary principle and the FDA mandated universal individual donation testing of samples. While this proved to be helpful in gaining the trust of the public and physicians who were transfusing blood to patients, the decision to implement such wide-spread measures even in areas where local transmission was non-existent was a heavy burden on the industry, costing an estimated $137 million per year (Ellingson et al., 2017), $314 million per quality-adjusted life year for individual donation testing (Russell, Stramer, Busch, & Custer, 2019), and costing approximately $5.3 million per Zika-positive donation (Saá et al., 2018). When the RBDM Framework is applied to the Zika pandemic, it becomes clear that despite the need for a thorough evaluation of the data available and the apparent risks, stakeholder opinions and the culture and emotion surrounding an issue can sometimes be stronger in decision-making; there is a "human component to decision making that defies the prevailing evidence" (Bloch, 2019).

Table 2-3. Advantages and Disadvantages of Using the Risk-Based Decision-Making Framework for Blood Policy Decisions

Advantages	**Disadvantages**
- Universal decision-making framework developed by a team of experts in the field	- Communication and timeliness of recommendations

- Contributes to a clear and easy to follow decision-making process	- Formal process of updating and revisiting recommendations as technologies develop - The use of the Framework when appeasing decision-makers and stakeholders with various levels of risk tolerance - Reliance on data – what do you do if no data yet exists? - The US blood industry is a competitive business made up of numerous players who make their own independent risk calculations based on their local, regional, or national markets. Unlike other countries where policy decisions are made by one or two centralized blood centers, the US relies on FDA to set policy recommendations. FDA does not take cost into consideration. They define their role as one to "drive risk to the lowest level reasonably achievable without unduly decreasing the availability of this life saving resource" (U.S. Food and Drug Administration, 2020)

Inferences For This Study

As described in the analysis of the three primary decision-making frameworks above, there are many factors that contribute to decisions that are made in the interest of blood and blood donor safety in the US. Historical context, social and political push on current events

and the “disease of the day”, as well as the state of the scientific literature can all contribute to what decisions are made, by whom, and how fast. None of the above frameworks, nor the few others that are less commonly used (Custer, Agapova, & Martinez, 2010; Kleinman, Reed, & Stassinopoulos, 2013), address all the needs of the blood industry, protecting the health of the donor, safety of the recipient, and integrity of the blood supply.

So which framework is best? Are multiple frameworks needed, or should a combined framework be developed? These questions must be answered if policy- and decision-makers are to work efficiently to address the needs of the blood industry as the health of the nation continues to evolve. A new decision-making process, whether formed organically or from a combination of one or more existing frameworks, may be needed. If so, it should consider the challenges of making decisions in the US blood policy context which include:

1. The historical context in which policy makers are measured
2. The limited historical involvement of stakeholder groups
3. Reliance on outdated or inapplicable decision-making frameworks for current problems
4. Lack of a definition of “acceptable” risk or a measure of what is “safe enough”
5. Political challenges
6. Funding challenges and the economic state of many US blood centers

To overcome these challenges, it is important to engage leadership, expand training opportunities, enhance the transparency and accountability of public decision-makers, and to use the best available evidence to better address health disparities, specifically as it relates to blood donation and transfusion safety (Brownson, Chriqui, & Stamatakis, 2009). Whichever framework is decided on should be able to marry scientific decision-making with political

decision-making by understanding the complexity of the situation, involve and educate appropriate and interdisciplinary stakeholders, communicate effectively, improve training and education, and develop robust systems for surveillance (Brownson, Royer, Ewing, & McBride, 2006). It will only be at this point that consistent decision-making will happen, and the process will be clearer for all those involved.

By using the above referenced frameworks as a guide, a series of interviews with relevant decision-makers at various levels of the process determined how they make policy or other applicable decisions, what their definition of acceptable risk is, what their perceived barriers and facilitators to the decision-making process are, if a decision-making framework exists that would address all barriers and facilitators, or if a new one should be developed.

CHAPTER 3: METHODS

The purpose of this dissertation is to characterize the decision-making process for blood and donor safety policy within the United States and to identify barriers and facilitators to current decision-making frameworks. Using a qualitative approach, interviews with decision-makers at central agencies as well as key stakeholders external to these agencies informed an in-depth analysis of the current state of the decision-making process. Published literature, highlighted in Chapter 2, and public records complement the data gathered from the interviews and together inform the recommendation of potential process improvements.

Subjectivity Statement

Explicitly stating a researcher's biases, values, and experiences is important to ensure validation in qualitative studies (Creswell & Poth, 2018). I am an epidemiologist at the American Red Cross and have the perspectives of a scientist within the largest blood collection organization in the US and as a member of the US blood system. I have experience on the Transfusion-Transmitted Diseases and Donor Health and Safety Committees within AABB and am a blood donor.

Research Questions

Research Question 1: How do decision-makers describe the factors that contribute to the current decision-making process related to U.S. blood and blood donor safety?

Sub-question: How do various decision-makers in the U.S. blood industry describe the process of making decisions with respect to blood and blood donor safety?

Research Question 2: How do decision-makers describe barriers and facilitators to the decision-making process surrounding blood and blood donor safety?

Qualitative Inquiry

This dissertation is a collective case study using semi-structured qualitative interviews to gain insights from decision-makers and stakeholders in the blood industry and policy field surrounding the process, barriers, and facilitators to decision-making. Because each stakeholder and decision-maker have experienced a different reality and perspective on risk tolerance - and policy's role in mitigating these risks - a constructivist lens allows the researcher to understanding these multiple realities and for the researcher to be a passionate participant in the research process. Versus other qualitative methods of inquiry, a case study using interviews is most appropriate in for these research questions because it allows for an in-depth exploration of a bounded system (Creswell & Poth, 2018). In this study, the system is bounded by members of the five primary decision-making groups and the interviews focused on specific recent and current decisions that represent the major categories of decision-making within modern transfusion medicine (e.g., infectious disease testing, donor health and safety, and recipient safety). The constructivist lens lends itself towards a collective case study because, as argued by Creswell & Poth (2018), each participant has a unique perspective on the case and can offer something different to the holistic understanding of the problem.

Purposeful sampling of decision-makers and stakeholders helped to ensure that all possible viewpoints are being represented in the data collected. Member checking, by sending a summary of the findings from each interview back to the participant to ensure the analysis and interpretation are correct, provided validation to the findings and allowed any further information a participant wanted to provide to be collected. A cross-stakeholder analysis allowed for comparison and synthesis of the multiple perspectives offered by various stakeholders. Data gathered from the qualitative interviews and the literature review (Chapter

2) allow for a holistic understanding of the policy- and decision-making process and where it might be able to be improved upon.

Table 3-1. Data Acquisition Matrix

Research Question	***Why do I need to know this?***	**Sampling Decisions**	**Data Collection Methods**	***Whom do I contact for access?***	**Data Analysis**
How do decision-makers describe the factors that contribute to the current decision-making process related to U.S. blood and blood donor safety?	To understand how to improve the process of decision-making in blood policy, it is first important to have a complete understanding of the factors that play a role.				
How do various decision-makers in the U.S. blood industry describe the process of making decisions with respect to blood and blood donor safety?	Existing decision-making tools may provide context to consider some or all stakeholders' concerns.	Federal decision-makers; Professional Organization decision-makers; Blood Centers; Hospitals	Semi-structured Interviews	Each organization independently using AABB member directory and committee member connections	Audio taping and transcription of interviews; memoing, coding, and rereading/relistening to recorded interviews
How do decision-makers describe barriers and facilitators to the decision-making process surrounding blood and blood donor safety?	To develop recommendations for improvements to the decision-making process, it is important to understand the barriers and facilitators to the current process.	Same as above	Semi-structured Interviews	Each organization independently using AABB member directory and committee member connections	Transcription and coding of interviews; memoing

Research Procedures

Participant Sampling

Purposeful and maximum variation sampling guided the selection of participants for the qualitative interviews. It was very important to addressing the research questions of this dissertation to ensure diversity of opinion and variations of experience contribute to the data collected for the study (Creswell & Poth, 2018). To achieve this, purposeful recruitment of participants with various experience in the industry and involvement in decision-making bodies were enrolled. Thick rich description was developed through interviewing representatives from as many stakeholder groups as possible (Maxwell, 2013). These stakeholders included federal decision-makers (i.e., leadership and staff from the Office of the Assistant Secretary of Health, FDA, and CDC); members of the Advisory Committee for Blood and Tissue Safety and Availability (ACBTSA), BPAC; leadership at the AABB and College of American Pathologists (CAP); medical directors, senior scientists, and executive leadership at U.S. blood centers and the U.S. Military Blood Program; and transfusion medicine specialists at U.S. hospitals and the NIH Clinical Center (see Figure 3-1). Eligibility criteria included involvement in policy, procedural, or protocol decision-making at a local or national level, either through the recommendation of policy or being part of a decision-making team. Pilot interviews were conducted with three individuals who were ineligible to participate in the study, either due to conflicts of interest with the student investigator or other limitations, to determine if any changes needed to be made to the interview protocol.

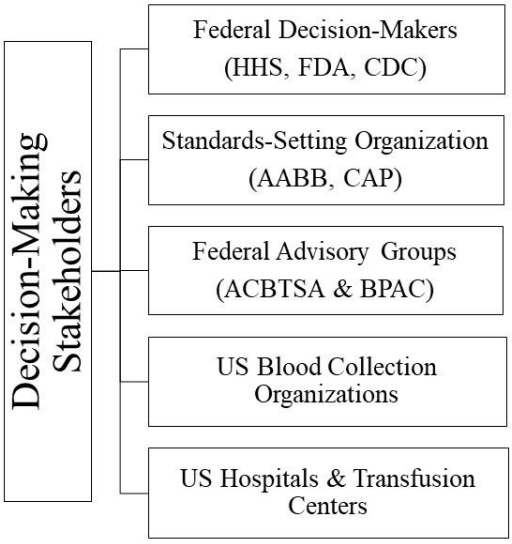

Figure 3-1. Decision-making stakeholders (sites) for recruitment

Participant Recruitment

Participants were recruited in April and May 2021 for virtual interviews conducted over WebEx or Microsoft Teams. Recruitment of all participants was conducted by the student researcher through direct email contact. Once a participant agreed to participate in the study, the informed consent document was sent via email for the participant to review, ask questions, and sign. Once all of the participants' questions were addressed, the informed consent document was either signed and scanned back to the doctoral candidate or electronically signed using the Research Electronic Data Capture (REDCap) eConsent platform. The participant was then scheduled for a 60-minute audio-recorded semi-structured interview to explore the participant's relevant experience with the decision-making process within the US blood system (Appendix A). Every effort was made to recruit stakeholders from each group as indicated above so all possible perspectives are included in the analysis.

Sample Size Determination

At a minimum, this study was designed to have a minimum sample size of 3 interviews per stakeholder group for a total of 15 interviews. The study included 21 interviews, with at least four representatives from each of the targeted decision-making perspectives.

Data Collection & Analysis

Once a participant agreed to be interviewed, they were sent a copy of the informed consent document for signature, and/or a link to sign the document electronically using REDCap eConsent. Participant interviews took place virtually due to the ongoing SARS-CoV-2 pandemic, even in instances when in-person interviews would be feasible. Interviews were conducted using WebEx or Microsoft Teams, which each allow for audio recordings of the conversations. Transcripts of the interviews were stored in an encrypted file on a secure server. Transcription of the interview recording were automatically generated using Otter.ai but were verified through careful manual review by the researcher and comparison to the audio recording. Throughout the interview and review of the transcription processes, memos were created in an effort to both facilitate the identification of general themes towards the central goals of the study, as well as to document reflections, thoughts, or experiences of the researcher so as to aid in subjectivity during the analysis process.

Validity was key to the successful data collection, analysis, and interpretation of this dissertation. As a way to comply with this idea, the concept of trustworthiness was used. Trustworthiness, as described by Lincoln & Guba (1985) and Terrell (2016), is comprised of credibility, transferability, dependability, and confirmability. Credibility of this study was ensured by taking the time before and during the interviews to build rapport and develop a

relationship of trust and understanding between the researcher and each study participant. Transferability means the results are applicable in contexts outside the narrow scope of this study. Transferability for this study includes detailing the methods, analysis, and results in such a way that other researchers or students can duplicate the work described here in their own projects and other contexts. Dependability is a way of ensuring consistency of the results. For this dissertation, dependability was met by using a peer coder as well as the dissertation committee and readers to ensure the results make sense based on the data collected. Finally, confirmability is a way to ensure neutrality and awareness of the researchers' bias that she brings to the table when conducting the research. The confirmability of this study is a result of a carefully documented audit trail which can be shared with others upon request, as well as the careful and complete documentation of each step in the analysis process, including development of codes, categories, and themes.

In addition to the trustworthiness of the interview data provided above, validity of the data is supported through member checking to ensure the data collected from each interview are summarized and interpreted correctly (Maxwell, 2013). Participants were provided a summary of the results of their interview and given the opportunity to ensure their perspective was interpreted correctly. At that time, they were also able to provide additional context, feedback, or corrections. All but one of the participants responded to the member checking contact, with each indicating that the summary of the interview accurately represented the ideas they were trying to convey through the interview. Three provided clarifications or corrections. Three provided additional information at this opportunity.

Data analysis followed the Data Analysis Spiral method (Figure 3-2) which includes: 1) managing and organizing the data, 2) reading and memoing emergent ideas, 3) describing

and classifying codes into themes, 4) developing and assessing interpretations, and 5) representing and visualizing the data (Creswell & Poth, 2018). Following the creation of memos and codes, matrices of themes for both within- and between-stakeholder comparisons were generated to identify connections, similarities, and differences of findings. Thematic analysis helped to identify common barriers, facilitators, requirements for decisions, states of thought, or other themes that are present within each decision-making group. During analysis, common themes began to transcend stakeholder groups to reveal the underlying decision-making process and barriers and facilitators to that process; within-case and cross-case analysis aided in describing these overarching themes. Data analysis using NVivo (released March 2020) software began immediately following the first interview and continued throughout the data collection process to alert the investigator as to the point of saturation. Transcribed interviews were coded using a mix of deductive and inductive coding, in accordance with the pre-determined research questions and in accordance with the list of codes developed from prior interviews. New codes relevant to the research questions were added organically as necessary with subsequent interviews. Codes were grouped into appropriate themes based on concepts seen across multiple interviews. Data analysis continued until the point of saturation has been reached, that is, when no new themes of data are seen from additional interview transcripts within stakeholder groups or within cases (Creswell & Poth, 2018). Following coding and theming of the interviews, within-stakeholder and cross-stakeholder analyses provided the researcher the ability to discover possible comparable or common findings among decision-making groups.

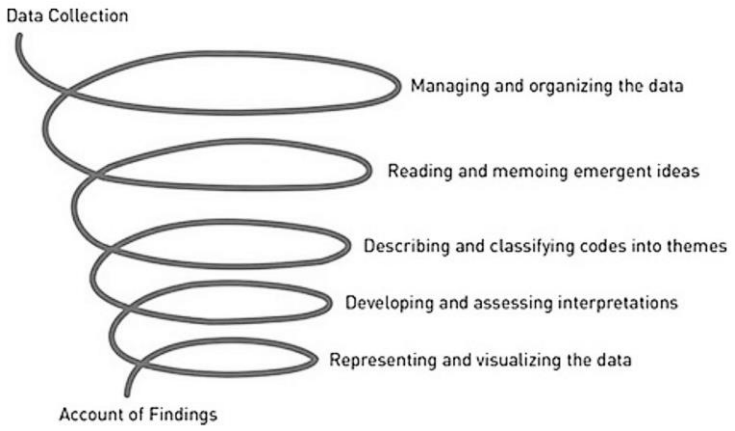

Figure 3-2. Creswell's Data Analysis Spiral (Creswell & Poth, 2018, p.186)

Human Participants and Ethics Precautions

This research was conducted following the principles of the Declaration of Helsinki and approval was attained from The George Washington University Institutional Review Board prior to any study procedures.

Informed Consent

Participants in this qualitative study were required to sign an informed consent document prior to participating in any study activities. A copy of the informed consent is provided in Appendix B. Since interviews were conducted virtually, an eConsent (REDCap eConsent Framework) was available to obtain and record consent for each participant choosing to electronically sign the consent form. The informed consent document provides an overview of the purpose of the research, the exact nature of the participant's involvement, and any risks and benefits of their involvement. Methods of data security to ensure confidentiality and anonymity of interview transcripts were detailed and provided to the IRB and the participants so as to alleviate concern over any participant's information being

released. Participants were able to withdraw their consent to participate at any point in time throughout the study.

Risks and Benefits

Participants likely experienced no benefit to themselves for participating in this research study, except that they were able to contribute to advancing the state of knowledge related to their own academic or professional career. The primary risk of participating was a breach of confidentiality or loss of anonymity for a participant's interview responses. To protect against this risk, several safety measures were used:

1. The only place a participant's name was saved is on the informed consent document.
2. Recordings of interviews were immediately transcribed and stored on a secure data server.
3. Once the transcription was completed and reviewed for completeness and accuracy, the recording of the conversation was deleted.
4. All references to a participant are through a participant ID number.
5. Reference to specific places of employment, names of coworkers or colleagues, or other individuals that can potentially reveal a participant's identity were redacted.

CHAPTER 4: RESULTS

Overview of Analysis Plan

This dissertation was designed to describe the decision-making process for stakeholders within the U.S. blood industry, highlighting the barriers and facilitators to this process. Using semi-structured qualitative interviews, the researcher was able to elicit qualitative data surrounding the three research questions: (Research Question 1) How do decision-makers describe the factors that contribute to the current decision-making process related to U.S. blood and blood donor safety?; (Sub-question) How do various decision-makers in the U.S. blood industry describe the process of making decisions with respect to blood and blood donor safety; and (Research Question 2) How do decision-makers describe barriers and facilitators to the decision-making process as it relates to blood and blood donor safety? Through a mix of deductive and inductive coding, the researcher was able to address all three research questions. Deductive coding using the established research questions to guide pre-determined themes based on set research questions was the primary analysis for Research Question 1. A mix of deductive and inductive coding for Research Question 2 allowed for new themes to emerge throughout the analysis process.

Research Question 1: How do decision-makers describe the factors that contribute to the current decision-making process related to U.S. blood and blood donor safety?

Federal Government Decision-Makers

Federal decision-makers who are responsible for blood policy and regulations are unique from other stakeholders in the U.S. blood system in that their primary focus is the health and safety of the entire U.S. population, not just one single group of people. Their concerns typically center around the safety of blood products as it relates to potential impacts

on blood component recipients, however their spectrum of concern is different for donors. Availability of products and how deferral policies and other regulations impact potential donation behavior of donors is considered, but the overall safety of blood products is paramount.

The principle of risk acceptance (sometimes referred to as risk tolerance) was frequently mentioned during the interviews. One participant said that while the body of scientific literature may inform what the risks and benefits of a decision are, it does not provide guidance on what level of risk to accept. Currently in the United States there is no definition of acceptable risk for federal agencies to base their decisions on. This means that risk acceptance is dependent upon the individual agencies' risk acceptability. In the case of the FDA, this is a low tolerance level. Interviewed participants from the FDA stated that while the Agency tries to take precautionary measures and promulgate precautions to the regulated industry, it does not operate on the precautionary principle. They instead rely on risk assessments to guide their decision-making.

In general, the current decision-making process at the federal level has been highly influenced by the response and perceived shortcomings to the HIV and HCV during the 1980's and 1990's, described previously in this dissertation. In fact, the impetus for setting up the Assistant Secretary of Health (ASH) as the blood safety officer in the United States was a report developed by the Institute of Medicine (Leveton, Sox Jr, & Stoto, 1995) which revealed there needed to exist a more formal structure and locus of control over blood safety within the United States.

The process of U.S. federal decision-makers responding to a safety threat or emerging agent of concern varies based on individual circumstances and continues to develop as

lessons are learned, data are gathered, and technology is developed. No two responses are handled the same way and there is no standardized structure guiding these responses. It was described by many participants that once an agent or organism has been identified and determined to be a potential threat to blood safety, information is passed to those who interface with other federal agencies. This is mentioned to be the biggest variable in the time of response at the federal level: the time it takes to get to the right people in each agency. This variance is highly dependent upon the way the concern was discovered, whether through a proven transmission, insights from other countries, potential risk of transmission due to the type of infectious agent (e.g., retroviruses which may act like HIV), or another way. At this point, a more structured response is followed in that once the concern and its known relevant data reach the appropriate parties, it is discussed on agency-wide calls or with larger groups (i.e., Blood Organ and Tissue Safety at CDC, the blood division of FDA, etc.), or to some other working level where people talk about the potential issues the agent can create. If they have not been brought in yet, the HHS OASH will come together with representatives from each HHS agency (typically as a working group with members from CDC, NIH, FDA, OASH, Biomedical Advanced Research and Development Authority [BARDA], and others as appropriate). Discussions about whether this is something that needs to be responded to and, if so, what the response should be. If the agent is something that must be addressed and is potentially impactful to the blood system, an assembly is called to include AABB, major blood centers, plasma groups, and others.

From that point, every response is unique because every situation is different; there is no standard structure to or direction on how to handle responses as would be in place if the United States had a National Blood Program. There are some situations where the system

speeds up and decisions are made more expeditiously. These include: if there is proven infection through transfusion (versus a theoretical risk); if something is a retrovirus, it is of particular concern due to the history of the US federal and blood system response to HIV in the 1980's; and if there is a high rate of fatality due to the attention it will get from the public. The latter two show the power of public perception and that it is just as important as all other factors.

No matter how the agent or concern was discovered and what risk level a particular threat is determined to hold, eventually the established infrastructure from the federal level takes over, however the time to triggering this is highly variable. All concerns, however, require purposeful and active coordination between federal agencies and other relevant parties in the blood system, which is almost always overseen by HHS and the OASH.

US Department of Health and Human Services

While all federal groups involved in blood and donor safety activities in the United States fall under HHS, the ASH is the official Blood Safety Officer for the United States. Under HHS, there exists an advisory panel made up of leadership from OASH, CDC, Agency of Healthcare Research and Quality (AHRQ), Centers for Medicare and Medicaid Services (CMS), Health Resources and Services Administration (HRSA), Office of the Assistant Secretary for Preparedness and Response (ASPR), Office of the Assistant Secretary for Planning and Evaluation (OASPE), NIH, FDA, Department of Defense (DoD), and the US Department of Veterans Affairs (VA) called Blood, Organ, and Tissue Senior Executive Council (BOTSEC). BOTSEC will convene regularly and as needed to discuss issues of concern for the blood, organ, and tissue community. However, ASH does not need to

convene BOTSEC in all situations. The ASH has direct authority over blood safety and can provide an order to any federal agency under its jurisdiction to make a decision, change guidance, or update rules. This may be advised by the ACBTSA or based on Presidential directives.

ASH reviews the recommendations from ACBTSA, members of the public, federal agencies, or other sources and will sometimes call on BOTSEC to weigh in on a response or determine action items for each of their respective agencies. This could be a request by the current political administration (if something is important to the Administration, it becomes an HHS priority), the US Congress, or others in the blood system. When something is brought to the ASH or the Secretary of HHS, it requires a politically inclusive assessment which includes risk acceptance, cost acceptance, societal acceptance, etc. This deviates from other federal decision-making groups where politics are largely rejected, and decisions are based on scientific evidence and data. While formally given the power of the blood safety officer of the US, the ASH does not make unilateral decisions themselves and in fact, very few recommendations from ACBTSA are implemented by ASH. It was mentioned by a few participants that, depending on the individual holding the ASH position and the focus and priorities of the current political administration, ASH is largely not invested in what's going on unless there is a real crisis. The Secretary of Health, ASH, and Commissioner of FDA are not generally brought into discussions and asked to act unless there is a large-scale problem, crisis, or a situation which will cause chaos.

US Food and Drug Administration

As the central regulator for blood and blood donor safety in the United States, the FDA is primarily focused on maintaining safety of the blood supply and generally does not

consider cost or availability since there are other mechanisms of the federal decision-making process charged with regulating or overseeing those factors, though those participating in interviews said they are not blind to these potential downstream effects. They provide direction and safety measures to the regulated industry through two primary means: regulations and guidance documents. Regulations, once enacted into the CFR, are legally binding and all blood centers, plasma centers, hospitals, and other members of the applicable regulated industry within the United States are required to follow them. Guidance on the other hand is the FDA's interpretation of the regulations, aimed at helping the regulated industry understand the thinking around current requirements and suggestions on ways for the industry to comply and does not add additional regulatory requirements. The industry is not required to follow these guidance documents and can comply with regulations in other ways as permitted by approved variance request. An example to determine between the two is that the CFR (Food and Drugs, 2022) states that donors must be healthy and well to donate blood. The FDA interprets this to mean that potential blood donors should have an adequate blood pressure and pulse (US Food and Drug Administration, 2022). Because guidance documents can be developed more quickly, do not require compliance by industry, and add in flexibility, the FDA tries to use this whenever possible to avoid delays in adding to the regulations.

The FDA's authority comes directly from Congress based on the Food and Drug Act, the Food, Drug and Cosmetic Act, and the Public Health Service Act. As such, FDA is given independent authority on certain decisions where secondary endorsements from other parts of government are not necessary. In addition, cost cannot be a factor except in rulemaking where the impact of a rule will be over $100 million on the regulatory industry. As a result of

the authority granted to FDA, they are highly bureaucratically structured and the standards for removing a regulation is much higher than adding to it. Regulators have a high burden of showing harm in order to overturn or remove something. In addition, regulators must meet certain standards to even revisit decisions which is a challenge when trying to stay current with developing trends and advances in testing and technology. The rule-making process is time consuming, tedious, and require more bureaucratic levels of input, thus they are not the favored method of disseminating decisions except in the highest level of safety concern. When a decision is needed internally, the process of decision-making is relatively consistent from situation to situation within the agency. When a concern is discovered, the process of learning everything possible about the agent or risk is attempted. Internal epidemiologists and researchers will attempt to figure out what kind of quick and easy to implement strategies can be instituted to prevent potential impact to the safety of the blood supply. Often these conversations will begin in the blood division but will then move to a called session of BPAC to seek outside opinion. Unfortunately, in these situations due to the purposeful attempt by FDA to reduce conflict of interest on BPAC, the recommendations on which the advisory committee votes could have a significant negative impact on the regulated industry. However, as one participant stated, “if the risk to the public is substantial, costs of testing are much less important” [Participant #18]. The FDA does not follow a formal decision-making framework, but instead uses a hierarchical decision-making process. Those at the reviewer levels can look at available data and determine what other data are needed without the pressure of directly making decisions. The leadership within CBER are then tasked with assimilating all the available information, including insights from the reviewers, and make the best decisions possible with the available data. While they do not follow a formal

decision-making process or framework when making decisions, "[FDA has] over the years advanced the use of formal tools, specifically quantitative risk assessment: put numbers of things, quantify risks, and quantify the effectiveness of interventions" [Participant #12]. They try to balance risks and benefits, incorporate stakeholder input, communicate with the public and regulated industry through public service announcements, media interactions, labeling of product, open public hearings, and receive stakeholder input through comments on draft guidance. Stakeholders are also involved through the process of rulemaking. Once a proposed rule is developed, it goes for public comment, the FDA responds to those comments, and then will issue a final rule. In truly urgent situations, a guideline or rule can be developed for immediate implementation and comments will be sought secondarily. Representatives from the federal level of decision-makers state that stakeholder engagement is scattered throughout the process, and at largely a sufficient level. However, others from the other four decision-making groups felt that their engagement and involvement in the decision-making process at the federal level was less than adequate.

Further engagement of stakeholders is challenging due to the Federal Advisory Committees Act of 2013, which requires a committee meeting if an agency is trying to contact more than two experts about a topic. Additionally, confidentiality requirements constrain dialogue with the affected industry. In addition to public comment on regulations and guidance documents, there are more ways for the industry and other stakeholders to the process to have their voices heard and, in some cases, participate in open discussion with the FDA. The first is through the Commissioners Roundtable, where the FDA Commissioner can openly dialogue with the regulated industry. The second opportunity is by Part 15 hearings, where the FDA will listen to information from the public, ask questions, and get input.

Finally, when public insight is sought on an issue, FDA will often convene BPAC. However, their congressionally determined authority restricts their questioning to BPAC to be very specific about the science and safety surrounding a particular issue, even if that means not asking the questions central to an issue. There is a role for societal interests and politics, but not within an agency driven by legal frameworks and science. "To the extent that those influences undermine the scientific framework, then I would say that they are largely inappropriate and problematic. I won't say they never occur, but the agency resists them very, very strongly" [Participant #12]. In general, FDA does not make unilateral decisions without listening to expert opinion, public statements and comments.

US Centers for Disease Control and Prevention

CDC's role in the federal decision-making structure is to collect data related to the safety or risk of infectious diseases. They provide recommendations to prevent transmission of infectious diseases and collaborate closely with other federal bodies by advising regulations. Data collection is primarily through the NBCUS and the National Healthcare Safety Network (NHSN) Hemovigilance Model. NBCUS collects data on blood collection and utilization within the US every two years and then is reported through peer reviewed journal publications, presentations to the public at AABB, BPAC, ACBTSA, or other venues, and other federal agencies as requested. The NHSN Hemovigilance Model is designed to track adverse transfusion reactions from hospitals around the country and is instrumental to monitoring safety of the blood supply, according to multiple research participants. In addition to these formal surveillance tools, the CDC also conducts ad hoc investigations of potentially transfusion-transmissible infectious agents that are of public health significance. Once the agency identifies a threat, they will work to develop a feasible solution or intervention to that

threat and then suggest one or more feasible interventions for possible implementation. When decisions about these steps forward are being made, the CDC involves stakeholders in its decision-making. When questioned about a specific framework, the participants interviewed said they do not follow a specific framework because each situation is different, but instead try to speak objectively to what the data are.

National Institutes of Health

Decisions at the NIH are made almost exclusively looking at the science of an issue. The NIH Clinical Center and associated blood center leadership will make a decision based on the best available science, and if the existing science is not strong enough to make a decision, the Institutes can develop a protocol to investigate that particular question. The NIH Blood Center is included in the federal section because they operate very differently from independent blood centers in that cost is largely not a factor for them and they are able to more easily support research and scientific investigations for interventions to improve donor and blood safety.

Standards Setting

In addition to federal regulations which govern the collection, testing, manufacturing, and distribution of blood products in the US, blood centers often seek accreditation from the Association for the Advancement of Blood & Biotherapies (AABB). “AABB is an international, not-for-profit Association representing individuals and institutions involved in the field of transfusion medicine and biotherapies. The Association is committed to improving health through the development and delivery of standards, accreditation and educational programs that focus on optimizing patient and donor care and safety” (AABB, 2022). AABB provides guidance and rules to the blood banking community through the

development of two primary products: Standards and Association Bulletins. The process of developing these products follow two different paths, which are detailed below.

Accredited blood centers and hospital blood banks are required to follow the Standards set by AABB. AABB has a robust system of developing and setting Standards for all aspects of blood banking through a Standards, Accreditation, and Regulatory (SAR) Council. The Standards Program Committee is responsible for overseeing and administering the AABB Standards Program and to harmonize all standards-setting activities from the other eight standards committees. The Accreditation Program Committee is similarly responsible for oversight and administration of the AABB Accreditation Program and harmonizing activities from the other eight accreditation committees. On each of the standards committees exists liaisons from other committees, working groups, and task forces from the Clinical, Scientific, and Research Council (CSR). These groups include the Transfusion Transmitted Diseases Committee, Donor Health and Safety Committee, Donor History Task Force, and others. Representatives from these other committees share important efforts and work with the Standards Committees to help update existing Standards and inform future Standards in development. Occasionally there will be a situation where an ad-hoc working group needs to be formed to address a specific challenge or opportunity for development in transfusion medicine. In these scenarios, a Board of Directors (BOD)-commissioned working group is formed for this purpose. They report directly to the BOD and do not pass information through other Committees unless those Committees are directly involved with the charge. AABB committees which make up the SAR and CSR consist of subject matter experts, interested members, and representatives from across the span of the blood industry. Membership of these committees is determined yearly by a process of application by

members and determination from the Chair and National Office Staff. These committees are "a forum for debate, development of policy options, ideas that are then promulgated to the Board towards what may become an AABB policy" [Participant #04]. "In general, committees try to be forward facing and horizon scanning, however they are often left to make judgements, decisions, and recommendations with badly inadequate data" [Participant #10].

AABB Standards are updated every two years on a regular schedule, however interim standards can be developed if an emergent issue presents, or a topic needs immediate attention. The appropriate Standards Committee made up of experts from the transfusion medicine and scientific community will draft and revise the standards based on current scientific data, best medical practices, and applicable regulations. These are sent to the AABB BOD for approval, then Standards are sent out to members of AABB for public comment. As comments are received, they are returned to the Standards Committee who will incorporate those comments as appropriate into a second version of the Standards. The revised final version of the Standards is then shared with the BOD for final approval and implementation.

AABB Association Bulletins are developed by Committees and/or National Office Staff and are approved by the BOD for distribution to individual and institutional AABB members. They provide the opportunity to update members on emergent Standards, statements of AABB policy, and other guidance, recommendations, and reports for membership. They do not go out for public comment and are approved only by the appropriate committee(s) and then the BOD.

The AABB BOD is charged with setting strategy for the larger organization and overseeing how that strategy is executed through the actions of the membership. The BOD has a fiduciary responsibility to the membership and is also driven to focus on what the membership wants from the organization. The AABB is similar to other membership-driven organizations in that they need to appease their membership for risk of losing membership, money, and ultimately ceasing to exist. Unfortunately, this means that despite best intentions there are often other factors driving decisions. However, each current and former AABB BOD member participating in this study said that their time on the BOD has shown them how dedicated the organization and its membership is to do what is right for blood donors and the patients who benefit from blood transfusions and other biotherapies. The BOD seems to be made up of those who have a genuine interest in furthering the field of blood transfusion and understand the importance of ensuring safety of each step in the process. Approval for Standards as well as many other decisions in front of the BOD is through full vote, using Robert's Rules of Order (Roberts HM, 1998). One challenge mentioned by multiple current/past BOD members is that there tends to be "group think" when it comes to a number of issues brought up at the BOD-level. Members do not want to offend each other by directly contradicting each other and thus it can happen that the BOD members just "go along with the crowd". Past presidents of the AABB BOD have mentioned that they try to avoid this by ensuring a diverse board which can help introduce differences of opinion and checks and balances.

The AABB has formally used the RBDM Framework twice in the past. These were board-commissioned and centered around the issues of iron taking in blood donors and second for babesia testing. The first RBDM framework experience was a risk-based decision-

making assessment of donor iron deficiency. There was not a lot of education about the RBDM framework prior to the Working Group beginning their investigation into the concern around iron deficiency in blood donors. Being so, not everyone involved with the process fully understood how the framework was designed to be used. One member of this working group said that there needed to be a more coherent introduction at the beginning. In addition to the framework not being thoroughly understood by members of the working group, there was an assumption at the beginning of the process as well as by those making up the working group towards those who thought there was a problem with iron deficiency among blood donors. Members of the Working Group as well as the BOD who commissioned and received the reports from this Working group mentioned the process was contentious and that the spirit of the exercise may have been lost due to the assumptions and bias of the members. The second RBDM exercise used by AABB was commissioned by the BOD and carried out by the Ad Hoc Babesia Policy Working Group. It was noted by several participants that while it went better than the first RBDM exercise, it was still not perfect because of the bias introduced by some participants in the exercise. Some participants were reluctant to support the decision of testing for Babesia in only certain areas of the country because of the disproportionate cost burden it would put on these centers versus other centers who would not be required to do testing. It was also noted that the process of conducting the RBDM for both iron and Babesia took a long time, happened behind closed doors, and was not transparent until the final report was released. In both RBDM exercises, there was inherent bias because of the participants in each exercise who, while established leaders in the transfusion medicine community and accomplished scientists, introduced bias, either based on their own experience or by representing their blood collection organizations. “There were

individuals […] who felt that their word as an expert should somehow outweigh anything done within the framework" [Participant #02].

Advisory Committees

The two primary advisory committees for the federal government are ACBTSA and BPAC. ACBTSA falls under the department of HHS and is meant to look at issues from a global public health perspective, including economic and social. After the events of the HIV epidemic and transfusion transmission of HIV through the blood supply in the 1980's, the Institute of Medicine (IOM) commissioned a study to investigate the missteps and failures at the federal level associated with this event. Among numerous other recommendations, the IOM suggested the restructuring of the BPAC to remove the numerous blood industry representatives and instead include "more members with expertise in principles of good decisionmaking [sic] and the evaluation of evidence" (Leveton LB, Sox Jr HC, & Stoto MA, 1995). It was also recommended that there be an advisory group for the ASH, who was to be the official blood safety officer of the US. The BPAC has a narrow remit to look very specifically at the science and is not designed to answer regulatory questions posed by the agency, but instead to inform decisions being made. The two Committees are intended to complement each other and balance interests.

Advisory Committee on Blood and Tissue Safety and Availability

ACBTSA is an advisory committee under the ASH, who is the official blood safety officer of the United States. The advisory group was formed in 1996 as a result of the IOM report and has a wide latitude to look at major concerns/problems within the United States blood system. Its charge is broad in scope as they are asked to consider all aspects of safety

and availability of the blood and tissue supply in the United States. They are specifically asked to consider scientific data as well as costs and financial implications of potential decisions, ethical and social issues, practicality of decisions, as well as the operational impact and impact of policy decisions on availability of blood throughout the country (US Department of Health and Human Services, 2022). They discuss comprehensive issues including the state of the industry, gaps in the U.S. blood system, widespread need by the system, recipients, and donors, and where is there opportunity for improvement. There is an effort for transparency on the committee and most meetings are recorded and widely available on the committee's website. When there are openings on the committee, a notice is released in the Federal Register.

Challenges faced by ACBTSA include that a lot of the committee's ability to influence policies are based on the current ASH's understanding of their role as the official blood safety officer of the United States. Depending on their understanding and "embrace" of this role there is an undulating efficiency of the committee. At times, after recommendations are given, it seems to membership that nothing is done based on those recommendations. A few current/recent members interviewed mentioned that it would be helpful to have a more standardized approach to what is put forward as a topic, greater input on proposed topics, and how recommendations are structured to be actionable by the ASH, Secretary, and Congress. In the past there has been "a lot of talking, but not a lot of results" [Participant #06] from the ACBTSA. One reason for this may be that the ACBTSA does not have the same access to resources as does the BPAC.

One strength that ACBTSA does have over BPAC is the breadth of expertise and representation of committee members. Stakeholder engagement is stronger in that many

voices are represented at the table and agencies are forced to work together if they aren't already. The membership of ACBTSA includes 14 public members, 9 representative members (one each from AABB, the American Association of Tissue Banks, Association of Organ Procurement Organizations, Eye Bank Association of America, a hospital accreditation organization, a major blood supplier, a member of the plasma protein fraction community, a manufacturer or supplier of blood donor testing and screening, and a medical device manufacturer), and six ex-officio members from the CDC, CMS, FDA, HRSA, and NIH. Membership of the committee can vastly influence recommendations and given this, those responsible for staffing the committee make a conscious effort to ensure diversity of background, demographics and experience while ensuring as many voices are represented. Oftentimes there is a conflict in motivation between blood center representatives and the hospital representatives, primarily when it comes to financial goals, however the main aim of the group remains constant in providing feedback to the ASH and HHS to increase safety and sustainability of the blood and tissue supply in the US.

The process of ACBTSA meetings and decisions follows a prescribed format in that topics are suggested by the HHS Secretary, ASH, BOTSEC, or their designee, based on perceived needs of the blood system and/or federal government. Once a topic is decided, experts from the community are convened to discuss certain aspects of the topic in question. A robust discussion and question and answer period is included in the meetings. Recommendations are developed by the committee and tend to flow from the order of the speakers during the meeting and are based on what the presenters bring to the meeting. These recommendations are presented from the Chairperson to the ASH via a letter. From the recommendations sent to ASH, there is a perceived lack of transparency among committee

members for what happens next. “From [the recommendations being sent to ASH], it is unclear what the process is unless there is a very specific ask” [Participant #08]. Other past and present committee members shared that the ASH would respond with a “thank you” letter to the Chairperson and then nothing happens afterwards. “The advisory committee makes recommendations that then go to HHS; what happens from there depends on HHS and the life cycle, election cycle, and understanding of responsibility of the ASH whether anything will come of the recommendations made.” [Participant #06].

Blood Products Advisory Committee

BPAC is an advisory committee to the FDA. Their charge is to advise and provide recommendations to FDA about future policy and regulations. As described earlier in this section, those BPAC members with ties to the blood industry were removed from the committee following publication of the IOM report and instead were replaced with those who had experience in decision-making and evaluating evidence. Various divisions (primarily the Office of Biologics Research and Review) within CBER will work towards a decision, but if additional input is needed before a guidance or regulation is presented for public comment, BPAC will be called together. The agency will assemble an expert panel to present data – both published and unpublished – for the committee to consider. One participant commented that this ability to establish an authoritative podium of speakers was a true strength of the agency and the BPAC process. There are restrictions on the types of questions FDA is permitted to ask BPAC and the way those questions can be asked. For example, costs are not permitted to be brought up as a reason to recommend or not recommend a certain regulation. Questions tend to be asked and committee members are asked to choose between multiple

options, or a binary yes/no. The committee will review the data presented to them and then will weigh in with their opinions, discuss, and ultimately vote. “Sometimes what we are asked is not necessarily the crux of the issue, but it’s the only thing they are able to ask because FDA is restricted by regulation” [Participant #06]. Another factor in the opacity of the process is that BPAC is blinded from internal discussions of decision-makers within FDA.

> I always feel like geez, if I knew what FDA’s considerations were, then that might help in making a wise recommendation. But on the other hand, FDA might say they don’t want to bias people. They are dealing with all kinds of political issues and who knows what kinds of forces are acting on the FDA that maybe they want to protect the committee from. [Participant #11]

Also included in a BPAC meeting is an open forum for public discussion and brief presentations on the subject. According to interviewed participants these presentations are often self-serving, but they are meant to broaden the discussion with public insight.

While BPAC’s recommendations are valuable by the agency and can be used to inform decisions, they are non-binding, and the agency is not required to follow BPAC’s decisions. However, the purpose of BPAC is to give the agency a sense of whether the agency’s ultimate decision is in line with expert thinking, to allow the public, blood centers, and others the ability to voice concerns and opinions. Because FDA will sometimes veer from the consensus reached by BPAC members, it can appear to many, as was expressed by participants in this study, that FDA is operating within a “black box” of sorts: where it doesn’t matter what the public sees as input, they can come out with a recommendation that is completely different. “And then they do with [the recommendation/vote] – well who

knows what they do with it, but that's how it works" [Participant #11]. BPAC is merely an advisory committee.

Strengths of the BPAC process include that there are numerous resources available to Committee members. These include the epidemiologists, data scientists, and wealth of data available to CBER. Prior to any BPAC meetings, a high-level summary of what is known on the topic is provided to BPAC and the public. These summaries are put together by very highly qualified people who are able to concisely describe the current state of knowledge on a particular subject. While FDA concerns themselves with the health and safety of blood recipients (i.e., regulating infectious disease testing, donor deferrals), they also do their best to ensure safety of blood donors, or at least attempt to do no harm to donors. Occasionally the health/best interest of blood recipients and blood donors are in competition with each other (over drawing vulnerable donor populations to ensure availability).

Limitations of the committee include that the composition of the panel itself since some study participants felt that there are many people on the Committee who are involved in public health, medicine, and hematology, but not many who are experienced in transfusion medicine. There is one industry representative on the committee that is a non-voting member. They can participate in the discussion and weigh in with their opinion about a topic, but they are not able to cast an official vote during the proceedings. The idea behind eliminating the voice of the regulated industry from the Committee stems from the desire to keep cost out of the conversation, however by doing that, the Committee membership does not often have a full understanding of the relevance of the question(s) being asked. One participant, with experience sitting on BPAC, suggested that perhaps the Committee can grow to allow more

voices to be heard, but also if one or two Committee members have a conflict they are drowned out by other voices.

Each committee member is tasked with listening to the speakers, asking pertinent questions to best aid in their understanding of the data, and then making a decision on their vote or recommendation. While each member of the committee is an expert in their field, they must determine what is the best decision for them to make in terms of science, fairness, and social pressures. Ultimately what each committee member decides to recommend or how they decide to vote is "largely due to individual conscience and interpretation of the data" [Participant #11].

Blood Collection Organizations

As with each of the five decision-making groups highlighted in this study, blood centers are responsible for their specific role in the transfusion medicine system: collecting and manufacturing a safe and adequate blood supply for their hospital and transfusion service customers. Their focus is often strictly on how they can maintain the supply, with lesser emphasis on innovation for how to improve this process. Most blood centers in the United States are nonprofit organizations focused on collecting and distributing blood components to hospitals or transfusion centers which need these products to meet patient need. Each blood center is required to follow policies and regulations set forth by the FDA, and most seek accreditation from the AABB and thus must follow their standards as well. As such, blood centers are required to operate mostly under a regulated environment, with exceptions for research and other innovative endeavors they choose to pursue. When it comes to blood collection, testing, and manufacturing, blood centers are required to follow regulatory

procedures and thus their autonomous decision-making power is limited: “testing is 100% driven by what we have to do from a regulatory aspect” [Participant #09]; “No decisions for a blood center are made truly independent of the regulators or accreditors […] and Centers are not at liberty to make independent decisions because the regulators hold our license in an iron grip, as they should” [Participant #17]. In addition, hospital contracts often require accreditation by the AABB, meaning blood centers must also follow AABB Standards. However, for other internal procedures, non-regulated testing, marketing, recruitment, or other innovative endeavors, blood centers are left decision-making power. Some blood centers choose to do only what is required by FDA and AABB, however others choose to look for opportunities for process improvement and innovative strategies to meet their goal of providing safe blood components to their customers.

As blood center leadership is faced with decisions as it relates to blood safety, there are a number of precepts that underlie the process. The first is where on the risk aversion/tolerance spectrum a blood center’s leadership falls. Risk tolerance is something that most of the blood center participants said was a strength of theirs. They are not 100% risk averse and are willing to make changes to internal processes should there be good reason to do so. A second facet underscoring decision-making at blood centers is the competition within the industry. Blood centers are often competing with each other for hospital contracts, notoriety, and recognition for their positive impacts on the health and safety of those in need of blood products throughout the country. The United States is one of the few countries around the world who have a blood system made up of mostly small independent blood centers. The American Red Cross is responsible for collections of approximately 35% of the U.S. blood supply, with many other community-based, independent blood centers collecting

roughly 60% within the consortium of America's Blood Centers. Given the competition for hospital contracts as well as limited research dollars for transfusion medicine and blood donor research, many decisions are made based on marketing, recruitment opportunities, and what other centers have decided to do (i.e., "if the Red Cross does it, we've got to do it too" [Participant #04]).

Many centers focus their decisions based on what is in the best interest of operating their business, however this does not always mean that cost is the only thing considered. One member of higher-level decision-making at a large blood center stated when it came to decisions about safety improvements for the donor experience, "while cost is always a factor, it is never the only factor and rarely a driving factor in decisions" [Participant #07]. Many blood center decision-makers noted specifically that almost all safety improvements are followed through on and are only limited when they are cost prohibitive, however with limited reimbursement for additional safety improvements and additional testing needs, especially during the SARS-CoV-2 pandemic, and the challenges of the current reimbursement structure within the US, "recently, safety has taken a backseat to cost" [Participant #09] and there is a challenge within the blood centers to find a balance between safety and costs when they are forced to absorb the expenses without adequate reimbursement.

All blood centers consider safety, cost, and feasibility, but can be limited in innovation and other advancements in the field because of resource constraints. If an idea is proposed, but it does not address a safety concern or other business-limiting challenge, financial elements are often brought in. However, if an idea will improve safety, save on personnel time or cut costs somewhere else in the blood collection, manufacturing, and

distribution process, it may be implemented. If U.S. blood centers were operating in a for-profit space, these decisions may be different, but as non-profit centers with limited resources, this is the current process in place. Ultimately, the question that decision-makers at the blood center level, and all levels of the blood system must answer is what is more important – the business or the donors and blood recipients. It's an impossible question to answer in some cases, but those in charge must often choose to make decisions somewhere along the spectrum.

Ideally, safety would be paramount and decisions surrounding safety would be made no matter what the financial impact on the organization, however the reality of operating a blood center is much more challenging and hard decisions and certain concessions must be made. Strategic plans drive operations and if a decision is made that does not impact regulatory requirements, it will become the way the center operates, especially if it reduces cost, increases revenue, and helps the center operate leaner.

Each participant in this study who is part of a blood center decision-making group described very different processes when it comes to making decisions related to donor and blood safety. Some prefer to use checklists or a pros/cons list to ensure all important considerations have been made, some use a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis, and others rely on economics, stakeholder opinion, and impact on donor or blood safety to come to a decision on what to do about a safety concern. No blood centers use a formal risk-based decision-making framework or a formalized process, however many do incorporate elements of the RBDM Framework into their process: identifying the issue, collecting data, gathering teams of internal stakeholders, attempting to understand

external stakeholders, assessment, and then a final evaluation. One participant detailed their process:

> Once a pathogen has been identified as being potentially of interest, we assemble everything known and suspected about its relevance to transfusion recipients and blood donors and then make value judgements about when does a pathogen rise to the level of requiring specific interventions and what interventions. But then once something is on our radar, its' really the tension between how much trouble is it going to cause and what is it going to take to reduce that trouble, and is it worth doing or not? One would like to think very clearly about morbidity and mortality and risk-benefit and all that, there is also a big political dimension that is a major factor which I think occasionally gets out of balance. You know, we are still paying the price for the perceived flaws in our response to HIV and to a lesser degree hepatitis. [Participant #10]

Larger blood centers tend to have a more formal operational procedure of bringing safety concerns to the leadership team charged with making decisions for the organization. Executive leadership largely rely on senior staff and other members of the blood center to bring ideas, innovation, and suggestions to the table for discussion and potential implementation. However even these larger blood centers mentioned that not every decision requires a large, formal framework; some more straightforward decisions can be made using a "lite" version of a decision-making framework or using one of the processes described above. All blood centers mentioned a desire for leadership to build consensus, however there is an executive level decision-maker who can ultimately decide, should the group be unable to come to an agreement. For those larger decisions which impact multiple areas of the

organization and could impact donor or blood safety, more formal processes make the decision-making more streamlined. In general, the questions asked include: What is the evidence? What is the magnitude of the risk? Who determines that risk? Who are the stakeholders? What are the health economics around it? What is the societal perception? What is the potential impact on the organization? Blood centers largely rely on data to influence decisions, however the fact that the United States, blood centers exist in a competitive environment cannot be ignored. Ultimately, it is a balancing act between operational risk, safety, and economics underpinned with the right values and motivations, ethics and principles.

Once a decision is drafted, an iterative process of communication with stakeholders is initiated. What works well for some centers is that once a draft of the proposed decision is created, it is sent out for review and comment. Communication also begins with affected departments in the organization who may be impacted by the decision. Not all decisions are popular with all stakeholders, whether that be with donors (e.g., ending COVID-19 antibody testing), hospitals (e.g., raising prices), or blood center staff (e.g., implementing new procedures that may demand more time or effort).

The involvement of stakeholders is very important to making decisions at a blood center especially given the numerous departments and individuals affected by those decisions. Every blood center representative interviewed as part of this study indicated involvement of various departments in leadership groups who oversee safety decisions for the organization. Most centers have a formal leadership team including representatives from the internal medical, information technology, scientific, quality assurance/regulatory, operations, and legal teams who come together to make decisions as a group. “First and

foremost is a thorough and robust discussion with our medical and scientific teams while looking at the data" [Participant #07]. Each member of the group is focused on their own specific perspective of the impact of decisions, however because of this equal pull from all sides of an issue, decisions made are often balanced. If the groups are unable to come to a consensus, there is a single leader or executive who will make the final decision. Each blood center mentioned that there was no inclusion of patient advocacy groups, donors, or direct involvement of hospitals (though large blood centers do offer other ways for hospitals to give feedback on new decisions which affect their supply or contracts). A member of the decision-making leadership committee from a large blood center indicated there is potential for more engagement of donors in decision-making. Some blood centers also mentioned that there is not enough, if any, representation by the research and scientific groups in these large decisions. Or, as one participant said, "Everyone may have a seat at the table, but that doesn't mean their voice is heard" [Participant #09]. One member of blood center leadership explained this as the juxtaposition of scientists with the business-oriented members of leadership groups: the business-focused people try to cut out the scientists because they need a quick decision, while scientists point out the flaws and potential handicaps of any decision. To increase expediency of decision-making, scientific stakeholders will occasionally be left out. In general, though, leaders try to listen to the scientists and say, "here are the facts, here is the application of those individual facts, and then here's my opinion." [Participant #22].

Hospitals

Hospitals, which have the responsibility of serving the ultimate end-user of blood - recipients – have a unique process of decision-making. Underscoring all decisions for transfusion medicine physicians and hospital-based blood bank medical directors is ensuring

there is enough safe blood available for all current patients and any potential patients who may present. One hospital transfusion medicine physician described it as "your own mini public health department" in that you need to make decisions about what is safest for your patients and experience will guide expectations of what you need on-hand, what products need to go where, and if there are any special patient populations which require consideration of different units (i.e., neonatal intensive care unit, sickle cell, obstetric, and oncology patients). Unless the hospital has a blood center – or even if they do but choose to supplement supply through an outside supplier – the transfusion medicine team must trust the supplier of blood products to be able to maintain an adequate inventory for patient needs, it should be close by and able to deliver products quickly, provide the right unit types (i.e., for sickle cell or CMV-negative units for neonatal intensive care unit patients), and that the products provided are safe (i.e., proper testing, irradiation, pathogen reduction/inactivation). The guiding principle is to do the best thing for the patients under their care: whether it be a single patient, all current patients, or all possible patients who could come in the door.

A consideration paramount to the hospital decision-makers is "how are we going to maintain adequate and appropriate inventory in the most inexpensive way?" [Participant #01]. As much as they would hope it would not be a factor, every hospital-based subject interviewed mentioned that cost is a driver for decisions, especially decisions on implementing innovations or changes to transfusion medicine process/procedure made at the hospital level. These changes often require education of hospital administrators which can be a challenge.

> The administrators will often say 'Well how many deaths have we had from that last year?' And the answer may be zero, but it would still be a good thing to do because it

would increase safety for our patients. Particularly when there is serious expense involved, they often don't want to hear about it. [Participant #11]

To overcome these contests, transfusion medicine leadership must often explain the risk-benefit of taking certain actions, or not taking those actions. In addition to hospital administrators who need education about the considerations of the transfusion medicine department, other clinical services also require outreach and education; this was especially true during the multiple blood shortages and other challenges seen during the SARS-CoV-2 pandemic. In a time of blood shortage, it is imperative that each department understand that not every patient will be able to receive blood immediately upon request. This sometimes requires the cancellation of surgeries, postponement of elective procedures, and transferal of patients to other hospitals with a more adequate blood supply.

In terms of actual decision-making by transfusion medicine leadership at hospitals, many interviewed subjects stated they had a transfusion committee or other multidisciplinary group of clinical services representatives who were able to advise, make recommendations, or bring up considerations from other departments which can play into a certain decision. To decide on a proposal to bring to the transfusion committee, oftentimes multiple board-certified transfusion medicine physicians (or the sole responsible physician) follow processes such as Failure Mode and Effects Analysis (FMEA), the Socratic Method, value-based judgements, or the principle of prudence. One example of this was a transfusion medicine physician interviewed as part of this study who recalled when they were deciding on whether to provide 100% pathogen reduced platelets: they favored pathogen-reduced (PR) products but decided to take a pragmatic approach by accepting other products as well because "I

don’t want to end up in a position where I have 100% PR platelets, but that means I have zero products on my shelf” [Participant #14].

Once a decision is made, communication of that decision prior to implementation (if appropriate) is taken. If possible, a purposeful rollout of the changes is taken to help ease the affected departments into the changes made.

Summary

The answers to Research Question 1 and its sub-question are summarized in Figures 4-1 and 4-2. Each decision-making group in the United States uses different factors and a different process to find the appropriate decision for their population. There are some overlapping factors between groups, for example data and cost, however the weight these factors have on the decision-making process vary from group to group.

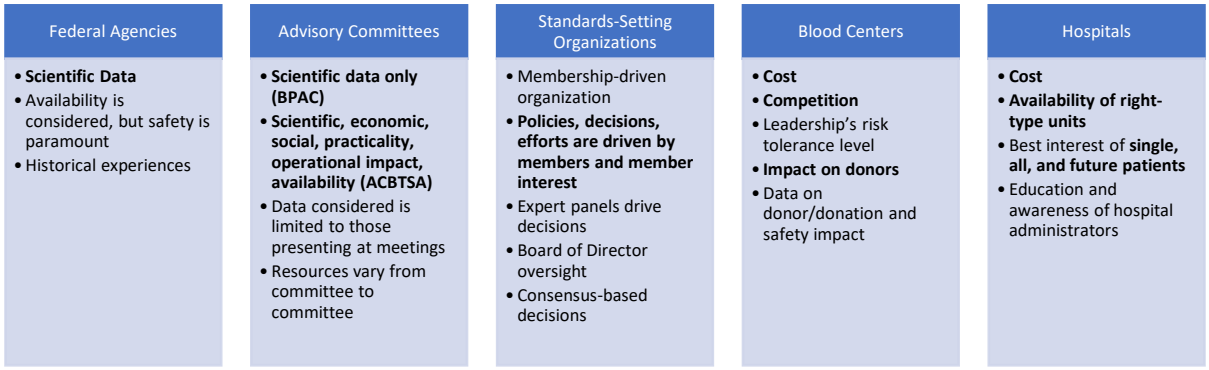

Figure 4-1. Factors Contributing to Decision-Making in the U.S. Blood System

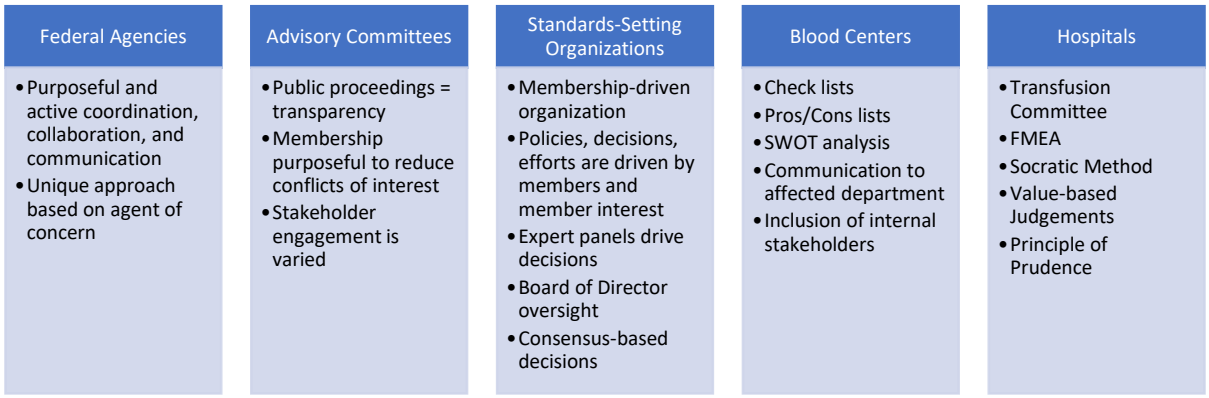

Figure 4-2. Summary of the Decision-Making Process for Groups Within the U.S. Blood System

Research Question 2: How do decision-makers describe barriers and facilitators to the decision-making process surrounding blood and blood donor safety?

Using a mixed deductive and inductive approach to coding, 21 barrier codes and 10 facilitator codes emerged from the data. These were further grouped into six primary barrier and three primary facilitator themes (Appendix C).

Barriers to Decision-Making

Absence of Collaboration and Communication

The most frequently mentioned barriers among all decision-making groups in this study was poor collaboration and communication within the larger U.S. blood system. Specifically, within hospitals and blood centers there is a sense that all stakeholders, departments, and key opinion leaders are not involved appropriately in the decision-making process. While donors and recipients are more involved now, especially around testing and deferrals, than they have historically been in the past, there remains room for improvement, according to those interviewed in this study. Hospital transfusion medicine physicians often

feel pressure from their hospital administration to make certain decisions which will result in resource savings, however, there needs to be a better understanding from these administrators in how the U.S. blood system works and why certain decisions are made by their transfusion medicine leadership.

Another challenge is the lack of collaboration and transparency. One participant explained it this way:

> Some blood organizations just want to do things themselves quietly and try to get an early publication and get credit for having made a decision. Or that their organization expects them to have the capacity to drive their own decisions and be invisible rather than be transparent and collaborative in evolving decisions. [Participant #04]

This can be extended beyond the blood centers and can at times involve regulators. Confidentiality restrictions and other concerns limit the amount of open dialogue regulators are permitted to have with the regulated industry and can result in the isolation of regulators from blood operators. This, along with a lack of communication (whether intentional or formally restricted) can make the FDA appear as if it is acting within a black box. Many non-federal participants in this study mentioned a lack of communication from the FDA on decision-making choices, how comments on guidance are taken into consideration, and what the impetus is for a decision when the BPAC advises one strategy and FDA chooses a different direction for their guidance or rule.

Insufficient Leadership

A lack of leadership, and the personalities and ways of ineffective leaders think, was mentioned by at least one member of each decision-making group as a barrier to decision-

making. Poor leadership at all levels of the decision-making structure includes inflexible and risk-averse leaders who exclude important stakeholders in the decision-making process. This is especially challenging when these leaders hold high positions of decision-making power and when there is an emerging concern which may lead to extreme thinking or fear-based decision-making. Poor stakeholder engagement by leadership, specifically of blood donors and transfusion recipients, was a specific barrier to the process of decision-making called out by those at the blood center level. At the federal level, many participants cited a lack of national-level leadership. There was also a lack of transparency of the decision-making process by leadership mentioned; this could lead to a lack of understanding of the decision-making process and those involved in the process. One participant at the standards setting level mentioned that there was no clear leadership on safety initiatives: sometimes it's FDA, sometimes it's CAP, sometimes it's AABB [Participant #20].

Current Regulatory Process

Another challenge mentioned by all decision-making groups is that the process of decision-making at the federal level is inconsistent, slow, and, at times, piecemeal. While many interviewees mentioned the effectiveness of interventions and policies used in the US, almost every participant in this study mentioned a challenge with efficiency. According to some participants, this was due to an inconsistent process of decision-making and that federal agencies (specifically FDA) will lag independent progress of the industry because they take time to reflect upon widely adopted practices and determine if those practices should become mandatory.

The regulatory authority of the FDA and what flexibility they do (and do not) have can have a direct result on efficient decision-making. These include a highly bureaucratically

structured internal system where it is difficult to revisit decisions, the process of taking something off the market or removing a test or regulation is often more difficult than putting something on the market, it is difficult to move forward quickly short of truly urgent issues, and finally it is difficult for FDA to receive expert opinion and have open dialogue with experts short of the formal mechanism of an advisory committee meeting. There are restrictions placed on the FDA on factoring cost implications of a safety measure or test into the decision-making process. In addition, there is absence of a structured process for including political considerations into science-based decisions often used at the federal level. Because there are a limited number of people on BPAC who understand the blood industry, recommendations to FDA do not always take into account the ramifications of a decision on the various members of the blood system. However, despite all of the inefficiencies of the regulatory system, "the current decision-making process has been effective. We have a safe blood supply, are able to meet all emergencies, and all transfusion needs" [Participant #16].

Lack of Data

When posed with the question of the biggest barriers or hinderances to decision-making within the US, one participant responded, "Lack of data. Lack of data. Lack of data. Lack of data." [participant 10]. Many participants were able to explain that while the researchers at the federal, blood center, and physician levels do a good job of publishing and presenting data, there is a great need for more real-time data capture. The NBCUS is performed by the CDC every two years, but that is not frequent enough for many to make informed decisions. It was suggested that the entire blood system should agree on a set of metrics from collection and transfusion facilities and this data should go into a larger freely available database. Data and studies showing the risks and benefits of certain decisions is also missing.

Availability of Resources

Another barrier mentioned frequently, especially by those participants from blood centers or with blood center experience, stated that the cost and reimbursement structure within the US blood system needs repair. Blood centers are struggling for survival and the lack of funding for the blood industry, especially blood centers, is a barrier to implementation of safety advances. Many of the US's largest blood centers have robust scientific and operational research programs which can provide data to inform other areas of the blood system decision-making hierarchy; without adequate funding to blood centers to recoup the costs of collecting, processing, and distributing blood, these large blood centers are not able to adequately invest in their research programs. One blood center leader said the research at their institution was valuable to leadership's decision-making. Despite these endeavors, they are still resource constrained and in response to how these research findings play into decisions at their organization,

> I think we've been much better at balancing the practicality of decisions with the scientific and medical evidence [while considering] the reality of what we can actually do in an environment where resources in both person-time and financial resources are not unlimited. [Participant #07]

With blood centers struggling for survival, undercutting each other to be the low-cost producer, hospitals in many cases choosing to buy from the lowest cost supplier, and the current structure of reimbursement directly to hospitals at a rate in some cases higher than what the hospitals paid the blood center, it is no surprise that cost has become a central issue to advancement of the industry. In addition, the advisory committees (specifically ACBTSA)

are under-resourced which can limit their ability to make appropriate recommendations based on all available data.

Structure of the U.S. Blood System

While the structure of the U.S. blood system was the barrier mentioned most often during the interviews, it was not mentioned by all decision-making groups. Those interviewed who are part of hospital decision-making teams did not feel that the current structure of the U.S. blood system was a barrier to decision-making and instead focused on other barriers which affected them. Other groups mentioned that the current structure of the U.S. blood system, its lack of a National Blood Policy, and the competition of the industry is a barrier that needs to be fixed soon to allow the system to survive into the future. Study participants said the U.S. system is Balkanized, broken, fragmented, and one participant questioned if the system was driven by science or by capitalism.

Facilitators to decision-making

Large-scale Collaboration

The federal agencies involved in ensuring blood and blood donor safety within the US are largely very successful in ensuring these charges are met. This is supported by the strong interdisciplinary scientific expertise at the Department of HHS and its child agencies of CDC, FDA, and NIH. Each part of the federal decision-making structure understands the role their agency plays in the process and there is strong intra-agency collaboration (within the legally permissible parameters) to facilitate decisions. This is coordinated by the OASH. International communication and cooperation are also strong with ongoing dialogues between U.S. agencies and European Medicines Agencies, Health Canada, and others,

always utilizing confidentiality agreements to strengthen and encourage discussions around current thinking, success and failures of approaches used in other countries, and emerging safety concerns.

Outside of the federal decision-making groups, blood centers work together especially when it will benefit them to do so because it adds to efficiency or when the FDA directly requests them to do so on large studies. Other large collaborations have been seen when the ACBTSA created the Section 209 report which was sent to congress, the use of public-private partnerships to achieve advances, and when other relationships are formed for the greater good. Hospital transfusion medicine leadership mentioned building relationships between their departments and others throughout the hospital are invaluable to the progress of new initiatives and help with decision-making at the local hospital level.

Strong Leadership

Many participants cited the leadership at CBER as a strong facilitator to decision-making, especially at the federal level. Past leadership was noted as being open to new ideas and a fierce advocate of the sustainability of the blood system. New leadership has been cited at forward-thinking, positive for the agency, and involved. One participant mentioned, in relationship to hospitals and blood centers attempting to stand up COVID-19 convalescent plasma (CCP), "You know, the whole CCP [experience] – they were [lists leaders within blood division at CBER] – they were right there with us, checking in, trying to figure out what was going on, what the barriers were" [Participant #20]. Leadership at all levels were cited as being facilitators to decision-making when they are stable, forward-thinking, inclusive of stakeholders, embracing of new ways to look at data and appreciative of innovative ideas.

Transparency & Open Communication

The last facilitator mentioned by four out of the five decision-making groups interviewed as part of this study was transparency and open and ongoing communication. Especially important to this was not one-way communication, but instead multidirectional transparent communication with all stakeholders, all departments, and between decision-making groups. The open communication between federal agencies is a facilitator to achieving greater, albeit still slower than preferred, efficiency in decision-making. Open communication using confidentiality agreements between other countries' regulators and the FDA was also specifically cited as a positive catalyst. Discussing challenges at multiple levels is helpful in that regulators (at a federal level) or leadership at blood centers and hospitals can explain the specifics of what is causing them a challenge and preventing efficient success. This open communication can then be used to formulate subsequent decisions. Also mentioned was the transparency and open communication of the Standards development process. Finally, it was discussed that advisory committees function strongest when they are provided specific questions to address and can in turn provide clear and specific recommendations.

Summary of Barriers and Facilitators

Barriers and facilitators to the decision-making process are similar between each decision-making group, as summarized in Tables 4-1 and 4-2. Each of the decision-making groups mentioned all six of the barrier themes, with the exception of hospitals, where interviewed participants did not specifically call out the structure of the U.S. blood system as a barrier (Table 4-1). Similarly, hospitals were the only decision-making group not to

mention strong leadership and transparency and open communication as facilitators to decision-making.

Table 4-1. Summary of Barriers to the Decision-Making Process in the United States as Mentioned by Interviewed Decision-Makers

	Federal	Standards-Setting	Advisory	Blood Centers	Hospitals
Absence of Collaboration & Communication	X	X	X	X	X
Insufficient Leadership	X	X	X	X	X
Current Regulatory Process	X	X	X	X	X
Lack of Data	X	X	X	X	X
Availability of Resources	X	X	X	X	X
Structure of the U.S. Blood System	X	X	X	X	

Table 4-2. Summary of Facilitators to the Decision-Making Process in the United States as Mentioned by Interviewed Decision-Makers

	Federal	Standards-Setting	Advisory	Blood Centers	Hospitals
Large-Scale Collaboration	X	X	X	X	X
Strong Leadership	X	X	X	X	
Transparency & Open Communication	X	X	X	X	

CHAPTER 5: INTERPRETATIONS, CONCLUSIONS, & RECOMMENDATIONS

Summary

This dissertation addresses the knowledge gap of the decision-making process at various levels within the U.S. blood system – from federal-level decision-making to blood centers and hospital transfusion medicine services – as it relates to blood and blood donor safety. It also explores the barriers and facilitators to decision-making in an attempt to inform improvements to current processes. The results will inform policy and practice decisions for U.S. blood centers, hospitals, and federal decision-makers on matters of infectious disease testing policy, operational decisions, and donor policies and practices. This study will also set the standard of bringing relevant stakeholders together to inform the public on the decision-making process for the U.S. blood system.

A collective case study approach was used to conduct a series of semi-structured interviews with a purposeful sample of policy makers and other stakeholders within the complete U.S. blood system. The inquiry collected data on the process of blood safety decision-making in the stakeholders' respective agencies or organizations, as well as a probe into barriers and facilitators to the decision-making process. Overall, the researcher collected data from 21 interviews, each representing one or more of five decision-making groups in the U.S. blood system. The results from these interviews, when analyzed collectively, provide unique insights into the strengths and weaknesses of the current decision-making process surrounding blood safety and allow for recommendations to be made to improve decision-making at all levels of the U.S. blood system.

Discussion & Recommendations

It became evident very early in the data collection for this project that there exists no over-arching decision-making framework or process for all members of the US blood community. Each decision-making group (federal, blood center, standards setting, advisory group, and hospital) uses their own process(es), and even within individual organizations or agencies those processes are not always standardized or used the same way every time. As shown by the small amount of literature related to decision-making in the U.S. blood system, this is a field without a lot of research and with many knowledge gaps. Specific to this project, there are numerous barriers to using formal frameworks for decision-making. This includes a lack of data, especially early in the decision-making process. Decision-making in the absence of known data is inherently more complicated to understand and, as suggested by the Cynefin framework, can often be complicated further by a complex system, such as the US blood system (Snowden & Boone, 2007).

Also important to note when discussing the results from this study are the varied and differing foci each group interviewed in this study have for blood and donor safety (Figure 5-1). The federal government and its agencies are focused on high-level data collection, research, regulations, and industry oversight. Advisory committees provide a voice to the federal government about what some stakeholders and medical experts, affected by their decisions, think related to blood safety matters. Blood centers are responsible for collecting, processing, and distributing safe products to their hospital and transfusion center customers. Standards setting organizations maintain a universal set of rules to guide the processes of blood collection centers and the industry. And finally, hospitals must maintain a safe supply of blood for their current and future patients, whether it be through collecting donations in-house, establishing a relationship with an outside supplier, or in some cases both.

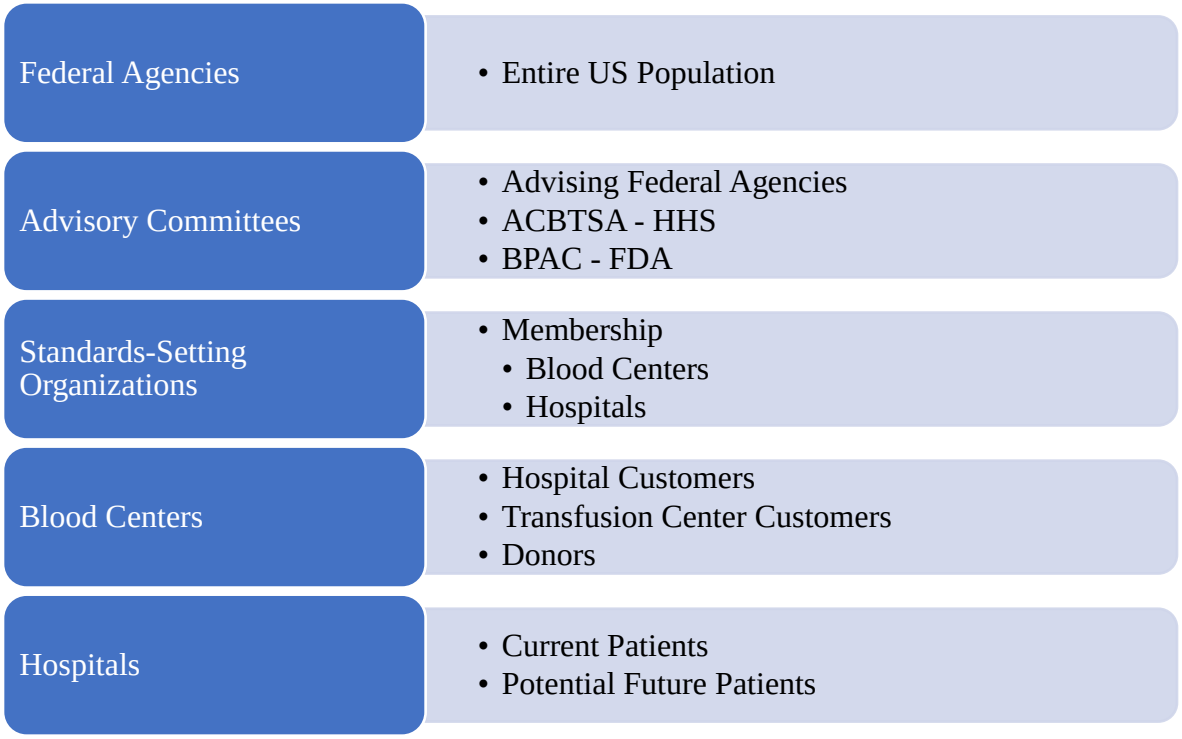

Figure 5-1. Focus of Blood and Donor Safety Decision-Making Groups

While this research suggests there are more barriers than facilitators to the decision-making process, there was a lot of overlap between the two groups of results (Figure 5-2). Collaboration, communication, and relationship building were key to ensuring appropriate stakeholders are involved. Leadership is needed, especially when there are inefficiencies or limitations of certain parts of the U.S. blood system where additional guidance and oversight is needed. The results of this study suggest that a champion and advocate for the U.S. blood system is needed at the highest level of the federal decision-making structure, that is, the BOTSEC "table". Strong, well-informed leadership is also needed when using new frameworks or tools for decision-making. This will help guide decisions to be influenced only by data instead of the biases of those involved in the process.

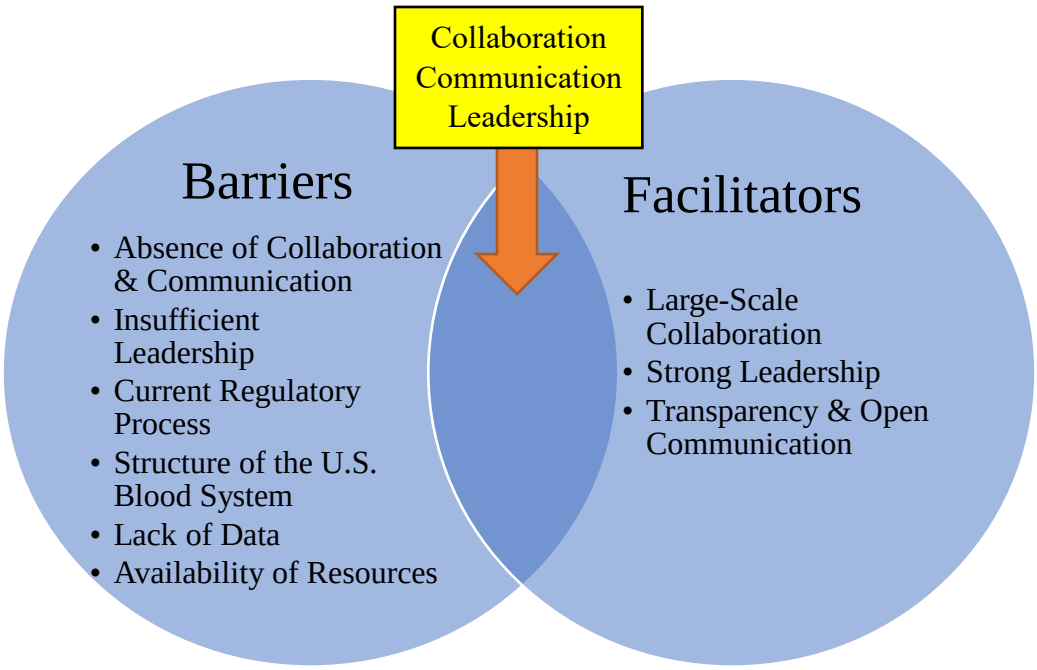

Figure 5-2. Summary and Overlap of Barriers and Facilitators to Decision-Making

Focusing on existing decision-making frameworks and tools, as outlined in Chapter 2, none of the decision-making groups interviewed as part of this study listed these as extremely useful for their purposes. In fact, only two were explicitly mentioned at all – the RBDM Framework (ABO, 2014) and the Precautionary Principle/Approach. The RBDM has been used twice in the past by the AABB, however when it was mentioned by those involved with those exercises, the overall thought was that while useful for local decisions or for countries with a national blood system or national blood policy program, its utility in the United States was limited. It also is a long process to go through and would require time, resources, and data that the United States does not have readily available. Some participants mentioned that they use a "lite" version of the RBDM to ensure they are collecting all the necessary data before making a decision, but this is not a standard or consistent practice. Similarly, a

precautionary approach to blood policy or blood safety decisions is unrealistic for the United States. This suggests there may not be a one-size-fits-all approach to decision-making within the United States. Given that each decision-making group interviewed in this study has a different piece of the "blood safety puzzle" they are charged with, instead of searching for a universal decision-making framework, what is suggested by the results of this study is individual frameworks or tools which encourage thorough documentation of the process for each part of the system may be more useful, as well as a way for all groups to effectively communicate and collaborate more efficiently together.

A recent example of this type of collaboration was seen in response to the Pandemic and All-Hazards Preparedness and Advancing Innovation Act of 2019: Sec. 209. Report on Adequacy of the National Blood Supply (US Department of Health and Human Services, 2020). This report was developed by members of a Steering Committee formed for this purpose as well as members of the public, blood centers, transfusion medicine physicians and scientists, other subject matter experts, and federal employees involved with blood safety and availability. They were charged with responding to Congress's request for information about: 1. Challenges associated with the continuous recruitment of blood donors (including those newly eligible to donate); 2. Ensuring the adequacy of the blood supply in the case of public health emergencies; 3. Implementation of the transfusion transmission monitoring system; and 4. Other measures to promote safety and innovation, such as the development, use, or implementation of new technologies, processes, and procedures to improve the safety and reliability of the blood supply. The report is an example of all parts of the blood community coming together, working toward a shared goal, and developing actionable recommendations

which were then directly provided to Congress for their response. As of the time of writing this dissertation, there is no response yet from congressional leadership about the report.

Impact of SARS-CoV-2

The SARS-CoV-2 pandemic, which began to have substantial impacts and implications for the US in early 2020, did not impact this dissertation research in a significant way. Interviews which may have been conducted in person were easily able to be scheduled virtually and there was no limitation to data collection due to this. While it did not impact this work directly, many participants mentioned that the SARS-CoV-2 pandemic was a facilitator to decision-making and that the scientific and federal communities coming together to quickly address any concerns to the safety of blood donors, blood components, and transfusion recipients, including standing up a national COVID-19 Convalescent Plasma supply was remarkable. A lot can be learned from the efficiency and effectiveness of decisions made during the entire pandemic period and hopefully can improve future decision-making in this space.

Alignment to Conceptual Framework

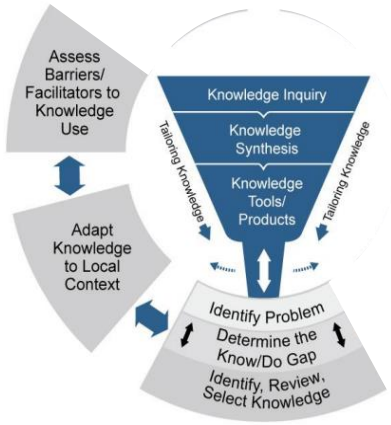

Figure 5-3. Focused Conceptual Model

The conceptual framework outlined in Chapter 1 suggests that the "knowledge funnel" part of the KTA framework can be informed by semi-structured interviews influenced by current or historically used decision-making frameworks. Through this knowledge generation and qualitative data analysis, recommendations for future action can be applied using the "action cycle" of the KTA. The findings from this study show that previously reported or assumed decision-making frameworks are no longer used in such high frequency and that even newly developed frameworks (e.g., the RBDM Framework) are not entirely useful as written and may need further development to be implemented in the U.S. blood system. The multidirectional nature of the KTA framework allows for revisiting data, subsequent exploration of frameworks' or tools' utility, and appropriate implementation based on results.

Using the constructivist lens was important for this dissertation in that most decisions and work within the U.S. blood system are made with a positivist or post-positivist lens. Relying on numerical and quantifiable data is undoubtedly important for policy decisions, but for the research questions and goals of this particular study, additional insights are unable to be gathered using these paradigms. Therefore, the strength of constructivism was that additional perspectives were able to be gathered for summarizing the decision-making process and determining barriers and facilitators to the process.

Implications for Future Research

Each member of the U.S. blood system represents an independent and equally important piece to the safety of the blood system; however, they are all striving towards the same goal. Central to the tasks of each group interviewed in this study is the integrity of the

U.S. blood supply, that is, a readily available supply of safe blood components at levels adequate to meet patient needs.

Future research will explore ways to improve efficiency of the decision-making process. This could include the use of specific frameworks to help guide efforts or to remove barriers and support of facilitators, as described here. Future work should also explore the concepts of stakeholders and how to better incorporate them into the process. This could range from inviting blood donors to the table when decisions are being made about something that would impact the donation experience, using focus groups, surveys, or other ways to gain insights into their perceptions of the donation process and their thoughts regarding potential changes that may impact them.

While strongly influenced by historical experiences (i.e., transfusion-transmission of HIV and HCV), decision-making should not be so precautionary that safety is gained at the expense of availability of products for patients in need. As was seen during the SARS-CoV-2 pandemic, and was occasionally experienced prior to this, the consistent need for blood will periodically strain the blood system so much that there is a national supply shortage. When this occurred early during the SARS-CoV-2 pandemic, the FDA decided to implement temporary guidance documents aimed at alleviating the pressure on the blood industry and blood donors. By removing or altering some of the deferral guidance documents (i.e., MSM deferral policy and malaria travel guidance) more donors were allowed to donate. At the same time, blood centers were working to increase donations from low-risk individuals through a variety of marketing tools – incentives, providing SARS-CoV-2 antibody testing, partnering with private companies to provide chances to win prizes, etc.

The barriers and facilitators explored in this research will help to increase efficiency of the process in the future. Future research will need to explore ways to increase efficiency of the regulatory process including introducing sunset clauses or other ways to revisit decisions as data are gathered. Other research can also explore the need for definitions central to the discussion of blood and blood donor safety. Suggested topics include "acceptable risk", "safety", what the U.S. tolerance level is for risk, and who should be considered a stakeholder in the decision-making process.

Strengths & Limitations

As with all research endeavors, there were a number of strengths and limitations to this project. Firstly, the response from the blood community to the request for interviews was very positive. Almost every individual I outreached to and asked for their participation was happy to do so. Only six potential participants were unable or declined to participate – three due to restrictions from their employer to speak to either students or a member of the regulated industry and three others due to their perceived inexperience in decision-making in their roles. Otherwise, I saw broad participation from all five decision-making groups.

Secondly, as anticipated prior to conducting the interviews with participants, the challenge of gathering complete and truthful information cannot be ignored. My employment at the American Red Cross and ways in which I was protecting the participants' identities and any information they shared with me was made clear prior to conducting any interviews. There was still a risk that participants were not completely forthcoming with internal processes or their perceived barriers and facilitators to their decision-making process due to fear of sharing proprietary information or other perceptions of helping a competitor.

Finally, a great deal of effort was made to build rapport with participants, reduce biases introduced as part of the qualitative data collection process, and to ensure accurate interpretation of the collected data.

Conclusions

As suggested by the results of this study, each decision-making body is responsible for a different aspect of the process of transfusion medicine. Thus, a one-size-fits-all decision-making framework would not be applicable in the U.S. context. Future studies can work to adapt existing frameworks as necessary to meet the needs of each decision-making body. However, the strength of the US blood system is in the priority by all involved for safety for blood donors and blood recipients. This shared mission can be seen in the passion and lifelong service expressed through the interviews with participants in this study, their dedication to the field and internal drive to improve the process in any way possible. To achieve this, there needs to be better coordination and communication between decision-making groups, as well as stronger oversight of the entire process in order to better maintain a safety and adequate blood supply. Any one or more weaknesses in the chain can result in loss of supply integrity – from an unsafe product to low supply to unnecessary strain on blood donors. It is the responsibility of all within the U.S. blood system to determine how best to improve the system and not rely on what has or has not worked in the past to inform the future.

REFERENCES

AABB. (2022). *About AABB: Organization*. Bethesda, MD: AABB. Retrieved from https://www.aabb.org/about-aabb/organization.

AABB Ad Hoc Babesia Policy Working Group. (2017). *AABB babesiosis risk-based decision-making assessment report*. Retrieved from https://www.aabb.org/tm/Documents/Babesia-RBDM-Report.pdf

AABB Ad Hoc Iron-Deficiency Working Group. (2018). *AABB donor iron deficiency risk-based decision-making assessment report.* Retrieved from https://www.aabb.org/tm/Documents/AABB-Donor-Iron-Deficiency-RBDM-Assessment-Report.pdf

Alliance of Blood Operators. (2014). *Risk-based decision-making framework for blood safety*. Retrieved from https://www.allianceofbloodoperators.org/abo-resources/risk-based-decision-making.aspx.

Alter, H. J. (2008). Pathogen reduction: A precautionary principle paradigm. *Transfus Med Rev*, *22*(2), 97-102. doi:10.1016/j.tmrv.2008.01.001

Bloch, E. M. (2019). A risk-based decision-making framework for blood safety: What's the case for Zika? *ISBT Science Series*, doi:10.1111/voxs.12500

Brownson, R. C., Chriqui, J. F., & Stamatakis, K. A. (2009). Understanding evidence-based public health policy. *Am J Public Health*, *99*(9), 1576-1583. doi: 10.2105/ajph.2008.156224

Brownson, R. C., Fielding, J. E., & Maylahn, C. M. (2009). Evidence-based public health: A fundamental concept for public health practice. *Annu Rev Public Health, 30*(1), 175-201. doi:10.1146/annurev.publhealth.031308.100134

Brownson, R. C., Royer, C., Ewing, R., & McBride, T. D. (2006). Researchers and policymakers: Travelers in parallel universes. *Am J Prev Med, 30*(2), 164.

Busch, M. P., Bloch, E. M., & Kleinman, S. (2019). Prevention of transfusion-transmitted infections. *Blood, 133*(17), 1854-1864. doi:10.1182/blood-2018-11-833996

Canadian Institutes of Health Research. (2016). *About us* Retrieved from https://cihr-irsc.gc.ca/e/29418.html

Creswell, J. W. & Poth, C. N. (2018). *Qualitative Inquiry & Research Design: Choosing Among Five Approaches* (4th ed.). Thousand Oaks, CA: SAGE.

Custer, B., Agapova, M., & Martinez, R. H. (2010). The cost-effectiveness of pathogen reduction technology as assessed using a multiple risk reduction model. *Transfusion, 50*(11), 2461-2473. doi:10.1111/j.1537-2995.2010.02704.x

Delage, G., Fearon, M., Gregoire, Y., Hogema, B. M., Custer, B., Scalia, V., . . . Stramer, S. L. (2019). Hepatitis E virus infection in blood donors and risk to patients in the United States and Canada. *Transfus Med Rev, 33*(3), 139-145. doi:10.1016/j.tmrv.2019.05.017

Devine, D. (2018, September 13). *An international perspective on a risk management approach for blood products* [Presentation]. 49th Meeting of the Advisory Committee for Blood and Tissue Safety and Availability. Washington, DC.

Dodd, R. Y., Notari, E. P., Nelson, D., Foster, G. A., Krysztof, D. E., Kaidarova, Z., . . . NHLBI Retrovirus Epidemiology Donor Study (REDS)-II. (2016). Development of a multisystem surveillance database for transfusion-transmitted infections among blood donors in the United States. *Transfusion, 56*(11), 2781-2789. doi:10.1111/trf.13759 [doi]

Ellingson, K. D., Sapiano, M. R. P., Haass, K. A., Savinkina, A. A., Baker, M. L., Henry, R. A., . . . Basavaraju, S. V. (2017). Cost projections for implementation of safety interventions to prevent transfusion-transmitted zika virus infection in the United States: costs of protecting U.S. blood supply from Zika. *Transfusion, 57*, 1625-1633. doi:10.1111/trf.14164

Federal Advisory Committees Act. (2013). Retrieved from https://www.gsa.gov/cdnstatic/FACA-Statute-2013.pdf.

Food and Drugs. 21 C.F.R. 630.10 (2022).

Glasgow, R. E., Vogt, T. M., & Boles, S. M. (1999). Evaluating the public health impact of health promotion interventions: The RE-AIM framework. *Am J Public Health, 89*(9), 1322-1327. doi:10.2105/ajph.89.9.1322

Graham, I. D., Logan, J., Harrison, M. B., Straus, S. E., Tetroe, J., Caswell, W., & Robinson, N. (2006). Lost in knowledge translation: Time for a map? *The Journal of Continuing Education in the Health Professions, 26*(1), 13-24. doi:10.1002/chp.47

Heddle, N.M. (2006). Evidence-based decision making in transfusion medicine. *Vox Sanguinis, 91(3),* 214-220. doi:10.1111/j.1423-0410.2006.00793.x

Hill, A. F., Zeidler, M., Ironside, J., & Collinge, J. (1997). Diagnosis of new variant creutzfeldt-jakob disease by tonsil biopsy. *Lancet, 349*(9045), 99-100. doi:10.1016/s0140-6736(97)24002-x

Jones, J. M., Sapiano, M. R. P., Mowla, S., Bota, D., Berger, J. J., Basavarju, S. V. (2021). Has the trend of declining blood transfusions in the United States ended? Findings of the 2019 National Blood Collection and Utilization Survey. *Transfusion, 61(S2),* S1-S10. doi: 10.1111/trf.16449

Kingdon, J. W. (1995). *Agendas, alternatives and public policies* (2nd ed.). New York, NY: Harper Collins.

Klein, H. G., Hrouda, J. C., & Epstein, J. S. (2018). Crisis in the sustainability of the U.S. blood system. *N Engl J Med, 378*(3), 305-306. doi:10.1056/NEJMc1714807

Kleinman, S., Reed, W., & Stassinopoulos, A. (2013). A patient-oriented risk-benefit analysis of pathogen-inactivated blood components: Application to apheresis platelets in the united states: Risk-benefit analysis of PI APs in the United States. *Transfusion, 53*(7), 1603-1618. doi:10.1111/j.1537-2995.2012.03928.x

Kramer, K., Zaaijer, H. L., & Verweij, M. F. (2017). The precautionary principle and the tolerability of blood transfusion risks. *Am J Bioeth, 17*(3), 32-43. doi:10.1080/15265161.2016.1276643

Leach Bennett, J., Blajchman, M. A., Delage, G., Fearon, M., & Devine, D. (2011). Proceedings of a consensus conference: Risk-based decision making for blood safety. *Transfus Med Rev, 25*(4), 267-292. doi:10.1016/j.tmrv.2011.05.002

Leach Bennett, J., & Devine, D. V. (2018). Risk-based decision making in transfusion medicine. *Vox Sang, 113*(8), 737-749. doi:10.1111/vox.12708

Leveton L.B., Sox Jr. H.C, & Stoto, M.A. (1995). *HIV and the Blood Supply: An Analysis of Crisis Decision Making: Institute of Medicine (US) Committee to Study HIV Transmission Through Blood and Blood Products*. Washington, DC: National Academies Press.

Lincoln Y. & Guba, E. (1985). *Naturalistic inquiry*. Newbury Park, CA: SAGE

Llewelyn, C. A., Hewitt, P. E., Knight, R., Amar, K., Cousens, S., Mackenzie, J., & Will, R. G. (2004). Possible transmission of variant Creutzfeldt-Jakob disease by blood transfusion. *Lancet, 363*(9407), 417-421. doi:10.1016/s0140-6736(04)15486-x

Maxwell, J. A. (2013). *Qualitative research design: An interactive approach*. Washington, DC: Sage.

Menitove, J. E., Leach Bennett, J., Tomasulo, P., & Katz, L. M. (2014). How safe is safe enough, who decides and how? from a zero-risk paradigm to risk-based decision making. *Transfusion, 54*(3), 753-757. doi:10.1111/trf.12569

National Center for Advancing Translational Science. (2022). About translation. Retrieved from https://ncats.nih.gov/translation.

O'Brien, S. F., Ward, S., Gallian, P., Fabra, C., Pillonel, J., Kitchen, A. D., . . . Leiby, D. A. (2019). PMC6476743; malaria blood safety policy in five non-endemic countries: A retrospective comparison through the lens of the ABO risk-based decision-making framework. *Blood Transfus, 17*(2), 94-102. doi:10.2450/2019.0222-18

QSR International Pty Ltd. (2020). NVivo (released in March 2020). https://www.qsrinternational.com/nvivo-qualitative-data-analysis-software/home

Roberts, H. M. (1998). *Robert's rules of order.* New York, NY: Berkley Publishing Corporation.

Russell, W. A., Stramer, S. L., Busch, M. P., & Custer, B. (2019). Screening the blood supply for zika virus in the 50 U.S. states and puerto rico. *Annals of Internal Medicine, 170*(3), 164. doi:10.7326/m18-2238

Saá, P., Proctor, M., Foster, G., Krysztof, D., Winton, C., Linnen, J. M., . . . Stramer, S. L. (2018). Investigational testing for zika virus among U.S. blood donors. *N Engl J Med, 378*(19), 1778-1788. doi:10.1056/nejmoa1714977

Savinkina, A. A., Haass, K. A., Sapiano, M. R. P., Henry, R. A., Berger, J. J., Basavaraju, S. V., & Jones, J. M. (2020). Transfusion-associated adverse events and implementation of blood safety measures - findings from the 2017 national blood collection and utilization survey. *Transfusion, 60 Suppl 2*, S10-S16. doi:10.1111/trf.15654

Snowden, D.J. & Boone, M.E. (2007). A Leader's Framework for Decision Making. *Harvard Business Review*. 85(11): 68-76.

Spring, B., Walker, B., Brownson, R., Mullen, E., Newhouse, R., Satterfield, J., . . . Hitchcock, K. (2008). *Definition and competencies for evidence-based behavioral practice*. Chicago, IL: Retrieved from http://www.integralsocialwork.com/wp-content/uploads/nis.pdf

Stein, J., Besley, J., Brook, C., Hamill, M., Klein, E., Krewski, D., . . . Devine, D. (2011). Risk-based decision-making for blood safety: Preliminary report of a consensus conference. *Vox Sang, 101*(4), 277-281. doi:10.1111/j.1423-0410.2011.01526.x

Straus, S. E., Richardson, W. S., Glasziou, P., & Haynes, R. B. (2005). *Evidence-based medicine; how to practice and teach EBM* (3rd ed.). Edinburgh: Churchill Livingstone.

Styles, C. E., Seed, C. R., Hoad, V. C., Gaudieri, S., & Keller, A. J. (2017). Reconsideration of blood donation testing strategy for human T-cell lymphotropic virus in Australia. *Vox Sang, 112*(8), 723-732. doi:10.1111/vox.12597

Terrell, S. R. (2016). *Writing a proposal for your dissertation: Guidelines and examples.* New York, NY: The Guilford Press.

United Nations. (1992). *Report of the United Nations conference on environment and development*. Retrieved from https://www.un.org/en/development/desa/population/migration/generalassembly/docs/globalcompact/A_CONF.151_26_Vol.I_Declaration.pdf

US Centers for Disease Control and Prevention. (2019). Blood safety. Retrieved from https://www.cdc.gov/bloodsafety/index.html

US Centers for Disease Control and Prevention. (1993). *Morbidity and mortality weekly report: Acquired immunodeficiency syndrome -- united states, 1992.* (). Retrieved from https://www.cdc.gov/mmwr/preview/mmwrhtml/00021209.htm

US Department of Health and Human Services. (2022). Charter: Advisory Committee on Blood and Tissue Safety and Availability. Washington, DC: Retrieved from https://www.hhs.gov/oidp/advisory-committee/blood-tissue-safety-availability/charter/index.html.

US Department of Health and Human Services. (2020). Adequacy of the National Blood Supply: Report to Congress. Retrieved from: https://www.congress.gov/bill/116th-congress/senate-bill/1379.

US Food and Drug Administration. (2020). Blood & blood products. Retrieved from https://www.fda.gov/vaccines-blood-biologics/blood-blood-products

US Food and Drug Administration. (2022). Blood Pressure and Pulse Donor Eligibility Requirements – Compliance Policy: Draft Guidance for Industry. Silver Spring, MD: Retrieved from https://www.fda.gov/media/158609/download

US Food and Drug Administration. (2019a). *Questions about blood*. Silver Spring, MD: Retrieved from https://www.fda.gov/vaccines-blood-biologics/blood-blood-products/questions-about-blood

US Food and Drug Administration. (2019b). Recommendations for Reducing the Risk of Transfusion-Transmitted Babesiosis. Silver Spring, MD: Retrieved from https://www.fda.gov/media/114847/download

Vermeulen, M., van den Berg, K., Sykes, W., Reddy, R., Ingram, C., Poole, C., & Custer, B. (2019). Health economic implications of testing blood donors in South Africa for HTLV 1 & 2 infection. *Vox Sang, 114*(5), 467-477. doi:10.1111/vox.12788

Ward, S. J., Stramer, S. L., & Szczepiorkowski, Z. M. (2018). Assessing the risk of babesia to the united states blood supply using a risk-based decision-making approach: Report of AABB's ad hoc babesia policy working group (original report): babesia risk to the blood supply. *Transfusion, 58*(8), 1916-1923. doi:10.1111/trf.14912

Wilson, K. (2011). A framework for applying the precautionary principle to transfusion safety. *Transfus Med Rev, 25*(3), 177-183. doi:10.1016/j.tmrv.2011.01.004

Wilson, K., & Ricketts, M. N. (2004). The success of precaution? managing the risk of transfusion transmission of variant Creutzfeldt-Jakob disease. *Transfusion, 44*(10), 1475-1478. doi:10.1111/j.1537-2995.2004.04116.x

Wilson, K., Atkinson, K. M., Fergusson, D. A., Brown, A., Forster, A., Murphy, M. S. Q., . . . Keelan, J. (2019). Problems with precaution: The transfusion medicine experience. *J Risk Res, 22*(2), 137-149. doi:10.1080/13669877.2017.1351478

Zuck, T. F. (1987). Greetings - a final look back with comments about a policy of a zero-risk blood supply. *Transfusion, 27*(6), 447-448.

APPENDIX A: SEMI-STRUCTURED INTERVIEW GUIDE

Introduction

- Thank participant for their time
- Background of the project, purpose of the dissertation
- Explain recording, transcription, confidentiality/anonymity, and member-checking
- Consent to begin recording

[Begin Recording]

Background

Tell me how you became interested in working in the U.S. blood industry.

- Why have you stayed?
- What do you enjoy most/least?

What has been your role in decision-making for blood and donor safety?

- Past and present experiences
- Day-to-day work
- Organizational, national, international, federal committee involvement (if applicable)

RQ1: What factors contribute to the current decision-making process related to U.S. blood and blood donor safety?

Focusing on how decisions related to blood and donor safety are made, what factors do you feel are most important to this process?

- Do these factors differ based on the type of decision being made (i.e., blood safety vs donor safety)?
    - Probes: Zika, CMV testing, donor safety issues

- What factors related to blood safety decisions do you think are missing or should be focused on more?
    - Probes: stakeholder engagement, risk tolerance
    - Do you feel these are excluded completely or not focused on enough?

RQ2: How do various decision-makers in the U.S. blood industry describe the process of making decisions with respect to blood and blood donor safety?

Walk me through the blood/donor safety decision-making process that you use in **your *specific* organization**?

- In terms of efficacy/effectiveness?
- In terms of strengths/weaknesses?
- Are there factors that influence whether decisions are made or not?

[For those participants not at the federal decision-making level] How would you describe the blood/donor safety decision-making process at the **federal level** in the US?

- In terms of efficacy/effectiveness?
- In terms of strengths/weaknesses?
- Are there factors that influence whether decisions are made or not?
    - Probe for policy window if it is not mentioned specifically by participant.

What other decision-making frameworks currently being used by organizations, the US, or by other countries to make decisions are you familiar with?

- Probes: Precautionary Principle, Zero Risk, RBDM
- What are the strengths/challenges of these as they are applied to U.S. policy making?
- Do you have any suggestions on ways to improve these for use in the US?
    - If yes, what would you recommend?

If you were able to design a decision-making tool, what would be included in it and why?

- What would be the most important components this tool? Why?

RQ 3: How do stakeholders describe barriers and facilitators to the decision-making process surrounding blood and blood donor safety?

What are things that hinder decision-making regarding US blood policy?

- What are some ways to combat these barriers?
- Do you think any of these barriers are too difficult to overcome?
    - Why or why not?

What have been facilitators to blood or donor safety decision-making?

- How can other facilitators be promoted?
- Who is responsible for driving decision-making in this industry?

Closing/Summary

Is there anything else you would like to add?

[End Recording]

APPENDIX B: INFORMED CONSENT FORM

Informed Consent for Participation in a Research Study

Title of Research Study: A Collective Case Study to Improve Transparency and Characterization of the Decision-Making Process for Blood and Blood Donor Safety Within the US Blood Industry

IRB # NCR-203123

Investigators: Marcia A. Firmani, PhD, MSPH, MT(ASCP)MB
Lauren A. Crowder, MPH, CPH

You are being asked to take part in a qualitative research study about the decision-making process in the US blood system. As a participant, you will be asked to complete a 30-60 minute, semi-structured, audio-recorded interview aimed at learning about your experience and opinions about decision-making at the blood center, hospital, federal, or other organizational level of the US blood system. You have been identified as a potential participant in this study because of your position and/or experience in a decision-making stakeholder of the US blood system.

Purpose

The purpose of this collective case study will be to understand the existing decision-making process regarding blood and donor safety decisions within the US blood system. Together with others in your own stakeholder group, along with members of other stakeholder groups, the data we gather will be used in aggregate to inform recommendations for future decision-making frameworks and strategies.

Procedures

If you volunteer to participate in this research study, we will ask you to do the following:

1. Schedule and complete an individual, 45–60-minute, semi-structured interview with a member of the research team.
2. Review of a summary of the interview and return to the research team with comments and additional information, if necessary, within 1 week.

Time Commitment

Your participation will last for the length of time it takes to consent to participate after reading this consent form, completing the interview, and reviewing the interview summary. The total expected time of participation is estimated to be less than two (2) hours. The timeline for participation from consent through completion of participation is estimated to be less one (1) month, depending on scheduling of the interview.

Do you have to take part in this study?

You do not have to take part in this research. It is your choice whether or not you want to take part. You can agree to take part and later change your mind. If you choose not to take part or choose to stop taking part at any time, there will be no penalty to you or loss of benefits to which you are otherwise entitled.

What are the reasons you might choose to volunteer for this study?

As an experienced member of the transfusion medicine community and a key part of the decision-making process for blood and donor safety policies and procedures, your judgements and opinions are highly valued. Your participation in this study will help add transparency to the blood and donor safety decision-making process in the US and will help to identify barriers to these decisions that need to be overcome for increased efficiency and effectiveness of this process.

What are the reasons you might choose not to volunteer for this study?

You may choose not to volunteer for this study if you are not comfortable sharing information about your experience in decision-making for blood and donor safety, despite the confidential nature of this study. You also may choose not to participate due to the time commitments asked for this study. While the design of the study aims to accommodate busy schedules, this may be an understandable deterrent for some.

Potential Risks or Discomforts

The risks and discomforts associated with participation in this study are expected to be minimal. There is always the possible risk to loss of confidentiality. The research team has employed multiple efforts to protect the confidentiality of any collected data.

If at any time you feel uncomfortable with participating in the study, you can discontinue your participation without repercussions by emailing the research team at lacrowder@gwu.edu and you will no longer be contacted for study purposes.

Potential Benefits

We cannot promise any benefits to you or others from your taking part in this research. However, possible benefits include contributing to efforts to improve the decision-making

process in the US blood industry. Thus, the society level potential benefit is that knowledge gained from this study will improve future decision-making for the blood system and those who benefit from it.

Payment for Participation

You will not receive any payment for participating in this research study.

Confidentiality

Interviews will be audio-recorded and will be immediately transcribed. Once you have reviewed the summary of the interview and returned it to the research team, the interview transcript will be deidentified and redacted to remove all words and other information that could potentially be used to identify you. We will do our best to maintain the confidentiality of all information collected during this research study, including any information that can identify you. Direct quotes from the interviews may be used as a part of the study report, but these will not be traceable back to you. All original audio recordings and transcripts (identifiable and redacted) will be stored in a secure, password-protected computer file only accessible to the research team.

What happens to my information collected for the research?

To the extent allowed by law, we limit your personal information to people who have to review it. We cannot promise complete secrecy. The IRB and other representatives of this organization may inspect and copy your information.

Participants' Rights

Your participation in this research study is entirely voluntary You may refuse to participate, or you may discontinue your participation at any time without penalty or loss of benefits to which you would otherwise be entitled. You can decide to withdraw your consent and stop participating in the research at any time without any penalty. If you decide to withdraw consent from the study, please contact the research team. If the interview has not been completed or transcribed, your data will be removed from the analysis. Once the interview is transcribed and deidentified, your data may continue to be used since there will be no way for the research team to know which interview is linked to you.

Questions, Comments, or Concerns

If you have any questions, comments, or concerns about this research study, you can talk to one of the following researchers:

Principal Investigator: Marcia A. Firmani, PhD: firmanim@gwu.edu
Student Investigator: Lauren A. Crowder, MPH: lacrowder@gwu.edu, (302) 563-2399

This research is being overseen by an Institutional Review Board ("IRB"). You may talk to them at 202-994-2715 or via email at ohrirb@gwu.edu if:

- You have questions, concerns, or complaints that are not being answered by the research team or if you wish to talk to someone independent of the research team.
- You have questions about your rights as a research subject.

Signature Block

By signing below, you agree that the above information has been explained to you and you have had the opportunity to ask questions. You understand that you may ask questions about any aspect of this research during the course of the study and in the future. Your signature documents your permission to take part in this research.

_____

Printed name of subject

_____ _____

Signature of subject Date

_____ _____

Signature of person obtaining consent Date

APPENDIX C: BARRIERS AND FACILITATORS CODEBOOK

Code	Definition	Files	Example Quote	Theme
Barriers to Decision-Making				
Current Regulatory Process	Existing processes and procedures followed by regulators of the US blood supply	14	"Another weakness is […] we are very highly bureaucratically structured, which makes it very difficult to revisit decisions. And the standards for say, taking things off the market tend to be higher than the standards for putting things on the market." [Participant #12]	Current Regulatory Process
Training	Educational, technical, and vocational experience	2	"That has to do with the training of individuals – physicians and nurses – into understand the needs for transfusion and the appropriate indications. Because availability is jeopardized if somebody is being transfused needlessly with a product that could go to somebody else who needed it." [Participant #17]	Insufficient Leadership
Lack of leadership	A body or entity to guide a group or groups towards a decision	13	"There is no national level leadership at the government level." [Participant #02]	Insufficient Leadership
Personalities	Characteristics or qualities of a person, specifically in a leadership or decision-making role	3	"[They] were so risk averse, conservative, and [their] approach was just a barrier." [Participant #03]	Insufficient Leadership
Resistance to change	Attempt to prevent modifications or changes to something	2	"So number one, I think is that we have a tendency to fight the last battle early	Insufficient Leadership

			on. We try to apply old solutions to new problems." [Participant #22]	
Value opinion over data	Seeing the importance of a person's judgement about something rather than the scientific facts available	2	"Another barrier is not being open to scientific data […] or hearing other points of view." [Participant #03]	Insufficient Leadership
Current US Blood System Structure	Existing structure of the US blood system	18	"The biggest barrier is the fragmented nature of the blood system in the US. That's by far the biggest issue." [Participant #06]	Current Blood System Structure
Cost	Financial implications of collecting, testing, manufacturing, distributing, buying, and transfusing blood products	4	"Cost is an enormous barrier to safety because you can't even try things out that might be quite safe. Maybe they won't contribute anything to blood safety, but you won't know that for a while. Maybe the will. But you can't introduce it because of the cost." [Participant #18]	Availability of Resources
Reimbursement	Money paid to cover expenses for the collection, distribution, purchase, and transfusion of blood products	5	"So for example, if CMS has a standard price for blood at $300 a unit and the hospital has a deal with the blood collecting center to pay $150 a unit, the hospital pockets that money and the blood collecting center gets only whatever they bid on for the hospital." [Participant #16]	Availability of Resources
Available resources	Money, staffing, or other assets that can be used to carry out	3	"We are very under-resourced. Hugely under-resourced." [Participant #08]	Availability of Resources

	the process of transfusion medicine			
Lack of Data	Absence of information available to make an informed decision	12	"Without data – if you don't have data you simply can't make reasonable decisions. And you frequently have to make decisions with limited data, but then you should try to get additional information so you can modify the decisions. But the inability to get information is a barrier to decision-making." [Participant #18]	Lack of Data
Advocacy	Support to political or other federal appointees for a particular cause	2	"Unfortunately FDA is stuck in a really tough position, right? So they're told to be the advocate of donors and patients and to ignore cost. Well that, by definition, is antithetical to good decision-making." [Participant #13]	Insufficient Leadership
Competition	Rivalry between decision-making groups	3	"I'd say that there is still a substantial competitive component to the operational side […]. And on the scientific side and policy development side, certain levels of competitiveness that I don't think is healthy. Some blood organizations just want to do things themselves, quietly, and try to get an early publication and credit for having made a decision. Or that their organization expects them to have the capacity to drive their own decision sand be invisible rather than transparent	Absence of Collaboration & Communication

			and collaborative in evolving decisions." [Participant #04]	
Crisis Decision-Making	Acting and making decisions during times of a high sense of urgency, intense change, or other difficulty	2	"And the government, you know. If there's a crisis, they'll address it. If there isn't, it's not easy – at least in my experience, if you don't have the sense of a crisis you don't get the attention." [Participant #19]	Lack of Data
Fear	Emotion or feeling that something is a threat or likely to cause harm	2	"It's really challenging when it's not just 'what's the best thing to do based on the science?'. You have to be prepared to defend yourself in the press. And no matter what you do or say, somebody's gonna be upset. It does kind of weigh on people." [Participant #11]	Insufficient Leadership
Politics	Those activities associated with the governance of the US	5	"It is most problematic in the setting where the political voice tends to be silent and turns to the agencies and say 'make a scientific decision' when we know full well that the science doesn't make the decision." [Participant #12]	Absence of Collaboration & Communication
Collaboration	Working with another group to produce a desired result	2	"Formal tools somewhat restrict open and back and forth dialogue, particularly with regulated industry." [Participant #12]	Absence of Collaboration & Communication
Cooperation	Working together with another decision-making or stakeholder groups	3	"The ACBTSA and BPAC are not well aligned around what issues get brought up." [Participant #07]	Absence of Collaboration & Communication
Coordination	Organization of different elements of the complex	2	"[…] we should agree on a set of metrics from collection facilities and transfusion services that automatically	Absence of Collaboration & Communication

	processes of transfusion medicine		go into a big dataset so that we don't have to ask. So we don't have to do the NBCUS every couple of years." [Participant #10]	
Communication/Transparency	Exchange of information, data, or something else	6	"I mean, even the Guidance Documents. There is a comment period and people leave comments. I just don't know where those – it's not transparent about how those are taken into consideration." [Participant #20]	Absence of Collaboration & Communication
Facilitators to Decision-Making				
Collaboration	Effectively working together to achieve a result		"Blood centers will work together when it behooves them to do so, when it adds to their efficiency, or when the FDA tells us we have to." [Participant # 09]	Large-Scale Collaboration
Relationship Building	Forming and nurturing positive working partnerships	2	"[…] avoid getting adversarial with other people at the table" [Participant #10]	Large-Scale Collaboration
Data	Information available to advise decisions	6	"National Serosurveillance Study, TTIMS, REDS" [Participant #04]	Large-Scale Collaboration
Leadership	A body or entity to guide a group or groups towards a decision	13	"Stable leadership is, in my opinion, a kind of a hallmark of good decision-making" [participant #07]	Strong Leadership
Transparency	The ability for internal and external stakeholders to see the process of decision-making	4	"There's total transparency. Nothing actually is done in private on [this committee]." [Participant #08]	Transparency & Open Communication
Communication	Effectively exchanging or sharing information	8	"The ABO [Alliance of Blood Operators] is wonderful in that it allows	Transparency & Open Communication

	with internal and external stakeholders		people to exchange ideas" [participant #13]	
Inclusivity	Inviting all relevant parties to participate in a decision-making process	2	"[…] if you are not in crisis mode, it's much better to have a very transparent and inclusive process." [Participant #03]	Strong Leadership
COVID	SARS-CoV-2 (Coronavirus 2019) pandemic	4	"[…] there was an unprecedented level of support and flexibility and creativity during the pandemic at a national level from our regulators than there ever was before." [Participant #07]	Strong Leadership
Scientific Expertise	Skill acquired by training or experience related to the decision at hand	6	"I think the greatest strength is the strong scientific expertise at the agency. And the efficiency is that within house, the science base is very broad and very interdisciplinary." [Participant #12]	Strong Leadership
Political Support	Financial, guidance, or other means of providing a group or groups with what is needed to achieve a task; specifically, from those in political power	2	"[…] the authority and the level of empowerment of the federal agencies, for sure, I think, allows us to make sound blood safety decisions" [Participant #21]	Strong Leadership