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# Barriers and Facilitators to Implementing Simulation-Based Translational Research: A Qualitative Study

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# BARRIERS AND FACILITATORS TO IMPLEMENTING SIMULATION-BASED TRANSLATIONAL RESEARCH: A QUALITATIVE STUDY

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# BARRIERS AND FACILITATORS TO IMPLEMENTING SIMULATION-BASED TRANSLATIONAL RESEARCH: A QUALITATIVE STUDY

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## ABSTRACT

### BARRIERS AND FACILITATORS TO IMPLEMENTING SIMULATION-BASED TRANSLATIONAL RESEARCH: A QUALITATIVE STUDY

Translational simulation research has the potential to inform the way simulation is used to impact patient care and patient outcomes. Understanding how to approach translational simulation and the barriers and facilitators that can be used throughout the process can inform novice simulation and translational researchers. This qualitative dissertation sought to answer the following research questions: How do simulation experts describe the barriers and facilitators to implementing translational simulation programs? How do simulation experts describe their various approaches to implementing translational simulation programs? What recommendations do simulation experts describe for overcoming barriers to implementing translational simulation programs? The key findings include a lack of a standardized definitions for translational simulation and translational simulation research, the challenge of demonstrating the value of translational simulation, and that translational simulation programs should be aligned with and integrated into the work of the department of quality, patient safety, and risk management. The findings and advice from the experts in this dissertation can assist new researchers or those encountering challenges in implementing translational simulation.

This dissertation research study adds to existing literature by identifying barriers, facilitators, approaches, and recommendations for translational simulation. Future research can build upon this dissertation by focusing on the knowledge translational around translational simulation definitions, the use of implementation science frameworks applied to simulation, and by creating a toolkit to guide the planning, implementation, and rigorous assessment of translational simulations.


*Keywords*: Healthcare Simulation, Translational Simulation, Barriers, Facilitators, Qualitative Research

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# CHAPTER I

## INTRODUCTION

Simulation has been used in healthcare education for several decades and has been growing in popularity due to growing evidence of improved learning outcomes over more passive learning methods. A plethora of research exists to show its usefulness in changing healthcare learners' knowledge, skills, and attitudes. One key reason simulations are used in health care education is because they provide a safe place to practice without risk to a real patient. As an example, becoming proficient in placing a central venous catheter requires a combination of knowledge, skill, technical expertise, and practice. This skill can be learned in the simulation lab before moving into the patient care environment - which has been extensively studied. Evidence demonstrates increased safety for the patients and a decrease in cost for the healthcare system when using this type of simulation training. Once skills have been identified, practiced, honed, and tested in the simulation lab, they can then be applied into patient care.

Simulation can be used for teaching, making assessments, improving healthcare outcomes, and improving processes used to test health care systems. As a teaching modality, it is based on adult learning theory and experiential learning theories (Zigmont et al., 2011). Experiential learning theories have been shown to have higher retention rates than other types of more passive learning, such as reading or lectures (M. J. Austin & Rust, 2015). Simulation is an active method of teaching and learning that is not specific to the type of technology. In fact, there are several simulation techniques that can be used based on the learning objectives. Procedural skills are just one example of effective teaching using simulation. Other examples include using simulated patients to improve communication, teamwork skills, updates to new clinical guidelines and patient handoffs. In addition, manikins are often used for algorithm-based training protocols and any high-risk but low-frequency event in health care (Fent et al., 2015). Examples of high-risk, but low-frequency events that have effectively used simulation training are obstetric emergencies, such as shoulder dystocia, post-partum hemorrhage, and pre-

eclampsia (Fent et al., 2015). Surgery is another high-risk area where simulation training has been used to train staff and teams for rare but life-threatening events, such as fire in the operating room and the emergency treatment of malignant hyperthermia.

When simulation was initially introduced into healthcare education, researchers began studying if participants enjoyed their experiences in simulation (Dieckmann et al., 2011). Following this body of literature, the research continued to look at how well people learned within the simulation context. Now, there is a robust research foundation, demonstrating that people enjoy simulation and learn well using it. Therefore, the current research agenda has shifted toward determining how these trainings impact patient care and outcomes (Dieckmann et al., 2011; Issenberg et al., 2011; Scerbo et al., 2018). In fact, at the annual International Meeting for Simulation in Healthcare (IMSH) in January 2019, two of the plenary speakers' topics were on implementation and translational science. Although some authors have been talking about translational science using simulation for several decades, research in this area has only recently started growing, and remains a relatively small portion of simulation research. The health care simulation community is now at the right point in health care simulation research to focus its attention on studying the implementation of simulation-based translational research. To improve patient outcomes, it is imperative to increase the amount of simulation-based translational research. These studies will allow local decision makers, policy makers, regulatory agencies, and funders to have the necessary information to directly improve patient care and patient outcomes. The results of studies that use simulation to translate knowledge into clinical practice can inform decisions about prioritization of human resources and funding.

## Translational Science and Healthcare Simulation

This section introduces translational science, translational research, and the translational spectrum, and applies these concepts to healthcare simulation. This section begins with a description of the problem that translational science aims to solve, followed by a brief history of why translational science has become a larger, national focus and research endeavors. In the

latter half of this section, the concepts of translational science and research are applied to medical education, specifically in the context of healthcare simulation.

In 2001 the Institute of Medicine published "Crossing the Quality Chasm", which highlights the importance of basic science research findings being moved into patient care practices (Drolet & Lorenzi, 2011; Institute of Medicine, 2001). The idea behind engaging in translational science and research activities is to ensure the information gained in one context is shared with other stakeholders who can use the information to improve the health of patients and the population. While this may seem obvious, it is not consistently occurring on a large scale. In 2000, Balas et al. published a report stating that on average, it takes "17 years for research evidence to reach clinical practice" (Balas & Boren, 2000, p. 66). In addition, "only 14% of new scientific discoveries ever enter day-to-day practice" (Westfall et al., 2007, p. 403). How could this be occurring? What is happening to this research from the time of discovery to the time it is used at the patient's bedside? There are several reasons that contribute to this larger problem. Often, those who create bench research are not in contact with individuals, such as clinicians, who can implement the findings into practice. This speaks to a lack of broad stakeholder engagement in creating and disseminating new knowledge. Other times, even if knowledge is disseminated, it may be difficult to change habits or to get individuals to remember to implement new guidelines into daily practice. New guidelines are sometimes developed in an academic center and clinicians working in a rural hospital may not hear about them or have the resources to utilize the data in their healthcare practice (Westfall et al., 2007). In other instances, the population used in a research study does not always represent the individuals present in a physician's practice (Westfall et al., 2007). This can occur due to a study's strict inclusion and exclusion criteria. When this occurs, the study data is applicable only to the population examined in the study and not necessarily to the general population. Additionally, funding sources have not historically supported the dissemination and implementation work necessary for new research findings to be widely shared (Westfall et al., 2007).

The Institute of Medicine's *Crossing the Quality Chasm* report helped pave the way for additional infrastructure and funding for translational work (Institute of Medicine, 2001). For example, the National Institute of Health Clinical and Translational Science Awards and the National Center for Advancing Translational Science (NCATS) provide support to the growing field of translational scientist by funding diagnostic tests, drug or other therapeutic interventions, behavior change and medical procedures (C. P. Austin, 2018; Drolet & Lorenzi, 2011).

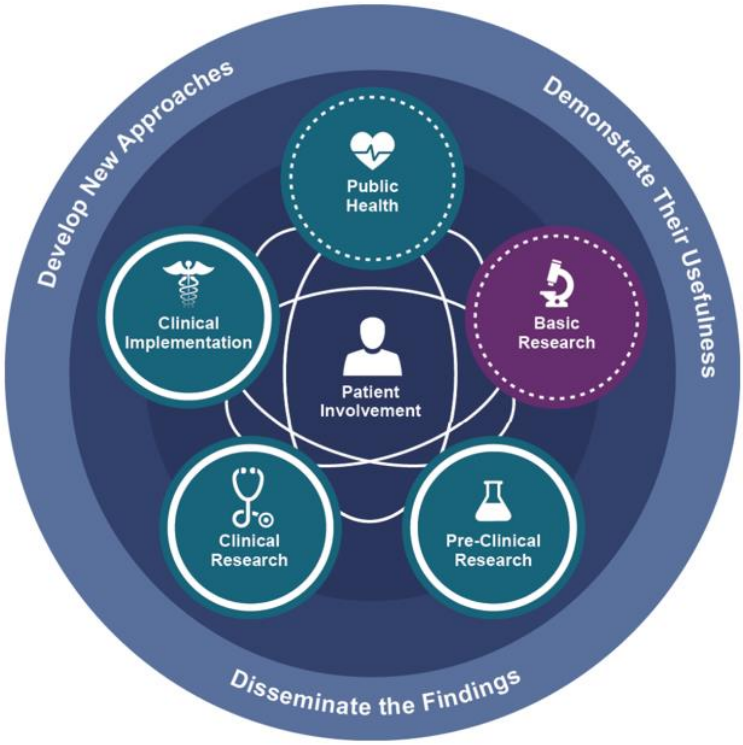
The NCATS defines translational science as "the process of turning observations in the lab, clinic and community into interventions that improve the health of individuals and the public" (C. P. Austin, 2018, p. 455).To further explore the idea of translational science, there are several phases of research and knowledge dissemination. Recently, researchers have come to a consensus regarding the definition of the translational spectrum's various phases, which are described as T zero (T stands for translational and the zero stands for the beginning phase) to T4 (Fort et al., 2017). "T0 [T zero] involves research such as genome-wide association studies which wrap back around to basic research" (Fort et al., 2017, p. 60). The T1 phase "involves processes that bring ideas from basic research through early testing in humans"(Fort et al., 2017, p. 60). The T2 phase studies effectiveness in humans and using that information to shape clinical guidelines (Fort et al., 2017). Depending on the research subject, it may be examining the effectiveness from an educational intervention or a new pharmaceutical product. T3 focuses on implementation of research findings and disseminating the research to necessary stakeholders who can put the findings into practice and continue studying the results in the clinical or practice setting (Fort et al., 2017). T4 moves from a focus on an individual or group of individuals to a population-based focus. It tests the effectiveness of the intervention on populations (Fort et al., 2017).

Engaging in translational science is not a linear process, but rather, it requires an iterative thinking process and considers the upstream and downstream effects of the generated

knowledge or research. This is exemplified in the most recent NCATS translational science model (see Figure 1) which positions patient in the center (National Center for Advancing Translational Sciences, 2020). This new model shows how each stage is built upon and informed by all other stages. It is best to think of it as an iterative process where the starting point can be at any phase and move in any direction among various stakeholders (Drolet & Lorenzi, 2011).

**Figure 1**

NCATS Translational Science Spectrum (National Center for Advancing Translational Sciences, 2020)




What does all this have to do with healthcare simulation? To apply the concepts of translational science to healthcare simulation, the translational continuum, comprising of T zero through T4, must be adjusted for the purposes of medical education. The term 'translational simulation' has been used to describe healthcare simulation activities that directly improve patient processes and outcomes (Brazil, 2017). This definition focuses on the T3-T4 end of the

spectrum, and could be expanded upon to include all simulation activities occurring along the translational continuum.

In 2017, McGaghie reconceptualized the translational continuum in relation to healthcare simulation (McGaghie, 2010). In this context, T1 focuses on improving the knowledge, skills, attitudes, and professionalism of teams and individuals within the simulation lab (McGaghie, 2010). T1 simulation research looks most like basic educational research and could ask, does a simulation curriculum have better learning outcomes than a traditional curriculum? Does one simulation curriculum have better learning outcomes as compared to a second simulation curriculum? T2 simulation research seeks to improve patient care experiences by targeting individuals and teams in the clinic and the patient bedside (McGaghie, 2010). T2 takes the information gained in T1 and determines how it is applicable to patient care. For example, it could ask if the education provided in the simulation lab transfers to the patient's bedside? T3 aims to improve patient outcomes by targeting individuals and public health initiatives in the clinic and broader community (McGaghie, 2010). T3 builds upon T2 by taking the lessons learned about simulation to improve patient care and tries to share this knowledge across different contexts. T3 includes scaling up of successful programs across various departments with a hospital or more broadly other hospitals within a city, state or nationally.

McGaghie's reconceptualization could be expanded to include both T zero and T4. This expansion could include T zero research which study theoretical or conceptual frameworks used to guide and support translational research. This could serve as an important foundational aspect of simulation-based translational research since theoretical and conceptual frameworks in the literature seem to be absent, or if present, underutilized in the study design. T4 could target local, state, or policymakers with the goal of improving patient care through changes in regulation, policy, and funding. Furthermore, T4 would build upon T3 knowledge by informing policymakers of successful efforts to improve patient care, therefore providing policymakers with the knowledge needed to improve the lives of more people. Reconceptualizing healthcare

simulation in relation to translational continuum research emphasizes the contribution to patient and population health.

Just as knowledge gained from scientific research needs to be implemented into clinical practice, so does the knowledge gained from simulation educational interventions. Simulation activities should aim to improve patient care through data that informs and changes clinician practices. Although all areas of the translational spectrum need continued research, a larger focus on the translational nature of simulation-based research could improve the flow of information along the continuum. Therefore, there needs to be an intentional focus on simulation training activities and the theoretical underpinnings of research beginning with the initial planning of simulation activities. This can include considering during the planning phase how information gained from each simulation will be used to inform the next stakeholder in the translational continuum. For example, when preparing a skills session for medical students, the information gained from the session can be shared with clinical supervisory staff to inform them of which skills the learners can use during patient care in the clinical environment. On the clinical side, when the clinical supervisory staff notices a student who is not able to perform skills adequately, the learner could be directed back to the simulation lab for additional training. A parallel process can be used for practicing healthcare professionals. Through this bi-directional feedback process, more stakeholders are involved to ensure the knowledge is translated into practice. To foster the goal of bi-directional feedback, it is useful to understand translational science and translational simulation.

Additional capacity building needs to occur in this area, particularly around faculty development. The field of translational science is gaining recognition as more researchers and simulationists become aware of its importance. Translational scientists need to share definitions, ideas, and reasons as to why and how translational research will improve the healthcare systems and the population's health. To facilitate cross-disciplinary work within a complex healthcare system translational scientists are expected to be team players, boundary

crossers, process innovators, skilled communicators, systems thinkers, domain experts and rigorous researchers (Gilliland et al., 2019). Each of these seven characteristics takes time and dedication to learn and develop. Even if individuals commit to developing these characteristics, it can be a challenge for one person to excel at all seven qualities. Therefore, it may lend itself to a team-based approach. The team-based approach could include several individuals who collectively possess the seven characteristics of a translational scientist. These ideas and traits can be taught through formal education, but also through non-traditional methods, such as mentoring, webinars, conference workshops, discussions across community members, and self-paced online learning. Ideally, building a translational research team that includes individuals who collectively possess these skills will facilitate the process of knowledge translation in practice.

Just as translational science and research have gained momentum in the recent decade, so has the idea of simulation-based translation research. This section provides rationale of why translational science has become a larger focus in recent years in both the larger scientific community and in healthcare simulation. It is anticipated this trend will continue with the ultimate goal of improving the lives of patients and populations through a continued focus on translational activities.

### Why use simulation as a methodology to translate knowledge?

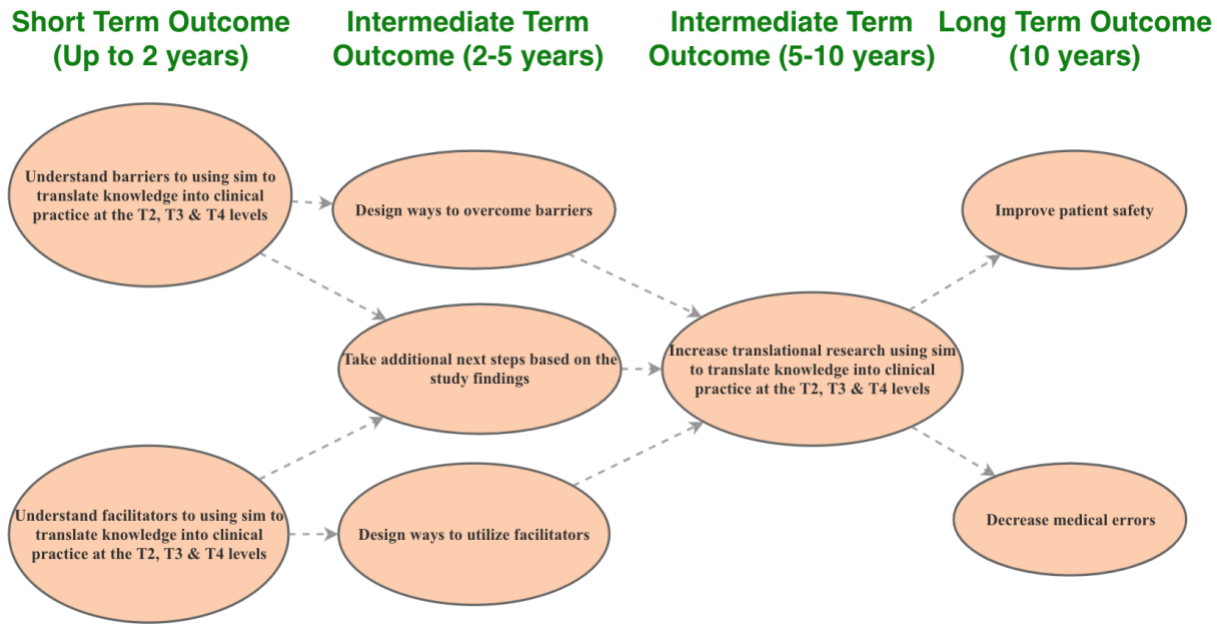
Over the last 20 years, it has been well documented that medical errors are one of the top causes of death in the United States health system, causing an estimated 251,454 deaths per year (Makary & Daniel, 2016). In addition to the large number of deaths due to medical error, as many as 210,000-400,000 additional preventable, adverse events occur each year, causing increased patient morbidity, cost, litigation, provider burnout, and other negative consequences (Makary & Daniel, 2016). The cause of up to 70% of these medical errors are ineffective communication (Bilotta et al., 2013). Since the Institute of Medicine (IOM) published *To Err is Human* in 1999, this topic has received considerable attention (Institute of Medicine, 1999). As

a result, an emphasis has been placed on quality and safety initiatives, which have grown over the last 20 years. The IOM report specifically called for health care organizations and professionals to use simulations to establish interdisciplinary team training programs and procedural skill training as a way to mitigate patient risks (Institute of Medicine, 1999). Additionally, the use of simulations should be used to train problem solving, crisis management, and the use of new equipment or processes (Institute of Medicine, 1999).

The use of simulations was brought to healthcare from other high-reliability organizations, such as aviation, aerospace engineering, and the military, all of which have used simulations to increase safety (Motola et al., 2013; Rosen, 2008). Healthcare simulation has been increasing in popularity within all aspects of healthcare education, from the novice undergraduate student to the most advanced. Following this exponential growth, research using simulation has also increased and, to date, there has been substantial evidence to support its effectiveness for training healthcare learners and workers in a variety of skills (Motola et al., 2013). Healthcare simulation has been shown to increase the quality of care and patient survival (Sollid et al., 2019). The evidence is so compelling that the in 2011, the World Health Organization emphasized simulation as an essential component of any patient safety curriculum (Sollid et al., 2019). The goal of many simulation exercises is to improve patient safety and reduce medical errors; however, there is not always be a direct link to patient outcomes. Overall, there remains a "lack of research examining performance transfer, sustainability, and direct patient outcomes and experiences" (Bilotta et al., 2013, p. 4). Recent simulation literature reviews have outlined the lack of outcomes data and the limited evidence for the transfer of simulated skills into clinical practice (Ross et al., 2012). To, Figure 2 has been created. Figure 2 shows a multi-year stepwise approach to achieve the result of improving patient care, and visually demonstrate the indirect connection between simulation-based translational research and this dissertation with the overall goal of reducing errors.

**Figure 2**

*Short-, Intermediate-, and Long-Term Outcomes For This Dissertation*




## Problem statement

The overarching problem is the high number of medical errors that occur in the healthcare system annually, and this issue can be effectively addressed by using simulation (Bilotta et al., 2013; Brazil et al., 2019). Translational science research is a priority for patient safety and quality improvement (Sollid et al., 2019). Translational research has been identified as a research priority for the National Institutes of Health (NIH) and the Society for Simulation in Healthcare (SSH) (Scerbo et al., 2018; Sollid et al., 2019). During the 2017 SSH research summit, simulation research matured from looking at what can be done to what should and needs to be done (Sollid et al., 2019). This maturity demonstrates the need to advance and expand translational research.

Despite a larger focus on translational research in recent years, the overall amount of simulation-based translational research remains low, accounting for 2.8% of the scholarly work published in four simulation journals (Cheng, Calhoun, et al., 2018). In a recent literature review, “only 10% of the 320 papers that were reviewed on simulation-based training included

data from the clinical environment, a necessary component for examining patient outcomes" (Bilotta et al., 2013, p. 4). In 2019, a consensus report continued to highlighted the need to "define more clear ways in which health care simulation can contribute more effectively to improve patient safety" (Sollid et al., 2019, p. 111). In addition, "the importance of a more rigorous approach to simulation-based medical education and evaluation based on concepts from translational science has been stressed" (Ross et al., 2012 p. 100).

To date, there has not been a research study looking at the barriers and facilitators present in implementing simulation-based translational research. Several studies are using simulation to translate knowledge, but none have studied the barriers and facilitators encountered in the implementation process (Brydges et al., 2015). Much of the current literature is non-research based and found in commentaries, consensus papers, and debate articles.

Most translational research in simulation is at the T1 level (McGaghie et al., 2011). Presumably this can be attributed, at least in part, to the idea that the methodology at the T2 and T3 levels are more complex and involve more confounding variables that may be difficult to study (Griswold et al., 2017). Some efforts have been made to enhance simulation-based research at the T2-, T3-, T4 levels, such as creating research networks that connect researchers and compile data across various locations. These networks can assist with providing infrastructure and support as well as to help researchers overcome challenges. Two such networks exist for simulation-based research. First, the International Network for Simulation-based Pediatric Innovation, Research and Education (INSPIRE) is designed to "facilitate multicenter, collaborative simulation-based research with the aim of developing a community of practice for simulation researchers" (Cheng, Auerbach, et al., 2018, p. S28). The second is the International Simulation Data Registry (ISDR), which aims to provide the infrastructure needed to support "translation of best practices into more standardized educational approaches, higher quality care and ultimately improve outcomes" (Calhoun et al., 2018, p. 427).

These research network initiatives work toward the same goal as this dissertation, which is to understand and facilitate simulation-based translational research. To inform the simulation-based translational research agenda, this dissertation aims to identify the barriers and facilitators encountered in the implementation of a translational simulation session or program. The identification of this problem and the subsequent research questions came from the literature review, and a personal interest in combining the worlds of translational science and the use of simulation as a teaching methodology.

## Research Purpose

The purpose of this dissertation is to explore the barriers and facilitators to simulation-based translational research. Barriers are defined as difficulties or challenges encountered when planning, implementing, and measuring translational research using simulation. The term facilitator will be defined as the enabler (person), event, circumstance or experience that assisted in the planning, implementing, and measurement of translational research.

This dissertation explores the experiences of simulation experts across the globe. This qualitative instrumental case study identifies the barriers and facilitators encountered when implementing various translational simulation programs. Since this is the initial research on this topic, the main goal of this dissertation is to describe in detail the phenomena of interest through the experiences of the participants. The central phenomenon to be studied is the approaches to implementation of a simulation-based research process. Both barriers and facilitators are examined in detail and explored through several units of analysis such as individuals, groups and organizations (Murphy et al., 2019). The interview questions were built around addressing this central phenomenon and the constructs from the Consolidated Framework for Implementation Research (CFIR). The CFIR model will be defined and discussed in detail in the theoretical frameworks section of this paper.

This dissertation aims to answer the following research questions:

1. How do simulation experts describe the barriers and facilitators to implementing translational simulation programs?
2. How do simulation experts describe their various approaches to implementing translational simulation programs?
3. What recommendations do simulation experts describe for overcoming barriers to implementing translational simulation programs?

## Dissertation Impact

These research questions aim to promote the use of simulation for measuring translational research outcomes. This information contributes to the NIH and SSH research agendas, and contributes to the literature by identifying barriers and facilitators encountered by simulation experts when implementing simulation-based translational research. To date, there have been a few barriers identified, but none have been through a research study, rather, they have come from the experiences of individuals or single research teams. This dissertation brings together the experiences and interpretations of several experts in the field to identify barriers and facilitators, providing stronger evidence to these concepts. Additionally, based on the information gathered, this dissertation recommends ways to overcome barriers and utilize facilitators to increase the use of translational simulations.

During this research dissertation there are several assumptions. Some underlying assumptions are that the programs have already performed a needs assessment, determined the necessary learning objectives for their educational intervention, identified or created an evidence-based educational intervention, and determined that simulation was the best modality for knowledge translation. These assumptions were tested in this research by reviewing the documents provided by the program before the interviews and by asking about these steps in the planning phase of the interview as needed. Despite these clarifying questions, the majority of the interview questions focused on the approach to implementation of the intervention.

## Introduction to Theoretical Frameworks

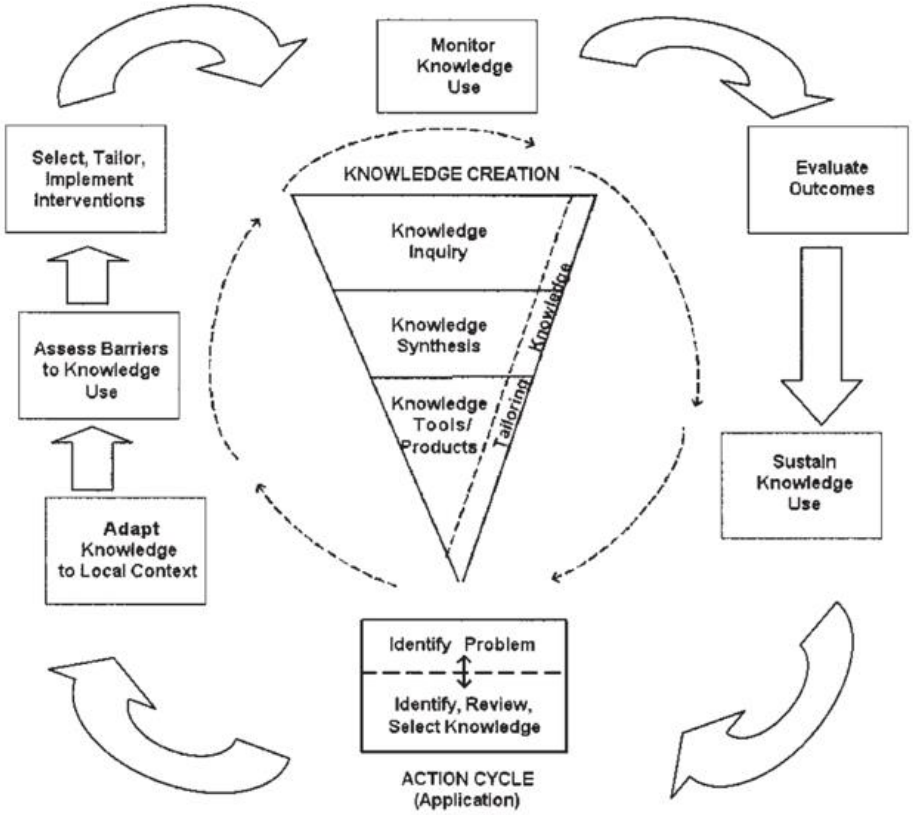
This dissertation relies on two theoretical frameworks. The first is the knowledge to action (KTA) cycle, and the second is the Consolidated Framework for Implementation Research (CFIR) (Damschroder et al., 2009; Graham et al., 2006). These theories will be introduced here; however, they will be explored in more detail in Chapter Two.

The knowledge to action cycle is made up of two sections, the knowledge funnel and action steps (see Figure 3) (Graham et al., 2006). The knowledge creation phase is present to take information and distill it to a useable clinical guideline or tool that can be used to move the evidence into action or clinical practice (Graham et al., 2006). The action cycle includes several phases that are intended to be investigated over several iterations, and the phases can occur at any time within the process, including simultaneously (Graham et al., 2006). The phases of the action cycle are: adapt knowledge to the local context, assess barriers to knowledge use, select, tailor and implement interventions, monitor knowledge use, evaluate outcomes, and sustain knowledge use (Graham et al., 2006). The knowledge creation portion covers all ways of knowing, which can be research findings, clinical practice observations, experiences, and simulation sessions. This dissertation focuses on specific aspects of the action cycle, namely the adaptation to the local context, assessing barriers, and evaluating outcomes. The use of simulation lends itself to applying or implementing new information, skills, or attitudes into practice.

There is a difference between internal and external knowledge. External knowledge is external to the local system or context, for example, knowledge found in the literature. Internal knowledge speaks more to the internal context of the department, organization, or team. This internal information may come from observation by clinicians or exceptionally good or bad patient outcomes. Both internal and external knowledge are important and will be explored in this dissertation.

**Figure 3**

Knowledge to Action Framework (Graham et al., 2006)




The second theoretical framework informing this research is the CFIR (Damschroder et al., 2009). This framework can be considered meta-theoretical, as it draws upon the constructs of many existing theories (Damschroder et al., 2009). There are five major domains including interventions characteristics, outer setting, inner setting, characteristics of the individuals involved, and the process of implementation (Damschroder et al., 2009). Under each of these major domains are sub-categories. This dissertation focuses on the process of implementation which includes four sub-categories or essential activities: planning, engaging, executing, and reflecting and evaluating (Damschroder et al., 2009). Planning includes designing an action plan to promote effective implementation. This stage includes creating an implementation plan that includes the input from a broad range of relevant stakeholders. The plan should be catered

to the stakeholders needs. This plan can include aspects of the organization and professionals that are being targeted, communication strategies, how the information will be delivered, and how the program will progress toward their goals and track progress (Damschroder et al., 2009). The planning phase also includes pilot testing simulation scenarios. Engagement involves engaging with opinion leaders, formal and informal leaders, champions, and external change agents (Damschroder et al., 2009). Executing is the process of implementing the plan. The reflection and evaluating phase includes research data collection, which can include both qualitative and quantitative feedback about all phases of the process (Damschroder et al., 2009). In the simulation context, this could include debriefing conversations, observation by simulationists or clinicians, and patient outcomes data, among other sources of evaluation. The four CFIR process components are the backbone of the interview guide used for this research dissertation (see Appendix A).

## Methodological Summary

Due to the nature of the research questions, this dissertation is a qualitative instrumental case study that interviewed multiple people to gather in-depth descriptions (Creswell & Pooth, 2018). An instrumental case study is used to explore an issue in detail, and this dissertation will conduct multiple interviews at multiple locations to explore barriers and facilitators (Creswell & Pooth, 2018). This dissertation enrolled individuals from a variety of simulation programs across the world. It focused on the interviewees approach to implementation of translational simulations.

Dissertation participants were involved in simulation programs as researchers, leaders, and other roles, but all the participants used simulation as a methodology to translate knowledge into practice. Initially, document review assisted in understanding the context for each location. Then, semi-structured interviews were conducted remotely using a teleconference system. Interview questions were guided from the KTA framework and CFIR model. All interviews were transcribed using an online automated transcription service, and then both

inductively and deductively coded. First, this qualitative study analyzed the results gathered from inductive coding, more specifically open coding, to allow the interview data to speak for itself (Terrell, 2016). The deductive coding applied a priori codes, derived from the various constructs in the KTA and CFIR models. After themes were identified, a focus group was conducted to discuss the findings from the interview data analysis and identify recommendations to further simulation-based translational research.

## Definition of Terms

This section outlines the definition of terms used in this dissertation. Additionally, there are a few relationships between constructs that will be explained. In this dissertation, the assumption is that knowledge, which can come from any way of knowing, will be used to create a simulation educational intervention, and will be used to produce research evidence. The terms "evidence" and "data" will be used interchangeably in this dissertation. The evidence produced will then, in turn, be used to inform future iterations of knowledge, educational interventions, and research design.

"Translational science" is a board term which refers to the entire process of bench to bedside research, whereas the term "translational research" is more specific to the research process, data collection, and integration of the newly discovered knowledge into various areas of the translational spectrum. The definition of "translational simulation" in the literature comes from Brazil in 2017. Although this definition is used due to its occurrence in the literature, the definition appears to be narrow and focused more on the T3 and T4 end of the translational spectrum by specifically stating that the simulation has a direct impact on patient outcomes. Simulation, even at the T1 and T2 levels, can be linked to patient outcomes, although the links may be more distant and difficult to measure. A more holistic approach is that all aspects of translational research along the continuum that use simulation can also fall under this term and attention should be paid to moving knowledge and data across different aspects of the spectrum.

It is important to reiterate here the term “facilitator” refers to two different definitions depending on the discipline. In healthcare simulation, the term “facilitator” refers to the individual running the educational session, typically a faculty member or an educator (Lioce et al., 2020). In the simulation context, the “facilitator” is a person who is guiding the learning. In contrast to this definition, the term “facilitator” in the implementation science literature is more broadly defined as the enabler (person), event, circumstance or experience that assisted in the planning, implementing, and measurement of translational research. In this dissertation, the term “facilitator” will be used the definition from the implementation science literature.

Lastly, it is important to point out the difference between “implementation science” and “implementation.” “Implementation science” refers to the study of the implementation process. In this dissertation, the term “implementation” will be used, which refers to the process or act of applying the knowledge into practice. Below are the definitions and sources that will be used throughout this dissertation.

*Simulation*- “A technique that creates a situation or environment to allow persons to experience a representation of a real event for the purpose of practice, learning, evaluation, testing, or to gain understanding of systems or human actions” (Lioce et al., 2020, p. 44).

*Translational research*- “The multidirectional and multidisciplinary integration of basic research, patient-oriented research, and population-based research, with the long-term aim of improving the health of the public” (McGaghie et al., 2012, p. 1098).

*Translational science*- “The process of turning observations in the lab, clinic and community into interventions that improve the health of individuals and the public-from diagnostics to therapeutics to behaviors and medical procedures” (C. P. Austin, 2018, p. 455).

*Translational simulation*- "The subset of simulation activities that are directly focused on improving health- care processes and outcomes" (Brazil, 2017, p. 1).

*Implementation science* - "The scientific study of methods to promote the systematic uptake of research findings and other evidence-based practices into routine practice, and hence, to improve the quality and effectiveness of health services" (Thomas et al., 2017, p. 439).

*Facilitator* - Any factor that promotes knowledge use or implementation (Straus, 2013).

*Barrier* - Any factor that inhibits implementation. Barriers can be viewed as difficulties or challenges encountered along the way to planning, implementing, and measuring translational research using simulation.

*Knowledge translation* - "A dynamic and iterative process that includes synthesis, dissemination, exchange and ethically sound application of knowledge" (Straus et al., 2013, p. 4).

# CHAPTER II

# REVIEW OF LITERATURE

## Search Strategy

A comprehensive literature review, aided by the expertise of the George Washington University librarians, was conducted to answer the following question: What is known about barriers and facilitators associated with using simulation to translate knowledge into clinical practice?" The literature review used a combination of the terms "simulation," "translation," "healthcare," or "medicine," and "nursing" to search for articles that provided examples of simulation used for translational education interventions, or articles that described barriers and facilitators to implementing a simulation program aimed at translating knowledge into action. The search used the following databases: Google Scholar, Scopus, PubMed, CINAHL Complete, ABI/Inform Complete Plus, and Business Sources Complete.

The search began with a few key articles; other resources that cited those key articles were discovered using a manual article reference review and the Scopus database. In total, 147 articles were identified and reviewed. Initially, abstracts were reviewed and 32 full articles were relevant to this dissertation. Relevance criteria for the abstract review included articles that talked about barriers or facilitators as well as the use of simulation to translate knowledge into clinical practice. Following this, a search on Google Scholar, limited to publications authored within the last 20 years, was completed using the search terms "simulation-based," "translational science," and "simulation-based translational science," along with the terms "nursing," "medicine," or "healthcare," which provided 264 results which were reviewed. A search that produced 50 additional results used the search criteria: "simulation-based" "translational science" AND "barriers" AND "facilitators". The business literature was searched using both ABI/Inform and Business Sources Complete databases using the topic areas of "healthcare/medical/nursing simulation," "implementation," and "translation". The search was limited to 2000-2020; the year 2021 was included when updating this search toward the end of

the dissertation process. PubMed was searched using MeSH terms: (("Risk Management"[Mesh]) OR "Patient Safety"[Mesh]) AND ("Systems Analysis"[Mesh]) OR "Systems Theory"[Mesh]) AND ("Simulation Training"[Mesh])). Finally, CINHAL was searched using the topic area of "healthcare/medical/nursing simulation" and implementation and translation.

The literature presentation begins with a brief introduction and clarification on the use of simulation, followed by an overall synthesis and critique of the literature reviewed. Key articles are described based on their relevance to this dissertation and are linked to CFIR components when applicable. Article strengths, weaknesses, and contradictions with other publications are highlighted, and gaps in the literature are discussed.

## Simulation

The term “simulation” has been defined many ways and the definition emphasizes simulation as a technique or pedagogy and does not focus on the technology used to accomplish the teaching (Lioce et al., 2020). The definition used in this dissertation comes from the Healthcare Simulation Dictionary and defines simulation as, “A technique that creates a situation or environment to allow persons to experience a representation of a real event for the purpose of practice, learning, evaluation, testing or to gain understanding of system or human actions” (Lioce et al., 2020, p. 44). The use of simulation technology can include task trainers, full body manikins, simulated participants, and virtual reality. The type of technology used is decided depending on the best methodology to meet the learning objectives for the session.

The advantage of simulation over other teaching techniques is the incorporation of active learning, which requires the learner to engage in and apply the material in a realistic setting. In contrast to passive learning, active learning has been shown to improve knowledge retention (Sperling et al., 2013). Simulation allows for practice, repetition, and learning from mistakes in a setting that does not put patients at risk. Specifically, the use of deliberate practice has been

shown to improve healthcare provider skills, which has directly improved patient care through a reduction in errors (Griswold et al., 2017; McGaghie, 2010; McGaghie et al., 2011).

It is widely known that mere dissemination of information is ineffective for applying knowledge to practice (Kristensen et al., 2016). Passive educational methods may be effective at raising awareness and increasing knowledge, but they have been shown to be ineffective at making the information actionable (Kristensen et al., 2016). Once a new skill has been tried, tested, practiced, and applied in a simulated setting, it is easier to utilize in patient care and change the behavior of medical professionals. Other than simulation, on-the-job training and bedside learning are effective formats that assist information being applied to practice (Kristensen et al., 2016). An advantage simulation has over on-the-job training is that clinicians can practice in the simulated environment without any negative consequence for real patients. Once a skill has been mastered using simulation, then it can be safely utilized with real patients. The use of in-situ simulation (i.e. patient simulation that takes place in the real clinical environment) can be used to facilitate the transfer of knowledge into clinical practice.

## Literature Critique

Overall, there is little empirical evidence on the topic of implementing simulation-based translational research (Bilotta et al., 2013). The only implementation framework that has been used in the literature is CFIR (Brazil, 2017; McGaghie et al., 2012). Other frameworks that appear are mastery learning and deliberate practice, which are ways to design the educational intervention but do not touch on the implementation aspects. Therefore, this literature review has been arranged according to the theoretical articles and articles that describe individual experiences that conceptualize how simulation-based translational research can be implemented. In addition, there is one case example available. Synthesis across resources is difficult due to the limited number of empirical studies on the topic, therefore, the following review details individual studies. When possible, synthesis of sources is explored. Additionally, the various factors are linked to the CFIR to give an idea of the components that have been

touched on in the literature. The CFIR components include intervention characteristics, outer setting, inner setting, characteristics of individuals, and process (Damschroder et al., 2009). This dissertation focuses on the process factors of the CFIR framework which are broken down into four sub-sections: planning, engaging, executing, and reflecting and evaluating (Damschroder et al., 2009).

## Literature Review

The articles that spoke to the CFIR inner setting included a debate article by Brazil and a commentary article by McGaghie (Brazil, 2017; McGaghie et al., 2012). The inner setting looks at the structural, political, and cultural contexts that occur in the implementation process (Damschroder et al., 2009). In the debate article, Brazil (2017) lists healthcare culture and "departmental tribalism" as a barrier. This could be expanded to include interprofessional tribalism, which occurs when students are trained by their own profession without significant interaction or practice with other healthcare professionals until clinical work begins. Brazil proposes that the use of in-situ simulation can help to overcome some barriers to implementing knowledge into practice. In-situ simulation means the simulation intervention is deployed in a patient care area that is the usual workspace of the team participating in the simulation. This contrasts with a simulation occurring in the simulation center or laboratory space. In-situ simulation helps improve the fidelity and realism of the simulation intervention by placing it in the team's natural context. This also helps to overcome another barrier listed by Brazil who explains that learners may experience unfamiliar equipment and environments when simulation intervention occur within the simulation center (Brazil, 2017). Institutional policies and procedures were listed as a barrier without further discussion (Brazil, 2017). Finally, a facilitator was noted as the right leadership and management support (Brazil, 2017). Having leadership participate in the design and process of initiatives is supported by implementation science frameworks and accreditation standards put forth by the Society for Simulation in Healthcare (Brazil, 2017; Damschroder et al., 2009; Grol & Ouwens, 2013). While all these topics make

intuitive sense, these ideas can be further extrapolated and built upon. This gap provides an opportunity for additional qualitative research to further understand each of the factors listed above.

McGaghie also talked about a CFIR inner setting barrier, which is the lack of cumulative research programs necessary for “educational, clinical, quality and safety goals” (McGaghie et al., 2012). The best approach is sustained research efforts with a longitudinal view as opposed to individual research studies that may not be integrated with previous research findings (McGaghie et al., 2012). This is expanded upon in a 2013 systematic review, which found, "studies reporting patient outcomes or systems of care have been done primarily in academic settings, although researchers have used simulation in diverse clinical specialties, experience levels, and care settings” (Schmidt et al., 2013, p. 430). This brings up the question, is it necessary to have a translational research center or an academic research institution in order to have the personnel and resources to engage in translational simulation research? This question is not addressed in the literature. A facilitator was identified under the CFIR domain of characteristics of individuals when McGaghie et al. explains the need for a competent simulation research team who is knowledgeable in translational research (McGaghie et al., 2012).

In 2015, McGaghie et al. described the challenge of implementing medical education simulations into organizations as difficult and rarely rigorously evaluated (McGaghie et al., 2015). The article is addressing dissemination and implementation of a simulation-based educational intervention from one hospital to another. It also discusses the CFIR model and touches on lesson’s learned throughout the authors’ experiences; however, it did not use a case study qualitative methodology. Instead, it discusses the team’s experience as they disseminated a successful central venous catheterization training program from a tertiary care academic center and assisted with implementation of the same program at a nearby community academic hospital (McGaghie et al., 2015).

The article asks the following questions: “Why is it so difficult to transplant a highly successful medical education program from one medical education setting to another? What are the barriers that frustrate attempts to introduce new and successful ideas like mastery learning into established medical education curricula?” (McGaghie et al., 2015, p. 1488). In their case, they present four reasons that explain why they succeeded – all of which are represented in the CFIR model. The first was the evidence-based intervention they utilized, which included a theoretical foundation of mastery learning and deliberate practice (McGaghie et al., 2015). The second reason for success was early and sustained attention to implementation science principles (McGaghie et al., 2015). This was further expanded to include intense faculty training, frequent communication, tight program management, and engaged clinical leadership (McGaghie et al., 2015). The third success factor was a unified commitment to a culture of patient safety (McGaghie et al., 2015). The final factor was the establishment of a robust way to measure changes in patient care outcomes as a result of the training (McGaghie et al., 2015). How this was accomplished successfully could be explored to give additional insights into ways to replicate this success at other centers. They also underscored the importance of educationally influential physicians and local champions while tying the success of the intervention to the use of Rodger’s Diffusion of Innovation Curve (McGaghie et al., 2015). The authors state that leveraging the early adopter and early majority groups are the best chance for dissemination of the intervention (McGaghie et al., 2015). In fact, utilizing early adopters was listed as a facilitator to the process (McGaghie et al., 2015). The article reiterates the idea that knowledge of the innovation is insufficient to produce change. Instead, a heavy dose of “education, peer and public pressure, accountability, professional sanctions, and other social variables” are necessary for success (McGaghie et al., 2015, p. 1493). Each of these listed factors could use additional exploration to further understand their meaning and role in the implementation process.

Barsuk et al. published an article based on the same dissemination project as the McGaghie et al. (2015) article described above. Barsuk et al. describe their experience regarding

trying to move their central line training program from the tertiary care center to a nearby academic community hospital (Barsuk et al., 2014). In their paper, they map their experience to four component of the CFIR framework; planning, engaging, executing, and evaluating (Barsuk et al., 2014). They offer that even though their dissemination efforts were successful, it is difficult to know which parts of the multi-pronged intervention made it successful. Their implementation plan included the following; two authors spending 3 $^{1}/_{2}$ days at the community hospital getting a tour, learning their medical intensive care unit structure, and discussing barriers to implementation (Barsuk et al., 2014). It would be helpful to know what barriers were discussed, but this was not divulged in the paper (Barsuk et al., 2014). It does not specify how they used the discussion of barriers to adapt or adjust the curriculum. They also set up equipment and pilot tested the curriculum within the community hospital. Then, they used outcomes data from the original research site to achieve buy-in from the hospital leadership (Barsuk et al., 2014). This demonstrates the importance of having the appropriate organizational leadership support. Two chief residents had already taken the original research site's training course in preparation for the implementation at the new center, which totaled at least ten hours of instruction, observation, and supervision (Barsuk et al., 2014). This spoke to the preparation phase. The rest of the article discussed the patient outcomes data. Exploring how the planning, engaging, executing, and evaluating occurred in this case example were useful in understanding how to replicate this success.

Griswold et al. wrote a consensus report to identify gaps in knowledge and process related to the use of simulation for developing, enhancing and maintaining individual provider competency (Griswold et al., 2017). They identified a barrier to simulation-based translational research as "issues related to level(s) of analysis for individuals, teams, and systems persist within the literature and present a particular challenge for simulation-based translational research" (Griswold et al., 2017, p. 170). They also identified the multiple factors associated with measuring the procedural, cognitive, and communication skill of individuals and teams within

the complexity of the healthcare environment as an important consideration in moving from T1 research to higher-level translational outcomes (Griswold et al., 2017).

One article presented a mixed-methods before and after intervention study to observe organizational barriers and facilitators to implementing a simulation-based team training program from the perspectives of physicians and nurses (Clay-Williams & Braithwaite, 2015). The study's goal was to review the qualitative contribution, "to unpack the elements of evidence, context, and facilitation that may be relevant to implementation within complex organizational environments in healthcare" (Clay-Williams & Braithwaite, 2015, p. 672). Ten participants were interviewed and the interviews took place within one year of the conclusion of the training course (Clay-Williams & Braithwaite, 2015). Although the article states that they reviewed the qualitative questions for their relevance to implementation, the interview questions themselves focused on the participants previous experience with team training, their interest in participation, and if they learned anything new or interesting (Clay-Williams & Braithwaite, 2015). None of these questions speak to barriers or facilitators of implementation of the program or organization, but they provide background information on the implementation of the information into practice by an individual. There were two questions in the interview guide that asked directly about implementation. These two questions were: "Did you try to apply any of the techniques taught in the training in your workplace? What happened/were they useful?" and "Did you experience any barriers to applying the techniques/ideas from the training in your workplace?" (Clay-Williams & Braithwaite, 2015, p. 673).

Themes that emerged from the qualitative data analysis were the tribal nature of medicine and nursing, different climates and organizational cultures, time-pressured nature of clinical work, and difficult personalities (Clay-Williams & Braithwaite, 2015). Difficult personalities were described as those who did not listen, did not work well within the team, or were angered when their actions were questioned (Clay-Williams & Braithwaite, 2015). Nine of out the ten interviewees reported using or trying one of the strategies from the training in

practice despite the overall transfer climate and culture being categorized as poor (Clay-Williams & Braithwaite, 2015). Participants commented on the lack of time, lack of leadership/management investment, and lack of transfer from simulation skills/tasks/goals to the teamwork found in patient care (Clay-Williams & Braithwaite, 2015). The participants identified training that was offered to individuals but not to the whole organization as a barrier to implementation, which again spoke to the overall culture of the organization (Clay-Williams & Braithwaite, 2015). Since the training was team focused, it would make sense for the participants to work with teams they regularly work with, but in this study the participants were not necessarily training with the same team they work with in the hospital. The training resulted in several comments about better understanding of the relationship between nursing and physician duties (Clay-Williams & Braithwaite, 2015). One participant commented that, "we also found that even in the presence of unsupportive leadership and significant cultural barriers, healthcare workers who value an intervention are able to innovate and implement important aspects of learning," which gives hope and support to this type of training despite some of the potential barriers (Clay-Williams & Braithwaite, 2015, p. 681).

This article describes some of the practical barriers to intervention, such as the contrast between the leadership perceiving themselves as supportive, but the participants believing that there was not enough leadership support (Clay-Williams & Braithwaite, 2015). For example, study participants identified the authority who could excuse them from work to attend the intervention. Participants stated they had to receive clearance through their own individual channels, which were not clearly defined and took extra effort on their part. Those who participated likely had a particular interest in this training, creating a selection bias. In other words, there was no overall system in place to support attendance at the training. This study differs from this dissertation proposal in a few ways. First, this dissertation proposes to interview the leaders of the initiative instead of participants. Both perspectives are important and a follow up study can investigate both perspectives to identify similarities and differences,

as well as to gain a greater understanding of the barriers and facilitators from both points of view. Second, this study asked how individuals applied the information into practice, but this dissertation identifies barriers and facilitators to the process of implementing a simulation-based intervention.

A second qualitative study by Kristensen et al. examined clinician perceptions of barriers and facilitators when implementing research findings into practice (Kristensen et al., 2016). Even though this was not specific to using simulation as a modality to translate knowledge, it shed some light on the barriers and facilitators identified by the clinicians in trying to implement new clinical guidelines to practice. At the individual level, Kristensen et al. identified a difference between the physician and nursing groups. Autonomy was identified as a factor for consideration regarding physicians, due to their professional identity and ability to make their own decision about how to practice (Kristensen et al., 2016). Exemplified by the quotes, "we don't all do things the same way," and "we don't have to follow the guidelines. We might be satisfied with the treatment we already have, and not find the new treatment much better. It might even be more expensive. So we don't have to put it into practice" (Kristensen et al., 2016, p. 5). The physicians tended to prefer an individual, patient level professional decision over a standardized approach to patient care, even if the standardized approach was evidence-based. This study did not address using the standardized information to adapt to the individual patient as evidence-based practices are supposed to work, as opposed to a more cookbook-style clinical decision-making strategy.

Implementation barriers for nurses included the ability to advocate for evidence-based change, only if they were deemed to have the appropriate authority to do so. This included having "a clinical doctorate," and "be recognized as clinical experts with educational expertise and advanced interpersonal, teamwork, and communication skills" (Kristensen et al., 2016, p. 8). Nurses who possess these qualities are able to use them as facilitators, as they have been more likely to overcome barriers and be successful at implementation (Kristensen et al., 2016).

Other nursing barriers were lack of time, interest, and skill (Kristensen et al., 2016). Additionally, all individuals felt that conflicting priorities, such as multiple organizational initiatives, too many changes at one time, or an overall overwhelming workload, were barriers to implementation (Kristensen et al., 2016). At the team level, behavioral compliance with new recommendations requires all staff to continuously establish new routines utilizing the new guidelines (Kristensen et al., 2016). This information can help form an understanding of factors that impact why individuals implement changes into clinical practice (Kristensen et al., 2016).

A literature review and commentary by Walsh et al. (2020) identified barriers to develop, implement, and evaluate a team-based simulation built on the current literature to reduce risk in emergency medicine. These were not identified in the article as translational simulation because the focus of the article was on simulation for emergency medicine that addresses risk. It was looking at latent safety threats identified during the simulations. These latent safety threats can be corrected and have the potential to improve patient safety. Latent safety threats are "dormant weaknesses in technology and process that could potentially harm patients or staff" (Bender & Maryman, 2018, p. 96). It is not a direct measure, but more articles have been using latent safety threats as a proxy measure for improving patient outcomes (Lee et al., 2021; Nickson et al., 2021; Shah et al., 2020). These barriers may overlap with the barriers to translational simulations. They identified participant engagement, logistics, and addressing cultural complexities as barriers to development of simulation (Walsh et al., 2020). Barriers to implementation include participant reluctance, lack of stakeholder buy in, and a domineering participant (Walsh et al., 2020). Barriers to evaluation include program impact and disappointment in limited changes and results due to a lack of follow through on circulating the results to front line staff and ensuring changes are made to patient care (Walsh et al., 2020).

An interesting limitation of simulation-based translational research was proposed by Griswold-Theodorson et al., saying that since "educators spend significant energy implementing educational programs as performance and quality improvement efforts, rather than studying

them with the intent to publish their outcomes, it is also possible that successful simulation-based mastery learning (SBML) interventions at all four translational levels may not be submitted for publication and therefore will remain unknown" (Griswold-Theodorson et al., 2015, p. 1558). Additional barriers that limit the use of simulation-based training were identified as “expensive initial costs for equipment and facilitator training, a lack of rigorous proof of effect in translation and science, and a strong resistance to change among health care professionals” (Bilotta et al., 2013, p. 4).

An article by Trawber et al. (2021) describes the experience of a team who developed and implemented a simulation consultation service that was geared toward enabling translational simulations to occur across a large tertiary care hospital in Australia. The simulation consultation service provides anyone in the healthcare system who wants to request a simulation with an simple form and intake process. The simulation staff along with trained clinical faculty help to develop and run the simulation sessions in-situ. Their approach to planning a translational simulation was briefly outlined in the article but lacks detail. The data collection process included the number of simulations were requested and conducted, as well as their after-action report findings and participant evaluations. There was no implementation theory or model cited in the article, and the authors did not comment on barriers or facilitators encountered in the process. However, the article reiterates the challenge that “remains for health care service providers to fully harness and implement translational simulations throughout their institutions” (Trawber et al., 2021, p. 262).

Lastly, an article by Nicolson et al. in 2021 proposed an input-process-output model for using translational simulation. The article combines the experiences of the three authors as well as the simulation literature. The authors group translational simulation activities into three groups: diagnostic, which is to determine what problems exist in their characteristics; interventional, which is to provide solutions to problems; or a combination of both diagnostic and interventional (Nickson et al., 2021). According to the authors, one reason to use

translational simulation is targeted interventions that focus on improving clinical performance or patient outcomes (Nickson et al., 2021). It could also test and design plans for new infrastructure or a change in infrastructure, new equipment, or innovations (Nickson et al., 2021). The third reason is to explore work environments and the people within them, in other words, using it for human factors testing, diagnosing and improving (Nickson et al., 2021). Some overall guiding principles of translational simulation are identified as promoting organizational learning as opposed to individual knowledge (Nickson et al., 2021). This includes looking at the system as a whole and not focusing on teaching the participants a particular piece of knowledge (Nickson et al., 2021). Improving stakeholder involvement includes participatory design and co-creation of the intervention, such as goals, needs of the participants, and an overall shared mental model between clinicians, simulationists, and researchers (Nickson et al., 2021). Having an ongoing strategy for improvement, as opposed to a single event can also improve stakeholder involvement (Nickson et al., 2021). They stated that it is important to have narrow, specific goals and to use functional task alignment when choosing the equipment and location (Nickson et al., 2021).

The model includes three phases: input, process, and output. The input phase includes defining the problem, deciding if translational simulation is the right approach, determining if the focus is diagnostic, interventional, or both, and reviewing the project (Nickson et al., 2021). Reviewing the project means using a theoretical model, such as the Plan-Do-Study-Act (PDSA), and asking if the project is worth the cost. What are the unintended consequences? Is there capacity to run the program within the system? (Nickson et al., 2021). The process phase includes the simulation design, delivery, data collection, and data analysis. The output phase includes reporting and disseminating the results and reviewing the program for continuous quality updates that can be incorporated into a future iteration. The authors state that the future direction for translational research is to ensure data collection, analysis, and outcomes are included in the initial planning phase by studying return on investment. This connects

translational simulation to quality improvement and human factors, builds capacity for translational simulation within health services, and makes translational simulation a viable option when new knowledge must be quickly applied (Nickson et al., 2021). For example, COVID-19 demonstrated the necessity for the rapid application of new knowledge into clinical practice (Nickson et al., 2021). The article concludes that "translational simulation remains a nascent but promising approach to supporting solutions for the growing complexity of health care" (Nickson et al., 2021, p. 9).

## Gaps Identified by the Literature

There is limited empirical data on the barriers and facilitators to implementing simulation-based translational research. The majority of the current literature comes from opinions in the form of a single case example, several commentary articles, or one debate articles. The empirical evidence that exists is a single case description on experience of a research team disseminating a successful simulation-based intervention to another hospital site, and one qualitative study that interviewed participants for their personal barriers and facilitators to using the knowledge learned during simulation training in patient care (Clay-Williams & Braithwaite, 2015; McGaghie et al., 2015). There are several publications that demonstrate a translational outcome using simulation; however, those studies do not address the implementation of barriers or facilitators. Some of the authors of these studies were invited to participate in this research dissertation to gather further insights from their experiences. The addition of this instrumental case study which explores in-depth descriptions of barriers, facilitators, and approaches to translational simulation will add novel information to the literature.

# CHAPTER III

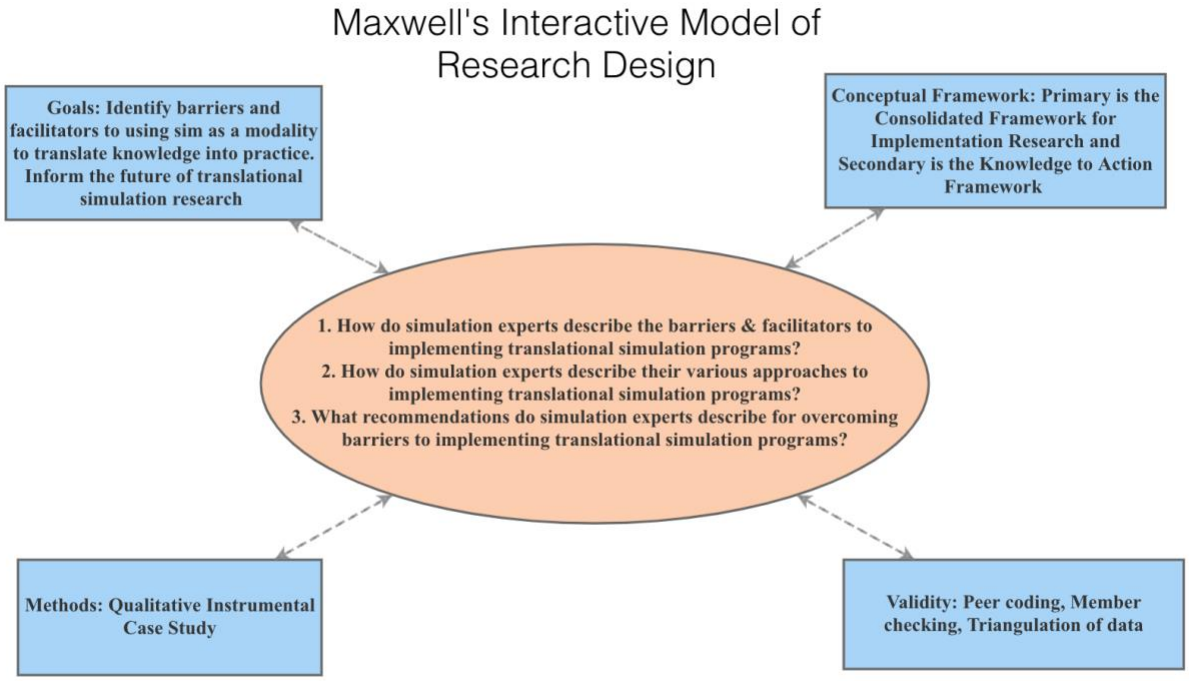
# METHODOLOGY

This chapter provides a discussion of the methodology for this dissertation, including data collection methods, participant selection, the interview questionnaire, ethical considerations, and the rationale for each decision. The end of this chapter addresses plans for passive and active dissemination of the research findings. The choice of methodology was guided by the research question, and this dissertation followed Maxwell's interactive model of research design to ensure alignment among the research goals, questions, conceptual framework, methods, and validity (see Figure 4) (Maxwell, 2013).

This dissertation aims to identify the barriers and facilitators to implementing simulation-based translational research. This research question is exploratory in nature, looking to understand the experiences of individuals who use simulation as a teaching methodology to study the translation of knowledge into clinical practice. Qualitative research is an evolving science which aims to observe, interpret, and transform the world (Creswell & Pooth, 2018). It takes place in the real world as opposed to a laboratory setting and seeks to make sense of the phenomena and provide meaning (Creswell & Pooth, 2018). These qualities align with the goal of this dissertation.

**Figure 4**

*Maxwell's Interactive Model of Research Design*




## Philosophical Foundations

Ontology, epistemology, and methodology are important foundational philosophical concepts to this dissertation, as they guide the research design itself. Ontology is the researcher's belief about the nature of reality and how we come to know that reality (Corcoran, 2018; Terrell, 2016). Epistemology is the researcher's belief about their role in the research process. In other words, how involved or separated from the research participants will the researcher be during the study? Will they be immersed and have direct communication with the participants, or will they try to keep their distance to maintain objectivity? These concepts together guide the methodology to align with the ontology and epistemology (Terrell, 2016).

This dissertation adopts interpretivism as an ontology, which reflects the goal of the dissertation, and is used to interpret the reality the research participants ascribe to translational simulation and the barriers and facilitators to conducting it. This is a relativist ontology, meaning the findings are relative to the research participant and are not necessarily objective truths, but rather they are the constructed realities of the interviewees. In addition, the

constructed realities of the participants will be interpreted by the researcher. The goal is to understand how the participants' local context has shaped their reality of the barriers they have encountered and the facilitators that have assisted them. An interpretivist epistemology was adopted for this research because it embraces multiple realities, and it is anticipated that this dissertation will reveal different truths depending on the experiences of the participants. This dissertation employs an emic approach, which allowed the researcher to gain a deep understanding of the participants narratives. The researcher engaged directly with dissertation participants during interviews and was immersed in the data to maximize understanding and inferences. As such, the researcher interacted with participants as opposed to taking an emit approach, which takes an outside view and aims to gather objective data. The researcher conducted the interviews, transcribed them, analyzed the data, and developed codes and themes. Therefore, the researcher had contact with the dissertation participants during the entire process in case clarification or further explanation was needed. Following the interviews, participants were contacted again for member checking. This research process has been influenced, consciously and unconsciously, by researcher's personal history, identification, cultural worldview, and professional experiences.

## Rationale for the Dissertation Design

Qualitative research typically stems from interpretivist or constructivist ontologies, and it often aims to shed light on social or behavioral constructs. As demonstrated by the literature review, there is a need for a deep exploration of the approaches, barriers, and facilitators to implementing translational simulation. This is one of the reasons for choosing a qualitative methodology, more specifically the use of a qualitative instrumental case study, which uses multiple instances of the case to gather an in-depth description (Creswell & Pooth, 2018). An instrumental case study is used to explore an issue in detail, and this study accomplished this by interviewing multiple individuals (Creswell & Pooth, 2018). An instrumental case study uses the context of the case setting to assist in the understanding and draws upon multiple data sources

to understand an in-depth picture (Creswell & Pooth, 2018). This dissertation uses the documents to understand context, and the interviews and focus group to gather a detailed understanding of the interviewee experiences. This dissertation includes multiple individuals from a variety of simulation programs across the world. It focuses on the approaches to implementation they undergo as part of their simulation program work. The emphasis is more so on the central phenomenon as well as the barriers and facilitators rather than on a comparison between programs, centers, or individuals (Yazan, 2015). Although some comparisons could be done as part of analyzing the data for themes, a focus on comparing programs could be a topic for a subsequent study.

Another reason qualitative research aligns with the purpose of this dissertation is the complexity of health care systems and the vast variation in health systems across the world. This complexity cannot be fully understood through survey data or other quantitative means. The complexity itself is one of the aspects that needs to be explored through the qualitative interview process. This exploration can provide the necessary depth to assist others who use simulation as a methodology to translate knowledge.

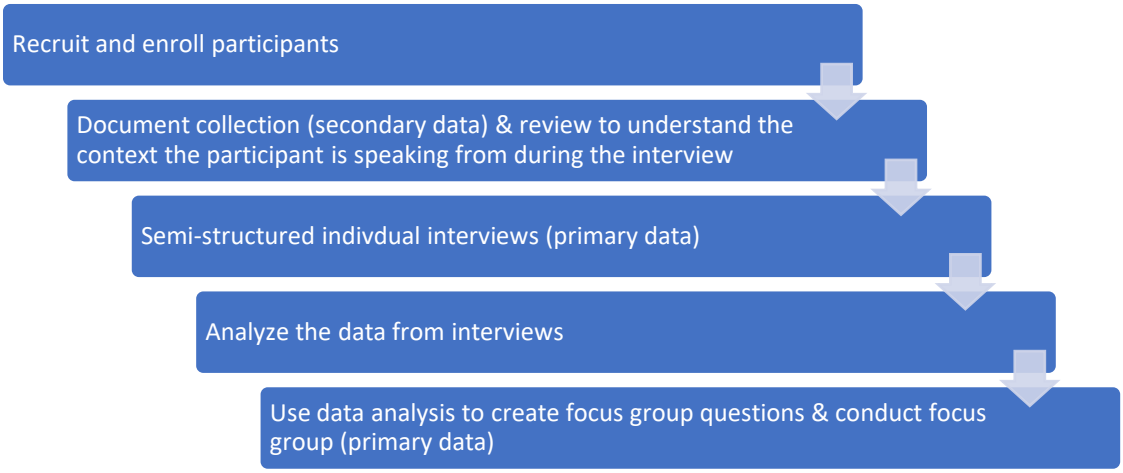
## Dissertation Design

This dissertation had three phases of data collection and analysis. Data sources included documents, semi-structured interviews, and a focus group (See Figure 5). Initially, participants were asked to share documents they use when planning and implementing their translational simulation projects. This helped set the context for the case study and helped the researcher understand what kind of data they collected to evaluate their program. It also served as a method of triangulation and verification for the codes and themes (Creswell & Plano Clark, 2018; Creswell & Pooth, 2018). The interviews and focus group were the primary data sources, and the documents were secondary data sources. The semi-structured interview protocol is based on both the KTA and CRIF frameworks (see Appendix A). This information was used to gather a deep understanding and description of the participants' experiences with barriers and

facilitators during their implementation processes. Following the data analysis from the interviews, willing participants were invited to a focus group.

**Figure 5**

*Dissertation design & process*




The document review, when documents were provided prior to the interviews, gave context for the conversations as well as verification when compared to the information provided during the interviews. A variety of documents were submitted by eleven dissertation participants, including links to YouTube channels, publications, simulation planning documents, unpublished articles, textbooks, accreditation documents, and organizational websites. While most individuals emailed documents before the interviews, a few participants emailed documents (or additional documents) following the interview. The documents provided to the researcher prior to interviews gave context for the specific type of simulation center (hospital, academic or university) and the topic (central line training, advanced cardiac life support, pediatrics, etc). This context was used to rephrase or modify the interview questions. The researcher was able to review the participants' organizational websites and relevant publications before their interview. That data provided context even if the participant had not emailed documents prior to the interviews. When participants sent documents after the

interview, they were analyzed using the same template as the documents that were sent prior to the interviews (see Appendix D).

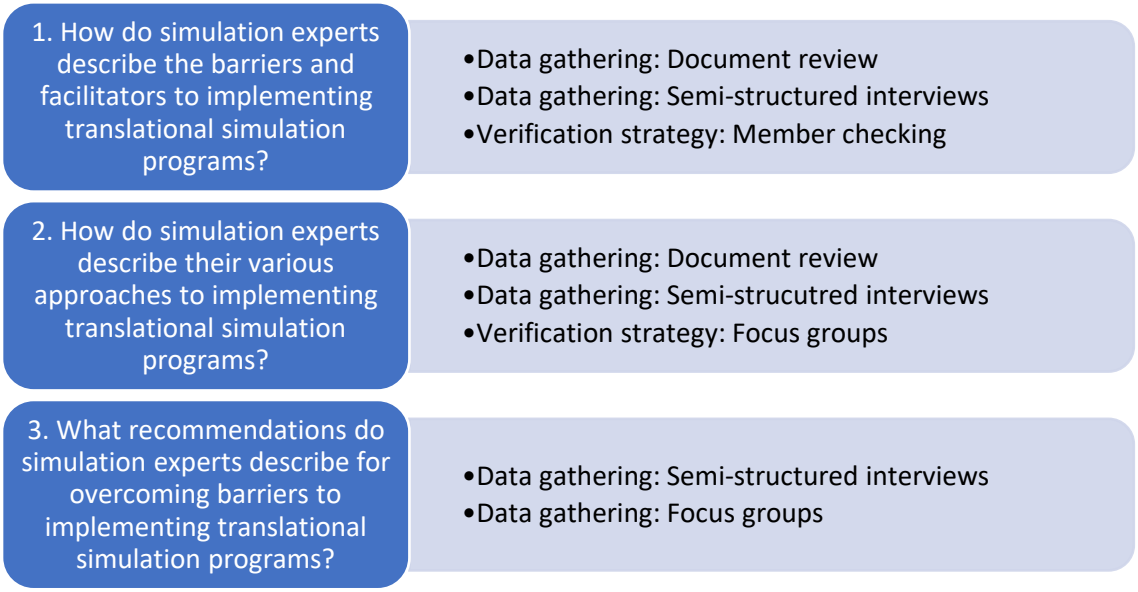
All documents were reviewed again after the interviews for consistency between the documents and the interview data. If documents were not obtained before the interview, the interview questions were asked as they appear in Appendix A. The document review used the standard template found in Appendix A, which was derived from the Healthcare Standards of Best Practice for Simulation Design (INACSL Standards Committee, 2016). The participants were not aware of how the researcher was analyzing their documents and no one discussed the Healthcare Standards of Best Practice; however, these standards are present in the documents published by INACSL as well as the SSH accreditation standards, in free online courses through the University of Washington and through workshops at conferences (*University of Washington Simulation Online Training and Resources*, 2021). Therefore, there are multiple opportunities for individuals to be aware of simulation best practices. After the analysis of the interviews and focus groups, the documents were reviewed again in relation to the themes and research questions. The document review was secondary data and was used as a verification strategy.

Eighteen semi-structured interviews, which ranged from 30 to 63 minutes, were conducted based on the interview guide (Appendix A). On average, each interview lasted 46 minutes. The interviews were a primary data source. After interview data collection and analysis, member checking was conducted by summarizing the data analysis into a short email, which was circulated to dissertation participants. Participants were asked if the summaries accurately represented their experiences and to provide feedback if it did not. Ten participants responded with a confirmation that the summary accurately represented their interview and experiences.

The focus group further explored the results from the interviews and queried next steps, recommendations, and questions that came out of the document review and interview data analysis. The focus group was a primary data source. The ideal focus group would have six to eight participants, but could be run with as few as two or three individuals since the topic was highly specialized (Onwuegbuzie et al., 2009). Based on scheduling and availability, the focus group for this dissertation consisted of four members who meet once, and the conversation lasted 1 hour. The focus group participants were already enrolled in this dissertation and had participated in the semi-structured individual interviews. The size of the group allowed for diversity of thoughts but also remained small enough that everyone had a chance to speak to each question while staying within the hour timeframe (Onwuegbuzie et al., 2009). The intention of the focus group was twofold. First, it was to ensure the data analysis from the documents and interviews accurately reflected the participants experiences. Second, it created a social context to tease out additional spontaneous responses about recommendations for implementing translational-based simulation programs (Onwuegbuzie et al., 2009). The focus group questions were determined after the initial data analysis of the documents and interviews (see Appendix B). The focus groups served as a verification strategy for the first and second research questions, and a data gathering approach for the third research question (see Figure 6).

**Figure 6**

*Research Questions & Alignment with Data Sources*




## Participant Selection and Recruitment Procedure

Individual dissertation participants were identified through their public facing work in translational research using simulation. Dissertation participants work as simulation program leaders or researchers who have been involved in implementing simulation-based translational research. These individuals have been identified either through published literature, presence on simulation podcasts, plenary speakers at conferences, or personal interactions with the researcher. Prior to contacting potential dissertation participants, the researcher read publications or other forms of scholarly work by the potential participants to ensure they had the relevant experience to participate in this research. This dissertation required that participants had first-hand experience running a translational simulation session or program to align with the dissertation goals. This dissertation involved individuals working in a multinational context due to the relatively few locations where this type of research takes place and the desire to tap into the expertise of experienced individuals. This is a purposive sampling strategy that identifies participants that align with the purpose of the dissertation (Terrell, 2016).

In addition, maximum variation sampling, which is ideal for meeting the needs of the research questions in this dissertation, was used (Creswell & Pooth, 2018). The criteria for the maximum variation sample included three components: duration of time in simulation, geographical region, and healthcare discipline. The more variation in the sample, the more diverse the information, which can provide a full picture of what is currently occurring in translational simulation programs. Since healthcare simulation is a relatively new field, some of the interviewees have 1 to 2 decades of experience; these individuals are the pioneers of healthcare simulation and likely created the groundwork for healthcare simulation today. This means they did not come into a field that had structure, theories, and foundational elements in place; rather, they helped create those foundations we have today. The view of both groups is important for this dissertation as it shows the evolving nature of the field. The geographical location is important because different areas of the globe are at various stages in their development of healthcare simulation and translational simulation programs. The third criteria, healthcare discipline, was added because nursing and medicine have different approaches to healthcare simulation, and this dissertation wanted to capture both. Lastly, snowball sampling was employed by asking the interviewees to identify additional experts through their professional networks who may be interested in participating in this research.

The initial data collection included 18 individual participants from 10 different sites. This allowed for more than one participant to be from the same location or to talk about the planning and implementing the same simulation-based translational research project but from different perspectives. For example, one interview could be with a simulation researcher, and one may be with a simulation clinician educator from the same organization. Additional experts identified by the participants were also be invited to participate in the dissertation until sufficiency was reached. See Figure 7 for the full listing of participant characteristics.

One of the limitations of this sampling strategy is that individuals have recall bias that limits their ability to accurately remember all aspects of the interview questions. Additionally, it is

human nature that once success has been achieved, every struggle throughout the process to get to the success may not be remembered or recalled. This may lead to remembering more of the facilitators than barriers or bias the information in other unknown ways. Therefore, these unconscious cognitive biases should be kept in mind when considering the results.

Potential dissertation participants were contacted individually via email and when possible, using a mutual acquaintance. Some individuals were already known to the researcher and the dissertation committee members through their work in simulation education and translational research. The email contained a short description of the research and the informed consent form (Appendix C). Any questions from potential dissertation participants were directed to the researcher or the Dissertation Chair, who serves as the Principal Investigator. The informed consent process is described in more detail below under ethical issues. Upon agreement, individuals were enrolled in the dissertation research. The dissertation participants were asked if they were willing to provide the documents they use to plan, implement, and evaluate their translational simulation. The documents were used as secondary data and provided the researcher with context for the interview conversation. Dissertation participants were asked to provide a few convenient dates and times for the interview. A calendar invite was emailed to participants through the telecommunications platform WebEx, which is through George Washington University (GWU) and uses end-to-end encryption (*Cisco WebEx*, 2021). This dissertation only required audio recording, but participants had the option of using voice only or voice and video capabilities with this platform. Exclusion criteria for this dissertation was a lack of expertise or experience using translational simulation. Lack of expertise included minimal experience with simulation or translational simulation as defined by years of experience and involvement in translational simulation planning and implementation.

The interview questions followed the semi-structured interview questionnaire found in Appendix A. The interview questions were shared with the participants prior to the meeting to allow them to plan and reflect on their answers to the questions. Each interview began with

introductions and a short background description from the researcher to provide context for the interview questions. This interview protocol allows for open-ended questions as well as follow-up questions that guide the interviewee toward the dissertation research interests (Terrell, 2016). All interviews were audio recorded and transcribed using GWU's WebEx transcription service (*Cisco WebEx*, 2021). Each interviewee was asked to identify a specific translational simulation project they have been involved in implementing. Individual interviewee responses were bounded by the healthcare environment in which their implementation took place. This dissertation did not specify timing, but rather allowed the interviewee to choose their most recent or most memorable experiences. The context was initially extrapolated through the review of documents and then secondarily explained by each research participant as part of their semi-structured interview.

Once data analysis of the interviews was complete, a focus group was held virtually, and the attendees were selected from those already enrolled in the study and based on the individuals' willingness to participate, ability to schedule the group, and their expertise and experiences. The number of focus groups was determined based on need and participant availability, with a goal of at least one focus group to allow for group discussion of the findings and provide additional insights into the topic and next steps. The focus group was audio recorded and transcribed using WebEx transcription service (*Cisco WebEx*, 2021). A group of four met once, for one-hour, and the questions discussed are in Appendix B.

## Development of Interview Questionnaire

The interview questions were guided by the KTA framework and CFIR model. Damschroder et al. created an interview guide that follows the CFIR constructs, and this was used as the initial template for the interview questions. This dissertation adjusted the Damschroder et al guide by cutting down the number of questions to fit within the interview timeframe. Additionally, questions about barriers and facilitators were added to each section of the process questions to align with the focus of the research questions. The questions were pilot tested by the dissertation

committee members, who provided review and feedback. The questions were also reviewed by simulation experts who commented on their relevance to the dissertation and ease of understanding the questions. Practice interviews took place with individuals who were not dissertation participants to ensure the questions were eliciting the desired answers. Two practice interviews were completed, and revisions were made to the interview protocol after each iteration before finalizing the protocol.

## Data Analysis

This section outlines the data analysis process. The unit of analysis for this dissertation is the individual interviewee. Although participants may have commented on team or organizational barriers and facilitators, the analysis focused on the experience of the individual participant.

Initially, insight into the context of the case study were extrapolated using the document analysis questionnaire (see Appendix D). There are two sections to the analysis questionnaire: the introduction section aims to identify context for the simulation by asking about the organization and the simulation program, and the planning section asks about the design of the simulation activity. The planning questions are based on the Healthcare Simulation Standards of Best Practice for simulation design (INACSL Standards Committee, 2016). One additional question was asked at the end of the document review: “What additional insights did you gain from this document review?” The information gathered from the document review was used to inform and adapt the interview questions to ensure new information was discussed during the interviews. This data was secondary to the interview and focus group data.

Interview transcriptions were coded inductively and deductively in two stages. First, an inductive approach was taken using open coding due to the qualitative nature of the dissertation and the desire for the data to speak for itself by emerging as the interviews are conducted and the results analyzed (Terrell, 2016). In this phase, the transcripts were read with an open mind. The researcher asked, “What is the data saying?” and coded based on the answer to this

question. The analysis was an iterative process. The data was initially read along with the audio to ensure the transcription was correct. Then each transcript was reviewed again to determine open codes. Immediately following each interview, field notes were written by the researcher. During or after each transcript was analyzed, a memo was created to capture the researchers' thoughts, reflections, and ideas from that interview.

Each quote was reviewed again to assign a sub-code to identify each as a barrier, facilitator, and/or advice. These additional sub-codes were used to identify barriers, facilitators, or advice to assist with answering the research questions. After completing the open coding, deductive coding was used to group codes into themes according to the theoretical frameworks. The codes were then mapped to the CFIR intervention characteristics, outer setting, inner setting, characteristics of individuals, or process factors. Since the CFIR process factors are the focus of this research, those were further delineated, including planning, engaging, opinion leaders, formally appointed internal implementation leaders, champions, external change agents, executing, and reflecting and evaluating (CFIR Research Team-Center for Clinical Management Research, 2019). Codes were grouped into categories based on their relationships to the theoretical models and represent patterns across the set of experiences (Creswell & Pooth, 2018). The codes were also grouped into categories based on their relationships to other codes within the same category. These categories then helped create the themes. Each code was reviewed for quotes and consistency across coding. Peer coding was completed by a fellow qualitative researcher who reviewed the code book as well as a transcript for discrepancies, inconsistencies in coding, and overall understandability of the qualitative reasoning. The peer coder found the transcript to be consistent with the code book. In addition, a dissertation audit was competed by a committee member. This included reviewing a code under multiple transcripts for consistency of the meaning of the code. During data analysis, a constant comparative approach was utilized to continuously return to the data to ensure the analysis is consistent with the data. The software program ATLAS.ti was used for data analysis (*Atlas.ti*

*Qualitative Data Analysis*, 2020). The data was analyzed to determine when sufficiency had been reached. After thirteen interviews, no additional codes were added, and it was determined that sufficiency had been reached. Additional interviews, that had been previously scheduled, were conducted and added to the richness of the data and expanded upon the stories and explanations behind each code.

The focus group provided both a verification strategy to ensure the results were reflective of the participants experiences and to gather new primary data about recommendations for others looking to implement simulation-based translational research. Therefore, focus group data was analyzed according to these two criteria: First, does the data reflect the experiences of the participants (verification)? Second, what recommendations do they agree with from the data and what recommendations to they add based on the focus group conversation? The data was recorded and transcribed using GWU's WebEx software platform (*Cisco WebEx*, 2021).

The reliability and validity of the data is important to this dissertation. In order to maximize these concepts for this qualitative dissertation, this research uses overall trustworthiness, which is a "function of four factors; credibility, transferability, dependability, and confirmability" (Terrell, 2016, p. 173). Credibility can be considered as a parallel qualitative concept to internal validity in a quantitative study. This is achieved through understanding the research environment and the central phenomenon as well as engaging with the study participants to develop relationships based on trust and understanding. Interviews were conducted until sufficiency within the data occurred. This means there are no new ideas being introduced by additional interviews, and signals that the researcher has reached a point where the topic has been adequately explored. Sufficiency in this research refers to a full understanding of the research question based on the data gathered so that the researcher can move forward with the newly gathered information in a meaningful way.

Transferability is the parallel term for qualitative research that external validity is to quantitative research (Terrell, 2016). Since qualitative results are not intended to be

generalizable, transferability allows the study's findings to be applicable in other contexts. This is done by detailing the results in a way that describes the scenario, situation, and events in sufficient detail that it can be used by other programs. Transferability also includes a thorough description of the methods, coding, and results of this dissertation, so other programs to use the information in their own context.

Dependability refers to the consistency of the results. This can be done by an external auditor who examines and evaluates the research process and accuracy of the results (Terrell, 2016). For this research, the dissertation committee, peer coder, and dissertation readers' provided review and feedback.

Confirmability is a discussion about how the researcher ensured neutrality during the dissertation and can include audit documentation trails and an awareness of the researcher's actions which can affect the study outcomes (Terrell, 2016). The confirmability of this dissertation was enhanced by an audit trail of documents, processes, codes, and themes, all of which can be shared upon request. Triangulation of data was conducted by looking for a consistent message in the documentation, interviews, and focus group. Additionally, confirmability was addressed by using member checking, which involves asking the dissertation participants to review a short summary of the results to verify the researcher accurately represented their experiences (Terrell, 2016). Participants were able to provide feedback and corrections during this phase to ensure their narrative was understood in the way they intended.

In addition to the above methods, the concept of reflexivity was utilized in this dissertation. Reflexivity is how the researcher acknowledges and discloses their role in influencing the dissertation (Creswell & Plano Clark, 2018). Creswell and Pooth state that, "a qualitative text cannot be separated from the author, how it is received by the readers, and how it impacts the participants and sites under study" (Creswell & Pooth, 2018, p. 306). Since the data is interpreted through the perspective of the researcher, it may be influenced in unknown ways by their conscious and unconscious thoughts. The way data is interpreted and written reflects an

individual's culture, gender, class, and politics. The best way to acknowledge this is to engage in self-understanding about the biases, values, and experiences (Creswell & Pooth, 2018). This dissertation fully embraces the subjectivity inherent in the data analysis process. One way to further acknowledge this concept is to discuss the researcher's experience with simulation-based translational research. The researcher of this dissertation has 10 years of experience using simulation in healthcare education, which brings understanding and life experience to the interviews and data analysis. Another way to acknowledge the researcher's influence on the dissertation is to record the researcher's observations and reactions in memos which can be used to collect and analyze. Memos were completed throughout the process after each interview and during data analysis to capture reflections, thoughts, and ideas. At the end of this dissertation, the memos were reviewed to reflect on biases, values, and experiences as a way to be self-conscious about how these have influenced the findings, conclusions, and interpretations (Creswell & Pooth, 2018).

## Ethical Issues

Ethical decision making is essential to all research practices, and this dissertation considered several ways to mitigate ethical risk to participants. The Institutional Review Board process, informed consent, individual risk, organizational risk, and data security will be discussed in this section.

After approval of this proposed dissertation by the dissertation committee and before data collection, this dissertation was submitted to the GWU Institutional Review Board (IRB) for ethical review. The documents included the dissertation protocol, the informed consent agreement (see Appendix C), and the interview questionnaire. This dissertation received expedited review due to the low-risk to the dissertation participants. After the IRB reviewed and approved the dissertation documents, data collection began.

As mentioned above, the risks to individual participants in this dissertation was low. Individuals were asked to share one to three hours of their time to discuss the barriers and

facilitators they encountered through their simulation work. The questions were not personal to the individual and did not address sensitive or controversial topics. The individual could also skip questions they did not wish to answer.

There may be organizational risks since the interview asked about barriers the participants have encountered. This may come across as organizational challenges and shortcomings. While this is not the intent of the dissertation and the researcher recognizes that issues and challenges are normal within an organization, the question may pose criticism to the organizations involved. To mitigate this risk, participants were each assigned an individual pseudonym, and organizational affiliations will not be mentioned. Additionally, participants had the chance to review the dissertation results to ensure their intentions were correctly captured.

The informed consent process began when dissertation participants were initially contacted via email. The email contained a short description of the research dissertation and the informed consent document (See Appendix C). Dissertation participants were asked to read the consent form and encouraged to ask questions before, during, and after signing the consent form. They were notified that they were allowed to change their mind about participation at any time with no consequence. They were asked to sign the consent form and email it back to the researcher. Participant consent was also revisited verbally at the beginning of the interview. Contact information for the dissertation chair was provided in case there were concerns. This process upholds the principle of autonomy, which includes respect for "participants' rights, the right to be informed about the study, the right to freely decide whether to participate in a study, and the right to withdraw at any time" (Orb et al., 2000, p. 95).

In accordance with general ethical standards, the principles of beneficence, respect for persons, and justice were also considered. Beneficence means doing the most good and preventing harm (Orb et al., 2000). This was accounted for by allowing participants and their institutions to remain anonymous. Additionally, the interviews, data, and results will be kept confidential among the researcher and the dissertation committee. Raw data will not be released

to the public, and all participants are referred to throughout this dissertation by assigned pseudonyms. The next general ethical standard is justice, which means equal sharing and fairness among those in the study and those who will benefit from the study and taking into consideration to use of vulnerable subjects (Orb et al., 2000). It also involves avoiding using coercion to force individuals to participate in the research. The selection of subjects was a fair process that identified dissertation subjects who can benefit from the results of this dissertation. The dissertation subjects are working professionals and are not considered a vulnerable population. Dissertation subjects will not be paid or otherwise compensated for their time. Since the interviewees are experts engaged in simulation-based translational research, they will be able to use the information provided by this dissertation to identify common barriers and facilitators shared with others in their field. This information should be useful to adjust their current practice and learn from others.

To maximize data safety and security, the researcher would only provide the dissertation committee members with access to the data if necessary. Data was stored online using ATLAS.ti Software and Otter.ai transcription software (*Atlas.ti Qualitative Data Analysis*, 2020; *Otter AI*, 2019). These platforms have data security measures in place. Otter.ai does not sell or share data except as necessary by law (Otter.ai, 2020). Data is synced over an encrypted connection and stored in a physically and electronically secure data center (Otter.ai, 2020). To further enhance the data security, once the transcriptions are downloaded from the Otter.ai website and the dissertation is complete, the data will be deleted from Otter.ai and maintained on the password-protected, personal computers of the researcher and a dissertation committee member. ATLAS.ti 9's security policy states the sharing of confidential information with a third party requires a non-disclosure agreement and that "transfer of sensitive information over public networks must be encrypted at all times" (*Atlas.ti Privacy Policy*, 2020). All data files are housed on the researcher's personal laptop which is password-protected. Sharing of files and data with the dissertation committee was done through a secure GWU Box account. After the

completion of this dissertation and graduation, all audio recordings will be deleted permanently, butthe transcriptions will be maintained. Anonymized quotes will be used in this dissertation report and any publications that may come from this work.

## Dissemination Plan

The dissemination plan is made up of both active and passive plans. The research results will be shared with the expert team that participated in this dissertation. They are the target audience for this research and this information should be interesting and helpful to them. Next, presentations will be submitted to the International Meeting on Simulation in Healthcare (IMSH), the Dissemination and Implementation (D&I) annual conference, and the Association of Medical Educators of Europe (AMEE) conference which has a conference section for dissertation presentations. This work can serve as the basis of one or more publications that share the dissertation findings in peer reviewed journals. One of the targeted journals is BMJ Simulation & Technology Enhanced Learning (BMJ STEL), which publishes articles on simulation as an educational intervention tool and seeks to contribute to "knowledge translation for practitioners, teachers, students and leaders" (BMJ Publishing Group Ltd & ASPiH, 2020). Another targeted journal is Simulation in Healthcare, which is a "multidisciplinary publication encompassing all areas of application and research in healthcare simulation technology" (Society for Simulation in Healthcare, 2020). In addition to presentations and publications, this research is the beginning of a larger research agenda that will continue to build upon the findings, potentially looking to apply the findings of this dissertation to a specific context building capacity within the simulation community for additional translational science and research work. This exact plan will depend on the dissertation findings and will be discussed in Chapter V.

# CHAPTER IV

# RESULTS

This chapter presents the results of the analysis from this qualitative dissertation on translational simulation, asking the following research questions:

1. How do simulation experts describe the barriers and facilitators to implementing translational simulation programs?

2. How do simulation experts describe their various approaches to implementing translational simulation programs?

3. What recommendations do simulation experts describe for overcoming barriers to implementing translational simulation programs?

This chapter begins with an overview of the dissertation context and participants, which describes the participants and their expertise in relation to translational simulation. Then, this chapter presents the themes that emerged from the analysis of the interviews and focus group data, along with the codes and categories that connect and represent the themes. The data analysis process began by reviewing the documents that were emailed by participants prior to the interviews. These documents were used to provide context for the individual's experience in using translational simulation and used as were secondary data. Next, the semi-structured interviews were analyzed in aggregate after the completion of all 18 interviews. Finally, the focus group data was analyzed. The data from the interviews and focus groups will be presented here in an integrated fashion according to the five main themes that emerged: clarifying goals and definitions, special considerations, social networking, research, and factors external to the simulation program. Throughout this chapter, the following will be used to stylistically identify a code, category, and theme: codes will be italicized, categories will be bolded and italicized, and themes will be bolded.

## Participant Education and Experiences

This dissertation had 18 total participants. Thirteen participants work within the United States of America, representing six states in the following regions: Midwest, Southeast, Northeast, and Pacific West. The remaining five participants work in Canada, Australia, or the United Kingdom. Participants from Asia were contacted but none were able to participate. Eleven participants had more than 10 years of experience and seven had less than 10 years of experience. The interviewees represent 10 different simulation programs and several participants worked at the same institutions, allowing for different views on the same projects. Fourteen individuals have clinical backgrounds, including nursing, paramedic, and medicine. There were also several non-clinicians in the dissertation with backgrounds in business, education, research, and one other unique discipline which will not be identified here to maintain anonymity. There was a mix of expertise with many clinicians also having a background, special training and/or experience in education, research, or simulation methodology. This distribution aligned with the initial intent for maximum variation sampling through identifying people from different countries, programs, experience levels, and disciplines (see Figure 7).

**Figure 7**

*Participant Characteristics*

| **Characteristics** | **Number (%)** |
|---|---|
| **Total Participants N:** | 18 (100%) |
| **Clinical Background:** | |
| No Clinical Background | 4 (22%) |
| Yes, Participants have a clinical background | 14 (78%) |
| **Experience:** | |
| Less than 10 years | 7 (39%) |
| Greater than 10 years | 11 (61%) |
| **Location:** | |
| Within USA (*Pacific West, Southeast, Midwest, & Northeast)* | 13 (72%) |
| Outside USA (*Canada, Australia, & United Kingdom)* | 5 (28%) |

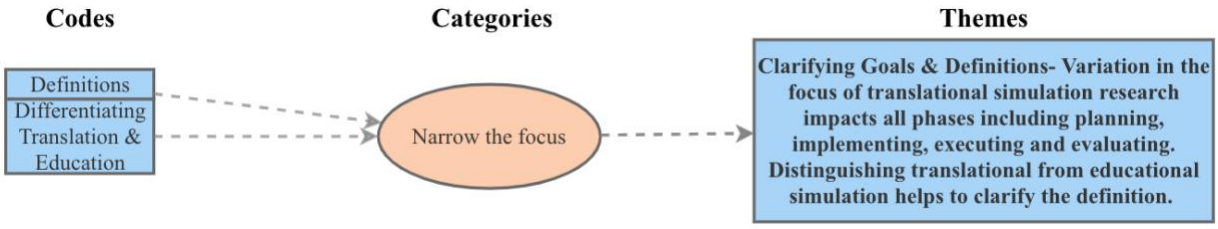
The analysis of the 18 interviews resulted in 26 codes, nine categories, and five themes (see Figure 8). While sufficiency was reached after 13 interviews, interviews 14-18 were analyzed for additional quotes and to enrich the data, but no new codes were identified. The five themes include clarifying goals and definitions, special considerations, social networking, research, and factors external to the simulation program (see Figure 8). Definitions, example quotes, when to use, and when not use, each code are available in the code book (Appendix E). The focus group consisted of four individuals and added two new codes (patient safety and quality and definitions) and added the theme clarifying goals and definitions.

## Interview & Focus Group Results

### Theme 1: Clarifying Goals & Definitions

**Clarifying Goals and Definitions** helps narrow the focus of the translational simulation by considering and choosing a translational simulation definition that works for the team and for the purpose of the simulation, and by distinguishing translational simulation from educational simulation. ***Narrowing the focus*** of the translational simulation clarifies the definitions that will be used by the translational research team, as well as the purpose and goals of the simulation. Since a lot of variety exists within the translational simulation spectrum of research, these are important initial conversations for the planning team. The researcher did not know a variation in definitions would emerge, but throughout the interview process it became clear that participants held different perspectives on translational simulation research. Clarifying the definitions, goals of the session, and differences between translational simulations and educational simulations was a critical finding for this dissertation. As there is overlap between educational simulation and translational simulation, differentiating the differences between translational and educational simulations helps provide clarification to the translational simulation planning, implementing, executing, and evaluating teams. Both *definitions* and *differentiating* were not found to be barriers or facilitators; rather they represent a foundational conversation that impacts all other aspects of the translational

simulation process.




### *Narrowing the focus*

During the interviews, the researcher noticed interviewees spoke about translational simulation in slightly different ways and wanted to clarify the various viewpoints. Overall, interviewees talked about simulation being used to improve patient outcomes in general terms, but they seemed to come at it from different angles. The various approaches are logical when considering the translational continuum encompasses many different aspects and is broad in scope. T1 simulation may take place in the simulation lab and collect learning outcome data, but T4 research may take place in-situ and collect patient outcome data. These are quite different in their purpose, planning, and approach. *Definitions* emerged to explain the various types of translational research as it applies to simulation.

Some individuals and teams use the definition proposed by the National Institutes of Health for biomedical translational research, and others more closely follow the definition proposed by Brazil (2017), which focuses more on classifying the simulation-based on the purpose of the event. Additionally, the Society for Simulation in Healthcare Accreditation standards focuses on integrating simulation into the quality and patient safety departments with a focus on bidirectional feedback (Committee for Accreditation of Healthcare Simulation Programs, 2016). These views are complimentary and provide slightly different interpretations on the definition. During the individual interviews, some participants who use Brazil's definition tend to separate an educationally focused simulation from a translational simulation-based on its purpose. For example, a simulation that can be directly linked to patient outcomes or a health service priority would be translational as well as those that are diagnosing, troubleshooting, or intervening in a

system issue (Michelle). To address the inconsistency in the definitions, this dissertation allowed participants to use their own definition of translational simulation. Although all views of the definitions are valid, this brings about the importance of narrowing the focus of the translational simulation program to the goals and needs of the organization. The simulation team, as well as the research and clinical teams, all need to share the same mental model to clarify of their purpose. The interviewees suggested that the researcher be crystal clear about what the team is trying to achieve.

*Differentiating translational and educational simulation*

Although there is overlap between an educational and translational simulation intervention, there are also key differences. Most translational simulations will have an educational component, but the learning may come as a result of the simulation instead of the simulation to transferring knowledge to the participants, which is typical of an educational simulation. *Differentiating translational and educational simulation* includes examples of similarities and differences between translational simulation research and educational simulation. Translational simulation research differs from education simulation in that the assessment is inseparable from the simulation. This assessment could be at the level of the individual, team, or system. Translational simulation research requires high quality rigorous metrics. Therefore, it is important to document outcomes that matter and use robust data collection to facilitate the process. There is a need in translational research for specific benchmarks for measuring outcomes. Participants noted that the metrics used for translational simulation are not as direct as those for educational research.

Translational and educational simulations are similar in the planning phase because they both start with a needs assessment (also see code *needs assessment*). The needs assessment for an educational simulation is different than for a translational simulation because an educational simulation tends to start with the learner and a translational simulation starts with an important patient outcome or healthcare service problem. Therefore, the need for a translational

simulation may come from a clinical indicator (or clinical data) and not necessarily a learning objective. It is similar in that the process begins with the end goal in mind and works backward to determine if simulation is the right modality to address that problem. Both may include an educational strategy in the process, but the goal of a translational simulation may not be to teach something specific. An example of this would be in the case of an educational simulation that might train clinicians to perform a procedural skill. The goal of the translational simulation could be to allow the team to work through a new process together, fix problem areas, and discuss ways to improve their process. Due to this difference, the simulation scenario may not be planned in as much detail for a translational simulation as it might be for an education simulation. The goals of the session are clear, but do not have a specified educational end point.

The planning phase is different because, in translational simulation, there are more stakeholders from a broad range of backgrounds. There are also typically more planning conversations, and the planning conversations could be the most beneficial part of the process because it involves the stakeholders discussing an important clinical or healthcare. As Michelle explained, “The simulation might look like an educational one, but the planning and discussions after would look different.”

Other differences include accounting for coverage of patient care during the simulation as well as the emphasis paid to minimizing the time spent to achieve the simulation’s objectives. This is both respectful of clinician time, which is valuable, but also keep costs low. Allowing people to practice in their work environment (in-situ simulation) with their actual team members is important because it is about knowing their environment and their team (John, Kimberly, Christopher, Jennifer and Karen). When a simulation occurs with an ad hoc team that would normally be done with standard team members, the result may not always reflect what would be expected to occur in the real world.

The reporting after the simulation is also different for translational simulation because many participants write up a patient safety report after the event to state who participated, what

patient safety risks were identified, what was learned, and what can be improved, as well as action items. These reports also include assessments on the room, space, and equipment that could be improved for flow, efficiency, or accuracy of patient care. These after-simulation reports are widely shared with the participants, leaders, and safety and quality professionals. This is one example of data that is gathered and shared from the sessions.

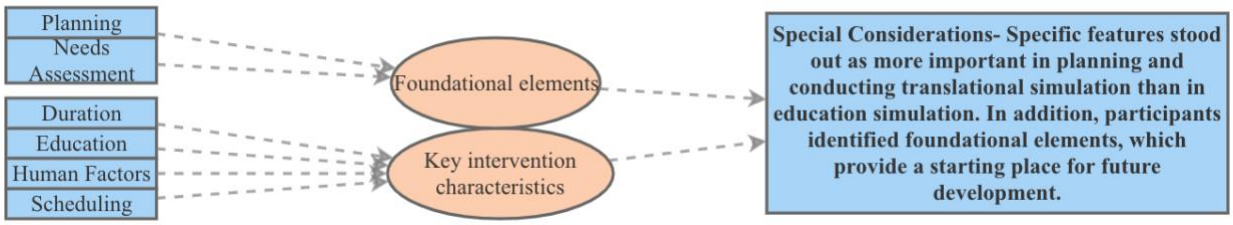
*Planning, stakeholders, needs assessment, patient safety and quality, patient outcomes, evaluation process and metrics, and human factors* all relate to **Clarifying Goals and Definitions** because a narrow and clear focus on the purpose of the translational simulation will impact these factors. The purpose of and focus on translational simulation can influence the planning phase because, without clear goals shared among the planning team, various team members could have different mental models of what should occur when implementing the simulation. Embedding the needs assessment into the planning phase helps to ensure the needs of the stakeholder and the organization are aligned and are being met by the simulation. Having clear goals also helps identify the appropriate stakeholder group, which should be broad enough to include all relevant perspectives based on the planning and needs assessment. During the early planning phases, consideration could be given to adding a human factor's expert and patient safety and quality professionals to the stakeholder group. Including the simulation and research team from the beginning of the process will help identify the right metrics to measure patient outcomes and create an evaluation process. In this way, this category in connected to several aspects of the process.

**Theme 2: Special Considerations**

Specific features in the development of a translational simulation stood out as different elements that have unique considerations when compared to educational simulation. In addition, participants identified ***foundational elements*** which provide a starting place for future developments. **Special considerations** describe planning the simulation, including a simulation educator in the process, scheduling challenges specific to in-situ simulation, and

consideration for including a human factors expert. Although these factors may be included in educational simulations, the details around these factors described by the participants are helpful to consider in the context of a translational simulation. *Duration, education, human factors,* and *needs assessment* were described as facilitators. *Scheduling* was consistently described as a barrier. *Planning* was both a barrier and facilitator.

There were several pieces of advice shared by interviewees when planning a translational simulation. The first piece of advice was to aim to meet an important need of the organization. Keep it simple, start small, and identify a small problem that can be addressed, then build upon the successes. Another interviewee strongly suggested using implementation science principles and change theory to support the planning phase. The last piece of advice in the planning stage was to shift one's own mindset before attempting to shift the mindset of others. This comment refers to ensuring the simulation facilitators and the entire team are clear about the process or translational goals versus educational goals since there can be a tendency for educators to revert to teaching toward a specific clinical practice.




### *Foundational elements*

Dissertation interviewees communicated that both the planning phase and the needs assessment are ***foundational elements*** to translational simulation. These two elements should be given special consideration because they are the basis for building the translational simulation intervention. This is because the duration of the event, designing the simulation intervention, the inclusion or exclusion of human factors experts, and scheduling all depend upon the need the simulation intervention will fill. This speaks to the planning phases and ensuring alignment of the simulation with the needs of the stakeholders and the organization.

*Planning Phase*

*Planning phase* encompasses the steps taken to plan the event before implementation. The steps for a translational simulation appear to be the same as for an educational simulation with a few additional important features. *Planning* includes the importance of stakeholder engagement, clarity of purpose and goals among the team, and the importance of planning.

There was a consensus about the steps used to create a simulation. Start by asking yourself, "what are you trying to do and what is the purpose?" Everyone needs to know what the purpose of the session is, and it should follow an identified institutional need. Several participants commented that the intention was clear but, as they started to implement, the team realized they were not sharing the same mental model. Kimberly captures this by describing,

> "I have gotten into a situation previously…We ran a really complex simulation with end users. I figured out halfway through they had no idea about the process that I thought we were implementing but in fact we were actually designing, but we didn't know that as the people running the simulation and it was hugely stressful and problematic so the planning is really important."

The preparation phase allows for focused testing or exploration to further clarify these goals if necessary. It is essential to clarify the goals of the session. A few participants made the distinction that the goal of a translational simulation was focused on process instead of trying to adjust someone's clinical skills to fit a particular standard, which may be the goal in an educationally based simulation. This type of shift in mindset for all team members is essential, otherwise the focus of the session gets lost. The individuals delivering the program shifted their mindset from focusing on educational value to allowing the team to identify ways they can improve or sustain better performance themselves (Jennifer). This may be nuanced, but the key difference is that the simulation staff's mindset go into a simulation with the idea that the participants must learn something specific versus allowing the team a chance to practice

(Jennifer). This can be difficult if the previous mindset for simulations was strictly knowledge transfer.

It is also best if good teamwork skills are modeled during planning. *Planning* relates to *social networking*. It was mentioned how important it is to realize that relationship building is occurring throughout the planning process and that the team should foster that opportunity. Michelle commented on this by talking about how she experienced the lack of relationship building as a setback, "It comes back to the planning phase where an overt goal was not actually to develop strong relationships in this group." She was commenting on the importance of the planning phase itself to avoid potential unintended consequences for participants. Michelle shared, "Doing harm, inadvertently…that you don't hear about and gets talked about on the sides, that results in colleagues crying…it sheds importance on the planning phase of translational simulation. This can't just be something that we throw together."

*Planning* also intersects with *stakeholders*. One of the key features of planning a translational simulation is engaging the key stakeholders, this emerged as more important in translational simulation than in educational simulation. This was expressed by several participants during the interviews and reiterated during the focus group. As James put it, "Engaging your stakeholders early and often, and knowing who those stakeholders are in the first place, because by engaging them from the beginning and taking into account their needs and wants, you're not going to run into barriers once you already get started" (James). Michelle added, "I think the more non-traditional we get about who those key stakeholder are, the better." Michelle was referring to inviting more stakeholder to the table, not just medicine and nursing colleagues. She mentioned inviting input from patient transportation, laboratory staff, and other ancillary staff members or leaders. Speaking to a barrier, Christopher added, it can be "hard to get the [clinician] subject matter experts in that area" to have the time to sit down and build the simulation during the planning phase due to time constraints and other competing priorities (Christopher).

The last foundational element of *Planning* relates to *evaluation and metrics*. Weaving research into a standard process from the beginning of the planning phase was described as a facilitator, which over time becomes part of routine work as opposed to something additional or an afterthought. This integration both includes the research team as a stakeholder group and allows them to help structure the intervention to allow for robust measurement to be captured.

*Needs Assessment*

All programs discussed beginning with a *needs assessment* which aligns with their institutional goals. This step is essential because the simulation program should address a important need and can be demonstrated to others. It was identified by the focus group as a foundational aspect of translational simulation. As one participant stated, “Getting people in the same room talking to each other collegially is half of the battle of what we do” (Michelle). Getting people together assists in obtaining stakeholder buy-in, and creates a purpose for the efforts. A distinction was made between starting with a learning outcome and starting with a health service priority or patient outcome. Typically, the latter is used for a translational simulation as opposed to starting with a learning objective or need, which is used for an educational simulation. After the needs assessment is completed, the planning for the educational program can begin. If it is a process-oriented session, there may be less of a structured scenario (Jennifer). As an example, the scenario could be geared toward a need to assess a new process of transporting a patient from the trauma bay to the imaging scanner and back (Jennifer). This process occurs during patient care and could be run with the clinical teams in their typical clinical setting to examine any issues or delays that occur in the process. In other words, a specific simulation scenario does not need to be created for that event. Instead, the learning would come out of the team’s assessment of ways the transfer went well and ways the process can be improved upon.

***Key intervention characteristics***

***Key intervention characteristics*** were discussed by participants as different for translational simulation than for educational simulation. Particular attention should be paid to arranging these factors to suit the translational simulation. The *duration* of the event is more important because of the large number of stakeholders. Particular attention was paid to keeping the event as short as possible while still achieving the goals. *Duration* also touches on the duration of the planning phase, which tends to be longer for a translational simulation than for educational simulation because of the need to include a broad stakeholder group as well as ensure the appropriate metrics will be captured. *Education* speaks to understanding simulation education, involving a simulation educator, and sharing translational simulation education curricula. These aspects of education overlap with those of an educational simulation; however, realizing that these aspects can have a larger impact on a translational simulation, the interviewees discussed them in detail. Although human factors may be used for educational simulation, it seems to be particularly important for translational simulation because similar methods are used when testing new workspaces and new processes. Scheduling for in-situ simulation and ensuring coverage of actual patient are duties are different than in most educational simulations.

*Duration*

*Scheduling* and *duration* are related in that the duration reflects the learning objectives or the goal of the simulation and respects the time of the participants by keeping sessions as short as possible while still achieving the goals of the session. The duration of the sessions dictates how long the simulation program leadership reserves the clinical space and which clinicians to involve, taking into consideration those who may be balancing patient care duties. Simulation program leadership need to consider the duration of the event, allowing it to meet the session goals but also to keep the time to a minimum if using clinician time and clinical spaces. John talks about this saying, “[When] we run an in-situ…we debrief at the bedside, and we try to finish in a very short range, you know, it’s 30 minutes” (John). Karen echoed this

duration by adding, “The scenarios usually run fifteen-ish [minutes]…the debrief is really honestly about fifteen minutes long” (Karen). This contrasts with an educational simulation which often lasts one hour or longer.

The amount of time the planning phase takes varies depending on the type of event. If it is a routine or algorithm-based simulation, it is quick to plan, but “if you’re really going to do something significant, you’re probably looking at a month or 2 or 3 months out” (John). Other participants gave a range of two weeks to 10 months for planning (Kimberly & Christopher). The duration of planning also depends on the “maturity of your simulation service, it depends on the investment and availability of people who are involved in that planning phase, and it depends a bit on the kind of complexity and timeline of what you’re trying to achieve” (Michelle). Clearly, the duration of time for planning a simulation as well as the duration of the event itself can vary based on a variety of factors and is typically decided on an individual basis as part of the curriculum planning process.

*Education*

*Education* speaks to understanding simulation education, involving a simulation educator, and creating and sharing translational simulation education curricula. The first concept under *education* is that clinicians are not inherently educators. Some participants commented that unless a clinician has a background in education, they will not know how to write learning objectives or clearly define the goals or outcomes of the session. Therefore, writing of learning objectives, goals or outcomes typically occurs as part of the role of the simulation educator in conjunction with the clinician (John). There were also comments about the training faculty or instructors. “All training that’s done in-house by members of staff in-house and…they aren’t necessarily experienced in teaching, really, they just have a bit of an interest in it, but they might not actually really have the knowledge or the skills to be a good trainer” (Amy). Again, a partnership including a clinician and an educator tends to make the best pairing to accomplish the goals of an impactful translational simulation. In the case of a

translational simulation, the simulation educators must have additional knowledge about translational simulation.

Other participants commented that the lack of understanding of simulation education, particularly translational simulation, by those outside of the simulation center may lead to the simulation team being included in a planning process too late. Jennifer an experience that resulted in an inability to fully bring her translational simulation expertise and experience, and did not allow her to shape the intervention in a meaningful way (Jennifer). In her example, the simulation staff were asked to be stakeholders in the process but were pulled into the project at such a late time, she was unable to fully contribute because she was asked to get involved a few days before the event was occurring (Jennifer). This did not leave sufficient time for her to give input and for the project to implement the recommended changes.

Another concept was finding balance between standardization of training and flexibility. David captured this by saying, “You need to standardize everything you can, and training gives you the flexibility to stop the system from becoming too brittle. You understand if you over standardize it becomes quite brittle, because what if your situation isn’t exactly what you’re expecting?” (David). This speaks to training a team to be adaptable but still be within best practice standards, that way people learn to work within the constraints of the system and the resources available to them. Clinical situations are rarely standardized . They may have similarities and routine aspects, but adjusting for the situation at hand based on the patient, context, available resources, and available expertise is one of the overall goals of translational simulation and should be built into the training (Amy, David, James). The education should be standard but flexible at the same time and considering how to balance these two concepts is important.

The last idea captured by *education* was the need to have well studied and researched simulation curricula widely available for adoption and use at other locations. The idea that some programs could have a shared educational program that works and does not need to be re-

written for each location. This could build upon the above idea that there could be a standardized program that is flexible enough to be adapted for each organization. David commented, “What people never do in my experience is give you a recipe book of simulations” (David). This was echoed by Robert, “The number one thing they can really bring is curriculum that is ready for mass adoption” (Robert).

*Human Factors*

Several participants discussed using translational simulation for human factors testing. *Human factors* describe the way humans interact with equipment and systems. Although human factors may be used for educational simulation, it is particularly important for translational simulation because translational simulations is often used to test new workspaces and processes before opening or using them in patient care. It was viewed as a facilitator to consider incorporating human factors experts or concepts into the planning phase. It is also a facilitator to have human factors experts present during the implementation, especially for translational simulations because they can have an eye for patient safety concerns, specifically when simulations are done in-situ.

*Scheduling*

*Scheduling* (personnel and space) was consistently described as a barrier. Availability for in-situ simulation needs to be coordinated with bed management to ensure there is an empty bed and room available for the simulation to take place. Available beds change by the day depending on patient load (John). In the case of using clinical space for the simulation, more flexibility for scheduling and participants was described. The use of “no-go” criteria for cancelling translational simulation is important because it may not be safe to run a simulation if there are sufficient clinical staff or if the department is particularly full and lacking a bed or room for the simulation to take place.

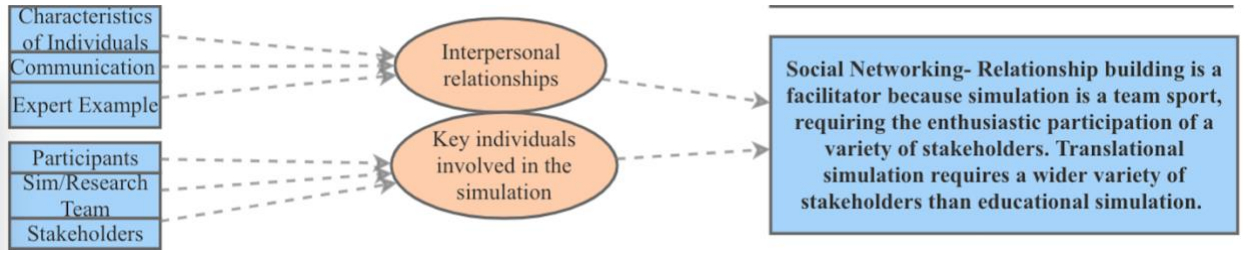
Special consideration is necessary to ensure ample staff are available to cover participants in the simulation and the patient care needs (Michelle). This may mean having

extra staffing on the day of the simulation or arranging the training at the beginning or end of a shift or providing other protected time. Several participants described how it can be difficult to get clinicians to attend a simulation because of competing priorities, the demands of patient care, and their clinical responsibilities. Overall, many participants commented on scheduling challenges and lack of avaliable clinical staff to participate. It was also noted that during the COVID-19 pandemic it was even more difficult to get clinician participation because everyone was called back to clinical duties, which was prioritized over administrative or teaching obligations.

**Theme 3: Social Networking**

***Social networking*** describes interactions and relationships between people; relationship building is a facilitator because translational simulation is a team sport, requiring the enthusiastic participation from a variety of stakeholders. In addition, translational simulation requires a wider variety of stakeholders than educational simulation. The following discussion explores how interpersonal relationships and key individuals involved in the simulation contribute to social networking. Relationships were discussed as an important underpinning of everything that happens within a simulation program. The stronger the relationships, the easier it is to accomplish the goals of the translational simulation program. Facilitators to successful translational simulation were described as *characteristics of individuals, communication, expert examples,* and *teams*. *Participants* and *stakeholders* could be both a barrier and facilitator. There were two pieces of advice provided by the interviewees about **social networking**. First, identify stakeholders early and include them from the beginning of the planning process. Second, in relation to the simulation and research team, build a team that has all the necessary skill sets and reach out to others as needed to ensure the

necessary skills are present.




### *Interpersonal Relationships*

The ability to have strong relationships was a key concept in accomplishing translational simulation since it requires several stakeholders and the ability to communicate well, market the simulation program as a resource, and gain the necessary buy-in. Interpersonal relationships were deemed essential to translational simulation, and they are highly influenced by the *characteristics of individuals* involved and the way those individuals communicate with others. The more personable someone is, the better they can make social connections. Several dissertation participants commented that it is "all about personal relationships," or it is all "about social networking," (Michael, James, John, Christopher). As Christopher put it, "When we get a new person that's leading that organization, then I put a full court press on to make sure that I get to know them" (Christopher). This quote exemplifies the proactive nature of a simulation center leader who connects with new people who are joining the organization.

*Characteristics of individuals* describes personality traits that often assist with communication and building social networks. *Characteristics of individuals* were described by interviewees as "simulation enthusiast[s]" or "advocate[s]", which helps to foster the necessary buy-in from clinicians and leaders. These qualities, in addition to those like "trustworthiness." increase the likability of the individuals and increase their ability to work well with others. *Expert examples* are specific ways to expand the social network by reaching out to someone who has experience in translational simulation and learning from their experiences. This requires *communication* to make the connection and build the relationship. Each interpersonal relationship helps to create a larger and stronger social network.

*Characteristics of Individuals*

Interviewees commented on the qualities of individuals that make their team and projects successful. These included “hard working”, “passionate”, “conscientious”, “maintaining lofty goals”, “care a lot about patients”, “simulation enthusiasts”, “trustworthy” and “incredible advocate” (Michael, Karen, Julie, William, and Amy). These characteristics described clinicians, simulation staff, researchers, and leadership. These characteristics stood out as attributes that facilitated the success of the translational simulation programs because these attributes make it easy to work collaboratively with those individuals.

Despite many participants commenting on the positive qualities, there were some comments on the negative qualities of individuals who inhibit program success. The interviewees described rarely interacting with individuals whose attitudes or behaviors were barriers. However, when those interactions occurred, the individuals were described as “hostile,” “aggressive,” or “resistant” (Kimberly & Michelle). Participants agreed in those cases, depending on who the individual was, they typically tried to avoid working with the difficult person by focusing on other projects or aspect of their work. One participant astutely summed this up by saying, “focusing on 20,000 people using the venue [simulation center]” is enough work (William). This quote comments on the idea that there is plenty of work that can be done with cooperative individuals, and therefore, it is better to focus attention and efforts on those projects, and to not worry about or waste time with people who are not supportive.

*Communication*

*Communication* is the foundation of relationships, and participants identified relationships as the foundation of getting work done. Personable individuals with good communication skills are better at forming and fostering productive professional relationships. Communication between individuals includes all forms such as verbal, non-verbal, written, and social media. When interviewees described a good relationship with others, they were able to work together to accomplish a shared goal. On the contrary, when individuals do not believe in

the value of simulation and communicated their view through words or actions, they become a barrier to the translational simulation.

One participant explained communication within relationships by saying, “I think everything is about knowing people and knowing how to get stuff done” (William). Another participant captured this by saying, “It came down to the people who were driving it and the relationships they had in the unit” (Amy). The overall sentiment was that everything involves personal contacts and social networking. Another participant commented, “In order to be [a] successful leader in simulation, I think you really have to have a very extensive social network” (Tammy). The importance of having a large social network and the social capital to get engagement in the simulation programs is echoed by James and Jennifer.

In terms of *communicating* from the simulation center out to the rest of the organization, one facilitator was to have a clear, consistent message from the simulation center. One participant explained their consistent message as, “We help people do their work better together and we help people explore, test, and embed better practice[s]” (Jennifer). This consistent message has been helpful across the institution because it communicates a partnership between the simulation center and the participants or clinicians. As the simulation centerbecomes more intertwined in the organization, it has been embraced more readily than if it was marketed themselves as a group of individuals who teach how to deliver patient care, since the participants are already practicing professionals.

Another participant mentioned that it was helpful to communicate through word-of-mouth advertising. This relates back to having a large social network and enough social capital to have good participation in events. In addition, it is important to communicate through the right channels. One organization described that they have a contact person for each hospital or unit, but they also communicate through the chief nursing officer, Director of Quality and a hospital administrator (Christine). This communication includes all the relevant leaders to keep everyone in the loop on simulation events. Providing simulation faculty development courses

was another way to communicate about simulation, create simulation champions, and build relationships (Jennifer).

Participants also commented on how the size of an organization could either serve to facilitate or inhibit communication critical to translational simulation. Smaller hospitals were described as having a more cohesive team interested in improvement (Christine). Smaller hospitals were described as tightly knit, and individuals and teams were willing to work together since people tended to know each other due to the smaller number of individuals working in the facility (Christine). This was viewed as a facilitator for working well together. In contrast, larger systems tend to be siloed, making it more difficult to collaborate. The more staff at the hospital, the less relationships existed between those individuals, especially across departments. Since translational simulation often requires a multidisciplinary approach, the planning phase of the process may involve individuals who do not have prior relationships with each other. Regardless of size, it was viewed as a facilitator for the team to be under one roof as opposed to being an entity from outside the organization.

*Expert Example*

Communication with someone who has expertise in translational simulation is particularly beneficial. **Social networking** includes reaching out to *expert examples* who have expertise in translational simulation. *Expert example* was used to describe the act of tapping into a larger social network to learn from others who already have experience. It can come from either inside the organization or outside, depending on the necessary expertise. As Christine states, “It's important to network and see what other people are doing because there's no reason to recreate the wheel” (Christine). Another participant commented that it is always possible to find someone who has the experience and learn from them. David said, “we’re very interested in positive deviance,” which is the study of units that function extremely well and exploring how they do it and what is the “active ingredient” that has given them their success (David). Building social networks to learn from others is a facilitator to a translational simulation program.

The idea of using the experts in in one's workplace for mentoring opportunities was discussed to enhance one's own career. James identified this by stating, "Find a great mentor that you trust and has your career interests in mind, not their own" (James). Angela added, "One of our really senior colleagues [name was taken out for confidentiality] is a wonderful teacher, so he volunteered to coach her and kept reviewing her stats [statistics] and talked through it with her because he thought it was such a fun academic exercise" (Angela). Melissa advised that if there is not someone within your network, ask around or reach out via email or social networks (Melissa).

> "Don't do it alone. Identify places, locations, people that are doing it if you're not in one of those places and you're still interested in trying to bring something new to where you are. Meet with the people who have already done that, you know, don't try to reinvent the wheel but learn from others." (Melissa)

Everyone described a positive experience when reaching out to learn from someone who has the knowledge and expertise they were seeking.

### *Key Individuals Involved in the Simulation*

Interviewees identified ***Key Individuals Involved in the Simulation*** should be included from the beginning of the process, and with whom it is important to form relationships to ensure a productive, collaborative effort. Key individuals include the participants in the simulation, the simulation staff team, research team, and relevant stakeholders who are chosen based on the needs of the program. Having a large social network can facilitate identifying the right team members. It is important to involve stakeholders at the beginning of the needs assessment and planning phases. The inclusion of a broad stakeholder group was identified as more important for translational simulation than educational simulation because of the variety of expertise necessary and the complex, multidisciplinary nature of healthcare delivery. Healthcare rarely takes place without the assistance of several professions, and this should be reflected in the translational simulation process to mimic real patient care (Collaborative, 2011).

The broad stakeholder group may include patients, participants, clinical and unit leaders, educators, human factors, and quality and safety professionals. As one participant stated, the more non-traditional they were in thinking about relevant stakeholders, the more inclusive they became. In other words, they have always included the medical and nursing staff, however, as they thought about being more inclusive, they added transporters, laboratory staff, and medical clerks to their translational simulation team. The simulation and research teams need to be involved to begin to develop relationships as well as guide the development of the simulation intervention to ensure it is designed and linked to important metrics. The research team should be brought in at the beginning, which may be different than in educational simulation, when an evaluation may be used as opposed to a research protocol. The use of metrics to evaluate translational simulation is inseparable from translational simulation research.

*Participant* and *teams* are closely related because multiple simulation participants could be considered as part of the team. For example, if a healthcare team is usually present for an obstetrical emergency, then that healthcare team is typically the same team that participates in the simulation. This ensures practice for team function, process, and communication with the actual healthcare team. Those who participated in the interviews and focus group thought about how to identify or target a team that can benefit from the simulation intervention. This quote describes the intersection of *participants* and *teams* by talking about participants as well as their clinical teams:

> "High performing teams are more than happy to do this [participate in simulations] and want to do it all the time and they probably get better doing it and it is probably important but your…impact may be less, but if you go into a totally dysfunctional team with a big problem this also isn't going to work so you kind of need to find what are the teams that are…precontemplation improvement. Maybe [they] don't have the skills to do it, but [they] want to, [this is] where you can be the most value added" (Michelle).

*Participants*

*Participants* are ***key individuals involved in the simulation*** and should be involved in the planning and overall improvement process. *Participants* are people who actively engage in the simulation activity and the description of their attitudes, beliefs, and behaviors about the simulation intervention. Some interviewees call them learners or students, depending on their level of training. These terms are included under participants because they are broader terms that encompasses all types of learners. *Participant* was differentiated from *stakeholder*; by using "*participant"* for those who the simulation was designed for instead of a larger stakeholder group, which would include faculty, clinical experts, and researchers. *Participants* were described as both a facilitator and a barrier, depending on their attitudes and assumptions about training. The first topic under participants was resistance.

> "We have more resistance from more established people. Even when we show that folks with 10 to 20, even 30 years' experience who have great reputations don't necessarily have the [measurable] skill sets that would…endorse their social label" (Michael).

Although this resistance was not specifically attributed to age, there is a correlation between older age and more experience. Resistance from learners can occur for several reasons. "Some individuals are resistant because they are afraid of being assessed and don't want to be exposed for performing as less than perfect, especially those who have been in practice for a longer duration" (Michael). It can be a result of the participants not understanding the impact of the intervention and therefore not appreciating the learning that can come out of the experience. Many people do not realize that simulation has real potential to improve their clinical care. Many learners attend training sessions with varying degrees of efficacy, which can lead to believing that the training may be a waste of time. Trainings are sometimes viewed as a checkbox instead of an actual quality improvement effort.

Another reason for lack of participant buy-in occurs when there is unrealistic staffing during a simulated event. One example of this was given when there were three nurses in the simulation scenario, but typically in an actual hospital patient care setting there would only be

one nurse present. Therefore, the situation itself was unrealistic to the participants. Additionally, logistical concerns can also contribute to resistance, such as when clinical duties do not allow for educational time, so it may need to be done during non-work hours. Resistance is more likely if the participants feel they do not have the dedicated time, ability, or inclination to participate.

Keeping patients and learners as the focus of the simulation facilitated successful translational simulation. James said, “It's about trying to help as many patients as we can and as many learners as we can.” Tammy described designing the simulation curriculum to meet the needs of the learners.

> “The learners are right that part of making sure you have optimal experiences for your learners was not just being able to develop curriculum it's also knowing where they are or meeting them where they are and making sure that they get the zone of proximal development that they can go from here in one session. People can't go from here to here in one session, so you have to know your learners enough to know what they are able to digest.” (Tammy)

Still Amy talked about how the participants came to value their expertise through the simulation training. “They really wanted us to be there to help them because a lot of them lacked confidence in what they were doing, and they felt that they hadn't really been prepared…so a lot of them really valued our input” (Amy).

*Simulation & Research Teams*

Another group of ***key individuals to be involved in the simulation*** are the simulation and research teams. These individuals should include both an educator and a researcher with knowledge in translational simulation. The term *simulation and research teams* is used to describe the makeup of the simulation team members as well as the characteristics and dynamics of the team. The idea of team makeup is to ensure that the right team members are in place, specifically that the team is large enough to have all the skills and experience

necessary (Kimberly). Social networks are also beneficial because knowing more people will assists the simulation leader in identifying the right individuals to join the team. If an organization has a larger network of researchers, statisticians, or clinical educators, it may be important to bring those individuals onto the team. If personal relationships are already in place, this will make the process easier. Not having the right team was described as a major barrier to accomplishing goals, such as creating and conducting research on a translational simulation program.

Participants suggested, if right skillsets do not exist within your organization, to engage with the bigger team even if it means looking outside the organization for team members. Having the right team overlaps with *characteristics of individuals* because the team should include members who are ambitious and their career goals should align with those of the group (Michael). Team members must be committed, and should want to find the time to accomplish the team goal because they believe in it. The team should have a structure whereby they can communicate effectively, abide by deadlines, and have mutual respect (Angela). In addition, building trust within the team is important (Melissa). It is best to have a team with diverse backgrounds to bring their expertise to the project (Angela). Generally, a mix of clinicians and researchers is ideal to ensure a varied skill set, in addition to having an administrator who can handle scheduling and provide logistical support (Angela, Doug & Melissa). The development of team members is also important for personal and professional goals. James describes this as,

> "The other thing that goes into the team is that everyone on the team is very goal oriented and aggressive with following through tasks. We've all been burned by having people that come up with great ideas and then it just fizzles away because no one takes ownership." (James).

One example of this is to partner a senior researcher with a junior researcher throughout the process. It also includes creating the team necessary to be successful, or partnering with simulation industry personnel and expanding the simulation and research team as needed.

When creating a team, it was suggested to ensure it is beneficial both professionally and personally for the individuals within the group because the group is more likely to succeed when the goals of the individuals align with those of the project.

It was important to hire the right team, “on purpose, when we are hiring for positions [we] wanted someone who has experience in qualitative research…It would be ideal if they had some experience…in survey design to make sure we're capturing as much as we can” (Julie). The “right team” depends on the specific goals of the team, however, the translational simulation research team, at a minimum, should at least include a simulation educator, translational researcher, and clinical expert. The team may also include a human factors expert, simulation champions from the unit or department the simulation will occur, and others, as specified by the goals of the team. Teams were overall viewed as a facilitator.

*Stakeholders*

Translation simulation requires a broader group of stakeholders than educational simulation. The idea of stakeholders was discussed frequently during the interviews and focus group. As mentioned earlier, stakeholders refer to everyone involved in the planning, implementation, and research of the simulation and anyone who touched a point in the process. It does not include participants who were categorized separately. Stakeholders can be identified though formal channels, such as through the department requesting the simulation or through an existing social network. Stakeholders were described as both a barrier and a facilitator to translational simulation depending on whether they believed in the benefits and the reason behind the translational simulation program or not; however, there are factors that can increase the likelihood of stakeholder buy-in, which are discussed throughout this section.

Interviewees described engaging with all stakeholders “early and often” as a facilitator (James & Jennifer). One reason for this is to find out “where your stakeholder needs and wants are and come into a compromise so that everyone’s idea can be taken into account” (James).

A barrier can be either not inviting all stakeholders to the planning phase or they could be invited, however, one profession dominates and essentially leads the simulation. Doing so, either intentionally or unintentionally, they create a bias toward the needs of their own profession, and the event becomes profession specific instead of interprofessional. Excluding stakeholders can have the opposite effect and further the issues associated with a culture of hierarchy. When a focus on one profession occurs, professionals who participate in the simulation but who are not the focus of the intervention wonder why they participated if their questions and needs were not addressed. Another barrier can be if all stakeholders are invited to the planning phase, but one group is not engaging. As Michele described it, “It is a very important diagnostic part of the process as well, right, like I think if you're planning something like this and there's just a single group that's not engaging.” Lack of engagement may need to be addressed or navigated around, depending on the issue underlying the lack of engagement.

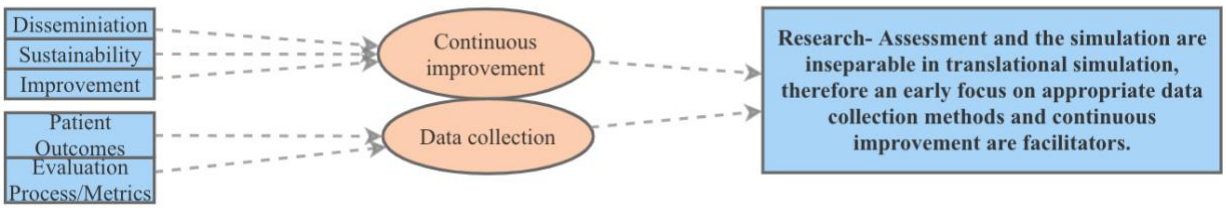
According to dissertation participants, it is essential when planning a simulation that will impact a particular hospital unit to make sure that people from the target unit are involved throughout the process from the outset. If they are involved in the process, they will feel that the simulation is an intervention coming from within their unit and are more likely to champion the efforts. When education is viewed as coming from an outside entity, it is often met with resistance. This tendency was described as occurring due to the assumption that the simulation was initiated because the hospital unit doing something wrong, and an outside team is being brought in to correct them. This incorrect assumption can be overcome utilizing the approach taken by the simulation team descried as partnering with the unit (Christopher, Jennifer, Amy, Angela, Melissa, Robert & Christine). The term “partnership” was used by interviewees demonstrating inclusive terminology and embracing the teamwork required to have successful translational simulation programs. Amy comments on this by saying, “I think that also came from the way that we sold it, we sold it from the beginning as a partnership that's not telling them what to do us working together to improve their training. It was more well received then I

was expecting" (Amy). This partnering is best done during the planning phase as opposed to waiting until the implementation phase, which can be viewed as too late by those impacted.

*Stakeholders* were discussed by several participants when talking about marketing the simulation program. Specifically, marketing within their own organizations as a group that can help teams perform better and identify process issues that can hinder great performance was a facilitator. This intentional marketing assisted with extending the social network of the simulation program because it worked to create more awareness across the organization of the translational simulation program. Stakeholders were described as barriers when the "major stakeholders with power didn't think it was necessary" (James). It was more of a comment on the observation, and alignment with the goals of the department and the simulation center. In other words, if the simulation faculty are not flexible in accommoding the needs of stakeholders, it will be a barrier. Flexibility describes *characteristics of individuals* involved in the simulation.

**Theme 4: Research**

Research assessments and the simulation are inseparable in translational simulation; therefore, an early focus on appropriate data collection methods and continuous improvement will facilitate success. **Research** describes the process of defining, planning, engaging in, evaluating, disseminating, and sustaining simulation-based translational research studies. *Continuous improvement efforts* and *data collection* are essential to the research process. The continuous improvement process extends to more than just implementing a translational simulation, it includes dissemination of the information, sustainability, and a continuous improvement cycle. Several pieces of advice were shared about research. The first piece of advice was about starting a translational research program, specifically starting with the end in mind to lay the foundation for a robust program. The rest of the advice was more specific to a particular project or creating a research plan. Begin each project with a literature search and define metrics that need to be collected. Remember to fold the research into a natural part of the daily work and begin by studying a T1 outcome then move to T2, T3, and finally T4.




### *Continuous Improvement*

Successful translational simulation requires continuous improvement to create and maintain a simulation intervention and to share an intervention across different units, hospitals, or countries. The constant research evaluation of these programs is inherent in the translational simulation process. *Continuous improvement* refers to the ongoing effort required when adapting to the local environment, monitoring, and action to spread the intervention, sustain it, or improve upon it. *Dissemination* and *sustainability* were viewed as barriers and *improvement* was a facilitator.

#### *Dissemination*

*Dissemination* refers to the spread of a translational simulation program from one unit, location, or hospital to another. Dissemination of programs was described as a challenge that requires ongoing effort. Several participants had success in doing so, but it was not without overcoming several barriers. Even with a highly successful program that is backed by extensive research and publications, participants described the need to continuously convince people that simulation works (Angela). Not everyone believes the data or they are resistant to making changes, so it still takes convincing to achieve the necessary buy-in (Angela).

When disseminating to another location, one program used 60% implementation as their marker for success (James). James commented that even though this is a good amount, it still leaves 40% of the program that was not implemented and, therefore, it could have the potential to work better and to improve patient care and outcomes (James). Depending on who the information is being disseminated to, it is important to consider that target audiences may lack certain skills that are necessary to continue the implementation. For example, when

disseminating a program to clinicians, one interviewee found that many individuals lacked the basic computer skills necessary to adapt the PowerPoint materials to their local contexts (Amy).

Adaptation to the local context was a key facilitator in the successful dissemination of all programs. To adapt to the local context, participants typically did a survey or scan of the equipment, materials, supplies and personnel available in that facility to guide the adaptation for that situation. One example given was when a clinician from a large hospital system was teaching at a rural location they realized the information being provided was not helpful in the rural context, therefore a rural clinician was then recruited because they have the experience to provide teaching and tips to others in that same situation (Christine).

*Sustainability*

*Sustainability* of simulation interventions requires continuous effort and monitoring. There is typically excitement and resources provided for a new program, but it takes extra effort to ensure the program remains intact, rigorous, and continues after the initial implementation. *Sustainability* relates to the historical code in that it is easy to revert to the way things have always been done instead of maintaining new habits, behaviors, or programs. It was described as overcoming a strong force to achieve sustainability of a new program. As Michael stated, "There's terrible power of regression toward the mean, reverting back to what we've always done." *Sustainability* is about maintaining a program once it has been implemented and it was described as a barrier, mainly because of the sustained effort and attention it requires.

A threat to sustainability is when champions or leaders leave the institution, or the project gets passed to less interested people who do not make time for it. As David put it, "There's something about discipline, there's something about sustainability, there's something about longevity that's really important, and let's not expect magic overnight." Some important ways the simulation center can facilitate sustainability were also identified. These include offering space, grant funding, and expertise through consultations in research, education, or simulation specific topics (Angela).

*Improvement*

Simulation programs exist to improve clinical performance and increase patient safety, and translational simulation is no different. *Improvement* encompasses any type of discussion, plan, or goal of improvement, and should be measured. Often simulation programs will use a continuous improvement cycle to ensure the feedback or research data collected is implemented into the next iteration of a simulation program. Interviewees talked about the organization's goals for improvement, including unit and department goals, and how those fit with the simulation center. William commented about the organization's feelings on improvement efforts by saying,

> "They love the US news and [world] report…rankings, they love trying to improve them. And a lot of investment goes into these programs…if we [as the simulation program] can link into some of these programs and be a supportive mechanism then we can help the institution move those programs forward to make them more recognizable, to maybe have more patients come…and have more income to become part of that entire…mission of the organization to improve patient care."

This statement highlights the organization's commitment and excitement about quality improvement and striving for excellent patient care. It also relates to the needs assessment of the simulations and assuring they align with the mission and goals of the organization.

Michelle stated, "The goal of improving our workplaces and our relationship and our team function, through a reflective process is something that can be done, it can be done anywhere." Interviewees talked about clinicians coming to the simulation lab after observing a particular performance improvement need within their department. For example, Michael noted, "Nurses said this is unacceptable and isn't tolerable and we've got to fix it." *Improvement* relates to *needs assessment* and *patient safety* because it encompasses partnering with clinicians to address problems important to them and improve patient safety. It was noted that

not all improvement goals align with simulation as a methodology and those goals should be addressed by other methods outside of the simulation program.

### *Data Collection*

*Patient outcomes*, *evaluation and metrics* are essential components of data collection for research purposes. ***Data collection*** encompasses all ways of measuring, evaluating, and researching translational simulations. Data includes patient outcome data but also other important metrics along the translational spectrum, such as qualitative data and after in-situ simulation reports. Measuring patient outcomes is an important aspect of translational simulation research and can be part of the evaluation process. The evaluation process includes considering which metrics to use and understanding the anecdotes shared with simulation staff about events that were simulated just before a similar real event occurred. Several participants discussed a post simulation written report about what was observed during the simulation and provided recommendations by and for the team. Evaluation can also include learner knowledge assessments, learner evaluations, faculty evaluations, and qualitative data. In addition, the focus group confirmed the challenge of deciding which metrics to use as well as how to define the boundaries of the research study. There were many barriers identified in the process of data collection. *Patient outcomes and evaluation process* were viewed as both barriers and facilitators.

#### *Patient Outcomes & Evaluation Process/Metrics*

*Patient outcomes and evaluation process and metrics* represent data collection, which is at the heart of translational simulation research. Showing improvement by using data to connect patient outcomes is necessary for conducting translational simulation research, yet it was discussed as one of the main challenges interviewees encountered. One barrier under *evaluations* was that “people don’t want to know,” meaning that some people want to run a simulation and feel that it made an impact without measuring it (David). The idea that people do not want to know was further explained by David who stated, “What if your life is wrong?” in

other words, what if everything you have been working for turns out to not have the impact you think it does when you study it (David). This itself can be a barrier. Other participants had similar comments about how some individuals are interested in taking pictures and reporting they ran simulations, but not necessarily interested in solving real problems. Other participants expressed this same idea by saying that some leaders are happy with the showcase of the simulation, for example, giving tours and showing off the “fancy toys and equipment” but not actually using it to improve patient care. This includes individuals within simulation programs and individuals in leadership positions. This is a barrier because there is no motivation, dedicated time, or necessity to conduct research in those situations.

In addition, some interviewees described how the hospitals also do not want to reveal their problems publicly for fear of tarnishing their reputation or losing business. William and Susan commented on how they are not allowed to go into certain events that involve sentinel incidents for this reason. John talked about the fact that the hospital is a public institution, therefore, the information is publicly discoverable, so the hospital is careful about protecting information. Yet another participant commented on how the hospital wants to keep the group small for litigation reasons, and therefore, the simulation team was not allowed into cases or meetings about medical errors.

It is helpful to have a built-in system for incident reporting with an area to indicate if it was identified during a simulation (John and Kimberly). This is one way to incorporate information from simulations into the larger patient safety data system. This helps integrate the lessons learned from simulations into patient care. It is also a facilitator to have a system where the simulation team can access patient care level data. That facilitates the ability to use the data for research purposes. In addition, having a longer track record within the institution helps to achieve integration into the system because you've already successfully completed other projects (Julie).

*Patient outcomes and evaluation/metrics* relates to *cost and resources* because funding was discussed as a reason for not enough robust outcomes data. Robert believes the main reason simulation has not become more widespread is the lack of evidence that its value exceeds its cost. “The reason that simulation hasn't been advanced is they haven't justified the cost of the additional expense…if you're just adding cost to the educational process and you're not explaining the benefit to the people, why are they going to give you more money?” (Robert). Robert extrapolates upon this by explaining that hospitals are businesses and chief financial officers (CFO) are business trained individuals looking to save money and keep costs low. Jennifer agreed with the idea there is a lack of information about return-on-investment.

> “I don't think we'd have return-on-investment for doing the return-on-investment analysis. That's a little bit to do with our budget systems. We still work on sort of historical systems and because no one has asked us to [justify our budget]. Part of it is also that actually we're a pretty cheap service for the volume that we do, so it's always easy to defend your budget when it's not very big.” (Jennifer)

Even for those who have the time, energy, and dedication to engage in research, there are additional challenges to conducting translational simulation research. These include loss to follow-up when simulation participants leave the hospital or system, such as during a study of medical students, residents, or nurses (Susan). When thinking about research, the “things that are easy to measure in terms of patient outcomes often times aren’t as important” and the important patient outcomes are difficult to measure, so it can be challenging to figure out what data to collect (Michelle). Several participants wondered, “How do you know what to measure?” (Michelle, Jennifer, Amy, Angela & Susan). They described some simulation events as solving one-off problems and others as addressing more consistent needs (John). In that case, measurement would make more sense for the simulations addressing consistent needs (John). Also, as one participant noted, “This is a complex adaptive system and we’re trying to put a

lovely linear process outcome on top of it" (Jennifer). This comment reflects on the many co-variables present at any one time in the clinical setting.

Others commented around this same idea of knowing what to collect and understanding how to demonstrate value. For those who have experience collecting patient outcome data, they also ran into barriers. For example, if studying a rare event, it takes a while to collect the data (Melissa). Also, it may be unpredictable when the clinical event is going to happen because it occurs randomly at all hours, so a clinical team is necessary to help collect that data (Melissa). Another challenge was, "When you prevent something bad from happening it's really hard to demonstrate that value" (Tammy). At any given point in time, there are multiple quality improvement programs going on, so it can be difficult to measure the direct impact the simulation program had on the outcomes versus the effect of other initiatives occurring simultaneously. In other words, there are many confounding variables always present and it can be challenging in the real world to control for them.

It was noted by Robert that, without the explicit goal of demonstrating a need for research and proving the impact of the simulation, there are often enough dedicated human and material support for research (Robert). This is discussed more in relation to *cost and resources*. The focus group also discussed a research facilitator; making research part of everyday work, so it is not something additional.

The actual planning, implementing, and measuring of research were all identified as barriers. There is overall a general lack of time committed to research within the simulation positions, and other job duties do not leave time to devote to it. An overall lack of simulation research positions was identified. Interviewees commented that simulation teams tend to be small and do not always have the capacity to take on all the simulation work that is requested, including dedicating time to translational and simulation research projects. Several participants commented that they do not have a team of researchers and their schedules are already full, which does not allow for taking on additional workload. Having dedicated simulation

researchers was a key facilitator identified as many interviewees did not have research as part of their job description. This was confirmed during the focus group discussion when the idea of a lack of simulation specific researchers was linked to the lack of funding for translational simulation research. There must be funds to pay for a research position, as well as funds for conducting the research projects. Also, when looking to engage in research, most individuals in healthcare are accustomed to quantitative research and therefore "qualitative [research] can be overwhelming" or outside of the skill sets of the individuals on the team (Julie). Additionally, some participants did not have direct access to patient outcomes data and therefore needed to go through another department where the data is tightly regulated for patient privacy, so it is difficult to access (Susan).

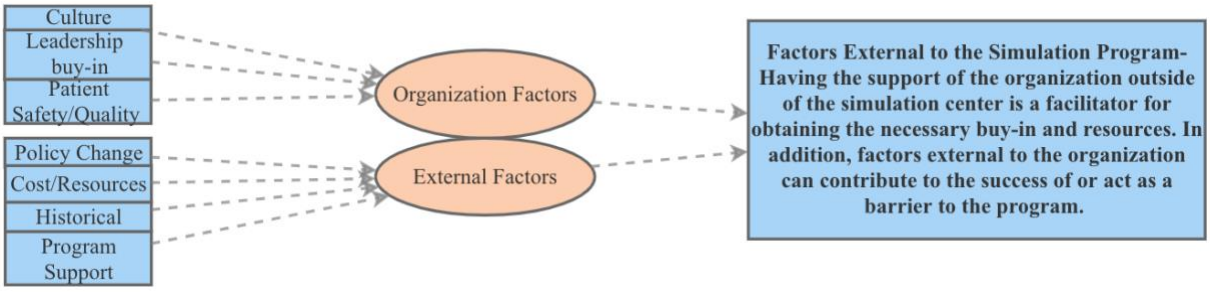
Another facilitator to translational simulation research is to make a convincing case that the educational intervention is what is responsible for the downstream results by demonstrateing results in sequence . This was described as starting with sequentially measuring T1, T2, T3, and T4 outcomes. Although this process may work for some translational research projects, particularly for those that begin in the simulation lab, it can be difficult to follow this approach when studying actual patient care areas and outcomes. Different approaches were utilized depending on the goals of the study and the research group. Some groups started at the T3-T4 level due to the needs of their organization. This was highlighted in both the interviews and the focus group discussion.

In relation to *risk, quality, and patient safety*, it can be helpful to incorporate research data into a study that is already being collected by patient safety and quality department within the institution (Michelle, Jennifer, William & Christopher). In addition, it would be extremely helpful to have a template for data collection that outlines a core set of outcomes that will be measured (Susan & William). The size of the organization was noted as a facilitator for research because the larger the systems had larger datasets to facilitate research. Lastly, it was identified

as a facilitator that there are many existing tools available for studying skill performance and communication, which can be used for translational simulation research (Susan).

**Theme 5: Factors External to the Simulation Program**

Having the support of the organization outside of the simulation center is a facilitator for obtaining the necessary buy-in and resources to support a translational simulation program. In addition, **factors external to the organization** can contribute to the success or act as a barrier to the program. The important external factors to consider are policies, funding and resources, the history of medical education, and external support such as organizational or vendor partnerships. The qualities that tend to originate from within the organization but outside of the simulation program itself that impact the program are organizational leadership, the organizational culture and departmental alignment with patient safety, risk, and quality. In relation to an educational simulation, these factors were identified as more important for consideration due to the idea that more stakeholders, leadership buy-in, and resources are necessary for translational simulations. This requires broad support that comes from the organization as a whole and not just from within the simulation center. Additional resources or support from larger organizations, governments, or policy makers are also helpful in providing support for translational simulation. *Policy*, *cost, culture*, and *leadership buy-in* were identified as both barriers and facilitators. *History* was a barrier, while *program support* and aligning the simulation program to the efforts of the *patient safety, risk management* or the *quality improvement* departments were facilitators. There was one piece of advice given about external factors and more specifically speaking to ***organizational factors***. The advice was to start to understand the culture, how the hospital works, and how quality systems and quality initiatives work in the politics of the institution before trying to start a translational simulation program. The knowledge of the organization outside the simulation program will facilitate the development of a successful translational simulation program.




### *Organizational Factors*

***Organizational factors*** originate from within the organization but may be from outside of the simulation program. They speak to larger support from the organizational structure, leadership, and ethos of the organization. The *culture* of an organization is related to the *leadership buy-in* because when leaders are supportive of the simulation program, it tends to influence the other clinical leaders and staff. When the leaders have simulation buy-in, it is easier to achieve organizational structural changes, such as imbedding the simulation program into the efforts of the quality, patient safety, or risk management department. Typically, the reporting lines for departments were in place before a simulation center came into existence, therefore, the way the simulation center becomes administratively connected to the quality and safety department is if the simulation leadership as well as the overall leadership of the organization agree it should be integrated in that way.

#### *Culture*

*Culture* refers to the attitudes, behaviors, and beliefs of the individuals within the organization. Some organizations are known for staying current with new practices in healthcare, continuously striving to be safer and improve their services, while other organizations do not put as much emphasis on improvement. These variations impact the employees and the culture of an organization. Interviewees talked about a culture of learning, which described a willingness and openness to new ideas and making changes to their work. Having a good "simulation culture" was an expectation that events will be simulated as a routine part of clinical work, process evaluation, and improvement. Once it is an expectation, it does not

seem unusual nor does it feel that anyone or any group is being singled out, but rather it is just a matter of routine practice. In addition, having a "good simulation culture" means the participants generally understand the value of simulation as a training tool. The culture can be a barrier when participants are happy with the status quo, unable to see the benefit of the intervention, or view the intervention as unnecessary because they believe they do not need improvement.

*Leadership buy-in*

*Leadership buy-in* refers to the organizational leaders, such as the chief medical officer, chief academic officer, chief nursing officer or other clinical leadership position. When these individuals believe in simulation as a tool for improving the organization, they support the program, which may be through their words, actions, attitude, time, and funding. *Leadership buy-in* assists in the overall program support typically through resource allocation as well as influencing the culture through their dedication to the simulation efforts. One participant described gaining leadership buy-in through aligning the goals of the simulation with the goals of the leader who could provide the additional program support they needed, such as funding.

> "The chief medical officer was very receptive when it hit his area of interest, which was quality… The fact that it wasn't just another ask, we weren't going to him like everyone else saying I need money. We came to him and said we've already raised some money and I need a little more…This is something Department of Medicine has already selected to invest in, so I have the support of my department chair". (Angela)

In this quote, Angela showed her commitment to the project by doing preparatory work and gathering the leadership buy-in from her department chair, as well as raising money before going to the next level in leadership. This enabled her and her team to successfully launch their program. Leadership buy-in also was described as modeling behaviors and attitudes toward innovation and having high standards and a focused attention toward improving patient care. John describes this modeled behavior and a positive attitude toward simulation in this quote,

> "We had a big win on key stakeholders… when we called the code…and when all the residents showed up to the code, the chairman of Pediatrics was the guy doing CPR [cardiopulmonary resuscitation], and from that point on we really never had a problem because no resident gave us a hard time anymore… that was a huge win."

*Leadership buy-in* is related to patient safety and quality because the more leadership support that exists, the easier it is to integrate the simulation program into the healthcare system. This is because patient safety and quality are always a priority for healthcare leaders as this is the purpose and goal of healthcare organizations.

*Patient Safety, Risk Management & Quality Improvement*

*Patient safety, risk management,* and *quality improvement* departments was identified as an organizational structural component, and it is a key facilitator of a successful translational simulation program. Depending on the institution, the title of the department might be patient safety, risk management, quality improvement, or a combination of those titles. The goal of the department is to use data to identify patient errors and risks, then develop strategies to mitigate them. The department is typically also in charge of performing root cause analyses for errors that occur and providing remediation or training to prevent a recurrence. This was viewed as a facilitator if the simulation program can be administratively linked, such as reporting to the quality and safety department. If an official reporting link is not possible, at least being integrated into the work of that department is key to being included in improvement efforts that could be addressed using translational simulation. One focus group participant explained, "I don't think you can have a …translational simulation service in isolation… I think it needs to be embedded in a real quality improvement or other strategy that comes with the resources available to help" (Michelle). Another commented, "Our primary focus is on looking at quality and risk management metrics for the institutions that we work with and finding ways to use simulation both as education but also for simulation-based testing to try to decrease patient safety risk" (Christopher).

### *External Factors*

***External factors*** originate from outside of the organization but impact the translational simulation program. The relationship between *cost* and *policy* is that often funding is associated with policy changes, for example, once a medical society decides to mandate or recommend a training, there are funds allocated to programs that can provide the training. These types of funds are a facilitator to translational simulation programs who can either tap into the funding source or use the policy as evidence of the need for the training. This relates to *program support* again by providing additional resources to a program by funding a new employee or support resources. External *program support* can come from a variety of sources, and can be financial support or other resources, such as administrative help or logistics support for implementation of a simulation program. *Program support* could include sharing simulators or educators across organizations. The history of medical education remains present in today's culture. Although many efforts, including simulation, are seeking to address and change some of the perpetuated norms of medical education, it remains a barrier. *Historical* speaks to the larger culture of medical education that spans beyond organizational boundaries.

#### *Policy change*

*Policy changes* can occur at the local, state, regional, or federal level. Policies that relate to simulation-based training can support the use of simulation to improve patient care, thus contributing to translational simulation programs. Policy changes are helpful in mandating training initiatives but must be researched to understand their impact before policy changes can occur. Several participants described a variety of policy changes from those within their institutions to larger city- and state-wide changes, such as a "10% decrease in [malpractice] insurance rates" after participating in the simulation training program (David). Some policies have changed over time in response to the success of a simulation program. Kimberly describes this by saying, "[The] clinical trial research governance process has now mandated that they

simulate an emergency response prior to early phase clinical…trials being approved, so that's something that's being written into policy" (Kimberly).

*Policies* were also described as a barrier, including competency policies that require a specified number of hours or replications of a skill without a requirement to demonstrate competency. In that case, the credential standards are too loose and do not require high quality programs that improve or demonstrate the improvement of clinician skills.

*Cost & Resources*

*Cost and resources* are external factors that are necessary for the function of any translational simulation program because funding is required for personnel, supplies, and equipment to allow planning, implementation, research, and continuously improve translational simulation programs. Many costs are paid for with a simulation center budget, which is allocated to the center from an organizational budget. However, other funds come from outside the simulation program such as grant funding and government or vendor support. *Cost and resources* describes who will pay the individuals attending the program, costs for running the program, and complete return on investment calculations. For example, James "had the issue of how are we going to pay for the nurses to do this training?" Cost was also discussed as something to be mindful of when planning a simulation, for example, when using clinical faculty time, keep it as brief as possible to minimize interruptions in clinical care and understand that their time is expensive. Michelle mentioned that, when bringing "together 20 or 30 or 40 people from around the hospital, you think about the number of person hours that are in a room and that could be the equivalent of like $50,000." Tammy added, "If you're really gonna be doing a study where you're looking at clinical outcomes you have to have funding." This was supported by the focus group discussion, which narrowed in on the necessary funding for simulation research and faculty positions as well as grants for conducting the research itself. The focus group confirmed the importance of cost and resources by identifying it as the root cause of not having more simulation research positions. Funding is related to many other codes because it

provides the money to increase program support and employees. Typically, the more buy-in a program has and the more it can demonstrate its successes and value, the more funds will be allocated to the program.

*Historical*

*Historical* speaks to the overall culture of medical education and the way things have functioned in the past. It speaks to the broader culture of medical education globally and therefore is not confined to one institution. *History* and *culture* are closely related because the larger medical education history can impact organizational culture. Below, *culture* is used to specify the culture within an organization and how it impacts the extent to which innovation or interventions are embraced. *Historical* specifies the past, whereas the *culture* speaks to the present and future. In other words, the history of the organization is fixed, and the culture is malleable.

*Historical* was also described as accepting the "status quo" or simple "inertia". Michael explained, "We've educated this way forever and ever, I learned this way and it'll be good for you too." The history of medical education was described as a barrier to new innovations including simulation because it is difficult to make changes both for individuals as well as within healthcare systems. Michael described one example of this saying,

> "When you look at the quality and the impact or the nature of CME [continuing medical education] as we know it today, its basically people go on a cruise or they sit in a conference room or some hotel ballroom for four or five hours, listen to lectures and go have lunch with their buddies and call it a day. And that's deemed to be education. Well, we know that doesn't work, but that's the state of affairs, that's the status quo and it's really difficult to change it, really, really difficult." (Michael)

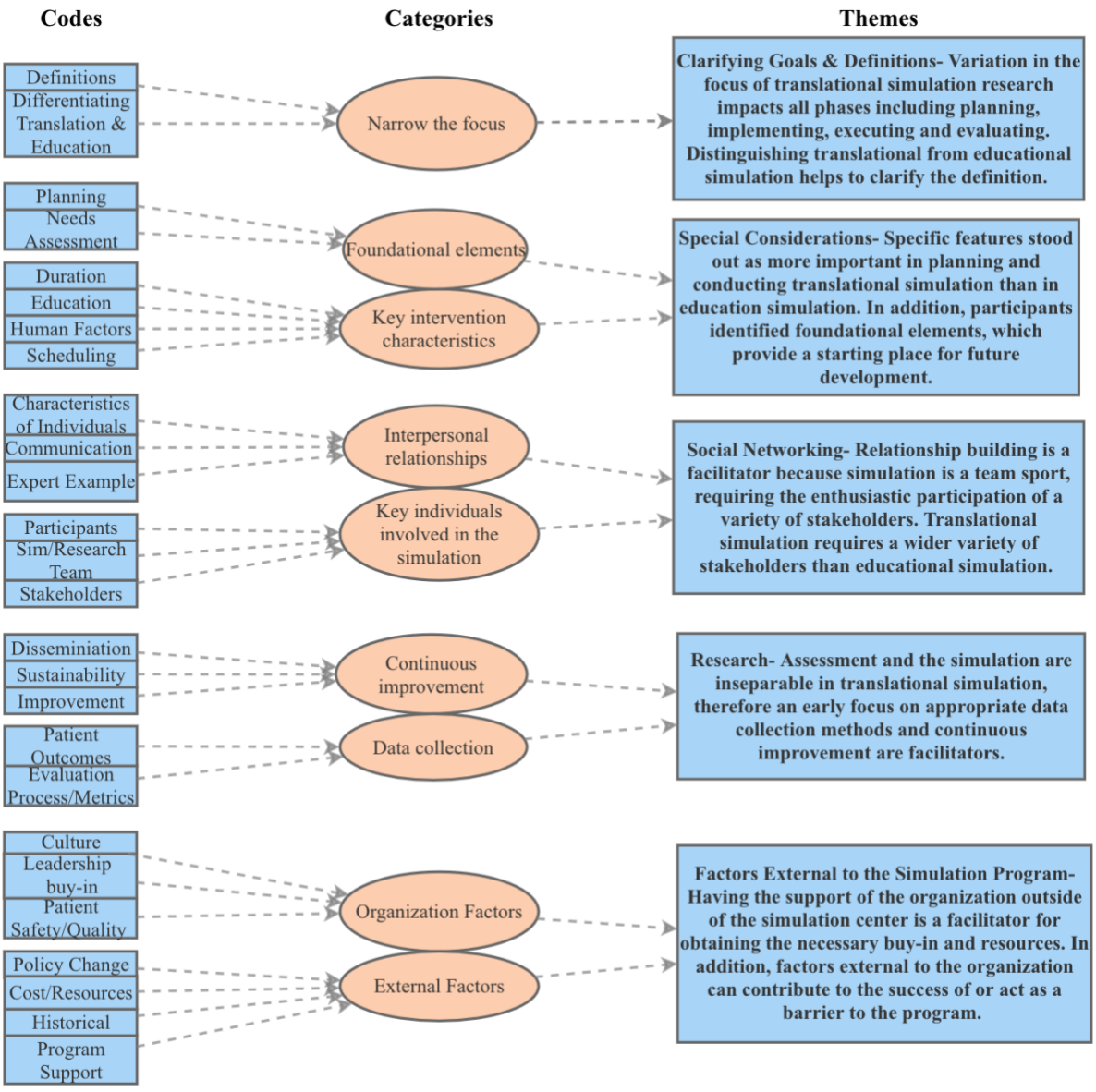
This quote exemplifies some reasons why it is difficult to change the way medical education is conducted.

*Program Support*

*Program support* describes program champions, administrative support, logistics support, national incentives, and any additional local support for the training. Examples of support from outside the organization came from government sponsored programs, vendor, or simulation industry partnerships. David comments that, "People…want to belong to a network, they wanted us to help them set standards, they wanted data sharing, they wanted personalized training with ongoing support." Robert added "We played just tons of logistics support. You know we had to book airline tickets…to go there…schedule appointments with people…get them a hotel room…rental car…[be sure] simulators were there on site in advance and they had everything they needed." Administrative staff were facilitators that supported scheduling logistics and release time for clinicians and staffing from the patient care areas during training (Amy). One example of the relationship between *program support* and *cost* is the government paying each hospital for taking the training course (David). *Program support* and *cost* are also related because support staff require funding to pay for their positions. These additional program supports were identified as key components to facilitate the efforts of the simulation program. See Figure 8 below for a complete image of the codes, categories, and themes for this dissertation.

**Figure 8**

*Codes, Categories & Themes*




## Document Review

After the data was coded and analyzed from the interviews and focus groups, the document review was used as a triangulation strategy and to determine how the information from the documents related to the themes. This section will review how the document review relates to each theme.

None of the documents mentioned a definition or differentiated translational simulation from educational simulation. A specific form for translational simulation could be created to

focus the planning stages on some of the important features of translational simulation that have been identified in this dissertation.

The theme **special considerations** was best represented in the document review since all documents included questions about education or simulation intervention, scheduling, and planning. Nine out of 11 documents also included a needs assessment. Even though two documents did not include a needs assessment, all interviewees described beginning their process with a needs assessment during the interviews. Questions on the document review that also relate to planning are the preparation materials for learnings, simulation's pilot test, outlines for pre-briefing and debriefing, and the type of simulation technology to be utilized. Another strong aspect of the planning process was the approach for the facilitator, which was identified in 10 out of 11 documents. It makes sense the planning process would be best represented in the documentation because the document review form has a section dedicated to planning.

Speaking to *duration*, when reviewing the documents, the top four published participants on the topic of translational simulation did not have a longer duration of experience in translational simulation than others. This was observed by reviewing the top four publishers with the duration of their time in simulation or educational research, which ranged from 17-20 years, as identified during their interviews,. There were four other participants with experience from 19-21 years without as many publications. The researcher suspects this may be due to the difference between the career focus of the participants on research versus a focus on education or clinical practice.

Ten out of 11 documents indirectly addressed relationships through identifying both the participants and instructors, but they did not say how the simulation center was contacted by those individuals. This is logical because most simulations come to the attention of the simulation staff through a request by the content expert or the faculty member via an electronic form, email, or personal contract. The documents do not ask for this information since the forms

are used after the simulation center has been contacted to assist in developing and running an event. The documents do not ask for identification of stakeholders. Overall, the documents did not contribute to **social networking**.

The theme of research was represented in the document review as improvement and the evaluation process questions. Nine out of 11 documents asked about the evaluation process. However, none of the documents specified a translational outcome versus a general participant evaluation. In addition, the term evaluation in education often refers to a student evaluation of the session or a student evaluation of the faculty member as opposed to a patient or learning outcome. A more intentional focus on both learning and translational outcomes in the planning process and documentation could improve the translational nature of the outcome measures.

Overall, the document review did not contribute to the theme of **factors external to the simulation program**. This is not surprising as the planning documents are looking more at the educational intervention and outcome measures within the simulation than with overall outside influences. Concepts such as culture or who the simulation center reports to are outside of the scope of these documents. However, since these factors contribute to the success or detriment of the simulation, to have a more comprehensive understanding perhaps they should be considered and added to planning documents. If these aspects are not included in the planning documents, they risk being overlooked during planning phases. A standardized form that asks about the organization's culture, cost/resources, policies, support, and history may support a more holistic planning process that looks at factors outside of the immediate simulation that could impact the program. One area on the document review that could elicit ideas on how the simulation relates to policy changes would be under needs assessment; however, none of the documents used this area to list a policy. Overall, the document review did not speak to this theme.

The document review was consistent with the data discussed in the interviews and focus groups. The documents contained information on two of the five themes. There was no

difference in planning documents for a translational simulation as compared to an educational simulation, which was identified by lack of use of a term “translational” and confirmed via emails with dissertation participants who sent documents. For example, no documents asked, “How will this translate knowledge?” or “Where does this fit in the translational spectrum?” or other questions that would prompt a connection to translational simulation. This was confirmed during the interviews when individuals stated their planning documents were the same regardless of the purpose of the simulation.

## Results Summary

Overall, the data analysis revealed five major themes: clarifying goals and definitions, special considerations, social networking, and research, and factors external to the simulation program. Advice was provided to support all five themes. Four of the five themes include a combination of barriers and facilitators, except for clarifying goals and definitions, which emerged as an important concept but were not necessarily perceived by the dissertation interviewees.

Each theme details the barriers and facilitators encountered by our experts throughout the process of preparing and implementing a translational simulation. The major barrier under **special considerations** is scheduling, which speaks to the use of in-situ training and the need to arrange patient care coverage for staff to attend the simulation session. In addition, finding a room or location for the simulation to take place in a clinical area is logistically more challenging than scheduling in the simulation center. Under **special consideration**, *duration, education, human factors,* and the *needs assessment* can all be used as facilitators. When deciding on the duration of time for the translational simulation event, a balance must be reached between using the shortest amount of time but still being effective. Including someone knowledgeable about translational simulation and human factors can bring the necessary expertise to the planning phase. Finally, aligning the translational simulation with a health service priority is essential to establishing stakeholder and leadership buy-in necessary to support the program.

Facilitators under **social networking** include *characteristics of individuals, communication, expert examples,* and the *simulation and research team*. "Enthusiastic" individuals who are "simulation advocates" are good at communicating the goals and need for the simulation intervention. These attributes, as well as being "trustworthy" and having other positive personality traits, assist the simulation leadership in both **social networking** and achieving the goals of the translational simulation program.

The barriers under **research** are *dissemination* and *sustainability* due to the longer duration they require. There is often excitement around a new program, but less so around sustaining or maintaining a current program. *Implementation* and *improvement* are facilitators to a successful translational simulation because improvement goals align with healthcare organization's mission.

The barrier under **factors external to the simulation program** is *historical*, meaning the overall history of medical education can be a barrier to implementing a new or innovative program. At times, there is more resistance from experienced clinicians than from newer graduates. This resistance can spread from the senior clinical staff to more junior staff, thus inhibiting newer training models. Aligning the translational simulation program with the *quality, risk, and patient safety department* is a facilitator. A summary and discussion of the barriers and facilitators will be discussed in Chapter Five in response to research question one.

The approaches to translational simulation are varied depending on the context, needs assessment, and goals of the simulation. However, despite these differences, there was a standard approach to planning translational simulation which focuses on a needs assessment, early and broad stakeholder engagement, and incorporating research at the beginning of the process. In addition, the approach paid special consideration to certain aspects of the planning and implementation process that stood out to the interviewees as different in the translational simulation process than in an educational simulation process. The importance of having a simulation program leader with good communication and social networking skills was

identified. In alignment with the theoretical models used, there were factors within and external to the organization that can influence the success of the translational simulation program.

Results from this analysis provide detailed information on the approaches to translational simulation, the barriers and facilitators, and recommendations. Understanding this information provides insights for the overall translational research agenda. Individuals and teams can utilize the insights provided by the experts in this dissertation to beginning or enhance their translational simulation programs. Several key aspects of translational simulation were expressed and will be discussed in more detail in the interpretation of the results sections in Chapter Five.

# CHAPTER V

# SUMMARY, IMPLICATIONS AND RECOMMENDATIONS

## Introduction

The purpose of this dissertation was to identify various approaches to translational simulation research, ] identify barriers and facilitators encountered in the process, and provide advice to others who wish to begin translational simulation research. This chapter will discuss how the findings answer the research questions, respond to existing literature, and suggest implications for future practice. This chapter begins with a discussion of the three research questions and how the data responds to each. Key findings from the dissertation are reviewed along with how the findings relate to the literature and the theoretical frameworks used. It ends with this dissertation's limitations as well as recommendations for future research.

## Research Question 1: Barriers & Facilitators

Research questions one states: How do simulation experts describe the barriers and facilitators to implementing translational simulation programs? The answers were woven throughout the interviews, focus group, and all five themes. This dissertation identified four main barriers and twelve facilitators (see Table 1 & Figure 9). Additionally, many aspects of translational simulation were viewed as both a barrier and a facilitator (Table 1 & Figure 9).

**Table 1**

*Barriers & Facilitators by Theme*

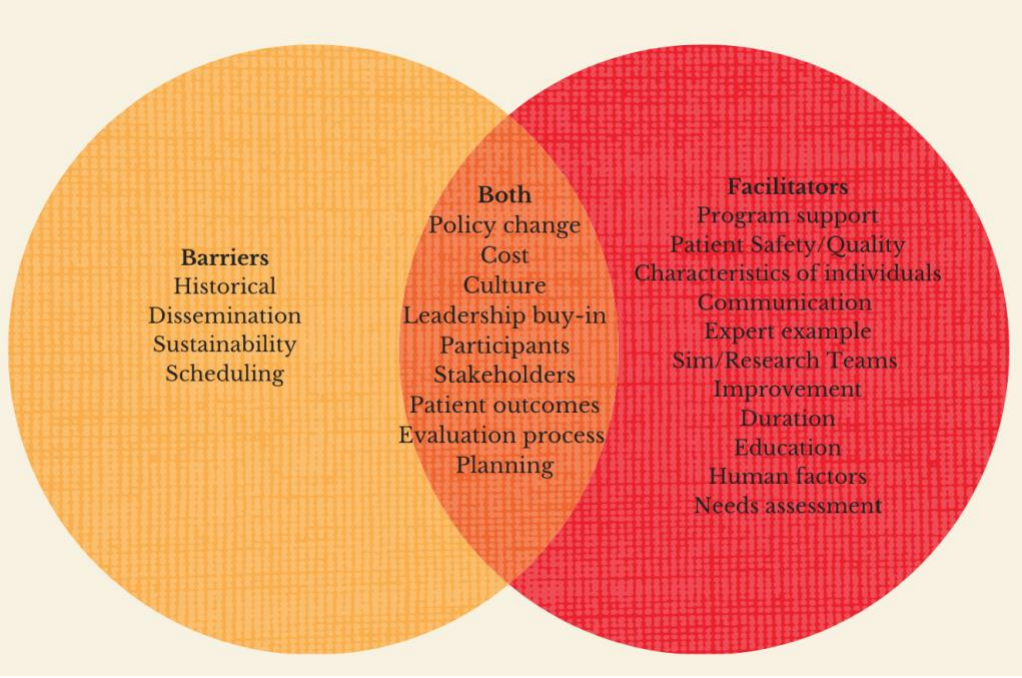
| **Theme: Clarifying Goals and Definitions** |
|---|
| Definitions |
| Differentiating Translational & Education |
| |
| **Theme: Special Considerations** |
| Scheduling |
| Planning |
| Duration |
| Education |
| Human Factors |
| Needs Assessment |
| |

| **Theme: Social Networking** |
|---|
| Participants |
| Stakeholder |
| Characteristics of individuals |
| Communication |
| Expert Example |
| Simulation & Research Teams |
| |
| **Theme: Research** |
| Dissemination |
| Sustainability |
| Patient Outcomes |
| Evaluation Process |
| Implementation |
| Improvement |
| |
| **Theme: Factors External to the Sim Program** |
| Historical |
| Policy change |
| Cost |
| Culture |
| Leadership buy-in |
| Program Support |
| Quality/Risk/Patient Safety |

*Key:* Red=Barrier, Yellow=Both a Barrier & Facilitator, Green=Facilitator, & White= Neutral

**Figure 9**

*Barriers and Facilitators Venn Diagram*



### Clarifying Goals & Definitions

Clarifying goals and definitions was not discussed as a barrier or facilitator by interviewees. From the researcher perspective, a lack of standardized definitions is a barrier to the progression of translational simulation research because it has implications for literature searches and publications, and this will be discussed in the section that follows on key findings. Furthermore, the field cannot advance without having clear definitions that are understood by all. Clear definitions will also help when sharing knowledge across fields and disciplines, which is important for translational science as well as translational simulation.

### Special Considerations

Special considerations had a mix of barriers and facilitators that need to be considered in the planning and development of a translational simulation. If the elements discussed in this theme are incorporated into the planning phase, they have a higher likelihood of being used as facilitators. For example, including a simulation educator and *human factors* expert in the *planning* process. *Duration* of the event can be kept short while still ensuring to address the *needs assessment* of the simulation. Paying attention to the duration of the event shows respect for the staff and their time and allows for short but focused simulations to address the needs identified. *Scheduling*, a barrier, is one of these considerations which needs coordination and planning for bed space, faculty availability, and patient care coverage.

### Social Networking

Although relationship building may come naturally to some people, it is not always a personality trait of the simulation leadership or staff. This dissertation brought out the importance of social networking and personality, which could have hiring implications to ensure the simulation leader is at least willing to intentionally engage in social networking when building a translational simulation team, otherwise it can be overlooked or simply not done. Relationship building should be done explicitly because it takes time. It is important to foster

relationships with leaders and all stakeholders because stronger networking relationships will allow a simulation leader to accomplish the goals of the simulation program.

**Research**

Dissertation interviewees freely discussed the barriers and challenges presented when researching translational simulation. *Dissemination* and *sustainability* were particularly challenging issues due to the long-term effort and attention needed to accomplish them. Since measuring patient outcomes and the evaluation process could be viewed as a barrier or facilitator, it is best to pay attention to these during the planning phase to try to mitigate potential barriers. Due to these barriers the amount of translational simulation research has not substantially increased and what information is being learned through simulation is not necessarily being shared through scholarly work, even though more translational simulation work is being done now than in the past. If this is the case with this group of experts, then it is likely the case outside of this group as well.

Another key barrier that came out of this theme was the idea that leaders are happy to showcase simulation and use it as marketing tool for public relations, but do not require rigorous metrics and evaluation to demonstrate value. Without this push from the leadership, many programs do not have the time or resources within their simulation staff to track the metrics required. This demonstrates that leaders do not understand or value the translational simulation program. This has several implications for programs and could mean less resources such as funds and staffing. It could also mean less focus on the program offerings because the leader only wants to know the simulation program is giving tours and being showcased. One way to overcome this barrier is to focus the translational simulation program on the goals that are important to the organizational leadership. As an example, one interviewee stated, “they love the US news and [world] report…rankings, they love trying to improve them. And a lot of investment goes into these programs…if we can link into some of these programs and be a supportive mechanism then we can help the institution” (William). Therefore, = using the

translational simulation to improve the US news and world report rankings, this will allow for common ground among diverse stakeholders such as the simulation team, the organizational leadership team and the patient safety team.

The final barrier was that “people don’t want to know” or in other words, they are afraid or have a reservation about studying what they do, because their hard work may not have the intended impact (David). A lot of resources, effort, and energy is invested in simulation interventions, therefore, it is desired, especially by those who are investing their time, that it has a positive and meaningful impact. This is understandable, however, without studying the outcomes, but it is not possible to know the impact. This was an important idea that has been overlooked in the literature thus far.

**Factors External to the Simulation Program**

External factors can serve as barriers and facilitators to translational simulation. The overall history of medical education is one barriers that can leak into the organizational culture and impact the willingness of staff to engage in innovations and improvement efforts. *Cost and resources* are essential to run any successful educational program and translational simulation. There may be policies that can support funding for the program, andhaving strong *leadership buy-in* typically allows for more allocated funding. Aligning the translational simulation program with the quality, risk, and patient safety department is a facilitator that can help the program reach more departments and, from an organizational structure perspective, can increase visibility and integration within the improvement efforts of the organization.

The importance of this theme is that the simulation program looks outside their center or program for other elements that will impact their translational simulation program. It can be easy and natural to have a siloed view when running a program; however, without consideration to the larger organization, and even aspects outside the organization, the efforts may encounter significant barriers. Some barriers that come from external factors could even halt a translational simulation project, such as a lack of organizational *leadership buy-in*. The goal

would be to consider these factors well in advance of a translational simulation, so a plan can be put in place early in the process or before embarking on a translational simulation to ensure the right support is in place. Barriers that arise external to the simulation program will likely take more time to address than those that are from within the program, so considering if it is necessary to influence the organizational culture, leadership, and structure should be done early.

## Research Question 2: Approaches

Research question two states: How do simulation experts describe their various approaches to implementing translational simulation programs? The answers were woven throughout the interviews and focus group. The results give a variety of ideas and are discussed through the lens of each theme below.

### Clarifying Goals & Definitions

The approach to clarifying goals was discussed as an important to allow the simulation and research team, as well as all the relevant stakeholders, to share one mental model around translational simulation. This is tied to the success of the program and several participants gave examples of when the lack of a shared mental model had negative consequences. Therefore, the translational simulation team and stakeholders may need to have multiple conversations about goals and definitions throughout the planning process to achieve and maintain a shared mental model.

### Special Considerations

The approach to translational simulation includes some of the same elements as the planning process for an educational simulation, such as conducting a needs assessment, but there are also several aspects of the planning and development process that were considerably different. These different aspects have a shorter duration for the simulation event, including an individual who is knowledgeable about translational science or simulation, potentially a human factors expert. This individual would ensure coverage of patient care responsibilities during the

event, which would allow the participants to fully engage in the simulation. These differences require consideration early in the planning process.

Administrative assistance is helpful for coordination of both the duration of the simulation and the logistics of scheduling. Careful thought should be paid to how patient care would be covered and not just deferred while the simulation is occurring. Including a simulation educator in the planning process is essential for both translational and educational simulation, but translational simulation does require that someone on the team is knowledgeable about translational simulation. This finding suggests the need for more knowledge sharing and capacity building within simulation programs or for coordination and collaboration across disciplines to have access to this expertise. A human factors expert would be helpful, and it is recommended to at least have access to one. This is because translational simulations are more likely to have a human factors component in comparison to educational simulation. Even when working in the in-situ space, having a human factors expert present can allow them to observe the session with an eye for safety around human interactions with equipment or process.

**Social Networking**

The approach to social networking should not be overlooked. This process and its role in the success of translational simulation can be taken for granted. It is not something that happens automatically, but rather specific strategies are required as discussed by participants. One strategy was to reach out and meet in-person with new leaders across the institution. Another was to use the simulation faculty development program for social networking. Yet another strategy was to touch base with relevant leaders monthly regarding the simulation program and upcoming activities. Lastly, explicitly using the planning phase an as opportunity for relationship building is important. Instead of thinking of social networking as a secondary obligation, this approach takes the time to intentionally foster those relationships. All these approaches take a more long-term perspective, and most of them assuming that there will be interactions with stakeholder again in the future. This approach assumes that if the initial

interaction is productive, collaboratively work will be easier in the future. Interestingly, social media was not mentioned by participants for social networking.

**Research**

The overall approach to research was to incorporate translational research from the beginning and create a process where research occurs automatically as part of everyday work instead of allowing it to become or feel like something extra. This approach is especially important because there are few funded simulation researchers with dedicated time for research; therefore, it is important for staff with other roles to try to incorporate it into their everyday work. However, the suggested approach is not always practical and is dependent on the staff's time. If it is not possible, the absence will limit the amount of translational simulation research produced.

It is important to mention this dissertation has been done at one point in time during a larger simulation research agenda. Participants commented on the overall timeline of simulation research and remarked that translational simulation is relatively new. The evolution of simulation research over time highlights pioneers, who did not have formal training, models, or frameworks to follow, and contrasts their experience with those who have entered the field in the last decade. The latter group has the advantage of formal educational training in simulation as well as a plethora of theories and models that support and guide the use of simulation. This evolution also means that moving into the translational simulation research space is a recent phenomenon. As such, there are many opportunities for development of theories, models, frameworks, and educational tools to advance this area of simulation research. The variation in experiences and education around simulation impacts the interviewees and their perspectives on translational simulation. In addition, a clarification about research using simulation and research about simulation is important. Translational research can be used as either a method to intervene or a method to assess. In other words, translational simulation can be either research

using simulation, typically to test a process or team interaction, or research that uses simulation as an educational intervention to translate knowledge into practice.

### Factors External to the Simulation Program

The approach described for factors external to simulation is to address these factors early on, even before trying to begin translational simulation. These factors can be roadblocks in the process and therefore are important to navigate. *Social networking* and *metrics* showing the program's value can have a positive influencing these external factors. Additional ways to address *leadership buy-in* is to align the goals of the translational simulation with those of the organization, and to be able to explain that alignment to the leadership. When the simulation program can show they are providing value, even if it is not monetary value, they are more likely to get the necessary support. In addition, earning or finding partial funding and resources before asking for additional organizational funds, can show the leadership how committed and dedicated the simulation program is to the project and the project's success.

## Research Question 3: Advice

Research question three states: What recommendations do simulation experts describe for overcoming barriers to implementing translational simulation programs? As part of the individual interviews, one of the questions was "What advice would you give to someone else who wanted to start a translational simulation research program?" The results give a variety of ideas and are discussed through the lens of each theme below.

### Clarifying Goals & Definitions

The most common pieces of advice given were to keep it simple, start small, identify a problem that can be addressed, and be "crystal clear" about the goal (Michelle, Kimberly, Julie, Jennifer, Amy, and Karen). This helps when choosing an approach to translational simulation and ensuring the team has a shared mental model about the goals, direction, objectives, and aims.

### Special Considerations

During the planning phase, aim to meet the needs of the organization and do not worry about what others are doing (William). This was mentioned because every situation and institution are different, therefore the work will be different based on these variations. There are several goals that span across organizations and countries, but there are also specific needs to can be addressed locally. Addressing the needs of the employer is key to demonstrating value. Additionally using implementation science principles and change theory can not only support the planning phase, but also increase the likelihood that the change will be implemented into clinical practices (James).

Another piece of advice during planning phase is to "shift your own" mindset before attempting to shift the mindset of others (Jennifer). This comment was in reference to ensuring simulation or clinical leaders are entering a translational simulation with the right goal in mind and that their mind is open to learning from the clinicians and from the session. This is preferable to going in with a fixed mindset, such as that the clinicians must think the same as the simulation or clinical leader, or follow a specific way of accomplishing a task by the end of the simulation.

**Social Networking**

Establishing relationships with others and learning from those with experience is helpful (Melissa). Melissa suggested building the right team that can work together toward the simulation and research goals (Melissa). Identify stakeholders early and include them from the beginning of the planning process (James). Another participant suggested trying to take opportunities as they come because it allows for additional learning as well as building a social network. These aspects combined enhance individual professional growth opportunities.

**Research**

Some participants focused their advice on building a research program and suggested starting with the end in mind. For example, imagine a robust translational research program in a future state and start by laying the foundation for it. How could we get to that desired future

state? Be sure to start with foundational systems and processes in place before adding on and starting larger projects (William). In other words, start slowly and small, and build upon successes over time. Other participants commented on individual research projects, suggesting beginning with a literature search to ensure the idea will add to the literature and build upon what has already been done (Susan). The next piece of advice was to fold the research into a natural part of daily work and to define metrics to be collected in the beginning because the excitement can be harnessed as a facilitator (William and Christine). If aiming for a translational research program, go in order by starting with developing a T1 outcome study and then moving to T2, T3, and eventually T4 (Michael). The goal would be to build an overall research program where one project follows the last and builds upon the findings, as opposed to conducting several individual research studies.

### Factors External to the Simulation Program

Even before the planning phase begins, one participant suggested starting by addressing the external factors such understanding the culture, how the hospital works, how quality systems and quality initiatives work, and the politics of the institution. This information can be used as groundwork for building programs, as the context and culture of the institution must be considered. The more the current culture is understood through conversations and observations, the easier it will be to work within the existing culture. Once these aspects are understood, they can be incorporated into the planning process to anticipate barriers.

## Major Findings

One of the benefits of this qualitative research study is the plethora of rich data, including quotes and examples from the participants about their experiences. Yet, distilling the information into key findings that are actionable and useful can be challenging. The goal of this section is to summarize the major research findings from this dissertation.

The first key finding was the lack of a standardized definition for translational simulation and translational simulation research. This became apparent during the interviews, more than

when analyzing the interview data. Having clear definitions impacts all three research questions; therefore, this research provides clarification and a schema of more detailed definitions for translational simulation. In conducting the interviews, the researcher realized there was a variation in the way participants discussed translational simulation. Some participants initially responded to say they wanted clarification about what the term meant, and others seemed to know but talked about it in a varying context. The definition of translational simulation first appeared in the literature in 2017; therefore, it may be too early in the evolution of translational simulation for a unified definition. Based on the findings from this dissertation, the individual definitions used by participants were conceptualized based on background, education, experience, and mentor influence on the topic. Some participants utilize the definition commonly used within the biomedical translational research spectrum, others simplify it to be any simulation that can be linked to patient outcomes, and some use the definition provided by the Society for Simulation in Healthcare's Accreditation standards for System's Integration (Committee for Accreditation of Healthcare Simulation Programs, 2016; Drolet & Lorenzi, 2011). Due to the evolution of simulation-based research over time, individuals who have been taught by a mentor tend to use the same definition as their mentor. As a result, there appears to be a difference in definition based geographical regions and time spent working in the translational simulation space. As it is a small group of people focusing on translational simulation research, there is a lot of overlap between the individuals in this dissertation and their mentors. In addition, due to snowball sampling, the researcher was referred to mentors and mentees during the sampling process. This difference in definitions did not appear across disciplinary lines. None of the interview participants mentioned that the definitions were a challenge or that others might conceptualize translational simulation in a different way.

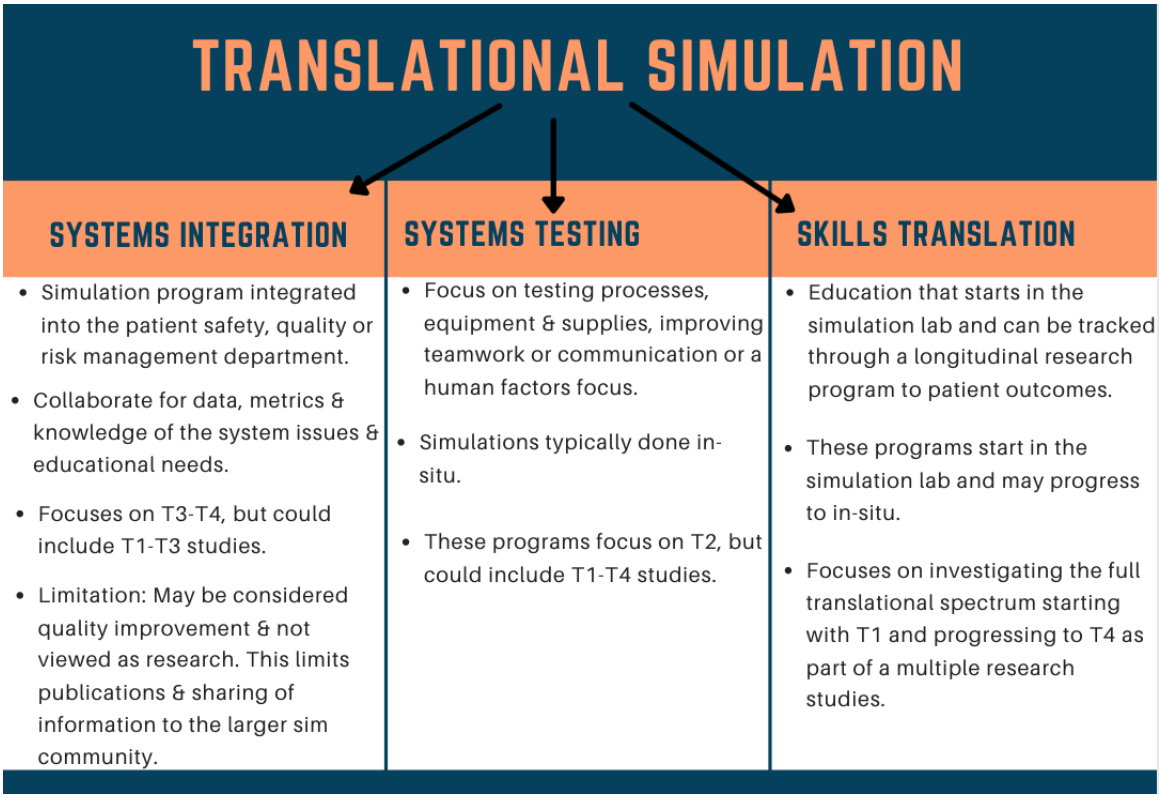
To address the inconsistency in definitions, this dissertation allowed participants to discuss their use of translational simulation in the way they viewed it. Asking participants to explicitly define the term was not part of the interview questions. Although it was considered in

the research design, and participants were asked if an inductive or deductive approach should be used in this regard. It was decided that if the researcher gave the participants a definition, they would have stuck within that definition and this finding would not have been revealed. This study explored the term translational simulation as it was defined and used by the participants, and this dissertation defines it in a way that encompasses every conceptualized version of this term that emerged during this dissertation. This follows the overarching definition proposed by Brazil stating "translational simulation as an appropriate term for describing the subset of simulation activities that are directly focused on improving health- care processes and outcomes" (Brazil, 2017). This definition is broad enough to include the three distinct approaches that emerged from this dissertation (See Figure 10). As a result of this research, Figure 10 was created to help distinguish the variety of definitions for translational simulation. The first is systems integration, which is where the simulation center is integrated into the hospital patient safety, quality, and risk management department. The simulation program and patient safety, quality, or risk management department collaborate with bidirectional feedback and share data, metrics, and knowledge of system issues. This definition tends to focus on T3 to T4 but could also include T1 through T3. In some institutions this work is considered quality improvement and may not be viewed as research. This view limits publications and information sharing with the larger simulation community. The second focus is systems testing which can have a focus on human factors or include testing processes, equipment and supplies, improving teamwork, communication. In this focus, the simulation can be the intervention, or it could be the method of assessing a new process or piece of equipment. Systems testing programs focus on T2 but could include T1 through T4. They are typically done in-situ. The third approach is to start with a skill translation or educational sessions in the simulation lab that can be studied through a longitudinal research program. This approach tends to start by researching T1 and progressing in order through T2, T3, and finally T4. This approach may also start in the simulation lab and progress to the patient care areas. Alternatively, teaching could start in the

simulation lab and the research could extend to the patient care area even though the training is only done within the simulation lab. The best example of this from the literature is a central line training program that consisted of a four-hour simulation-based training in the simulation lab. The rates of complications of central lines were studied both before and after the implementation of the program (Barsuk et al., 2009). In addition, cost reduction was also measured as a result of the training (Cohen et al., 2010). This could be expanded beyond procedural skills training to include communication skills and training that can be mapped to patient outcomes; therefore, the term skills translation was used. When using this lens of focus for translational simulation, each step in the research process needs to linked to the other steps. In other words, it would be possible to do a T1 study of improvement of skills in the simulation lab without continuing the research to determine if those skills learned in the lab were utilized in the patient care environment. If that occurs, the simulation would not be considered translational because it is not linked to any patient care outcomes.

**Figure 10**

*Translational Simulation Variations in Definitions*




The second key finding was the challenge of demonstrating value of translational simulation, including the lack of incentives or need to demonstrate value. The idea of demonstrating value is about knowing what is important to measure as well as knowing how to assess value, this is especially challenging in cases when the intervention is intended to prevent patient harm. This finding includes the lack of necessity for translational simulation programs to measure and demonstrate value to their leadership. First, many interviewees described the multiple confounding variables that are constantly present when trying to conduct translational simulation research. Although this is a reality, there is still a need to try to account for the variables and measure important outcomes. Another challenge is figuring out what those important measures are and how to go about assessing them. Figuring out how to assess means identifying the correct measurement tools to use, how to collect the data, or sometimes how to access the data, especially when using patient outcomes data. Some programs are not expected to conduct research or present outcome measures, but rather they can use utilization data for demonstrating their contribution to the organization. Still other programs stated that they can

do a lot with a small budget, so they do not have to justify their outcomes. Many simulation interventions are aiming to prevent errors or patient harm, therefore, taking a preventative measure makes it even more difficult to measure the impact. Another potential cause for this lack of necessity to demonstrate improvement in patient outcomes may be a lack of leadership awareness of translational simulation and its impact. Despite these challenges, there is still a need to disseminate the work being done so others can benefit from the lessons learned. Overall, identifying important metrics and measuring outcomes remains one of the biggest challenges in translational simulation research.

The third key finding was that the translational simulation program should be aligned with and integrated into the work of the department of quality, patient safety, and risk management. This idea already exists as an accreditation standard for the Society for Simulation in Healthcare; however, it was further supported by the results of this dissertation. Although it is an accreditation standard, not all programs are striving for simulation program accreditation, so this organizational structure may not exist or may not be a goal of the simulation program. In addition, if a simulation program exists and they want to begin translational simulation, it is even more important to consider this structural change. The goal of the integration between patient safety and translational simulation is to allow the translational simulation program to be integrated into the continuous improvement efforts of the hospital. This is a logical alignment since the goal of translational simulation is also to improve patient care and outcomes. As a unified team, knowledge, resources, and data can be shared across programs and clinical care to address relevant issues.

## Implication of Findings Using Theoretical Models

This dissertation used two theoretical frameworks: the Consolidated Framework for Implementation Research (CFIR) and the Knowledge to Action (KTA) Cycle. This section will relate the result to these frameworks through the lens of each research question.

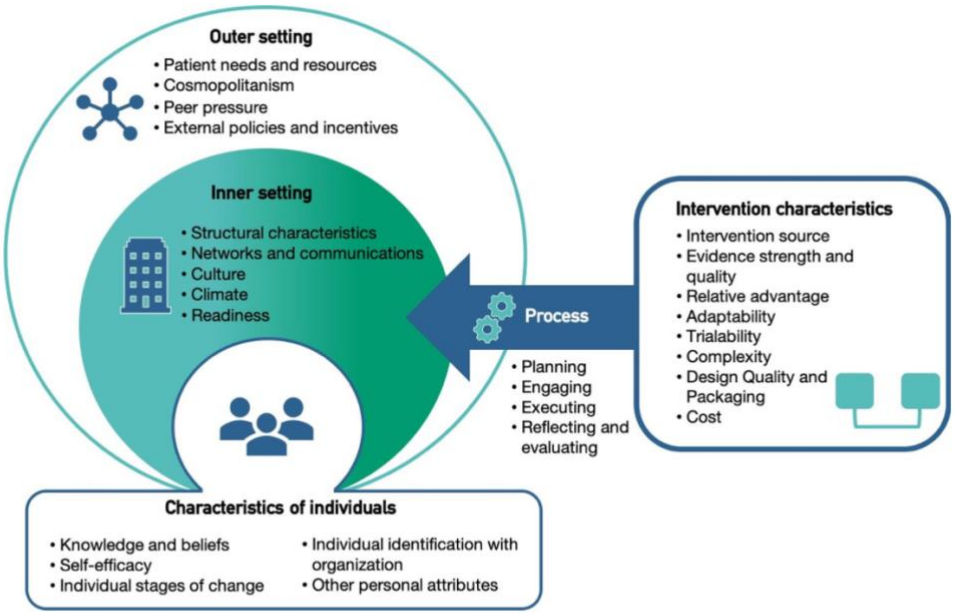
### Research Question 1

Research question one asked about barriers and facilitators to implementing translational simulation research. This question focused around the KTA box of "assessing barriers to knowledge use." This dissertation and the CFIR model are comprehensive in nature and reflect the large number of variables that must be considered to fully understand the barriers and facilitators. The complex nature of healthcare requires a complex model in which many dynamic variables need to be considered. The comprehensive nature of the CFIR model a benefits as well as a limitation to those new to the framework. The model can be overwhelming and have too many elements to be practical in the beginning stages of a translational simulation.

The findings from this dissertation are supported by the CFIR model (See Table 2). The most important CFIR domains for the planning phase for a translational simulation are a combination of tension for change and relative advantage, which means the degree to which the stakeholder perceives a need to change and views the intervention as a better alternative to the current approach. During the engagement phase, the most important CFIR domain is the various stakeholder who might need to be involved, such as opinion leaders, champions, and change agents. While executing or implementing the simulation, the learning climate is extremely important for lessons learned to be implemented into clinical practice. The final stage of reflecting and evaluating includes using qualitative and quantitative metrics to measure process and outcomes that can inform a continuous improvement cycle. A visual of the CFIR model is present in Figure 11 followed by a visual of the themes and codes from this dissertation applied to CFIR in Table 2.

**Figure 11**

*Visual of the CFIR Model* (CFIR Research Team-Center for Clinical Management Research, 2019)




Consolidated Framework for Implementation Research (CFIR) - for more info see: https://cfirguide.org/

**Table 2**

*Codes & Themes Applied to CFIR*

| CFIR Five Construct | Theme | Code |
|---|---|---|
| Intervention Characteristics: Intervention Source | Special Considerations | Education |
| Intervention Characteristics: Adaptability | Special considerations | Human Factors |
| Intervention Characteristics: Complexity | Special considerations | Duration |
| Intervention Characteristics: Cost | External Factors | Cost/Resources |
| Outer Setting: Patient Needs & Resources | External Factors | Patient Safety & Program Support |
| Outer Setting: External Policy & Incentives | External Factors | Policy change |
| Inner Setting: Networks & Communication | Social Networking | Communication |
| Inner Setting: Access to Knowledge & Information | Social Networking | Expert Example |
| Inner Setting: Culture | External Factors | Culture |
| Inner Setting: Learning Climate | External Factors | Historical |
| Inner Setting: Leadership Engagement | External Factors | Leadership |

| | | |
|---|---|---|
| Characteristics of individuals: Other Personal Attributes | Social Networking | Characteristics of Individuals |
| Process: Planning | Special Considerations | Planning & Needs Assessment |
| Process: Engaging | Social Networking | Participants |
| Process: Reflecting & Evaluating | Research | Patient outcomes, evaluation process/metrics, Dissemination, Sustainability & Improvement |

Key: Red= CFIR Intervention Characteristics, Yellow= CFIR Outer Setting, Blue= CFIR Inner Setting, White= CFIR Characteristics of Individuals, Green= CFIR Process

**Research Question 2**

Research questions two asks about the approach to translational simulation. The use of the CFIR model can be applied to the development and implementation of simulation-based translational research programs. Using the CFIR model can ensure that the program is taking a wholistic picture of the intervention instead of focusing only on the intervention characteristics, which may occur if a comprehensive model is not used. Especially in translational simulation, the need for considering the context, culture, setting, individuals, and the process work synergistically to increase the chances of success. This was described by the interview participants in this dissertation, and only one interviewee mentioned using implementation theories and three participants who were authors on a paper that cited the CFIR model. Presumably, the others do not utilize implementation models or at least they were not mentioned. This may reflect the natural progression of translational simulation research being in the early stages, and as the field becomes more mature, we will see models and frameworks used more frequently. As more simulation researchers become aware of translational science, including implementation, change management, and team science, it would be expected that these concepts will be incorporated into the design of the research. This is a natural process that occurs as research matures in any field, but can also enhance translational simulation by sharing these models and adapting them to translational simulation. A more direct way to address this is

to strive for a basic understanding of several concepts around translational simulation and teach them though conference workshops. In addition, a national online course or a series of webinars could be effective, and could be disseminated through simulation research networks.

Research question two asked about the approach to translational simulation and looked at identifying the problem, then selecting, tailoring, and implementing interventions. Research question two also touched on the adaptation to knowledge at a local-level, evaluating outcomes and sustaining knowledge use. Although the KTA model was not mentioned or cited in the literature by participants, the elements in the action cycle of the model align with the process that was described for developing and implementing a translational simulation (See Figure 3). All programs described the KTA stages of beginning with a problem, determining the know/do gap or completing the needs assessment as well as identifying and developing an intervention to address it. One of the main differences is that the term "knowledge" in the KTA cycle may be broader in the context of translational simulation since there is not necessarily one knowledge-based answer to the problem. The other steps in the process were all discussed throughout the interviews, including adapting to the local context, assessing barriers and facilitators to use, selecting, tailoring, and implementing interventions, monitoring the use, evaluating outcomes, and sustaining the program.

It may be helpful to have a few examples of how this model can be used. In translational simulation, the knowledge creation funnel may be created during the simulation experience by the participants at the time of the event. This would be knowledge creation through experience, because there is not one right answer to many complex clinical problems or processes. If, for example, the simulation was being used to test a new workspace, the simulation would be used as a diagnostic tool for any potential issues or safety threats when working in the new space. There are other examples of translational simulation that would more traditionally fit into this model, which would be the training of procedural skills. For example, when training clinicians to

perform central lines, there is an evidence-based body of literature to guide the training program, which can be distilled down to knowledge tools and products before implementation.

**Research Question 3**

Research question three asked for advice from the experts based on their experiences. The advice shared by interviewees aligns with the both the knowledge creation and action cycle of the KTA model. The bidirectional arrows between the funnel and cycle are key to translational simulation because sometimes the knowledge is generated during the simulation, so there may be some back and forth between the two areas of the model to define the problem and determine the know/do gap.

The secondary theoretical framework was the knowledge to action cycle (KTA), which closely aligns with the way the interviewees described their planning and implementation processes. Considering practical applications of these two models, the KTA may be a better fit for novice translational simulation researchers.

## Revisiting the literature

As indicated in the literature review, the state of translational simulation research is nascent and there is much to learn about how it is being done as well as lessons learned from those with experience. This section revisits the literature to discuss the ways this dissertation intersects with the existing literature.

Brazil (2017) described barriers to translational simulation as ad hoc teams, unfamiliar equipment and environments, institutional policies and procedures, culture, and departmental tribalism. The concept of teams was captured in this dissertation under the codes *simulation and research teams* as well as touched on in the theme of **social networking** as it relates to communication. The idea of unfamiliar equipment and environments was discussed by dissertation participants most often as using in-situ as the location for the translational simulation. Institutional policies and procedures were captured by *policy change* and healthcare *culture* and *historical* which speaks to the larger medical education culture. The idea of

departmental tribalism was not explicitly discussed in this dissertation; however, a few participants discussed the use of interprofessional education, as well as how focusing on one discipline may be detrimental to the individuals from another profession who may feel their needs were unmet. Brazil's article describes the necessary components of translational simulation as being "most effective when explicitly integrated with an institutional quality improvement program," which was supported by the both the individual interviews and the focus group in this dissertation (Brazil, 2017, p. 3). This was further expanded upon to say, "Translational simulation requires close relationship with clinical governance and quality improvement services" (Brazil, 2017, p. 4). This quote was echoed in the focus group stating, "I think it needs to be embedded in real quality improvement or other strategy that comes with the resources available to help," (Michelle) and "Our primary focus is on looking at quality and risk management metrics for the institutions that we work with and finding ways to use simulation both as education but also for simulation-based testing to try to decrease patient safety risks" (Christopher). This article also comments on *metrics or outcomes* by stating,

> "In the context of translational simulation, education and training is directed at a specific healthcare outcome target, not just an assumption of improved system performance as a result of improved individual knowledge or skills. It has to link the intervention to the translational outcome" (Brazil, 2017, p. 2).

This was discussed and supported by the focus group, especially when discussing the differences between a translational simulation and an educational simulation.

In this dissertation, one of the main barriers identified was the challenge of sustainability. One of the main barriers to sustainability is staff turnover. Specifically, when a key stakeholder or champion of the program leaves an institution, it causes disruption in the continuation of a translational simulation program. This is supported by the 2018 article by Whitelaw et al. which used a train-the-trainer program for obstetric emergencies and then sent a follow up survey 10 years after the training program began to determine if the hospitals were

able to sustain the training program (Whitelaw et al., 2018). Their training used simulation as the teaching modality and they found that when the program had not been sustained, the main barrier was due to staff turnover. They also had the barrier of staff release time from their clinical duties to attend training which is supported by this dissertation under the code *scheduling* (Whitelaw et al., 2018).

This paragraph reviews the literature and this dissertation in relation to *research* and *metrics*. McGaghie's 2011 articles discussed barriers around metrics at the T3 level, especially around access to patient level data, which was supported in this study's interviews. This study supports the barrier identified by Rosenman et al. about "measuring and capturing clinical data" and the challenges caused by lack of resources and funding (Rosenman et al., 2018). When comparing this study's results to the Griswold et al. article, one difference was that issues related to the level of analysis utilized, such as measuring the individual, team, or system were not mentioned (Griswold et al., 2017). This does not mean that it is not an issue, but rather it was not mentioned by participants during the interviews conducted in this study. The idea of using a research program as opposed to individual research studies was supported by this dissertation as well as by McGaghie et al., Griswold et al., and the Society for Simulation in Healthcare's Research Consensus Summit (Griswold-Theodorson et al., 2015; McGaghie et al., 2012). This study lends further supports to the idea that educational inertia or the way things have been done historically in medical education is a barrier to change (McGaghie et al., 2014). This study did not identify physician autonomy as a barrier, but it did support the idea that leadership and management support is important and that either on-the-job training or in-situ is more efficient for translating knowledge into clinical practice (Kristensen et al., 2016).

The article by Walsh et al. was written as a practical guide to using simulation for risk mitigation in the emergency department (Walsh et al., 2020). The article presents a table which describes key challenges. In this chart they break down the challenges into three phases: development, implementation, and evaluation (Walsh et al., 2020). The barriers mentioned

under their development phase are participant engagement, logistics, and interprofessional tension (Walsh et al., 2020). This dissertation further supports this idea through the codes *participants*, *scheduling,* and *culture*. In this dissertation, *participants* and *culture* were described as both barriers and facilitators, and *scheduling* was a barrier. In the implementation phase, the challenges described by Walsh et al. were participant reluctance "denial of simulation to life error translation," and domineering participants (Walsh et al., 2020). These were not mentioned in this dissertation. This may be because these are more specific to running the simulation session itself and the group dynamics within the participant group. In the evaluation phase the challenges described by Walsh et al. were difficulty measuring program impact, and disappointment in limited changes and results (Walsh et al., 2020). Although no one described being disappointed by a lack of changes as a result of translational simulations, there was support for the idea that it is difficult to evaluate the program's impact.

Overall, this dissertation lends support to the existing literature as well as adds a significant amount of detail to the barriers and facilitators that may be encountered in translational simulation research. It provided several barriers that were not documented in the literature. First, the idea that some people may not want to research their simulation programs because they would rather believe it is making a difference, as opposed to measuring it is a new idea. The assumption is if it did not have the intended impact, it could be disappointing for the individuals who invested significant amounts of effort and energy into creating, preparing, and deploying the translational simulations. This could be addressed by increasing accountability of outcome measures within simulation programs. This would need to come from the organizational leadership; however, an awareness of this concept could also be helpful because sometimes blind spots are not visible until they are pointed out. Just knowing this idea could spark reflection, contemplation, and perhaps change.

Characteristics of the individuals involved in translational simulations were also not described in the literature. This dissertation added several personality traits that can impact the

success of a simulation leader and the translational simulation program. Emphasizing the need for stakeholder engagement, especially in translational simulation, was also not present nor was there mention of an expanded explanation of who the stakeholders might be, how to reach out to them, and when to involve them. The use of expert examples for learning from others was also not mentioned in the literature review. However, the idea of using expert examples does relate to system one and system two errors (Hollnagel et al., 2015). Type one errors are described as learning from what went wrong, and type two errors are learning from what went right (Hollnagel et al., 2015). The idea of using an expert example is learning from type two errors, or from positive deviance. Discussion about duration of the planning phases, the simulations themselves, and the debriefing time for translational simulation activities was not found in the literature. This dissertation also provides advice for beginners in translational simulation. This dissertation supports the goal of further understanding the steps that need to be taken to accomplish translational simulation research, as well as the resources necessary. These findings can further the translational simulation research agenda by supporting future work in this area. Revisiting the translational spectrum, this work classifies as T0 (T zero), since it studies the theories and foundations that can support the work of translational simulation researchers.

## Implications for Practice

This section pulls together the data and integrates it into a summary that intends to guide those who may want to implement the findings from this dissertation into translational simulation research practice. The implications for practice include a focus on the planning phase, which has been deemed the most important phase in translational simulation. Actionable steps for beginning translational simulation research that emerged from this research are to start with a needs assessment that align with an important healthcare service need of the organization and the department/unit. Ensure all relevant stakeholders are invited to the planning phase; at a minimum, be sure to include a simulation educator, a human factors expert, the research team, a variety of participants, and leaders. Consider if all the necessary

skill sets are present within the team and, if not, reach out to experts who can fill any additional team skills. Once all relevant stakeholders are present, have several conversations about which definition and approach will be used for the translational simulation project. Try to achieve a shared mental model of the goals, objectives, and assessment for the project. Ensure stakeholders understand the difference between educational and translational simulation to avoid a difference in mindset about how teaching and learning should occur during the simulation. Keep the simulation as simple as possible while still achieving the goal. Allow the translational simulation expert to share implementation science and change theory principles that can inform the development of the project. Finally, consider using the CFIR or the KTA models. Figure 12 has been created from the results of this dissertation to represent the implications of this dissertation for practice.

From an organizational perspective, performing an organizational survey to assess the culture of the department the simulation will take place on as well as ensuring the leaders for that area are supporters of the program and feel it is necessary to improve their patient care and aligning with the efforts of patient safety and quality can facilitate the success of the translational simulation. If other ongoing efforts exist to address the same issue, be sure to be aware of them and how the simulation will contribute to solving the issue.

The major barriers to anticipate are difficulties in scheduling, dissemination, sustainability, and the history of how medical education has been delivered in the past. Understandably, depending on the translational simulation project and goals, dissemination and sustainability may not be initial goals. In addition to these four main barriers, there may be several challenges in identifying the correct metrics, tools, and ability to complete the data collection.

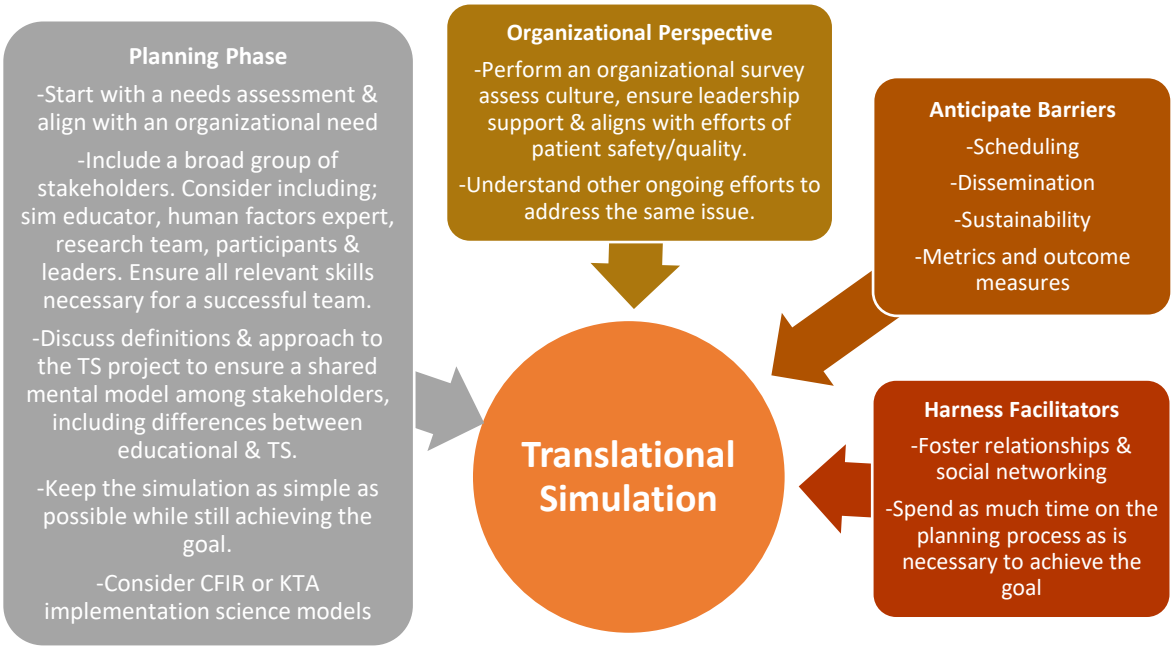
To harness facilitators, make a concerted effort to foster relationships and social network throughout the process. Spend as much time on the planning process as necessary, sometimes

taking up to 10 months just for planning. Recognize that a lot of the improvement and discussions that need to take place may be occurring during the planning phase.

This section distills the results into actionable steps. Although each project, organization, and team will be different and have different goals, this dissertation and its findings aim to be general enough to help those who are starting out avoid pitfalls that have been experienced by the participants in this dissertation and learn from the participants' experiences.

**Figure 12**

*Implications for Practice*




## Limitations

This dissertation has few limitations, as it was conducted as originally envisioned. There was great participation by experts in the field of translational simulation. The dissertation participants were successful in their pursuits to engage in translational simulation research, which may have led to more facilitators than barriers. The view of describing overcoming obstacles as facilitators may play a role in the way the codes were determined as a facilitator or barrier. This is because barriers and facilitators can be viewed by participants, depending on

their experience, as something they were able to turn into a facilitator or something that remained a barrier. However, the way they were categorized does not change the themes or codes discovered in this dissertation.

The researcher brings her own limitations as a novice researcher, especially as a qualitative researcher. The researcher's personal experience in simulation education for the last decade and the influence of her generational perspective may have unconsciously influenced by interpretations from this dissertation. To mitigate this influence, the researcher used bracketing throughout the process to address reflexivity. In addition, conversations with committee members were used to check ideas and thoughts, working specifically with the methodologists to minimize the inclusion of personal views. Despite the researcher using memos and bracketing for opinions, thoughts, and feelings throughout the process to become aware of them, her experiences and viewpoints have influenced the data analysis and results of this dissertation.

Another limitation may be to the application of these dissertation findings. As the knowledge translation and implementation literature demonstrate, mere publications will not effect change. The same is true for this dissertation, therefore emphasis on the dissemination plan is essential for real world application of these findings.

## Recommendations & Research Next Steps

This research suggests several implications for the healthcare simulation community. First, knowledge translational about translational simulation is needed within the simulation community. This can be sharing the current definitions and findings from this dissertation with the larger simulation community, especially those new to translational simulation. At the same time, standard definitions and a differentiation between translational simulation and translational simulation research should be further clarified and discussed with the simulation research community. Consistent use of definitions across the literature can also assist in differentiating translational simulations from educational simulations despite overlap. In addition, standard definitions will help articles to be more easily found on a literature search.

This will be especially useful as the field matures and the number of articles increases. The use of standard definitions will also unify the field in conceptualizing, understanding, and engaging in translational simulation research. This understanding will help the field as it grows, and more scholars will be trained through formal educational programs for simulation, translational research, and specifically for combining the two fields. A Delphi methods study could address this by consolidating expert opinions and reaching a consensus.

In addition, the use of an implementation framework within individual translational simulation research would help ensure a comprehensive approach. The combination of the KTA and CFIR models could provide a translational simulation specific version of KTA which specifies the key factors and considerations brought forth from this dissertation. An adapted KTA can be used as a process model but highlight a few elements as a starting place, especially for someone new to translational simulation. Since CFIR can be overwhelming, the new proposed model can serve as an entry point for someone new to translational simulation research. The next research study could create, test, and measure the use of the new proposed model.

The third study would be to develop, apply, and test the use of a translational simulation specific planning document. The development of a tool that can be specifically used for the planning of translational simulation activities, and will include the foundational elements and key intervention characteristics identified by this dissertation. The translational simulation specific planning document can include more specifics about the evaluation process and research plan. It can ask for key stakeholders as well as their contact information. In addition, it could include the organizational and external factors that influence the program. Potentially, there may be three planning documents if the differences between the definitions identified in this dissertation prove to be relevant for different approaches to planning. Including standardized examples of data collection tools could be useful in assisting teams to identify what they should be measuring. Identifying which metrics are used for which purposes by

translational simulation research experts could be the focus of another research study. These would need to be broad enough to be flexible within the specific context and organization, however, could be a starting place or at least lend ideas and example to those who are getting started.

Once the results of the above listed studies are completed, it could be useful to create a translational simulation toolkit which includes the expert consensus definitions from the Delphi study, an adapted KTA model for translational simulation and a planning document that is specific to translational simulation. These three pieces of information can be especially helpful for researchers entering this field.

Future work beyond the above recommendations includes capacity building within the simulation community to enable clinicians and educators to conduct qualitative and mixed methods research. Potentially having a pool of experts as part of a simulation research group who are willing to consult with others as expert examples would be beneficial. This would need to be organized and coordinated information about the potential uses disseminated, and the utilization of these consultants by other simulationists.

At the local, organizational, policy, and federal levels, more simulation researcher funding is necessary to both fund the research and to increase the number of simulation research positions. This dissertation highlighted the fact that the research follows the money. If programs are not asked to conduct research or given resources to do so, the simulations may be occurring, but the research does not happen. This leaves a gap in the current understanding of translational simulation because not everyone doing this work is researching and publishing the results. Without those publications, the larger simulation and translational science communities are not able to benefit from the knowledge gained. In addition, the minority of programs in this dissertation had specific simulation research positions within their staff. Instead, the most common model was the simulation program staff had to incorporate research into their daily work and often without funding or protected time to do so. In addition, the workloads were

described as full even without the addition of research, and many program leaders were not requiring data. This combination led to a lack of emphasis on research. Since this can be linked back to funding, the recommendation is to fund translational simulation research positions.

This research dissertation offers several suggestions for steps to take and advice to follow. The hope of this dissertation is to assist others in engaging in translational simulation research. There is a desire both in the literature and this dissertation for more research in this area to guide future decision making. This field is ripe with opportunities for future research as more research studies in all areas of T1 through T4 are necessary.

## Additions to the Dissemination Plan

After completing this dissertation and considering all relevant stakeholders for this information, the researcher realized that individuals working in simulation should know this information. In addition, simulation administrators who lead simulation programs should be aware of this information since they impact the organizational structure and factors. In addition, funding agencies should also be aware that this is an area that needs additional funds, and they need to understand why those funds are necessary and important. The earlier dissemination section outlines a plan for publications in simulation-based journals, however, the researcher also plans to disseminate this information through the research committee at the Society for Simulation in Healthcare, the INSPIRE network, and the European Simulation Research Network, sharing it on a simulation-based podcasts, and through webinars on a simulation-based website. The goal is to use as many forms of dissemination as possible to allow for a larger audience, and to accommodate those who learn in different formats, including audio, visual, and written communications.

## Conclusions

Translational simulation research has the potential to inform the way we use simulation to impact patient care and patient outcomes. Understanding how to approach translational simulation and the barriers and facilitators that can be used throughout the process can inform

novice simulation and translational researchers. The findings and advice from the experts in this dissertation can be applied into practice to assist others who are new or encountering challenges in the translational simulation process. This dissertation research adds to the existing literature by identifying barriers, facilitators, approaches, and advice on the topic of translational simulation.

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APPENDIX A

## SEMI-STRUCTURED INTERVIEW GUIDE

Introduction- Hi, I'm Lisa, thank you for agreeing to participate. Do you have any questions about the informed consent? We only need audio recording for this study, however, you have the option of being audio and video recorded. I'll start the recording now.

***HIT RECORD***

I'll start with some general questions about your simulation program. Then, I'll ask you specifically to comment on implementation of the programs you have led that translate knowledge into clinical application and demonstrated improved patient outcomes.

### Introduction Questions

- How many years have you been working in simulation?
- How many years have you been in educational research?
- Is your institutional setting academic or tied to a university?
    - How many staff are at your organization?
    - How many staff at employed at your simulation program?
    - Which learners you serve?
    - What is the mission of the simulation center?

Lisa to name specifically the program (if known). Think of a simulation scenario/program that you can directly link to improving patient care that you have been a part of developing, deploying, and measuring.

**Planning-** I want to start by asking you about your planning process (of the simulation-based translational research session/program).

1. Can you describe the planning process for implementing the simulation intervention? What was your approach? What steps did you go through to plan your simulation program?

- What is your role in the planning process? (CFIR)
- Prompt if needed: How did you realize there was a problem that needed addressing?

2. If it was a program that worked elsewhere, what steps did you take to adapt your plan for your local context? (CFIR & KTA)

3. Specifically, what top three barriers were encountered in your planning phase? (CFIR & KTA)

Follow up- Were you able to overcome the barrier? If so, how? If not, how did you decide to move on despite not overcoming the barrier?

Follow up- In what ways did you have to modify or revise your plan due to barrier, errors, or mistakes?

4. Specifically, what factors were present that helped you moving forward with your planning phase (facilitators)? (CFIR)

- Follow up- Was it something you asked for or was it something that was automatically set up in your system (for example, do you already have dedicated time for research design in your job duties or did this need to be updated).

**Executing**

5. You planned the sim one way, but sometimes the implementation does not go according to plan? Did this happen for you? Do you feel that the simulation (intervention) was implemented according to the implementation plan? (CFIR & KTA)

- Follow Up: [If No] What happened?

6. Specifically, what barriers or facilitators were encountered during the implementation process? Examples: budget, space, personnel…

**Engaging Key Stakeholders**- I would like to ask you about the key individuals (it could be the participants but it could also include the necessary individuals you needed to support the idea, these can be leaders, champions, clinical staff, simulation staff, etc.) involved in the implementation.

7. What are the titles of the key individuals you needed to get on board for the intervention to be successful? (CFIR)

8. What was your communication strategy to get the word out to your key stakeholders? (CFIR)

- For example, emails, posters, going to staff meetings, talking to people informally, personal relationships, phone call, social media, meeting agenda, etc?

9. Specifically, what barriers were encountered in engaging key stakeholders? (CFIR)

- Follow up- Were there any key stakeholders you wanted to have on board who did not "buy-in"? Or they said they bought-in but did not show actions to really help the program. Were you able to overcome the barrier? If so, how? If not, how did you decide to move on despite not overcoming the barrier?

10. Specifically, what factors enabled you to move forward with engaging key stakeholders? Examples: personal relationships, networking…

**Reflecting and Evaluating**- Simulation programs typically use a combination of debriefing, learner, program and faculty evaluations to elicit feedback.

11. Which methods did you use to assess progress toward your goals? (CFIR & KTA) How did you measure your outcomes?

12. Specifically, what barriers were encountered during the evaluation (data collection) process? Examples: personnel, electronic tools…

13. Specifically, what factors enabled you to move forward with the evaluation (data collection) process?

Closing questions:

- If you had to give advice to others who wish to implement a simulation-based translational research program. What advice would you give?

***STOP RECORDING***

I will transcribe the audio files of our conversation. With your permission, I would like to email you a summary of the data I gather as part of the verification process to ensure that I have captured and understood your contributions accurately. At that time, you will be able to make any changes you see necessary. Is that okay with you? Do you have any questions for me?

Thank you for taking the time to talk with me and be a part of my study. At this point I will stop the recording.

- Do you know anyone else who uses simulation to translate knowledge into clinical practice who might be interested in talking with me for this study?

APPENDIX B

**FOCUS GROUP QUESTIONS**

***Start recording***

Moderator: Thank you for joining me. I'd like to start with introductions. I want to welcome healthy conversation and respectful disagreements which will lead us to productive conversations. It is a small group, so I encourage everyone to speak and I'll try to help us find a balance between having an organic conversation and ensuring everyone has a chance to share their thoughts. Does anyone have any questions before we get started with the discussion questions?

In my study there seems to be variation in the term "translational simulation" I'd like to start by talking about…

- What is translational simulation?
- How would you define it?
    - Prompt if needed: What are the aspects that make it translational?
    - Prompt if needed: For example, are we running a sim that shows an educational outcomes in the sim lab but never progress to demonstrate if those skills were used in patient care, would you consider that a translational simulation?

- How should the planning process be different for a translational sim than an educational sim?
    - Prompt if needed: Would one recommendation be a sim planning template specific for a translational simulation research project?
    - Are there any specific approaches you have found successful?

Moderator: What are some ways we could overcome barriers to further the translational research agenda?

- Probes or examples provided by study participants (if needed)
    - Barrier: Culture change
    - Barrier: Determine standard metrics as a starting points for others
    - Barrier: Promote Sim Researcher positions
    - Barrier: People do not want to know or use the center for tours and showing it off but not for solving real problems

- What do you think would be the next best move to promote simulation-based translational research?

Thank you so much for your time.

***Stop recording***

APPENDIX C

**INFORMED CONSENT DOCUMENT**

**Study Title:** Informed Consent Simulation-Based Translational Research Study

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**Introduction**

The purpose of this study is to explore the barriers and facilitators to simulation-based translational research. Translational research in the context of this study is the process of turning research in the simulation lab into action in the healthcare setting to improved patient or population health outcomes. This study will explore the experiences of simulation experts across the globe. This study is a qualitative instrumental case study.

**Why is this study being done?**

This question aims to promote the use of simulation for measuring how simulation impacts patient or population outcomes research. The results from this study can contribute to the National Institutes of Health and Society for Simulation in Healthcare research agendas. This study aims to answer the following research questions:

1. How do simulation experts describe the barriers and facilitators to implementing translational simulation programs?
2. How do simulation experts describe their various approaches to implementing translational simulation programs?
3. What recommendations do simulation experts describe for overcoming barriers to implementing translational simulation programs?

**What will happen if I take part in this research study?**

If you agree to participate in this study you will be asked to provide documents you think may be useful to understanding how you planned, implemented and evaluated one of your simulation-based translational research projects. This will assist the interviewer in understanding your context. Then, you'll be asked to provide dates and one-hour times to be interviewed about your experiences creating and implementing your simulation-based translational project. A calendar invite will be emailed to you. Participants will have the option of using just voice or voice and video capabilities with this platform. This study only requires audio recording.

Following the interview, you'll be asked if you'd be willing to participate in a focus group discussion that will take place after all the individual interviews have been completed and the data has been analyzed. The purpose of the focus groups will be to discuss the results and next steps based on the findings to advance the simulation-based translational research agenda.

**How much time will it take?**

You may agree to none, one, two or all three components of this study. Each component of the study will take approximately one hour, therefore if you agree to all three components, it will take approximately three hours of your time.

**Will my information be kept private?**

To maximize data safety and security, the data will be accessible only by the research team members. Data will be kept online using Atlas.ti 8 Software and Otto.ai transcription software (*Atlas.ti Qualitative Data Analysis*, 2020). These software platforms have data security measures in place. They do not sell or share data except as necessary by law (Otter.ai, 2020). Data is synced over an encrypted connection and stored in a physically and electronically secure data center (Otter.ai, 2020). To further enhance the data security, once the transcriptions have been downloaded from the Otter.ai website and the study is complete, the data will be deleted from the otter.ai website and maintained on the password personal computers of the research team. A calendar invite for the interview will be emailed to you by using WebEx, which is through The George Washington University and is encrypted end to end. Sharing of files and data with the research team will be done through a secure GWU box.com account. The transcriptions will be maintained. Anonymized written quotes will be used in reports and publications. Participants will be assigned a pseudonyms to protect their privacy. While we cannot guarantee the privacy of the focus group discussion, we request that all present respect the group by not telling anyone outside the group what is said.

**Risks**

The risks to individual participants in this study are minimal, but still require explanation. You are being asked to share one to three hours of your time to discuss barriers and facilitators you encountered through your work in simulation. The questions are not personal and are not around sensitive or controversial topics. Any questions you do not want to answer can be skipped at your request.

There are organizational risks to participation in this study since the interview will ask about barriers they have encountered. This may come across as challenges and appear as shortcomings of the organization itself. While this is not the intent of the study and the researcher recognizes that all situations and organizations will have both issues and challenges present as a normal part of organizations, it still may be viewed as a threat to the organizations involved. To mitigate this risk, participants will be given an pseudonyms and organizational affiliations will not be mentioned. Additionally, participants will have a chance to review the study results to ensure their intentions have been correctly captured.

**Benefits**

The benefit to participating in this study is to the larger healthcare simulation community. The information provided by you and others in this study is intended to inform future simulation-based translational research. There is no personal compensation for this study.

**Can I stop being in the study?**

Yes, your participation is voluntary, and you can decide to leave the study at any time. Your decision will not result in any penalty or loss of benefit. To unenroll in the study at any time, please email the student investigator at lisaannbuckley@gwu.edu.

**Authorization to use and disclose information for research purposes.**

I have read this form and I am aware that I am being asked to participate in a research study. I have had the opportunity to ask questions and have had the questions answered to my satisfaction. I voluntarily agree to participate in this study. I am willing to be contacted by the

researcher to answer additional questions/clarifications or if they would like to use the data for additional research purposes as well as for the following purposes;

| | | |
|---|---|---|
| I am willing to share simulation documents for the purpose of this study. | Yes | No |
| I am willing to participate in a one-hour interview. | Yes | No |
| I am willing to participate in a one-hour focus group. | Yes | No |
| I am willing to allow the student investigator to retain my name and email for future research on a similar topic. | Yes | No |

_____

_____

**Signature of Study Participant** **Printed Name**

**Date**

APPENDIX D

**DOCUMENT REVIEW QUESTIONAIRE**

Interview Participant Pseudonym or Number _____

| **Question** | **Do the documents answer it?** | **What is the answer?** |
|---|---|---|
| **INTRODUCTION** | | |
| What type of institution do they work at? | | |
| How large is the institution? | | |
| Is it associated with an academic or university setting? | | |
| Can I tell the size of the organization? | | |
| Can I tell the size of the simulation program? | | |
| What location does the simulation take place? | | |
| **PLANNING** | | |
| Was a needs assessment performed? | | |
| Are there measurable objectives? | | |
| Did they identify the purpose, structure, theory and modality they will use? | | |
| Did the scenario provide context for the sim experience? | | |
| Does the sim design address/outline fidelity to align with the perception of realism? | | |
| Is there an approach for the facilitator that is participant centered and drive by objectives? | | |
| Do they have a pre-brief? | | |
| Do they have a debriefing outline? | | |
| Do they have a participant evaluation? How did they measure translational outcomes? | | |
| Do they provide preparation materials to participants to meet the objectives? | | |
| Did they pilot test the sim before full implementation? | | |
| What additional insights did you gain from this document review? | | |

# APPENDIX E

## CODEBOOK

**Advice**- Knowledge an individual would like to share with another.

Theme: Advice

When to use: When participants in the research study are speaking about advice or recommendations they would give to others.

When not to use: The advice code may also fall under other codes if it overlaps with other ideas.

Example quote: “Shift yourself before you shift others so also shift your own head away from thinking about educational simulation and only when you make that shift will you be able to ask everyone else to make it as well. And it doesn't have to be a bit of a false dichotomy. I am not saying you should have abandoned your educational roots, you should just see your role as an educator about improving teams and systems as much as it is about correcting individuals to norms.”(Jennifer)

**Characteristics of individuals**- Personality traits that appear to be inherent to an individual as observed by others.

Theme: Relationships

When to use: When discussing the qualities of an individual and how those qualities impact relationships between people.

When not to use: When talking about a group of individuals.

Example quote: “I will say [persons name] has been an incredible salesperson advocate.”(Karen)

**Communication**- Any type of information sharing, such as verbal, written, electronic, social media, etc.

Theme: Relationships

When to use: Any type of verbal or nonverbal communication, especially as it relates to relationship building.

When not to use: When it does not involve communication methods.

Example quote: “To train people around these types of conversations is a really exciting idea because it may be that they can facilitate the same type of reflective conversations at work outside of simulation; so while we run some faculty development to hopefully let you know have people running simulations in the workplace, I actually think probably the side effect is that we just have a bigger number of people who know how to talk to each other.”(Michelle)

**Cost**- Any mention of money, funding sources, grants, or monetary support.

Theme: Organizational Structure

When to use: Expressing ideas related to the cost, finances, or funding sources for the simulation program and research grants or funding.

When not to use: If it is not related to costs or funds.

Example quote: “We weren't going to him like everybody else saying I need money. We came to him and said we've already raised some money and I need a little more to get me over and this is something that Department of Medicine has already selected to invest in, so I have the support of my department chair. So I think that's why it worked, so we got the ultrasound and supplies that we could use to practice and we ended up getting a little philanthropy as well so it ended up that we were able to launch this.” (Angela)

**Culture**- The beliefs, values, and assumptions within an organization.

Theme: Organizational Structure

When to use: When discussing the culture of an institution, this includes their ability to collaborate, develop teams who feel psychologically safety, talk about errors, and give and receive feedback. It involves an openness to change, innovation and continuous improvement. Any espoused values or beliefs are included.

When not to use: There is a bit of overlap between this code and *historical*, but use this code when talking about the overall values, beliefs, and attitudes of individuals within an organization or the organization as a whole. Do not use this code when talking about a larger medical education culture outside of the institution.

Example quote: “Over the course of a few hours, we realized that this was a cultural problem and asking and receiving feedback… so it was identified that it was quite a tight unit that didn't even reach out within their own hospital to get help.” (Kimberly)

**Definitions-** When discussing how to define translational simulation, including how it is similar as well as different than educational simulation.

Theme: Research

When to use: When discussing how participants define translational simulation and translational simulation research.

When not to use: When discussing other aspects of the translational simulation planning or development process. When the discussion transitions to planning, that will fall under the code “planning”.

Example quote: “Our group at [institution name removed for confidentiality] has used the term translational science as part of simulation research in a way that's similar if not identical to what's done by the National Institutes of Health here in the United States and the NIH for at least biomedical research has defined three translational levels” (Michael).

**Dissemination**- Spreading of a simulation from the location or department of the individual speaking to other places either within or external to that individual's organization.

Theme: Research

When to use: Any discussion about distributing a simulation program from one unit to another unit, hospital, or system. This includes barriers, facilitators, process, or research aspects of the dissemination. There is some overlap with this code and research.

When not to use: When talking about the initial simulation program at one site; it must be a program that has been completed and studied at one location and moved elsewhere.

Example quote: "What we found was 1/3 of units they can take on training no problem at all. One third of units can do it but they struggle a bit and 1/3 of units are too dysfunctional to even get out of the way." (David)

**Education**- Expressing the creation of the educational session or describing the educational process.

Theme: Process of Translational Research

When to use: When talking about any aspect of creating the educational intervention including training, curriculum development, educational theories, and curriculum design.

When not to use: When talking about the planning process for a simulation event, that would go under the code "planning."

Example quote: The number one thing they can bring is curriculum that is ready for mass adoption where they really well thought out why it is the learner needs your curriculum versus another one." (Robert)

**Evaluating process**- Anything related to understanding the impact of the simulation, such as survey data, participant feedback, or research data.

Theme: Research

When to use: When discussing the collection or results of research as well as other forms of evaluation of the simulation, program, staff, or faculty running the program.

When not to use: Other aspects of research are covered elsewhere, such as patient outcomes specifically.

Example quote: “What we try to do is demonstrate what we call T1 outcomes immediate learning outcomes by the trainees in a controlled simulation environment. Can you do it on the mannequin flawlessly?”(Michael)

**Expert example**- Finding someone who is already doing what the learner wants to do and learning from them. Using the expert’s experience to assist in the learner’s progress.

Theme: Process of Translational Research

When to use: When talking about learning from others or using an expert as an example for what the learner is trying to accomplish.

When not to use: When talking about one’s own team which may have expertise in certain areas, but not an overall expert that one is tapping into for a particular reason due to their experience and education around a specific topic. If talking about pulling experts into the ongoing working team, use the code “teams.”

Example quote: “Identify places, location and people that are doing it if you’re not in one of those places, and you’re still interested in trying to bring something new into where you are. Meet with the people who have already done that, you know, don’t try to reinvent the wheel, but learn from others.” (Melissa)

**Facilitator**- *A*ny factor that promotes knowledge use or implementation (Straus, 2013).

Theme: Facilitator

When to use: Any time the participant mentions something that helps to accomplish the goal.

When not to use: It may overlap with other codes. For example, if someone is talking about how leadership buy-in assisted the resources they had for the project, that would be coded both “facilitator” and “leadership buy-in.”

Example quote: “I know some SIM services actually have their reporting line up to quality and safety, and that should enable the data.” (Jennifer)

**Historical**- Talking about the way it has always been, in other words, the status quo or the inertia that needs to be overcome to make changes.

Theme: Organizational Structure

When to use: Talking about the way the organization or training has been in the past as it relates to how it is still being done.

When not to use: If talking about the culture as a whole and not specific to the history of the organization or an individual, use the code “culture.”

Example quote: “when you look at the quality in the impact for the nature of CME as we know it today it's basically people go on a cruise or they sit in a conference room or some hotel ballroom for four or five hours, listen to lectures and go have lunch with their buddies and call it a day. And that's deemed to be education. Well we know that doesn't work but that's the state of affairs that's the status quo and it's really difficult to change it. Really, really difficult.” (Michael)

**Human factors**- The discipline or science of studying the interaction between humans and systems and technology (Healthcare Simulation Dictionary, 2020).

Theme: Process of Translational Research

When to use: When talking about studying or including professionals who focus on the way humans interact with their environment including technology, new information, or processes.

When not to use: If it is not specific to the interaction between humans and their systems and technology. For example, use education if it is part of the educational intervention.

Example quote: “There's gonna be a human factors component to anything. If you give people new drapes and new dressings and new caps they need to know how to use them properly for them to be effective anyhow.”(James)

**Implementation**- The process or act of applying the knowledge into practice (Healthcare Simulation Dictionary, 2020).

Theme: Research

When to use: When talking about moving knowledge into action, typically in this study that will mean simulated patient care.

When not to use: When talking about the planning phase before actually running the simulation, or after running the simulation and doing follow up research or curricular updates.

Example quote: “People reckon they do, but they don't, say you are a little bit of the work as done versus work as imagined, sort of gap and that can be quite tricky because people are quite sure that they know what they do often and it is very clear to you that they don't know.”(Jennifer)

**Improvement**- Making a process or action more aligned with the ideal .

Theme: Research

When to use: When talking about ways to improve an educational intervention, a process, use of equipment, a research strategy, or other general improvement upon the current approach.

When not to use: This may overlap with other codes such as education and patient outcomes. These may be double coded to account for both concepts.

Example quote: “Understands that the only way you improve is with practice and feedback in a way that's done always toward the goal of constant improvement.” (Michael)

**Leadership Buy-in**- Having leaders that believe in simulation and promote and support its use. This code also includes buy-in from others such as learners.

Theme: Organizational Structure

When to use: This code includes anything related to buy-in from leaders within an outside of an organization. It also can include buy-in from learners or stakeholders, which could be double coded with participants or stakeholders, respectively.

When not to use: When talking about team members roles or support of the program in ways other than achieving their buy-in to the translational simulation research process.

Example quote: “I think a big component of simulation is you have to do it once before you understand how it can be impactful. And so bringing people and then even administrators or faculty or whatever in having them see what we do by having them involved in it that's the way to get them really really invested… If you're standing back and I type up a paper and say this is what we're doing it doesn't, it's not nearly as impactful as coming in.” (Christopher)

**Participants** (Trainees/Learners)- The people who participate in the simulation training program.

Theme: Relationships

When to use: When discussing aspects around the people who participate in the simulation event.

When not to use: When speaking about any individual other than those who participate in the simulation event.

Example quote: “Part of making sure you have optimal experiences for your learners was not just being able to develop curriculum it's also knowing where they are or meet them where

they are and making sure that they got the zone of proximal development that can go from here in one session. Yeah, like people can't go from here to here in one session so you have to know your learners enough to know what they are able to digest." (Tammy)

**Patient outcomes**- Discussing the improvement of a health condition or regaining health for patients.

Theme: Research

When to use: When talking about the collection of data as well as the evaluation process of measuring the impact of the simulation on patient care.

When not to use: When talking about an evaluation that is not about patient care, such as learners enjoying the simulation.

Example quote: "[We went] from 75% to under 10% with reduction in infections, I think it's a very powerful metric for people to understand that maybe they're not as good at doing this as they possibly thought they were. And I think once they understood that, once they saw that, they were paying a lot more attention."(William)

**Planning Process**- The way a program prepares for a simulation event.

Theme: Process of Translational Research

When to use: This is used to discuss the planning process for a simulation event as well as planning for the translation research aspect of the program.

When not to use: When speaking specifically about the needs assessment aspect of the planning process. That would be found under the code needs assessment.

Example quote: "You would need a researcher. You want to know the plan and you want to even know what kind of analysis you want done in the end, so you make sure you get all your ducks in a row in the beginning."(Susan)

**Needs Assessment** - The part of the planning process that involves identifying why something need to be addressed or changed using simulation.

Theme: Process of Translational Simulation

When to use: When identifying problem areas or needs of a department or organization that can be met using simulation. The needs assessment can come from accreditation standards, patient safety data, patient or clinician observations or feedback, educational requirements, and mandatory professional training standards.

When not to use: When talking about the overall planning process that would be found under the code planning.

Example quote: “When I go in, I ask them what their problems are, what their problem areas are, whether it's getting their sepsis bundles met or if they need simulations in their Department to keep their accreditation or even like communication. Are they not getting good scores back on their patient surveys? So anyway, I ask them what their problem areas are and then I go from there.”(Christine)

**Patient safety/quality/risk management department-** Wher the simulation center sits within the organizational chart of the institution, and how well its work is integrated within the work of the department of patient safety/quality and risk management.

Theme: Organizational Structure

When to use: When discussing where and how the work of the simulation program interfaces with patient safety initiatives across the organization. It can include ways it does and does not integrate including barriers and facilitators in the process.

When not to use: When talking about researching patient safety that would fall under research and translational outcomes.

Example quote: “So I think it needs to be embedded in a real quality improvement or other strategy that comes with the resources available to help.” (Michelle)

**Policy change**- Discussing how simulation can be used to change policy or how a policy change promoted or assisted the use of simulation.

Theme: Organizational Support

When to use: Any discussion about policy change in relation to the simulation program. This can include ways that policy has supported the use of the program and ways the simulation research has enabled policy changes. Use it for any mandate for training.

When not to use: If it is not related to a mandate or policy change.

Example quote: “The first implementation into policy was regarding people regarding an expectation that people would participate in a pop up SIM as part of our training methodology for medical emergency so that was kind of the first implementation of simulation into policy that there's an expectation at this hospital that if a simulation is being run you participate.”(Kimberly)

**Program support**- Having the necessary assistance from others outside of the simulation center to be successful.

Theme: Organizational Structure

When to use: When talking about in the government or national support or the overall structure that supports the efforts of the simulation program as well as industry partnerships, which provide logistical support and other departments within the organization that can be utilized has additional resources for the simulation program.

When not to use: If the program support is specific to a policy change our cost those would be found under those respective codes.

Example quote: “What we did in [redacted country], what we did very successfully was lining up national incentives and local support, so the government actually paid you time at each

unit. The people do the training and they [the government] provide a sort of meta-level of support."

**Relationships**- Knowing another individual and having the ability to get a hold of them and work well together to accomplish goals.

Theme: Relationships

When to use: When speaking about the personality traits of individuals, or the communication and interactions between individuals and team members. Creating social relationships, social networking, and developing an atmosphere of trust and mutual respect. Discussing aspects of relationship building which are conducive to working well together

When not to use: When speaking specifically about leadership buy in and building a relationship with an expert whom you otherwise do not have a relationship with, those would be discussed under their respective codes of leadership by-in and expert example.

Example quote: "Then when we get a new person that's leading the organization then I put a full-quarter-press on to make sure that I get to know them and if I don't know them then I talk to somebody who does, another board member or so forth." (Christopher)

**Research**- Overall code pertaining to the research process.

Theme: Research

When to use: Use this to discuss any aspect of the research process including planning for data collection, use of data collection tools, implementing of a research plan and measuring patient outcomes, as well as barriers and facilitators related to the process of researching.

When not to use: When discussing process factors such as the planning stages for an educational simulation intervention or needs assessment related to the education.

Example quote: "I think one of the challenges in the world of research is the fact that there's not a ton of sim[ulation] researchers." (Julie)

**Scheduling**- Anything pertaining to the time it takes to accomplish something or discussion about scheduling.

Theme: Process of Translational Research

When to use: When discussing scheduling of participants, the space that will be used to hold the simulation, or the timing, specifically finding the time within people's schedules.

When not to use: Do not use it in describing the duration of an event.

Example quote: “When can we do that? Right? When can we run the simulation for night shift? When can we run it for day shift? While day shift is there all day [and] our time is 8 a.m. to 5 p.m. so can we squeeze that in there somewhere? What is a good time for nursing to run a sim, right? If you ask any nurse out there, never…but truly it is 10 a.m. in the morning or it's 2:00 o'clock in the afternoon. You have to avoid lunch, watching that and all kinds of other stuff so the big challenge is when can we do it? For the night shift it's generally pretty easy because 5:45 am you know there's no admissions [and] they know what their status is. The afternoon there's a lot of procedures so there's a lot of things going on and it's much harder to do during the day shift.”(John)

**Stakeholders**- Individuals involved in the process of planning, developing, implementing, and disseminating simulation or those whom the simulation is serving.

Theme: Relationships

When to use: When discussing individuals involved in the planning, design, leadership, or participation of a simulation. This includes any individuals that will be touched by the program.

When not to use: Speaking about individuals who are not involved or impacted by the simulation.

Example quote: “Knowing who your stakeholders are I think properly engaging your stakeholders, finding out where your stakeholder needs and wants are and come into a compromise so that everyone’s idea can be kind of taken into account in the end.” (James)

**Sustainability**- The ability for a program to continue after the initial implementation period.

Theme: Research

When to use: When discussing the longevity of a program and how to maintain an effective program on an ongoing basis. This is specific to maintenance of programs.

When not to use: When talking about the initial implementation of a program or the initial dissemination of the information to another unit.

Example quote: “It's not just creating and implementing an evidence-based curriculum that we know will work period it's trying to figure out a way in which that we can see to it and that the innovation is maintained…it grows and thrives once the Champions leave or move on. And we found this three or four or five times in [program] that we have built and installed. And they worked just great and everybody's happy but once the champion or the pioneer moves on or does something else, it just dies.”(Michael)

**Simulation and Research Teams** – Describing the simulation and research team as well as the characteristics of the team and team building activities. This includes individuals who may be outside of the core simulation faculty or staff who are brought into the simulation team for the planning, implementing, or evaluating of the simulation.

Theme: Relationships

When to use: When discussing teamwork, team training, characteristics of the team, or team member interactions within the simulation and research team.

When not to use: When talking about individual characteristics and not commenting on the relationship or teamwork between people.

Example quote: “I think you need teams from places to engage in how to do this together…so whether that means, um, going to them and working with their team to identify and understand what their problems are and giving them the tools and confidence to start or whether it means groups of people coming in and engaging in faculty development but I think the one off do you know single person from a site coming and learning how to do this this wouldn't really be helpful necessarily.”(Michelle)