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Gendering Trust in General Surgery Training: Examining the Role of Trust Between Residents and Attendings

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GENDERING TRUST IN GENERAL SURGERY TRAINING: EXAMINING THE ROLE OF TRUST BETWEEN RESIDENTS AND ATTENDINGS

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GENDERING TRUST IN GENERAL SURGERY TRAINING: EXAMINING THE ROLE OF TRUST BETWEEN RESIDENTS AND ATTENDINGS

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MEDICAL SOCIOLOGY

ABSTRACT

In medical training and throughout medical careers, women face disadvantages –especially in surgery. To better understand origins of these gender inequalities, this study examines the role of gender in surgical training, focusing on trust between faculty serving as attendings and medical residents. An environment of trust enables residents to gain hands-on experience and acquire practical skills during surgeries performed jointly with attendings. In this sequential explanatory mixed-methods study, 105 surgical encounters were rated utilizing the OpTrust tool, an instrument designed to measure entrustment between surgery residents and attendings. Furthermore, seventeen attendings and ten surgery residents gave in-depth interviews. Attendings' average entrustment was modeled using linear regression models with robust estimators, controlling for resident and attending demographic backgrounds and intraoperative factors. The results revealed gender disparities in trust. Female residents experienced a loss of trust from their attendings when performing their second to fourth surgery together, whereas male residents rapidly gained trust at the same point of their training. These findings suggest that experience in

the operating room benefits male trainees more than female trainees in terms of faculty trust. Qualitative results indicate that gender stereotypes and biases influence attendings' trust in female residents, thus limiting female residents' active participation inside the operating room. These findings inform interventions to ensure equal surgical opportunities for female residents.

Keywords: surgery, residents, gender, trust, OpTrust, mixed methods

DEDICATION

This dissertation is dedicated to my husband, Yihsrael Yahyl Vélez Alicea. Thank you for being an exceptional man. I am grateful for your unconditional support. Thank you for driving me to the hospital when I was collecting data and holding my hand when major storms threatened my academic journey. I would not have made it this far without you. As you already know, this is not my accomplishment; but ours. This work is also dedicated to all women pursuing a career in medicine and currently working for the healthcare system in the United States.

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TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

Fifty years ago women could not easily enter medical schools and pursue a carrier in medicine due to institutional constraints (Burrow and Burgess 2001). For the first time in 2019, Medical Schools in the United States (US) enrolled more women (50.5%) than men compared to 2015 (46.9%) and 2018 (49.5%) (Boyle 2019, 2021b). Although this is a meaningful gender equality milestone, medicine remains a male-dominated work environment (Mangurian et al. 2018). In 2019, only thirty-six percent of medical doctors in the US were women (See Figure 1), and most of them were at the bottom of the medical specialty hierarchy (e.g., pediatrics) (Association of American Medical Colleges 2019a) with lower earnings compared to men (Anspach 2010). A quarter or less of physicians practicing prestigious specialties, e.g., gastroenterology, cardiovascular medicine, and surgery are women (Association of American Medical Colleges 2019a; Riska 2001b).

Surgery is one of desirable medical specialties with fewer female than male practitioners. Fourteen percent of surgeons in 2019 were women, representing less than a quarter of each surgical specialty (Association of American Medical Colleges 2019a) (See Figure 1). Unlike prior years, more women are taking their practice into teaching hospitals (Riska 2001a); nevertheless, women are still a minority across medical training programs in the US (See Figure 2). In respect to trainees, forty percent of general surgery residents in the US were women in the same year.

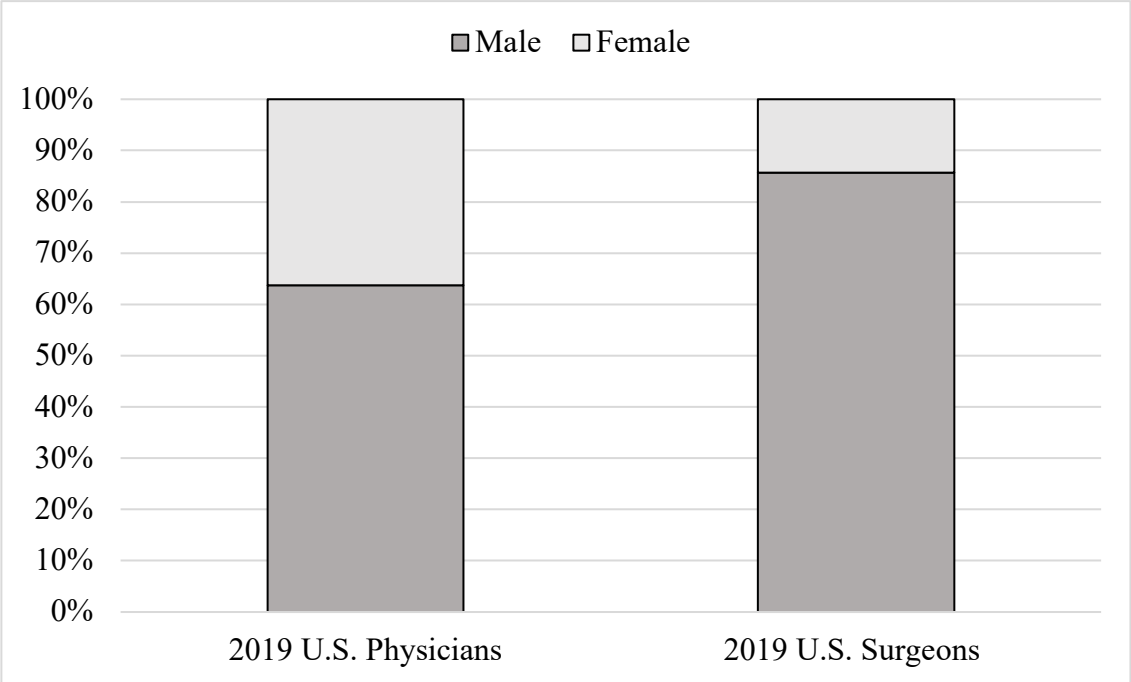

Figure 1. 2019 Active physicians and surgeons in the US by gender.[1]

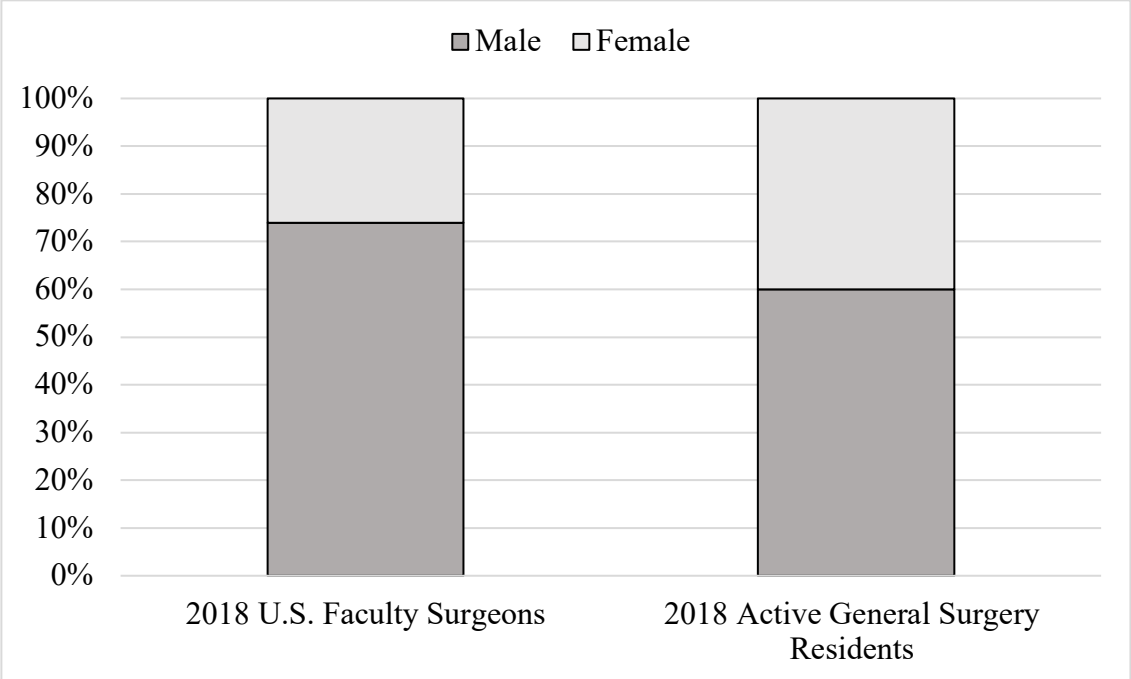

Figure 2. 2018 Active faculty surgeons and general surgery residents in the US by gender.[2]

[1] Source: *American Medical Association. AMA Masterfile (2019).*

[2] Source: *AAMC Faculty Roster (2018); GME Track (2018).*

Research suggests that medical socialization barriers in training, especially during residency, are responsible for the underrepresentation of women in medicine (Anspach 2010; Babaria et al. 2012; Brewer et al. 2020; Klein, Law, and Koch 2020; Lober 1993; McManus 2000; Mueller et al. 2017; Riska 2001b). The medical identity entails traits culturally associated with men (Becker 1961; Bosk 1979). Physicians, especially surgeons, are expected to endure long shifts without showing signs of tiredness and emotional weakness and treat illnesses cold-minded (Cassell 1998; Coverdill and Mellinger 2021). Meanwhile, behaviors generally associated with femininity collide with this ethos and the mismatch between what it means 'to be female' and the medical identity support assumptions about female trainees' inferior technical and leadership skills (Ridgeway 2009; Riska 2001a). Women undergo additional training challenges, such as unequal quality of feedback (Mueller et al. 2017), sexual harassment (Babaria et al. 2012), and skill undermining (Brewer et al. 2020). These gender dynamics limit female trainees' access to resources for pursuing specialized training and leadership positions, including participation in medical interventions during rotations, networking opportunities, and finding a supportive mentor (Lober 1993).

A recent line of medical education scholarship highlights the role of trust in general surgery training. The lack of teachers' trust in residents' skills helps to explain limited participation of residents in the Operating Room (OR) (Sandhu et al. 2017), which results in recently graduated surgeons feelings of unpreparedness for independent practice. Teachers' entrustment, meaning "actions that impart trust and responsibility for patient care to residents" (Sandhu, Thompson-Burdine, et al. 2018:519), influence trainees' chances of having hands-on and supervised experiences enabling them to

develop surgical skills. Concerned with competency issues due to fewer hands-on experiences in training, a group of medical educators from the University of Michigan associated this trend with scarcity of trust between faculty members known as attendings and residents. They argued that when trust is low, attendings limit trainees' participation in surgeries and their chances of developing technical skills (Sandhu, Nikolian, et al. 2018). Based on this assumption, they developed a tool for assessing entrustment in the surgical attending-resident relationship to identify significant factors affecting the development of trust (Nikolian et al. 2018). Sandhu and colleagues (2018) found a correlation between residents' postgraduate year and attendings' likelihood of entrusting professional activities to them, thus influencing trainees' chances to practice procedures under the supervision of a trained surgeon. In another study, they observed higher entrustment when residents and attendings knew each other well as a result of prior work experiences in the OR (Sandhu et al. 2020). These studies showed the relevance of building a long-term relationship to promote intraoperative trust in surgical training.

General sociological theories about trust suggest that the quality and availability of knowledge about those who are to be trusted inform people's trust choices (Hardin 2002; Sztompka 1999). Trustors who interacted with trustees in the past use the information they gather from prior experiences to choose whether or not to trust. During first-time interactions with strangers, there is not enough information to inform trustors' decisions. Thus, people often use stereotypical references (Burnett, Norman, and Sycara 2010), such as gender (Schniter and Shields 2020) and race (Stanley et al. 2011), to decide whether or not they should trust others. Research has reported gender disparities in the likelihood of trust (Croson and Buchan 1999; Kiyonari et al. 2006; Schniter and

Shields 2020), suggesting that women are more prone to trust others but are trusted less with tasks that are culturally associated with masculine behaviors and skills (Ridgeway 2009; Robbins 2016b). Given that prior studies associate the underrepresentation of women in medicine, especially in surgery, with social factors in training (Brewer et al. 2020; Lober 1993; Mueller et al. 2017; Riska 2001a, 2001b), trust should be examined as a potential training component that puts female residents at a disadvantage and limits their odds of succeeding and achieving prestigious careers in medicine.

This sequential explanatory mixed methods study aims to identify the role of faculty entrustment as a potential socialization barrier limiting female residents' chances of gaining hands-on operative experiences in the OR. The following research questions are proposed: (1) How is prior training, operationalized as residents' postgraduate year, and prior interpersonal experience, operationalized as the number of previous surgical encounters with the same resident, related to attendings' trust? (2) Does the association between residents' postgraduate year and trust in surgical training function differently for male and female residents? (3) Does the association between the number of prior surgical encounters and attendings' trust differ by residents' gender? (4) What does trust mean in general surgical training? (5) Which behaviors influence entrustment? (6) How the interrelation between residents' seniority, interpersonal experience with an attending, gender, and trust manifest in the OR? (7) What are attendings and residents' opinions and experiences regarding trust?

CHAPTER 2

BACKGROUND AND THEORETICAL FRAMEWORK

The Evolution of Medical Education in the US

The main prerogative of today's medical training format is to organize the medical profession and services physicians provide to their clients (Goode 1960). In this way, medical training contributes to physicians' professional dominance, meaning the control over a work domain of an occupation, including the discourses (e.g., diagnosis) distinguishing job roles in a work milieu (Freidson 1970b). In medicine, professional dominance is possible through the standardization of procedures and products physicians provide to patients (e.g., medical evaluation, treatment). This social process legitimizes medical doctors' work over commodities that other types of healthcare providers (e.g., naturopaths, chiropractors) offer to their clients (Freidson 1970a). The medical profession in the US, however, did not always benefit from the structures and control mechanisms in medical training that presently support its occupational status. Before the American Revolution, a small portion of those who provided medical attention to sick people received training from universities and medical schools; the rest were apothecaries, ship surgeons, or religious leaders who received limited medical training in Europe. Anyone could practice medicine and call themselves a "doctor" (Cockerham 2017).

The first US medical school was established in 1765 at the College of Philadelphia by several American physicians who attended medical school at the University of Edinburg in the United Kingdom (Brown 1979). Throughout the rest of the century, other well-known university-based medical schools, such as Columbia – originally known as King's College–, Harvard, and Dartmouth, were also established. During the 19th century, most medical schools were small, non-university affiliated, and for-profit (Schwartz et al. 2018). These institutions lacked standardized curricula and appropriate training facilities. Anyone who had the economic resources to pay tuition could enroll in their Medical Degree (MD) programs.

Thru the 1900s, the majority of the methods doctors learned in US medical training programs and employed in private practice were not scientifically validated. For example, phlebotomy, popularly known as bloodletting, was a commonly used procedure to treat cholera. This and other healing methods caused many discomforts, were not safe, and did not always provide desired results. In the case of bloodletting, patients had a fifty percent chance of dying of the illness or getting killed by their doctor (Brown 1979; Parapia 2008).

While medicine in the US was deteriorating, European medical knowledge flourished as a result of the growth of university clinics and laboratories and the rise of many scientific medical breakthroughs, including Louis Pasteur's germ theory, Rudolf Virchow's cellular pathology approach to diseases, and Robert Koch discovery of multiple bacterial pathogens (Foucault 1963). By the end of the 1800s, several Americans who wanted to pursue a trustworthy career in medicine traveled to the best European facilities known by their famous clinics and laboratories to learn from the experts of their

era. Eventually, those American physicians who studied in Europe returned to the US to build their private practices. These medical doctors treated patients with cutting-edge techniques and established medical laboratories to further the scientific research of diseases and gained greater prestige than other physicians who attended American non-university medical schools (Brown 1979).

In mid-19th century, Nathan Smith Davis founded the American Medical Association (AMA). This organization created the AMA Council on Medical Education (AMACME) in 1904 to provide and supervise medical training curricula (Schwartz et al. 2018). Initially, these entities dealt with political barriers that obstruct their lobbying efforts (Beck 2004). The AMA and the AMACME's persuading power, nonetheless, thrived when the most prominent piece of literature in the history of medicine, popularly known as the Flexner Report, was released to the public and revealed the audacities done by most US medical schools (Flexner 1910). With the sponsorship of the Carnegie Foundation for the Advancement of Teaching, in 1910, the educator Abraham Flexner published an account of his observations from his visits to 150 US medical schools. His report contained a list of schools that met the criteria for proper medical training. It included only Harvard, Western Reserve, and The Johns Hopkins University.

Even though the Flexner Report received negative responses from members of affected schools, it played a vital role in the standardization of medical education. This scientific study brought rigor to the medical training process in the U.S, thus initiating the Progressive Era (Mitka 2010). One of the most memorable contributions of this manuscript was a list of recommendations, modeled after The John Hopkins University, that remain at the core of medical education. First, medical schools must have an

academic faculty of full-time qualified physicians-educators and access to state-of-the-art laboratories and hospitals. Second, they should implement a comprehensive admission process to verify candidates' academic profiles. For example, applicants must have an undergraduate degree at the time of admission, and those who have taken premedical college courses are most preferable. Third, medical schools should offer graduate-level classes focused on scientifically validated medical knowledge, integrate research experiences into the training process, and operate under the supervision of universities.

This report hindered the reputation of many schools that did not pass Flexner's evaluation and eventually closed due to economic constraints and their inability to acquire state board licensing (Cockerham 2017). Nevertheless, some small medical schools that abided by the recommendations listed above benefited from large donations from the Carnegie and Rockefeller Foundations and rose to the training standards of leading schools. As for-profit schools perished and medical education based on scientific knowledge flourished, the medical profession gained its dominance (Freidson 1970a), and medical training transitioned to the structure it has been following till this day.

In the following section, I will explain the training process of surgeons from the beginning of medical school to the end of residency. This portion will provide deeper context regarding the daily experiences of the population of interest in this study, their struggles, responsibilities, and relationships with others with whom they socialize across their training journey.

The Training Journey of Surgeons

Medical training is an intense learning process designed to produce physicians who can treat illnesses within a complex modern healthcare system (Becker 1961; Bosk 1979; Lempp 2009; Szymczak and Bosk 2012). To achieve a career in medicine, students must commit to a long journey of at least nine years. The trajectory of medical trainees includes four years of medical school and five years of residency (Ludmere 2015; Swanson 1973) after completing an undergraduate degree, most likely in pre-medical training, natural sciences (e.g., biology), physics, chemistry, or psychology (Cockerham 2017). This time frame applies to medical carriers specialized in internal medicine, family medicine, pediatrics, emergency medicine, psychiatry, anesthesiology, obstetrics and gynecology, diagnostic radiology, neurology, and general surgery. Other medical subspecialties (e.g., pediatric surgery, neurosurgery, gastroenterology, endocrinology) require at least one additional year of fellowship training. Given the length of the training process and multiple steps to become a surgeon, it is useful to observe the expected training trajectory before and during surgical residency to understand the professionalization of surgical trainees and their relationship with attendings.

Today, the process of becoming a physician is highly complex and loaded with obstacles put in place to select the best of the best to practice medicine. In 2021, 62,443 people applied to medical schools across the US, and 36% were chosen to enroll this year (Boyle 2021a). These numbers show the level of selectivity of medical education compared to the pre-Flexner Era and how the system is designed to separate ordinary individuals from those who are “strong enough” to endure the challenges of medical

training and are “worthy” of practicing medicine even before the training begins (Jenkins 2020).

In a pioneering study on medical socialization, *Boys in White,* Becker (1961) described the culture of a medical school and identified challenges medical students overcome to complete their training and practice medicine independently. The first two years of medical school, known as the freshmen years, students spend the majority of their time learning through coursework and laboratories basic medical science (e.g., anatomy, pharmacology, microbiology) and techniques (e.g., physical diagnosis, clinical laboratory procedures) they will apply in their medical practice (Cockerham 2017). At this stage in their training, they do not engage in clinical work and their sole responsibility is to read and learn as much as possible from scholarly medical literature. Due to the immeasurable quantity of medical knowledge, medical students strive to determine what to study for their classes and board examinations (Becker 1961). Although Becker only observed and interviewed subjects from the University of Kansas Medical School in the late 1950s, current medical students are experiencing similar feelings of anxiety when preparing for the US Medical Licensing Examination (USMLE) Step exams. This assessment reflects these medical trainees’ retention and application of the knowledge they gain in medical school and plays a vital role in their residency prospects. Using a life-story approach, Tania Jenkins and her colleagues (2018) explored the different types of factors influencing stress among medical students in their training and identified the USMLE Step 1 as a preeminent stressor increasing students’ chances of experiencing burnout.

In the last two years of medical school, known as clinical years, medical apprentices receive their training at a teaching hospital where they execute clinical work and interact with patients and other teaching/clinical staff (Lempp 2009). In this phase of their training, students practice what they learned in the first two years of medical school and develop essential skills in the profession, i.e., diagnosis and patient-physician communication. At this stage, they focus on learning how to apply medical knowledge and assume medical responsibility by shadowing and assisting their physician-teachers as these fully trained medical doctors interact with, diagnose, and treat their patients. Medical students put great value on opportunities to practice medicine in a supervised environment; thus, they strive to participate in as many cases as possible and particularly unusual ones (Becker 1961). Furthermore, medical students learn to interact with other trainees, physicians, and healthcare workers as they participate in the care of patients in different medical services, known as rotations (e.g., psychiatry, internal medicine, obstetrics-gynecology, pediatrics, surgery, and other subspecialties) (Cockerham 2017). Their experience across each rotation exposes medical students to the specialties they ought to choose from for the next step in their training journey.

Unlike at the beginning of the 20th century, those who graduate from a medical school and earn an MD must now further their training through a residency program to practice internal medicine (Swanson 1973). In addition to clinical rotation years in medical school, residency is one of the most influential phases in the development of trainees' medical identity (Harter and Krone 2001). Through exposure to multiple work areas and practices, physicians in training learn how real doctors behave (Wallenburg et

al. 2013) via encouragement, punishments (Crowe, Clarke, and Brugha 2017), and role modeling (Wallenburg, Jeannette, and Bont 2015).

Compared to medical school, residencies provide trainees with more hands-on chances to practice medical approaches while still being supervised by senior physicians who work side-by-side with them, provide guidance, and take over cases whenever trainees can no longer proceed with a clinical intervention (Bosk 1979). During the first year of residency, trainees are known as interns. They have limited participation in clinical interventions and heavily engage in administrative work restricted to healthcare professionals with MDs. In the cases of surgical residency, interns are generally in charge of writing test and medication orders, admitting and discharging patients, and coordinating medical students' work during their surgery rotation. They rarely participate in surgical procedures (Bosk 1979).

By their second to third -year, trainees become junior residents and have greater authority than interns and medical students, especially inside the OR. Junior residents may have different responsibilities across rotations and programs due to their middle-ground position in the training hierarchy between interns and senior residents. Therefore, some trainers may appoint juniors to duties that other attendings might consider inappropriate for them. In surgical residency, second- and third-year residents spend most of their time in the OR, observing and assisting faculty surgeons. Compared to interns, they are more involved in the care of patients as they are responsible for monitoring patients' disease and recuperation process, especially during night shifts.

Throughout the last years of residency, trainees become senior residents. This older cohort is responsible for everyday decisions in patient care, i.e., monitoring

patients' disease progression and treatment response and verifying the timing of clinical tests and medication administration (Bosk 1979). At this stage of their training, faculty members often see trainees as their colleagues. From this group of residents, attendings choose at least one for the chief of residency position. In addition to the previously listed duties, this select senior resident is the liaison between other residents and faculty.

Residents gain most of their hands-on training from fully trained surgeons and members of a department of surgery, known as attendings, at a university or community-based teaching hospital. Besides being the source of medical knowledge, attendings serve as gatekeepers of opportunities to practice medicine within the training milieu (Wallenburg et al. 2015). One of the toughest challenges in residency, especially in surgical training, is to figure out the means to participate in the care of patients and perform surgeries to develop medical reasoning and technical skills (Wallenburg et al. 2013). These experiences allow physicians in training to earn clinical experience and gain skills required by the Accreditation Council for Graduate Medical Education (ACGME) to practice medicine after completing their training (Brasel et al. 2019).

The format of medical training in residency calls for daily negotiations on how much attendings will allow residents to practice medical skills on their patients. Before bargaining the extent to which trainees will participate in patient care, attendings evaluate the context of the case they will be working on and the resident's technical and medical knowledge proficiency (Wallenburg et al. 2015). When trainers and trainees share prior medical experiences, attendings are more likely to extend residents' chances of practicing medical techniques because they have seen their technical and judgment capabilities in

the past (Bosk 1979; Wallenburg et al. 2013). These opportunities to practice contribute to the residents' skill development and career prospects.

Gender Segregation in Surgery and Socialization Theory

Even though there are more women in male-dominated occupations now than fifty years ago, segregation in the labor force is still a critical issue and a significant factor driving the gender wage gap in the US (England, Levine, and Mishel 2020). To understand why women are in minority across specific occupations, scholars explored multiple mechanisms driving occupational gender segregation, i.e., access to social capital (Fernandez and Sosa 2005), early life socialization (Corcoran and Courant 1985), sex-typing of job roles (Campero and Fernandez 2019), reproduction of gender traits in training (Charles and Bradley 2009), and discrimination or anticipated discrimination (Correll, Benard, and Paik 2007; Petersen and Saporta 2004). In the case of the medical profession, most women are practicing feminized specialties (e.g., pediatric). Several studies attribute this trend to cultural assumptions about character traits and gender (Anspach 2010; Lober 1993; Riska 2001a, 2001b).

According to the *socialization theory*, throughout the life course –especially in early childhood– social structures influence women's acquisition and development of attitudes and behavioral traits associated with gender stereotypes (Leaper and Freidmand 2007). These attitudes and behaviors (re)produce stratification dynamics in the labor force, often excluding women from occupations entailing abilities associated with masculine stereotypes and pushing them into jobs where their femininity is more

appealing (Ferree and Hall 1996). In medicine, female physicians are less likely to be selected for specialties where a tendency toward caregiving does not seem to fit (e.g., orthopedics) or persuaded into applying for areas where caregiving skills will be well-received (e.g., pediatrics) (Riska 2001b).

Surgery is one of the specialties with the lowest proportion of females in the US (Association of American Medical Colleges 2019a). In the past twelve years, the share of women in surgery has been alarmingly low and declining, as the percent of female surgeons has dropped from 24% to 10% between 2008 and 2012 (Center for Workforce Studies 2008, 2012). Early European studies suggest that women who pursue a surgical career face obstacles fostered by a male-dominated environment where they are not seen technically and discursively as a good fit (Riska 2001b).

Surgical success is a socially constructed discourse. Surgery as a treatment option is constantly battling against other, less invasive medical approaches, e.g., preventive medicine and pharmaceuticals, that carry a lower risk of permanent damage. Surgery tends to be the most expensive and risky option for the patient (Katz 1999). To build and maintain their prestige, surgeons must use rhetoric to defend their medical approach. They must project assertiveness to own power over the medical decision process and enforce a treatment option (Fox 1992). Given that men are socialized into adopting bold behaviors, they seem to be naturally made for surgery, while women are likely to be excluded because they do "have what it takes" to dominate the surgical discourse (Corcoran and Courant 1985; Ferree and Hall 1996).

It is a great challenge to break away from the culture of surgery and the image of *the iron surgeon*, meaning a physician who is infallible and authoritarian, does not show

distressing emotions and is available twenty-four hours every day of the week (Cassell 1998). The prestige of male surgeons rests on a socially constructed ethos that favors men because they are "naturally" instrumental, tough, and precise (Katz 1999). Since women are expected to have children and invest a large quantity of their time into taking care of them and other household responsibilities (Orloff 1996), women may not be well suited for surgery. Hence, their gender does not match with the masculine ethos of surgery.

Even though an extensive line of research on gender inequality and the labor market focuses on factors during the recruitment process (Campero and Fernandez 2019; Correll et al. 2007; Fernandez and Sosa 2005; Petersen and Saporta 2004), other studies posit pre-hiring elements as relevant drivers of the gendered stratification and wage gap in the US labor force (Bolton and Muzio 2007; Collins 2010; Corcoran and Courant 1985). Recent studies show that female residents are not receiving the same quality of training as their male co-residents (Brewer et al. 2020; Mueller et al. 2017). This could potentially affect women's odds of gaining hands-on experiences and achieving careers in prestigious specialties. In the following section, I will provide a brief historical account of the integration of women in medical education. Then, I will present recent scholarship on training factors affecting female medical students and residents' training experience.

Medical Education and Gender

Throughout the first half of the 20th century, women faced substantial barriers while trying to attend medical school and practice medicine. In 1910, most medical schools that allowed women to earn a degree in medicine closed because they did not meet the standards suggested in the Flexner report, including stricter admission standards,

science-based curricula, state-regulated medical licensure, and required research load for medical faculty (Burrow and Burgess 2001; Flexner 1910). Hence, many women lost the opportunity to become physicians, given that remaining and new schools were hesitant to admit them or even review their application materials. Because of admission barriers, few women attended medical schools, and those who did, had a hard time joining the healthcare force since most hospitals did not hire female physicians (Lober 1993).

Moreover, the Flexner report endorsed the development and integration of scientific knowledge in medicine and the dominance of allopathic medicine[3] (Mitka 2010). According to feminist interpretations, this scientific discourse undermined "women's traditional skills and medical knowledge" (Riska 2001a:40), thus supporting a male-dominated enterprise in medicine. During the 1970s, several accredited medical schools increased the ratio of admitted women, including Yale Medical School (Burrow and Burgess 2001), which stimulated the first significant increase of female physicians in the US (Anspach 2010). Yet, segregation patterns are still relevant in the gender distribution by medical specialty, especially in surgery (Association of American Medical Colleges 2019a). Recent research has demonstrated unequal training conditions for female residents (Babaria et al. 2012; Brewer et al. 2020; Dayal et al. 2017; Mueller et al. 2017), and how they are related to the underrepresentation of women across medical specialties. According to Anspach (2010), female medical students and residents are less likely to receive or be chosen for prestigious training opportunities (e.g., fellowships) compared to male physicians in training.

[3] Mainstream medicine is regularly associated with allopathic medicine, and this approach focuses on treating symptoms.

Concerned with the quality of training across male and female residents, Mueller et al. (2017) analyzed attendings' assessment comments for second and third-year emergency medicine residents and found critical disparities in the quality of feedback. Comments on male residents' work were consistent across all faculty members and aimed at skill enhancement; female residents received discordant feedback and were mainly criticized for lacking leadership skills. Another study showed that female trainees experienced inappropriate comments from trainers but lacked any clear legal or institutional recourse to address these behaviors (Babaria et al. 2012). As a long-term effect, these comments diminish the role and position of female apprentices in the medical training hierarchy. A more recent study indicated that implicit gender bias interplays with role expatiations in medical training, therefore making women seem less competent, especially during the last years of residency (Brewer et al. 2020). Thus, gender differences in training experiences influence career paths for female physicians and their future career choices.

Sociology of Trust and Methodological Approaches

Trust has been one of several concepts studied across generations of scholars since the rise of sociological research. Presently, trust research is encouraged by a myriad of social phenomena enabled by this abstract concept, including social order (Cook et al. 2013), cooperation (Walker and Ostrom 2009), social networks (Cook 2005), psychological safety (Edmondson, Kramer, and Cook 2004), and many more. Hence, it is a significant factor in social interactions (Cook and Santana 2020). As research on trust

grows, scholars invested in this topic continue to develop several theoretical models and empirical approaches to understanding how trust operates across contexts (Hardin 2001). Given that this study seeks to understand the role of trust in general surgery training and how it could be responsible for the underrepresentation of females among surgeons, I will narrate the history of sociological theory and research on trust to contrast prior research on trust with the present study.

Early sociological literature exploring the purpose of trust in society dates back to the late 1800s and early 1900s in the work of the founding fathers of sociological research. As part of his goal of interpreting macro-social phenomena, Durkheim (1893) saw institutional trust as an essential element in economic and social contracts. His work described people's use of trust to enable social exchanges in industrial social life founded by the division of labor, especially with outsiders in their social networks. Weber (1968) contributed to this initial interpretation of trust when he argued that the functionality of modern societies rests on universal trust.

Modern social psychologists developed multiple models describing the nature of trust and mechanisms that stimulate or discourage trusting behaviors, some assimilating Durkheim and Weber's foundational views. At the beginning of the 21st century, for instance, Luhmann (2000) described trust as a social lubricant within an unpredictable and complex society. Modernity grants social actors the freedom to choose from a myriad of commodities and behaviors. Thus, it may be more arduous than in earlier historical times to predict others' future course of action; trust is essential to enable social interactions. On the other hand, Sztompka described trust as "a bet about the future contingent actions of others" (2003:48) and as a positive expectation of the future. When

choosing to trust, people behave as if there are no possible risks due to the interaction (e.g., betrayal). These two perspectives reflect common challenges in everyday social relations and exchanges. They can be applied to marriage (Burke and Stets 1999), work (Burt and Knez 1995), science (Zucker et al. 1995), investments (Yenkey 2018), and healthcare (Cook and Stepanikova 2008). In all these areas of life trust plays a critical role.

Importantly, Luhamann (2000), Sztompka (2006) and other modern trust theorists (Cook et al. 2013; Hardin 2002; Khodyakov 2007) prompted the development of several methodological approaches to study the impact of general trust (Almakaeva, Welzel, and Ponarin 2018; Delhey, Newton, and Welzel 2011; Dinesen and Sønderskov 2015) and situational trust (Lusher, Kremer, and Robins 2014; Schilke, Reimann, and Cook 2015) in social life. To assess the role of trust, social scientists mainly use survey questions, laboratory experiments, and survey vignettes. In what follows, I will provide a brief description of each of these research approaches.

Several early survey studies used data from national and international surveys aiming to assess social factors and values among large populations, including General Social Survey (GSS) and the World Value Survey (WVS). In its first four waves, the WVS included a question designed to measure 'generalized trust:' "Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with people?" (Inglehart et al. 2014). Participants chose one of the following statements to report their tendencies to trust others regardless of their identity: "Most people can be trusted," "Can't be too careful," or "Don't know" (Cook 2005). Studies on social capital

incorporated this question to identify factors associated with declining patterns of trust in the US (Paxton 1999; Putnam 1995; Robinson and Jackson 2001).

Although these studies provided important insights about trust at a macro scale, general trust questions have been criticized for several weaknesses, notably, poor reliability and validity. First, because individuals from different cultures do not hold standardized views on social network membership (e.g., family, friends) and whom they treat as strangers (e.g., people they just met), the phrase "most people" has multiple meanings cross-culturally (Glaeser et al. 2000; Nannestad 2008; Reeskens and Hooghe 2007). The general trust question does not consider the influential role of social ties, such as kinship or friendship (Delhey et al. 2011). To improve the quality of the data and provide other components to the generalized trust variable, waves five, six, and seven of the WVS included the following question, "From each of the following, tell me whether you trust [people from your family/ people from your neighborhood/ people you know personally/ people you meet for the first time/ people of another religion/ people of another nationality] completely, somewhat, not very much or not at all (World Values Survey Association 2009). With this new question, researchers can explore specific relationships of trust, known as 'particularized trust,' rather than observing people's tendency to trust unconditionally (Schilke, Reimann, and Cook 2021). For example, Delhey and colleagues (2011) showed that differences in trust circles, meaning whom people trust within their network, between Confucian countries (e.g., China) and Protestant countries (e.g., US) are explained by national mobility and prosperity, thus demonstrating the value of incorporating trustor categories.

Even though adding specific group categories helped to solve issues with in- and out-group membership, this particularized trust question has other theoretical problems. The structure of this question still has ambiguity because it does not account for confounding factors at the relationship level, especially the goal of a trust exchange. Respondents may report on their disposition to trust with different ends in mind (e.g., fidelity, keeping a secret, completing a task) (Hardin 2001). For example, a person may trust another individual with monetary transactions but not with the care of their child.

Laboratory experiments are the most popular approach in social psychology for measuring trust behaviors and identifying the conditions under which they take place. This methodology requires bringing real individuals to an isolated and secured space and testing their behavior with and without a treatment option (Jackson and Cox 2013). When testing trust behaviors, social psychologists generally ask participants to take part in a trust game (Buchan, Croson, and Solnick 2008; Cook et al. 2005; Haselhuhn et al. 2015; Kuwabara et al. 2007). Typically, each subject receives a determined amount of currency they can exchange with others. To operationalize trust in these experimental games, scholar treat currency exchanges as behavioral manifestations of this construct because it shows "willingness to make oneself vulnerable" (Schilke et al. 2021:242). According to the basic rules of this type of experiment, participants choose whether or not they will endow their currency to their partner or keep it. When both parties donate, they earn twice their donation; if not, they keep their initial amount of currency. If one endows and the other does not, the party who chose not to donate keeps her and the other party's currency. The rules of this game do not allow participants to develop strategies to win with the purpose of controlling their exchange choices (Walker and Ostrom 2009). To

change the treatment and outcome of interest, scholars alter the sequence, occurrence, rules, and context of the game. For example, players may get assigned fixed or interchangeable role (e.g., first move, second move) in the game or have fixed (Burks, Carpenter, and Verhoogen 2003; Kiyonari et al. 2006) or changeable initial currencies and how to endow it (Cook et al. 2005). Some studies allow participants to know specific information about the other person playing with them to explore how different forms of knowledge influence trust behaviors (Kuwabara et al. 2007).

Unlike other methodological approaches, experimental trust games provide greater control over the internal validity of the research design. The context of social laboratories, for example, a room with a desk, a chair, and a computer provide the mechanisms for controlling cofounding variables influencing variation in real interactions (e.g., gender, socioeconomic status, stereotypes) (Jackson and Cox 2013). Even though this approach allows researchers to test causal effects in social interactions, Brülhart and Usunier (2012) critiqued the external validity of trust games and argued that the operationalization of trust in these overcontrolled experiments might differ from trust in real social exchanges.

Although not as popular as survey questions and experimental designs, some research used vignettes to explore the conditions in which trust is more likely to occur within specific settings (Dennis et al. 2012; Olsen et al. 2020; Schafheitle et al. 2020). Robbins used this methodological approach to determine the association between trust motivations, emotions, and social relationships (2016b, 2016a). In her research, she employs factorial survey experiment designs. This approach provides subjects hypothetical scenarios followed by questions assessing their likelihood to trust a fictional

character and additional questions to collect other factors that might have influential effect on respondents' answer to this trust question (e.g., general social trust, preference aversions, motivations) (Auspurg and Hinz 2015).

Like laboratory experiments, survey vignette studies provide a mechanism for testing the effect of a treatment, such as changing the gender or race of a character in a hypothetical scenario (Robbins 2016b). In survey vignette studies, subjects are not limited to a time frame and can answer the survey whenever it is comfortable, and this data collection approach are less time-consuming compared to laboratory experiments. This feature allows researchers to aim for bigger sample sizes. Nevertheless, survey vignette designs assessing trust tendencies may not produce generalizable findings because subjects respond to a specific scenario. In the real world, people's behaviors depend on the context of their relationship with trustors and the social interaction goals influencing their trust choices (Hardin 2001, 2002). Therefore, the simulated nature of the vignette designs may not reflect the causal effects in mundane social interactions, even when real interactions are similar to those described in hypothetical scenarios.

A recent discussion about feasible strategies to study trust encourages researchers to develop and apply innovating methods for collecting and analyzing data in accordance with the contextual structure of specific trust relationships (Schilke et al. 2021). On the other hand, medical education experts argue that trust is a noteworthy and understudied factor affecting surgical residents' participation in surgical procedures and, consequently, their competence as future surgeons (Sandhu et al. 2017) Therefore, they are currently working on methods to assess this phenomenon to identify factors interfering with residents' learning opportunities and develop teaching models for improving the quality

of surgical training across the US (Sandhu et al. 2017). To evaluate the relationship between trust and other factors taking place in the surgical training process, Sandhu and her colleagues (2018) developed the OpTrust tool, an instrument suitable for rating residents' and attendings' trust in each other while conducting surgeries together. The development of this assessment tool represents a meaningful milestone for overall trust research and the study of this psychosocial concept in specific milieus (Schilke et al. 2021).

Encapsulated Interest Model

For the purposes of this study, the *encapsulated interest model* developed by Hardin (2002) has special relevance; therefore, I will review it in detail here. Compared to other theorists' interpretation of trust, which typically focus on the trustor and/or the trustee, Hardin's model contemplates both actors in trust relationships and what they hope to achieve with their interactions. To illustrate his model, Hardin proposes the following representation: "A trusts B to do X." "A" represents the trustor, "B" is the trustee, and "X" is the goal of the interaction between them. This theoretical perspective focuses on the role of shared interest and how individuals use it to encapsulate their interaction and secure current and future social exchanges. This is referred to as "encapsulated interest." Unlike other theoretical models, Hardin's (2001) "encapsulated interest" conception of trust enables its application to long-term trust relationship. Actors establish expectations in social exchanges to choose whether or not to trust. These expectations are based on the interaction's purpose and known capabilities of the trustee.

Importantly, these expectations can be applied to present and future interactions, thus supporting long-term trust relationships. They can also be modified if interaction goals change or if new evidence about the trustee's capabilities is available.

As a central tenet of his model, Hardin (2001) describes trust as a cognitive process and not as a behavioral response. Trustors use their knowledge about the trustee to choose whether or not to trust them. They assess others' trustworthiness, meaning B's commitment to fulfill A's interest(s) and goal(s) ascribed to the relationship (Hardin 2002). In general, there are three knowledge categories used in the process of assessing others' trustworthiness: (1) records of past deeds from first-hand assessments (2) reputation or third parties' testimonies, and (3) appearance or stereotypes (Sztompka 1999). All of these types of knowledge translate into what we know about the other person and how we use this information to build expectations about their future behavior. Whenever individuals assess trustworthiness, they employ one or more of these types of knowledge, depending on which is available to them (Ensminger 2001).

Individuals use prior exchanges and levels of familiarity to gather information about others they choose to trust or not to trust (Luhmann 2000). Individuals learn about the capability of others during first-time social exchanges by taking small risks and observing whether or not the other party reciprocates (Cook 2005; Cook et al. 2005). Based on how successful past exchanges were, trustors accumulate information about the other party's regularity in responding in a certain way. From a long-term relationship perspective, reciprocity becomes an intrinsic element because it builds a notion of consistency that prompts individuals into cooperating. Trustees who respond consistently

with the expected behavior are more likely to be trusted in the future, hence increasing cooperation (Walker and Ostrom 2009).

When there are no prior social exchanges, people may use social categories (e.g., gender, age, race/ethnicity, religion, socioeconomic status), or stereotypes, to determine whether or not the other party is worthy of trust (Burnett et al. 2010; Jussim et al. 2009; Schniter and Shields 2020; Sztompka 1999). In first-time interactions, most people do not know much about each other and rely on stereotypical references to decide whether or not to trust the other person (Amodio 2014; Sztompka 1999). During the first minutes of these meetings, people socially categorize each other (Crisp and Hewstone 2007). Trustors evaluate the social position of the trustee and judge their trustworthiness based on stereotypical references (e.g., seniority as a proxy of experience) and associate these social categories with the other party's competence or skill set to determine whether or not to trust her (Robbins 2016b). But social categories may remain influential even after the first meeting, when more information about the trustee becomes available, since they provide a general and durable cognitive framework for interpreting behavior. The function of gender as a cognitive frame will be discussed after proposing a working definition of trust.

Defining Trust

For the purposes of this study, I constructed a working definition of trust using Hardin's encapsulated interest model along with other insights from sociological trust literature. I will treat the concept of trust as the process (Lewis and Weigert 2012) by

which individuals use knowledge about others (Hardin 2002) to inform their decision of assuming risk (Cook et al. 2005) and to enable social exchange (Cook et al. 2013). This definition acknowledges the nature of trust as a process in dyadic relationships, the importance of cognitive decision-making, and the role of risk as a determinant of trust utilization.

In case of surgical training, my definition of trust can be applied as follows: Trust between an attending and resident is a process by which attendings and residents use knowledge about each other to inform their decision of assuming several risks, i.e., jeopardizing the patient's safety and their reputation in the training program, and enable social exchange between each other. First, with every movement and intraoperative choice, attendings and residents accept the risk of damaging critical anatomical parts of the patient's body, which can result in undesired and, to some extent, deadly intra- and post-operative complications. For this specific risk, trainers are held accountable for their trainees' errors because they are the patient's primary healthcare provider (Bosk 1979). Therefore, from this standpoint attendings play the role of "A" (trustor), while residents play the role of "B" (trustees) in Hardin's (2002) encapsulated interest model. "X" is the required surgical tasks, i.e., intraoperative decisions and instrument maneuvering, given or "entrusted" to the resident. In addition to risking the patient's safety, residents assume the risk of gaining fewer hands-on opportunities to practice skills in future surgical cases due to fatal decisions or movement choices (Bosk 1979). At the same time, the roles in the surgical training trust relationship are reversed, with residents ("A") trusting that their attendees ("B") will grant them enough hands-on experiences in the OR that will contribute to the advancement of their training while considering the patients' safety

("X"). This conceptualization acknowledged the two-way nature of trust between attendees and resident (Nikolian et al. 2018).

Because the relationship between the resident and attending physician is hierarchical with the attending holding more power, my conceptualization of trust is informed by literature considering the special case of trust in hierarchical relationships (Bosk 1979). Some scholars argue trust does not occur in hierarchical relationships due to coercion (Hardin 2002); yet, others believe that long-term, hierarchical relationships require a trust decision-making process (Miller 1992, 2001). Hierarchical relationships depend mainly on the interest of the actor with greater power. Actors who abuse their power and show little to no credible commitment to those who they need in social exchanges run the risk of encouraging distrust in the future (Farrell 2004). To continue the trust relationship, the powerful actor must avoid any abuse of power because it would jeopardize the credibility of her role. In the business world, for instance, it is often recommended that leaders demonstrate a caring attitude, instead of employing a dictatorial discourse, because this strategies will encourage employees to engage more in their work, trust the company, and cooperate more (Willemyns, Gallois, and Callan 2003).

In surgery training, the hierarchical nature of the relationship also informs faculty-resident trust. Noticeably trainers have a power advantage over trainees because they can withhold and grant them access to surgical case participation and opportunities to practice and refine surgical dexterities (Bosk 1979). Attendings have the choice to entrust residents and allow them to practice operative skills on their patients and be held accountable for any mistake their trainee would make in the OR. Concerning patients'

needs, attendings do not need residents to execute the surgery. Trainees cannot offer something (e.g., specialized surgical technique) to encourage trainers' entrustment. On the other hand, attendings can rely on other members of their surgical staff (e.g., surgical tech) who are fully trained to assist their needs in the OR. Hence, an attending can choose to operate without a resident, who most likely will delay the surgical procedure or cause complications that could lead to deadly consequences for the patient. Yet, trainers make the effort to entrust trainees in the OR and allow them to practice on their patients, thus assuming the risk of jeopardizing patient safety (Sklar and McMahon 2019).

In the effort to explain the nature of unbalanced power in long-term relationships, Emerson (1962) suggested that parties depend on each other to foster their power. In other words, one party's power is equal and founded on the dependence of the other party. Social exchange theorists have applied the *power-dependence theory* to solve the theoretical dilemma in long-term exchange relationships where one party seems to have greater power, and the other is at their mercy (Cook 1992; Cook and Emerson 1978; Cook and Yamagishi 1992). For example, successful leaders in modern democracies and enterprises refrain from abusing their power because they need the public to legitimize their role (Miller 2001). This example shows how "power is the property of [social relations]" (Emerson 1962:32) and not an actor's trait. With respect to long-term trust relationships, a party's dependence on others can diminish their motives for abusing their power as the damage of breaking the relationship might outweigh the benefits of exploiting such power (Farrell 2004).

In the case of surgical training, attendings depend on residents to define and fulfill their role in medical education (Becker 1961; Bosk 1979). In the absence of a learner,

surgical trainers are merely surgeons caring for patients' needs and not faculty physicians imparting knowledge. Moreover, attendings ought to engage residents in surgical procedures to help them gain and refine skills required by the ACGME, the same agency that oversights their program's accreditation and to whom they report their trainees' progress (Accreditation Council for Graduate Medical Education 2022). In sum, attendings' dependence on residents rests on their need to support their identity in medical education and their program's accreditation needs. This same dependence outweighs the benefits of abusing their power in the OR.

Trust and Gender Framing Theory

Since this study is focused on the role of gender in trust development, it is worth reviewing how trust operates in relationships between men and women. Empirical evidence of trust and gender is mostly based on laboratory experiments using trust games (Buchan et al. 2008; Croson and Buchan 1999; Haselhuhn et al. 2015; Kiyonari et al. 2006; Maddux and Brewer 2005; Schniter and Shields 2020; Wang and Yamagishi 2005) or survey vignettes (Robbins 2016a, 2016b). In both methodological approaches, gender is manipulated through a hypothetical partners' social profile. Much like in general trust literature, studies using these methods have been criticized as they may not resemble everyday trust interactions and may fail to account for contextual factors that could shape trust decision-making (Hardin 2002). Yet, experimental designs afford causal evidence on the role of gender in trust that is not be available in any other types of studies.

Currently, the evidence about gender and trust in social exchanges is mixed. Some studies report higher trust behaviors among men compared to women due to the fear of exploitation (Wang and Yamagishi 2005). At the same time, women seem to trust more compared to men because they feel the obligation to reciprocate (Buchan et al. 2008). Other studies find greater trust tendencies among women (Schwieren and Sutter 2008), especially after a trust violation (Haselhuhn et al. 2015) but the absence of significant gender effects has also been reported (Scharlemann et al. 2001). Yet another strain of evidence indicates that the context and the specific type of social exchange matter for how people judge the trustworthiness of men and women. For example, Robbins (2016b) found that when the maintenance and repair of their cars is concerned, trustors are less prone to trust a woman compare to a man. This finding is consistent with Hardin's encapsulated interest model, where "X", i.e., what the trust exchange concerns, represents a critical component.

Ridgeway (2009) offers a comprehensive theoretical framework to explain the role of gender in social relationships; *gender framing theory*. This general framework applies also to trust relationships more specifically. It is compatible with Hardin's (Hardin 2002) encapsulated interest model, which makes it a useful element for the theoretical background of the present study. According to Ridgeway's (2015) theory, gender serves as a primary cognitive framework during social interactions, along with race and age. It is the first system of social categories applied to those caught by the eyesight (Ito and Urland 2003). Research on social cognition shows that gender categorization occurs in less than a second and people often classify other social actors unintentionally and regularly are unaware of this mental process (Brewer and Lui 1989;

Fiske 1998). The purpose of these mental classifications is to make sense of a complex social world, define the *self* in relation to *others*, determine the best way to relate with others, and ease the work of initiating a relationship (Ridgeway 2009).

Although being a resourceful tool in social interactions, gender frames also have the potential to trigger biased judgment and behaviors. They can be defined as shared cultural beliefs on how "most people" typically behave based on social rules (Ridgeway 2009). For example, men are expected to be dependable and proficient, while women are allowed to be emotionally expressive (Eagly and Karau 2002; Fiske et al. 2002). When these stereotypes are attached to ideas of which group is more deserving of higher status, gender biases produce structural inequalities that put the subordinate category at a disadvantage (Ridgeway and Smith-Lovin 1999).

Importantly, when two parties engage in a social exchange in which one gender seems more suitable for the task due to cultural stereotyping, being a male or female will influence what each person expects from the other (Ridgeway and Smith-Lovin 1999). In many occupations, these sex stereotypes matter for the perception of men's and women's capabilities on the job. They make women appear less suitable for male-stereotyped work roles and create extra barriers for women who want to pursue a career commonly reserved for men, e.g., limited access to social networks and undermining of women's authority (Ridgeway 2015).

As explained earlier, surgery is a male-dominated and male-stereotyped job. Men are typically favored because their character traits seem more appropriate for the job (Cassell 1998; Katz 1999; Riska 2001b). The encapsulated interest model posits that people use stereotypical references, such as those elicited by gender frames, to determine

their trust choices with a stranger (Hardin 2002; Ridgeway 2015). Based on this model, women will likely experience less trust in a strongly sex-typed work milieu, such as surgery. Accordingly, attendings' trust choices in the OR may be susceptible to gender stereotypes and biases and may create training challenges for female residents. If the trainer's trust is negatively influenced by the resident's gender due to negative stereotypes of women in surgery, female residents may be afforded fewer chances of gaining hands-on experiences in the OR.

Hypotheses

Given my discussion of gender in medicine, medical training, and trust, I develop two theoretical arguments to frame my hypotheses. The first argument, based on gender in medicine literature, is that female medical trainees receive poorer quality of training compared to male residents due to socialization barriers shaped by the male-dominated culture of medicine (Babaria et al. 2012; Brewer et al. 2020; Dayal et al. 2017; Lober 1993; Mueller et al. 2017; Riska 2001b). The second argument is based on the trust and gender literatures, which posit that the context of the situation influences the likelihood of trust in women, especially if the task at hand is culturally associated with masculine behaviors (Hardin 2002; Ridgeway 2009; Ridgeway and Smith-Lovin 1999; Robbins 2016b). Based on this argument, I expect lower levels of trust whenever a female resident is included in a surgical case, even when the resident is in an advanced stage of training and when both parties have worked together before.

H 1.a Senior residents, based on their postgraduate year, experience more trust from their attendings while conducting a surgery together.

H 1.b The association between residents' postgraduate year and attendings' trust is moderated by residents' gender. Specifically, this association is larger for male compared to female residents.

H 2.a Residents who have operated more with the same attending experience more trust while conducting a surgery together.

H 2.b The association between the number of surgeries a resident performed with the same attending and attending's trust is moderated by the resident's gender. Specifically, this association is larger for male compared to female residents.

These hypotheses reflect the theoretical features of the encapsulated interest model (A trusts B to do X) (Hardin 2002). Hypotheses H1.a and H2.a acknowledge the well-established positive effect of experience (postgraduate year) and familiarity (number of surgeries residents and attendings have executed together) on trust (Cook et al. 2005; Luhmann 2000; Sztompka 1999). Hypotheses H2.b and H2.b account for the effects of gender stereotyping in medical training contributing to the underrepresentation of women in medicine, especially in surgical specialties (Brewer et al. 2020; Lober 1993; Riska 2001a).

By evaluating these hypotheses, this project seeks to contribute to the sociological literature on medical education and provide empirical findings for the trust literature. By focusing on general surgery residency, this study describes the role of trust in surgical training and how it is related to the underrepresentation of women in surgery. Finally, this project bridges the discussion between Medical Sociology and Medical Education literature to improve the quality of training in surgical residency programs.

Following Chapters Outline

In addition to the Introduction and Background and Theoretical Framework, this dissertation includes four additional chapters. Chapter Three contains a detailed description of the data and methodological procedures I applied with a step-by-step account of the mixed method design employed in this research project. In Chapter Four, I present qualitative findings regarding general meanings of trust in surgical training and how residents' and attendings' ideal meanings of trust differ from behavioral factors influencing their trust decisions. Chapter Five includes both quantitative and qualitative results concerning the association between the resident's postgraduate year, the number of times she operated in the past with the same attending, and gender. The final chapter of this dissertation delves into a theoretical discussion regarding the findings reported in Chapter Four and Chapter Five to understand the role of trust in surgical residency training. Also, in this final chapter, I discuss the limitations and the scholarly and policy implications of this study.

CHAPTER 3

DATA AND METHODS

To overcome the limitations of quantitative and qualitative approaches, Mixed Methods Research (MMR) incorporates data collection, analysis, and integrations from both methods into a single project to combine strengths from these two types of data and develop holistic conclusions (Creswell 2014; Johnson, Onwuegbuzie, and Turner 2007; Tashakkori and Creswell 2007). This study employs a sequential explanatory MMR design to explain quantitative results with qualitative findings by "extend[ing] the breadth and range of inquiry" (Greene, Caracelli, and Graham 1989:259). This MMR design had two strands, each taking place separately, starting with a quantitative strand to inform the development of the qualitative data collection instrument, followed by a qualitative strand to identify trends and explain findings from the first strand.

This study aimed to seek a deep understanding of how trust may contribute to training inequalities between male and female surgical residents. Applying a MMR approach helped me answer different types of questions, gain a holistic understanding of the research problem, gather different perspectives on the role of trust in general surgery training, and strengthen the validity of my findings (Teddlie and Tashakkori 2009). A mono-quantitative approach would have provided the resources to draw generalized findings; nevertheless, I would only gather superficial interpretations of the observed phenomena. Whereas a mono-qualitative approach could have produced a rich narrative

of what happens in general surgical training. These data, however, would not permit me to execute statistical analysis and test postgraduate year, prior interpersonal encounters, and gender as correlates of trust.

MMR design

To gain a deeper understanding of the role of trust in general surgical training, I employed a sequential explanatory quant→QUAL design (Morse and Niehaus 2009). In other words, this study had two strands, where the quantitative arm happened first, followed by the qualitative phase (See Figure 3). I integrated quantitative and qualitative data and methods through the selected MMR design to explain the observed relationship between trust, resident's postgraduate year, the number of surgeries previously performed with an attending, and resident's gender across rated surgical training encounters (Greene et al. 1989). For the quantitative portion of this project, I utilized the OpTrust tool; this instrument measures entrustment between surgery residents and faculty while they conduct surgeries together (Nikolian et al. 2018; Sandhu, Nikolian, et al. 2018). With follow-up qualitative in-depth interviews with general surgery residents and attendings, I identified emerging themes to explain the results observed in the quantitative strand of this study.

Because I aimed to gain a holistic and deeper understanding of trends and patterns collected through the OpTrust tool, the qualitative strand of this MMR study had the

biggest priority. The quantitative part served as a guiding strand to inform the development of the qualitative data collection instrument (Collins 2010). The first level

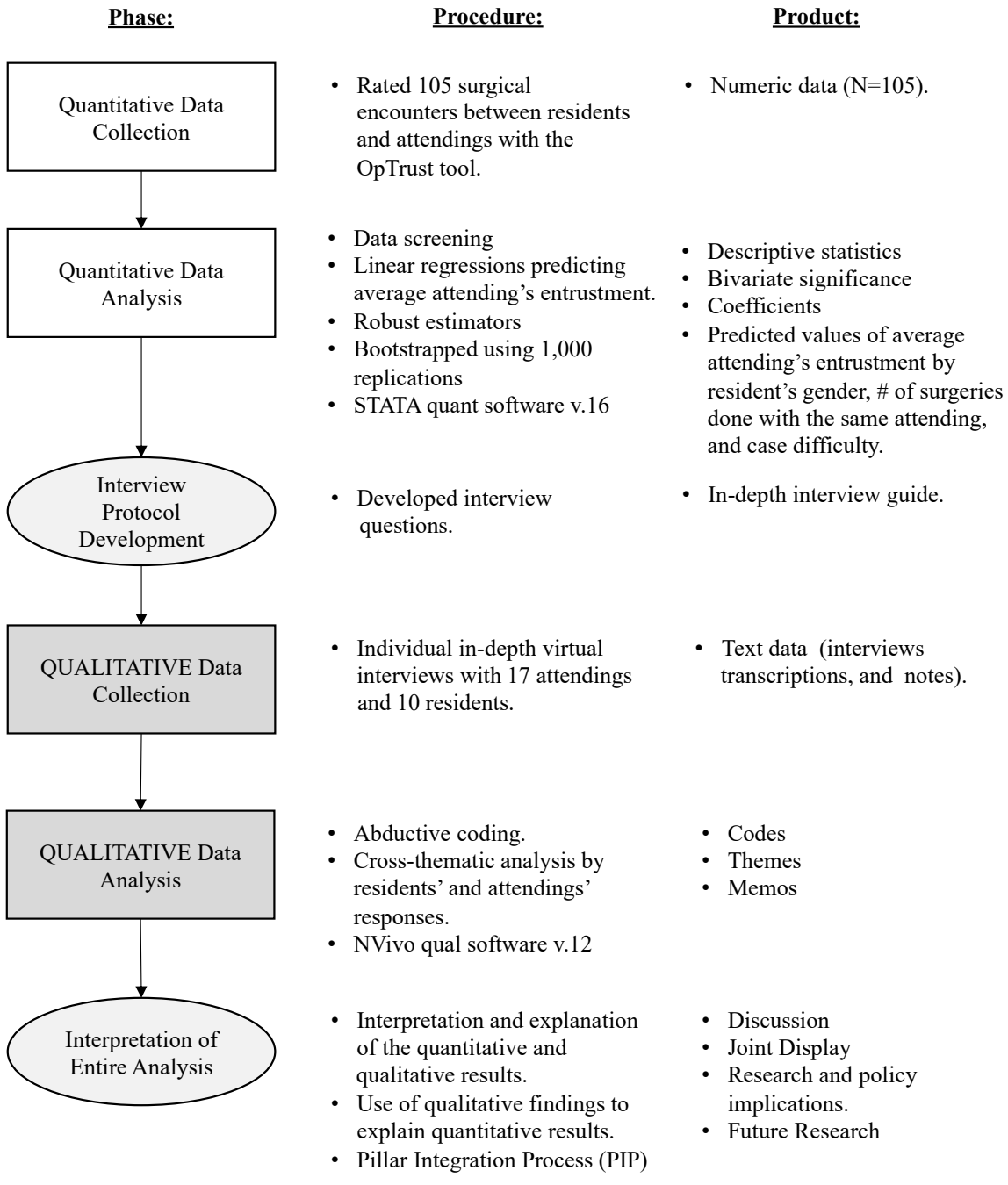

Figure 3. MMR procedural diagram; This diagram was adapted from Ivankova and Stick's (2007) mixed methods design.

of MMR integration, meaning the first point of overlap between methods, took place in the transition from the quantitative data analysis to qualitative data collection: I developed a qualitative interview guide based on the results gathered in the quantitative data analysis (Ivankova 2015). The second point of interphase occurred after finishing the qualitative data analysis. In the final stage, I combined both types of findings to explain quantitative results with qualitative themes (Curry and Nunez-Smith 2015).

Sampling

The sampling scheme for this research project is based on a Sequential quan → QUAL MMR design. First, the team who collected the data I used for the quantitative strand of this study used non-probability sampling. Subsequently, for the qualitative strand, I used purposeful sampling (Ivankova 2015).

For the quantitative strand of this mixed methods (MM) study, I had access to 105 rated surgical encounters between general surgery residents and attendings from one teaching institution located in the East South of the US. To gain access to this dataset, I contacted the principal investigators (PI) and asked permission to use their data for my study. The selection of the research site was based on the existence of a general surgery program engaged in the data collection for the application and improvement of the OpTrust tool (Nikolian et al. 2018; Sandhu, Nikolian, et al. 2018). The selection of the abovementioned program was based on personal contacts.

To participate in the quantitative strand of this study, participants had to either be a general surgery resident or a faculty member –meaning an attending– in the department

of surgery in charge of the residency program from the previously mentioned institution. The PI who coordinated the OpTrust data collection project sent an invitation email, with an attached copy of a consent form, to faculty members and residents enrolled in the surgical residency program describing the design and purpose of the study. All subjects interested in participating in this study responded to this email by sending a signed copy of the consent form. The sampling approach for this strand was subjected to the availability of surgical procedures conducted by attendings and residents who gave informed consent[4]. Thus, the existing data was built from convenience sampling (Teddlie and Yu 2007).

For the qualitative strand of this MMR study, I collected the data from the institution selected for the quantitative strand and followed the same subject selection criteria for this part of the study. To be eligible for this part of this study, participants had to either be a resident enrolled in the general surgery program or a surgical attending at the previously mentioned institution. For the qualitative portion of this study, I used non-probability sampling and recruited seventeen attendings and ten residents for a total sample of twenty-seven subjects (Teddlie and Yu 2007).

I started the recruitment process for the qualitative strand of this study with an invitation email describing the design and purpose of this study to faculty members and general surgery residents who worked and trained at the previously mentioned institution. Invited subjects had the option to opt-out of the study. Those who agreed to participate joined the sample. Interested subjects received an email with additional information about the study and a copy of the consent form attached. Participants were asked to carefully

[4] Emergency surgeries (e.g., trauma) were not included in the sample.

read the consent form, share their questions about the study, and provide a signed copy of the document if they did not have further questions and wished to participate in this study.

Data Collection

The data collection scheme for this project was based on an intermethod mixing approach, meaning the collection of different types of data for each strand (Johnson and Turner 2003). Therefore, the data collection for both strands happened at separate times, using two different approaches. The quantitative data collection began in July 2018 and ended in May 2020. After conducting all quantitative data analysis –between June and July 2020– I reviewed and adapted a previously developed and piloted in-depth interview guide. I initiated the recruitment process for the qualitative strand of this study in August 2020 and began collecting the data as soon as I gained consent from the participants. This part of the data collection lasted nine months as I reached theoretical data saturation (Bryman and Cassell 2006; Teddlie and Tashakkori 2009) (See Figure 4).

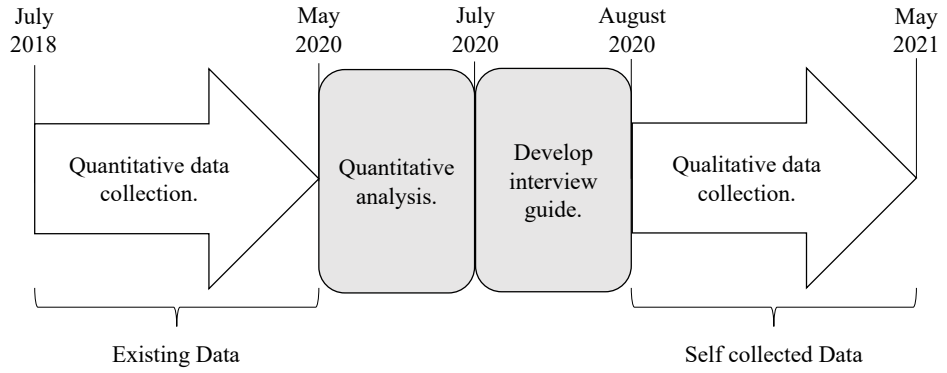

Figure 4. MMR data collection timeline.

Quantitative Data Collection

A group of trained raters,[5] including the author of this study, observed surgical cases between residents and attendings. Raters assessed attendings' levels of trust while performing surgeries with residents using the OpTrust tool. This tool treats each surgical case as a unit of analysis, regardless of who is performing the surgery. The instrument measures attendings' entrustment and residents' entrustability as a proxy of trust in surgical training.

Compared to other tools (George et al. 2014; Gofton et al. 2012), the OpTrust instrument captures the "complex, dynamic, and evolving" (Sandhu, Nikolian, et al. 2018:670) construction of intraoperative entrustment from a third party's perspective to reduce potential response bias commonly captured through self-reported indexes. It was developed following the ACGME Millstone for surgical residency and refined under the advisory of an international and multidisciplinary board (Brasel et al. 2019). This tool uses "descriptive anchors that explicitly delineate behaviors for progression towards independence from novice to expert" (Sandhu, Nikolian, et al. 2018:671) surgical participation. It is applicable to all surgical specialties, and its levels are not sensitive to residents' postgraduate year.

At the end of each surgery, attendings and residents answered a post-surgery questionnaire assessing contextual aspects of the rated surgery,[6] including familiarity (e.g., how much they know each other, how many surgeries they have performed

[5] The creators of the OpTrust tool trained the raters before the data collection. Within the training process, raters were introduced to the tool and practice their rating skill with videos of real surgeries perform by an attending and a resident. After finalizing the first stage of training, pairs of raters observed real cases and used the OpTrust tool to practice their rating skills. After each surgery, raters compared their results and aiming for a total of 3 cases with similar outcomes (80%).

[6] See Appendix A.

together), case difficulty, “resident’s level of earned autonomy” (DaRosa et al. 2013:25), etc. (See Appendix A). Before initiating the data collection process, demographic data on residents and attendings were collected from electronic records from their institution, including age, gender, and postgraduate year. Raters collected quantitative information from 114 surgeries performed by attendings and general surgery residents.

Qualitative Data Collection

For the qualitative data, I interviewed ten general surgery residents and seventeen attending surgeons. Using the structure of an interview guide, I conducted in-depth remote interviews with residents and attendings. These interviews ranged from 27 to 65 minutes. Participants shared their daily experiences in the training process, described their relationship with their respective counterparts, provided their personal definition and use of trust in general surgery training, and indicated factors influencing the development of this psychosocial concept (See Appendix B). As I collected each interview, I transcribed them and wrote individual memos for each of them describing participants’ roles, my role, difficulties, and topics not included in the initial interview guide. All documents containing raw data did not include identifiable information. Participants’ names were substituted with pseudonyms. I kept all audio recordings, transcriptions, and additional notes from the interviews encrypted in a password-protected external memory, locked in a cabinet.

Data analysis

Stage 1

Since I used existing data for the first stage of this study, I explored the dataset and recoded some of the variables of interest before conducting any statistical test. Nine cases in the data set had missing information. These surgical encounters were excluded from the sample. Hence, the final analytic sample included 105 rated surgeries.

Quantitative Variables. Average attending's entrustment. Medical students and I observed surgical intraoperative interactions between faculty surgeons and trainees and used the OpTrust tool to measure entrustbaility levels within five domains: types of question asked, operative plan, instruction, problem-solving, and leadership by the surgical resident (See Sandhu, Thompson-Burdine, et al. 2018 to review quantiative instrument). For each domain, raters chose one option on a Likert scale ranging from low entrustability to full entrustability for attendings and residents separately.

The creators of the OpTrust tool treat "actions that impart trust and responsibility for patient care to residents while providing appropriate supervision" (Sandhu, Thompson-Burdine, et al. 2018:E2) as *faculty entrustment*. Meanwhile they define *resident entrustability* as "behaviors and decision making that warrant entrustment [as trainees] must actively participate in driving their own learning" (2018:E2). Prior scholarship often combine these dimensions of trust in surgical residency because they are interrelated in this medical training context (Nikolian et al. 2018; Sandhu et al. 2020; Sandhu, Nikolian, et al. 2018).

Given that the purpose of this study is to explore trust as a stratifying mechanism in surgical training, I selected attending entrustment as the main outcome. First, for each domain of faculty entrustment, values of 0-3 were assigned to each category, i.e., 0 for 'Low Entrustability', 1 for 'Medium Entrustrability', 2 for 'High Entrustability', and 3 for 'Full Entrustability'. This coding assumes that entrustibility is a latent continuous variable. Then, an *average attending entrustment index* was created. This was calculated as the sum of each entrustability domain divided by the total of domains, yielding a variable ranging from 0.00 to 3.00. Cronbach's (Cronbach 1951) alpha coefficient for reliability is 0.83.

Resident's postgraduate year. Previous research implementing the OpTrust tool has demonstrated an association between resident's postgraduate year and entrustability (Sandhu, Thompson-Burdine, et al. 2018). In the present study, postgraduate years functions as a predictor. Initially, this predicting variable was recorded as continuous. For the purposes of sensitivity analyses, this variable was recoded as categorical for each possible outcome ("1st year," "2nd year," "3rd year," and "5th year") and as dichotomous distinguishing junior residents (1st to 2nd year) from senior residents (3rd year or older). The Akaike's Information Criterion (AIC) and Bayesian Information Criterion (BIC) favored the continuous variable; therefore, the measure is treated as continuous in final models.

Number of surgeries previously performed with the same attending. According to Russell Hardin (2002), individuals use knowledge about others to choose if they will trust them or not; this knowledge can stem from prior social exchanges. Based on this argument, number of previously performed surgeries with the same attending were

treated as a proxy for prior social exchanges. Residents were asked the following question: “Before today, how many times have you performed any operation with this attending?” to which they could choose: “First time”, “2-5 times”, “6-10 times”, and “10 or more.” This measure is treated as a categorical variable and serves as a predictor.

Gender of the resident. Gender is treated as a categorical variable with two possible outcomes: male or female.

The control variables for this study include the attending’s gender, length of residents’ rotation, familiarity (how well residents and attendings know each other) reported by both residents and attendings separately, the resident’s reported level of difficulty of the observed surgery, and presence of a Registered Nurse First Assistant (RNFA). These measures were collected through a post-surgery questionnaire administered to residents and attendings (See Appendix A). Length of rotation, familiarity, and level of difficulty were treated as ordinal variables, while the attending’s gender and the presence of an RNFA were treated as dichotomous.

Analytic Strategy. The statistical analysis is focused on three key independent variables, the resident’s postgraduate year, the number of surgeries she has previously performed with the same attending, and the resident’s gender. Initially, a set of bivariate tests using ANOVAs were executed to determine whether or not there were associations between average attending entrustment and all of the predictors described above. Using Stata 16, a series of linear regression models with robust estimators were executed, treating average attending entrustment as the outcome (StataCorp 2019). To address the small sample size

and the presence of sparsely populated cells, estimates were bootstrapped using 1,000 replications.

Table 1.

Models

Model 1:	$y = \alpha + \beta_1 X_{pgy} + \beta_2 X_{\#\ surgeries} + \beta_3 X_{female\ resident} + \beta_4 X_{case\ difficulty} + \beta_0 \mathbf{Z} + \varepsilon$
Model 2:	$y = \alpha + \beta_1 X_{pgy * female\ resident} + \beta_2 X_{pgy} + \beta_3 X_{female\ resident} + \beta_4 X_{\#\ surgeries} + \beta_5 X_{case\ difficulty} + \beta_0 \mathbf{Z} + \varepsilon$
Model 3:	$y = \alpha + \beta_1 X_{\#surgeries * female\ resident} + \beta_2 X_{\#\ surgeries} + \beta_2 X_{female\ resident} + \beta_3 X_{pgy} + \beta_5 X_{case\ difficulty} + \beta_0 \mathbf{Z} + \varepsilon$
Model 4:	$y = \alpha + \beta_1 X_{case\ difficulty * female\ resident} + \beta_2 X_{\#\ surgeries} + \beta_2 X_{female\ resident} + \beta_3 X_{pgy} + \beta_5 X_{case\ difficulty} + \beta_0 \mathbf{Z} + \varepsilon$

Note: **Z** denotes control variables, including attending's gender, length of rotation, resident's perceived levels of familiarity, attending's perceived level of familiarity, presence of Registered Nurse First Assistant (RNFA), self-rated level of autonomy, and attending-rated level of autonomy. pgy = Resident's postgraduate year.

Model 1 tests the association between resident's postgraduate year, the number of surgeries previously performed with the same attending, and average attending entrustment when controlling for other factors (See Table 1). Model 2 includes an interaction between resident's postgraduate and resident's gender, as well as the number of surgeries previously performed with the same attending and control variables. Model 3 includes an interaction between the number of surgeries previously performed with the same attending, resident's postgraduate year, and control variables. Adjusted marginal

estimates of average attending entrustment by the resident's gender based on the estimates obtained from Model 3 were calculated. Since a significant interaction with gender was obtained, gender-stratified linear regression models predicting average attending entrustment were estimated to see the effect of main predictors for male and female residents separately. These gender-stratified models revealed different directions of coefficients for case difficulty. For women, the effect was statistically significant, hence an interaction between these two variables was tested post-hoc in the full-sample model.

Stage 2

This study has two levels of MM integration. The first level took place in the data collection phase. Following MM connecting strategy guidelines, I used results from the first strand to finalize a pre-developed qualitative data collation instrument, meaning an in-depth interview guide, for the second strand (Ivankova 2015). Therefore, quantitative results from the first strand of this study were used to construct in-depth interview questions (Creswell and Plano Clark 2018). I used the significance levels and direction of regression coefficients from the quantitative results to develop questions that helped me gain a deeper understanding of the relationship found in quantitative data analysis. For example, the interactive effect of the numbers of times a resident operated with the same attending and resident's gender was significant. Hence, I used this finding to develop questions that could yield nuanced qualitative themes to explain this quantitative result

about the combine effect of resident's gender and the number of times a resident operated with the same attending.

Stage 3

The analysis of qualitative data in this MM study followed an abductive approach (Timmermans and Tavory 2012). This method combines deductive and inductive reasoning to theoretically guide the data analysis process while allowing the discovery of unexpected themes (Charmaz 2014). This approach provides the space to confirm and contribute to prior theoretical work and develop new theories from participants' social experiences while considering their motives and understandings of these events (Timmermans and Tavory 2012). Since surgical training is an underexplored topic in sociological research, an abductive approach is the best strategy to study the role of trust and gender in this setting.

Qualitative researchers use coding to identify relevant themes in their data. This approach provides the tools to understand collective and individual meanings and motives and compare them across groups within an analytic sample. Coding involves categorizing significant pieces of the data to contribute to an existing theoretical framework or develop a new one (Bryman and Cassell 2006). With the aim of constructing theory on medical education and trust and follow an abductive approach (Timmermans and Tavory 2012), I used the encapsulated interest model (Hardin 2002) and gender framing theory (Ridgeway 2015) to explain the role of trust in surgical residency and inequality of training between male and female residents. Hence, before

initiating the coding process, I reviewed the literature on the encapsulated interest model and gender framing theory, in addition to several empirical studies showcasing different socialization factors affecting the quality of medical training for women (Babaria et al. 2012; Brewer et al. 2020; Jenkins et al. 2021; Lober 1993; Mueller et al. 2017). This step in the qualitative data analysis process allowed me to initiate the coding process with a cognizant perspective to identify themes observed and discuss in prior scholarship and discover unforeseen observations that can help explain the studied phenomenon (Timmermans and Tavory 2012).

The first coding step within an abductive approach is to become familiar with general topics captured in the data and write memos describing the content and frequently discussed topics for each interview. As I finished transcribing interviews, I read them to identify general trends in the data and envision potential codes I planned to use further in the analysis. The second step in the coding process requires developing and applying open codes. This step entails organizing and classifying pieces in the data to identify significant meanings and trends (Charmaz 2014). To facilitate this process, I uploaded the transcribed interviews into NVivo 12® (QSR International 2019). This qualitative data analysis software provides the tools for saving and organizing data, codes, and memos to ease the qualitative data analysis process. Based on the research question, MM aims, and the interview guide, I developed a set of broad codes for the first coding phase (Creswell and Plano Clark 2018). Then, I used fine codes to organize and classify excerpts from the interview and identify emerging themes (Timmermans and Tavory 2012). Within the coding process, I wrote memos to identify themes in the data and contrast their relevance between residents' and attendings' responses. At least twenty thematic categories

emerged from early memos and open coding. A final revision and analysis of these themes generated refined concepts described in Chapters Four and Five.

Stage 4

The second level of integration in this MM study took place in the data interpretation stage through a combination of integration strategies (Ivankova 2015). In this portion, I analyzed findings from both strands of this study together. Since the design of this MM study is sequential explanatory, I used themes that emerged from the qualitative data analysis to explain the quantitative results (Creswell and Plano Clark 2018).

MM Meta-Inference

For the meta-inference of this study, I used a *contiguous approach* to present results from both strands in a single manuscript (Curry and Nunez-Smith 2015). With this strategy, I developed a single report divided into two Chapters. Chapter Four includes qualitative themes describing attendings' and residents' understanding of trust in the OR to support the MM findings of this study. Chapter Five presents both quantitative and qualitative findings in two sub-sections (Fetters, Curry, and Creswell 2013). The first sub-section includes the results from the quantitative data analysis from the first strand of this study. The second sub-section lists the qualitative themes explaining the quantitative results presented in the first subjection of this chapter. This form of data reporting

allowed me to follow the sequence (quant→QUAL) and meet the aim of this MMR study, which is to use qualitative themes to explain quantitative findings (Creswell and Plano Clark 2018).

To make the integration process transparent and provide a visually appealing reference, I used the *Pillar Integration Process* (PIP) (Johnson, Grove, and Clarke 2019). This four-stage strategy (i.e., listing, matching, checking, and pillar building) uses a specific joint display format to pair up and compare quantitative and qualitative data to develop integrated themes from both sets of results. I started by placing findings from both strands in the outer columns of the display; quantitative results in the left column and qualitative themes in the right column. Then, I organized them in a compatible fashion and cross-check each set of findings. Finally, I developed integrated themes in the middle column as part of the meta-inference portion of this study.

Ethical Considerations

Since the quantitative strand of this study used existing data, this portion of the study did not require ethical revision. For the qualitative strand, I submitted a protocol to the University of Alabama at Birmingham Institutional Review Board and received approval on August 8th, 2020 (See Appendix C for Approval Letter). Interviewed participants received informed consent through verbal acknowledgment and an informational sheet describing the purpose, risk, and benefits of the study (See Appendix C). Those who took part in the qualitative of this study did not receive compensation. In

the informational sheet, I identified one main potential ethical consideration: breach of confidentiality.

Given that participants were from a specific population and shared a place of work, most of them might know each other. To minimize the risk of breach of confidentiality, interviews were solely conducted and transcribed by myself. Participants' names were changed to pseudonyms and any additional identifiable information (e.g., site name, surgical specialties) was not included in the results section of this study. Data collection documents and interview recordings and transcripts were electronically saved in a password-protected external disk.

Reflexivity and Positionality

Qualitative research is a subjective approach sensitive to the researcher's social, cultural, and political position in society. Reflexivity allows qualitative scholars to question how their social background and life experiences influence the content of their data and how they asked questions and interpret interviewees' responses (Bryman and Cassell 2006). Thus, researchers must consider, review, and abandon their assumptions and perspectives during the collection and analysis of qualitative data. My weekly visits to the OR allowed me to develop relationships with several interviewed participants and helped me gain further comprehension of their and other interviewees' reactions and responses to my interview question. Nevertheless, to assure the quality of this MM study, I used reflexivity to make sense of my positionality.

Interviewed subjects were aware of my academic background and lack of medical training. As they described their experiences in their medical practice, most of them tried to avoid using medical jargon and replaced terms and acronyms with mundane words. Few of them used surgical terms I recognized at the time of the interview or searched afterwards. As some of them were trying to find easier words I could understand, their thought process might have shifted and influenced their responses to my questions. Occasionally, I noticed some interviewees losing their train of thought while sharing their beliefs and experiences. To help them regain their thought process, I asked them to revisit and explain their responses. Some interviewees notified me whenever they got lost in their response and asked me to repeat specific questions.

Because I am a woman, male subjects might have felt uncomfortable sharing thoughts and actions that might seem misogynous. Some interviewees might not have provided honest answers to my questions about sensitive topics, especially those concerning gender. Furthermore, I am an outsider to their surgical culture, and several participants might not have felt comfortable talking about events involving gender bias or discrimination. They might have felt concerned about my personal judgment and interpretations as a researcher. To lessen these sentiments, I used questions that did not explicitly inquire sentiments about women in surgical residency; for example, “Do you think gender plays a role in the trust development process?”

Finally, interviewees might have thought I was approaching and interpreting their daily work activities naively because medicine is commonly categorized as a hard science and sociology a soft science. Also, they might have thought I was unaware of other social interactions outside the OR and did not know how surgical teams operate. During the

recruitment process, I informed attendings and residents about my previous research collaborations with faculty surgeons and medical education scholars. Furthermore, they knew I made weekly OR visits to observe attendings and residents conduct surgeries together for approximately one year. Some subjects remembered meeting me during the first strand of the study and occasionally referred back to those moments I shared with them.

CHAPTER 4:

QUALITATIVE RESULTS

From a total of twenty-seven in-depth interviews with seventeen attendings and ten general surgery residents, I created seventy-four open codes. With these codes, I developed thirty themes. In the following sections of this chapter, I will present and discuss findings from these themes concerning general perceptions of trust in general surgery training, specifically in the OR.

First, I will summarize attendings and residents' meanings of trust inside the OR and how they use specific trustworthy training attributes and behaviors to define this psychosocial concept. As I present these meanings of trust, I will compare predominant themes between attendings' and residents' responses to highlight similarities and discrepancies interfering with the trust development and surgical training process. Second, I will explain how participants described the role of the patient in the trust development process. Third, I will present OR-specific trust factors to contrast them with meanings of trust. In the final section of this chapter, I will highlight how participants' ideal meanings of trust differ from tangible trust factors, such as character traits, and introduce additional elements that were not relevant to their meanings of trust.

Meanings of Trust in the OR

Both attendings and residents defined trust with descriptions of behaviors associated with *preparedness*, in other words, whether or not trainees did pre-operative work to earn their trainers' trust. Attendings were more prone to trust residents who show they have "done their homework" and understand the knowledge and skills they will apply in the OR. A trustworthy trainee knows what to look for in the patient's body and clearly understands how diseases or injuries disturb organs' purposes. She knows and correctly applies general medical knowledge –especially anatomical familiarity– and can identify inner and outer portions of the patient's body that need surgical care. Consider the following description of preparedness as a trust factor from Dr. Burke:

> "…me knowing that they understand the basics. In other words, if I get the sense that they prepared. Now, they don't have to know exactly what we're supposed to be doing in the OR. But be prepared as best as they can… If I understand they know what they are looking for and they're approaching it the way they're supposed to be, I'll give them more of the chance to complete the task. If I noticed early on that the person doesn't seem to understand what they're looking for, I'll take over the dissection, in the sense that I have my own ways in which I can redirect the dissection to the place I want it to go… Because the more they show they've prepared, the more I'm willing to let them do." Dr. Burke M [7]

In the previous quote, Dr. Burke explained his search for preparedness concerning residents' basic medical knowledge and how they use it to make effective choices and movements inside the OR. Residents do not have to know everything about the procedure, but they ought to demonstrate they prepared for it as much as possible. For example, he will see they did their homework when residents "know what they are looking for." By this, he meant identifying anatomical parts in the

[7] M indicates that the interviewee is male, and F indicates that the interviewee is female.

patient's body they are planning to fix or avoid. According to Dr. Burke, trainees who show clear comprehension of case-required knowledge will not just gain initial trust but continued participation in the procedure and even complete a specific step independently. More than getting a chance to practice steps of the procedure, demonstrating clear comprehension of medical knowledge will influence trainees' opportunities to continue working without him hovering over their work.

Furthermore, residents indicate a positive attitude and readiness to learn by doing their homework. In the quote below, Dr. Pierce defines trust in the light of preparedness, which to her is an indicator of eagerness:

> "Trust means that I can count on someone, that I know that they've done the work leading up to a case. Whether that is knowing the pathophysiology and the anatomy of the case, or the specific details related to that patient. I know that they came 'to win on that,' I will say. To me, that just means that I feel open to them and I'm open to teaching if they have initiated that." [Dr. Pierce] F

From Dr. Pierce's perspective, prepared trainees go into the OR wanting to succeed or, in her words, "to win," which entails doing what it takes to earn active participation in the surgical procedure. Further in the interview, she explained that enthusiastic residents are more trustworthy to her because, as a teacher, it is easier to teach those who are excited to be there and gain hands-on experiences. A couple of other attendings echoed her sentiment when they described a trustworthy resident as someone who is "invested in their training" [Dr. Karev] and interested in the case and tries to do the operation while following their attending's feedback.

Attendings are more likely to trust residents who comprehend the rationales behind a specific surgical procedure on behalf og the patients' healthcare needs and history. Medical reasoning is one of the first and most essential skills physicians in training learn and regularly implement in their daily work to maintain their membership in medicine, especially surgeons (Becker 1961; Bosk 1979). Why does the patient need this medical intervention? Why the surgeon follows a unique sequence of steps for this specific operation? Why is she approaching the case in this specific way? In the following excerpts, Dr. Hunt associated trust with medical reasoning:

> "And it's also about having an understanding of the bigger picture of what we're trying to do and what the operation is trying to achieve. I'm very firmly of the opinion that I can teach almost anyone to operate. But it's really important for residents to understand why we're doing an operation, why we're doing certain parts of an operation –all of it– and what has to be completed in step twenty-three before we can move to step twenty-four. And that ties into me speaking to them before hand and asking them to take me through the operation that we're going to do step by step. And that's where I start to establish that trust. That I can think, "That residents they kind of know what's expected of from here. That's good. We can move on with that." So, it's that bigger picture that is part of that trust." [Dr. Hunt] M

As Dr. Hunt shared, more than just having the required information and skills to conduct a surgery, residents need to appreciate the procedure as a whole, see the "bigger picture," and clearly identify the goal of the surgery to gain his trust. To trust a trainee and allow her to lead specific steps of the surgery, this attending needs to make sure she understands case-specific rationales and objectives. Therefore, he does informal reviews to evaluate whether or not residents know what he expects them to perform and how they will carry specific portions of the surgery before they both walk into the OR and start working together. To gain

trust, trainees should also exhibit they have read the medical chart and know the patient and why she needs the surgery. In many cases, residents have constrained schedules and may not have time to read about the case in advance (Szymczak and Bosk 2012; Wallenburg et al. 2015). Yet, attendings have greater trust in residents who can make time to read the patient's chart and clinic notes ahead, in addition to scholarly materials (e.g., medical journals and textbooks) trainers expect them to read.

Furthermore, many attendings are prone to trust "skillful hands." In other words, residents with advanced or up-to-their level technical skills are more trustworthy. Attendings need to know whether or not residents can carry out a task with little to no instructions and as safely as possible to entrust them. Trainees who show they can execute surgically required technical skills, such as suturing and dissecting, and smoothly handle instruments (e.g., scalpel, catheter, needle driver) are more likely to actively and, in some instances, independently participate in the surgery. Trainers trust skillful residents because they perform efficiently and are less likely to commit technical errors that may result in unexpected intraoperative complications (Bosk 1979; Szymczak and Bosk 2012). Therefore, trainees who demonstrate well-developed technical skills are seen as reliable. Teachers grant them autonomy because they trust their technical skills and their response when asked to apply their knowledge and abilities in the OR. Consider the quote below from Dr. Shepherd:

> "But in the operating room it's more about the technical skills and what can you do safely and at what point can I step back to give the trainee some of that autonomy that they need to develop. Because eventually their going to be in my position. Right? Where there's not going to be an

> attending looking at everything that they do. They're going to be the attending. [chuckle] And there's nothing magical that happens the day you finish training and become an attending. Where all of the sudden you're ready to be on the other side of the table. There has to be an organic process. But it's about figuring out where you can step back." [Dr. Shepherd] M

Technical skills develop over time and do not arrive "magically." Therefore, Dr. Shepherd recognizes the value of giving residents hands-on experience; eventually, residents will apply the skills they learn without an attending telling them how to maneuver instruments and tissue. For this reason, Dr. Shepard assesses trainees' technical skills as a proxy of trust in the OR. This allows him to gauge when to hand over instruments and give residents space to develop surgical techniques under his supervision. Until a resident reached the appropriate level of expertise to safely lead portions of the surgery, Dr. Shepherd will keep taking away and giving back the instruments based on the resident's skill level.

Most residents echoed attendings' sentiments about preparedness and trust in the OR. Unlike their trainers, residents gave more attention to the technical competency aspect of being prepared, namely, having surgical skills. Bellow, Dr. O'Malley explains how he sees himself as a trustworthy trainee because he has the skills to operate autonomously:

> "…trust is actually the amount of autonomy that an attending would offer you during the operation. Like how much of an operation the attending would give to you to do. And how he or she would supervise you, as opposed to taking over, taking it away from you, and doing the operation him or herself. …is **trusting your skills**. That you are able to do a portion of the operation with more amount of autonomy." [Dr. O'Malley] M

Dr. O'Malley noticed his trainers trusted him when they allowed him to play an active role in surgeries and asked him to lead a portion of the procedure. He will gauge their

trust based on how much they supervise his work. Like all other residents, he believes attendings do not trust him or his skills when they "take over the case," mainly by taking away the instruments.

This distinction demonstrates how attendings search for abstract elements of trust (e.g., medical knowledge, medical reasoning) that one can only find through conversation. Most attendings would initiate a relationship with a resident by assessing their general medical knowledge relevant to the surgery they are about to conduct. Thus, preparedness in the form of knowledge serves as the first gateway toward gaining trust in the OR. If residents fail to demonstrate they have general and case-specific medical knowledge due to shyness or lack of information, they may miss the opportunity of gaining trust. Trainees who do a better job in these assessments will have an advantage in the OR because they will gain hands-on opportunities early across rotations and earn more trust by showing their technical skills. Consider the quote bellow from Dr. Shepherd:

> "Are they, you know, responsive? Are they prepared? Do they know the patients? What's going on with the patients? What the issues are? If I come in a round in the morning and they don't know what happened overnight, that's a problem. And similarly, if it's a patient surgery and they haven't looked up the patient to know what we're doing, that's a problem. If you just kind of show up and just assume, you know, that all has been taken care of, that's not a good thing. So, it starts outside of the OR. And I think I start from a place that's kind of assuming that they'll do those things. But I think failure to do so probably hurts more. Showing up unprepared makes it really hard for me to trust them or give them some of that autonomy during that case. Hopefully they learn from that and the next time we operate together they come, they're prepare, and they're ready to go. But it makes sense outside of the OR." [Dr. Shepherd] M

According to Dr. Shepherd, trustworthy residents are responsive and know the patient. They should have talked to the morning round, i.e., staff in charge of

morning patient checks, and read the patient's health record to understand the purpose of the procedure and be aware of any unexpected patient-related changes relevant to the surgery. He assumes all residents will do all these tasks. Hence, it will "hurt" his trust when trainees fail to carry out these responsibilities and show a lack of knowledge. Because it seems they showed up solely to get hands-on experience and undermined the purpose of doing the work required to participate in the procedure.

Attendings and residents described their meanings of trust in the OR in the light of expectations for trainees. Attendings expect residents to have and apply medical knowledge within the case, safely execute technical procedures, respond to their instructions, or act upon their feedback in the OR:

> "I guess, to put it simply. So, what you're **expected** to do, and what I'm guessing the attending is trusting you to do, is, one, know the patient, what is the case, what are the patient's comorbidities, what are some of the things that could go wrong in the case –you know– what part is going to bleed more… Just small things that you need to know about the patient because you're in the surgery… So, that's one part when they're trusting that you know that. The second, it's trust that you know the anatomy, because that you can learn from any textbook. If you don't know what you're cutting into, that's a hazard. And that's across the board from chief of residents to an intern. You need to know where you are, the patient's body, and what nerves, blood vessels or other critical structures you can encounter. So, they're trusting that you know that. The third thing would be trust that you're follow instructions. No one will let you do a part of the case if they ask you to –you know– cauterize certain areas and you cauterize a complete different one. Because that means you aren't following instructions." [Dr. Edwards] F

Based on Dr. Edwards's experience, trust is closely related to a set of medical training expectations. As seen previously in other quotes and themes, attendings expect residents to know the patient, their medical history, and what could go wrong in the procedure. Also, attendings expect residents to know general anatomy, as they will need to identify

critical structures and organs (e.g., nerves, blood vessels, organs, sensitive tissue), and follow instructions and feedback.

Residents are expected to mimic their attendings' technical and decision-making skills. Trainees who imitate trainers' operating styles are more likely to be trusted. Consider Dr. Hayes and Dr. Schmitt's role modeling description as part of their understanding of trust inside the OR:

> "In my mind, trust in the OR would be believing that things will be carried out as I want them to be carried out if I was not present. If I was not present, that would be ultimate trust. Assuming if I was not there, they will carry things out as I wanted if I was not there." [Dr. Hayes] M

> "Trust it's understanding that everyone is there for the same reason; to help the patient and everyone is going to do the best and safest things for the patient. Understanding or hopefully doing the same thing that the attending would do. The idea of trust is that everyone is passing information towards the right direction. [Long pause]. Yeah, that knowledge. From a teacher's perspective, that a senior resident or a junior resident is going to do something that you would do and they're going to pass information when it's appropriate. I think that's the best I can come up with right now." [Dr. Schmitt] M

Both interpretations of trust in the OR portrayed the role modeling feature of surgical training when Dr. Hayes and Dr. Schmitt used the phrases "carry out as I want" and "doing the same thing that the attending would do." Hence, both attendings and residents know that trust is achievable through mimicking behaviors.

For Dr. Hayes, believing the other person will operate as he would do encourages his trust. He uses the term "ultimate trust" for situations in which the procedure is being carried out his way, especially when he is not present in the room. This sentiment suggests attendings are less likely to trust residents when they need to directly supervise them. Later in the interview, Dr. Schmitt echoed Dr. Hayes and provided more context to this tendency when he explained how attendings' trust was rooted in their responsibilities

as the patient's physician and the surgical team leader. For this reason, trainers expect trainees to model their surgical skills, decision-making process, and leadership traits in front of other healthcare workers who are part of the surgical team (e.g., certified registered nurse anesthetists, circulating nurses, surgical techs). See Dr. Riggs's description of a surgeon as the surgical team leader:

> "The people in the operating room are parts in the machines. Little pieces. You can pull them out, put them in, and they are interchangeable. And they marry that to the concept of captain of the ship. I don't know if you have heard of that concept. But in the Operating Room you're captain of the ship. Kind of like a pseudo lead. Basically, it means that I'm responsible for everything in an Operating Room. That allows everybody else to absolve themselves a responsibility." [Dr. Riggs] M

In Dr. Riggs's mind, the OR functions like a machine; each surgical staff member is an interchangeable piece in it, and the surgeon is the center of operations or, in his words, the "captain of the ship." Because they head the surgical team, surgeons are responsible for "everything in the OR" and, as explained above, residents should assimilate the responsibilities of this role in their training (Bosk 1979).

Although they are parts of the surgical team, or, in Dr. Riggs's words, interchangeable pieces of a machine, trainees and trainers have a different relationship compared to other surgical staff members. Like in other medical training milieus, the hierarchical structure of the learning process in surgery places attendings in a position of power and residents in a subordinated role. Trainee's lack of knowledge and the need to learn from a fully trained physician support this hierarchy (Bosk 1979; Wallenburg et al. 2015). Therefore, attendings tend to initially assume that residents "don't know what they're doing" [Dr. Marsh]. As explained above, they only gradually and carefully assess

residents' knowledge and decision-making competency to gauge their trust because a "bad call" can result in inter-operative complications or even death. In the quote below, Dr. Avery shared his experience with a resident who, from his perspective, did not have the required knowledge to make safe decisions:

> "So, we had a patient who had a gunshot wound at the lower part of the abdomen, that seem to be bleeding to death. So, pretty critically ill patient. We immediately started transfusing and took him quickly to the operating room. It became pretty apparent early on that the patient had an injury in one of his iliac vessels. So, right after the aorta. The resident and I started the case and the resident kept wanting to make an incision on the wrong spot. Kept wanting to make an incision in the groin and it needed to be higher up to get proximal control of this vessel. I tried to redirect him the first time, but he kept insisting on doing what was not the right move. So, at that point –because the patient was literarily going to die in front of us– I had to call one of my partners in and the partner and I did the case together. The resident essentially ended up, not just watching, but retracting and not being as an active participant in the case. I've kind of reviewed that in my head a couple of times because I don't like taking a case away that abruptly from a resident. But having to do it over again, I will still make the same decision. Because I thought that the patient's life was on jeopardy and the resident wasn't demonstrating the knowledge necessary to help me finish that case safety." [Dr. Avery] M

Dr. Avery had a patient with a gunshot wound in his/her abdomen. This injury was in a very critical part of his/her body. For the safety of the patient, he suggested an approach different from what the resident proposed, who was reluctant to abandon his choice. Eventually, the resident lost his chance to participate because the course of action he suggested was unsafe for the patient. This example demonstrates how role modeling and the hierarchy in surgical residency govern the interactions between attendings and residents. If trainees are not willing to model their teachers, they will lose their chance of gaining hands-on experiences in the OR. Residents should work towards becoming like their attendings (Wallenburg et al. 2015).

In general, attendings and general surgery residents interpret trust in the OR as a set of behaviors trainees ought to follow to gain assisted or independent participation in surgeries. They should go into the OR prepared, meaning they have "done the work leading to a case" [Dr. Pierce], such as reading about the procedure and the patient's medical history and having the skills they will apply in the surgery. When attendings ponder trusting or not trusting a resident, they assess both knowledge-based and technical-based competency. In contrast, residents believe they might or might not be trusted solely due to how well they use instruments and perform specific surgical tasks (e.g., suturing) and whether they carefully cut, cauterize, and suture anatomical tissue. Trust was also described in the light of expected skill performance, decision-making, and leadership behaviors trainees ought to pick up from their attendings. Both trainees and trainers see trust when learners seek to imitate their teachers.

Although this study is primarily focused on resident-attendings trust, an important theme concerning the role of the patient emerged from the interviews as participants shared their meanings of trust. This a-priori unforeseen theme describes a three-part trust relationship between the patient, attending, and resident. Thus, in the following section, I will explain how the patient plays a role in the training and trust relationship between residents and faculty.

Trust and Patient Safety

Even though none of the questions in the interview specifically asked about the patient, most participants could not talk about trust in surgical training without including

the patient in their responses. In this section, I will describe how patients' trust is embedded in attendings and residents' trust inside of the OR. I will conclude this subsection by explaining how attendings and residents' notions of patient safety inform this additional trust exchange.

Attendings described a three-dimensional trust relationship that starts with a patient. The patient initiates the social exchange by trusting the attending's judgment and competency as a physician and teacher. During the surgical procedure, the attending transfers the patient's trust to the resident. While trainers transfer their patients' trust to trainees, they also bear a two-way trust interaction. The attending trust or does not trust the resident to lead specific portions of the procedure; the resident trusts or does not trust that the attending will safely engage her in the surgery.

In the quote below, Dr. Weber describes the organic trust transfer that starts with a "contract" between the patient and the attending:

> "The faculty member has to give some trust to the resident to be operating on their behalf. Or to participate in the care of the patient when [in reality] the original contract is between the patient and the attending. You have to trust them to be able to act on your behalf or with you in the care of that patient. So, essentially, you're passing on the trust that the patient has placed in you to the resident. But you are assuming the responsibility of the resident's actions." [Dr. Weber] M

In the OR, the attending passes the patient's trust to the resident and expects her to "act on [his] behalf," meaning that they will perform to satisfy the patient's needs and maintain her safety. When Dr. Weber gives a trainee part of that initial trust, he takes full responsibility for the resident's actions. This is because he remains the patient's principal healthcare provider. Dr. Karev shared a similar description of this transference when he explained how the patient chooses to trust him based on his abilities to treat her illness

while safely integrating and handing that trust to a trainee during the surgical process. He also adds more context to this three-part trust relationship by explaining the interactive dynamic between the attending and the resident's trust.

> "So, clearly there's patient trust. Like, I think, the patient has to acknowledge who [I am] and my decision-making and abilities as a surgeon. But also, trust the fact that, you know, I am comfortable and capable doing an operation with a trainee. So, I mean, there's that element. And then there's the trust I have between me and the resident. You know, I have to have trust that residents will be kind of safe in the Operating Room, just as they'll have trust in me that, you know, I'll be there to help and guide them through the operation." [Dr. Karev] M

Most residents echoed these perceptions of trust transfer between patients, attendings, and residents. Like Dr. Weber and Dr. Karev, Dr. Murphy identified the patient's trust as the origin and the most critical part of a more complex trust dynamics in surgical training, specifically when a patient trusts that the attending will make appropriate clinical and teaching decisions while considering the patient's best interest. Based on what is best for the patient, the trainer will decide when and how the resident will participate in the surgery. Attendings use their stands on patient safety as a trust proxy to inform their teaching decisions. Therefore, residents must build their reputation as trainees who care about the patient's safety to gain autonomous participation in the OR.

> "First of all, the patient trusts that the surgeon –the attending surgeon– it's doing what's in their best interests and so, that attending surgeon has to take that patient's trust and know when they can and cannot trust a resident to do certain clinical tasks because that patient's life is at risk, and this is sort of like a trust by proxy. So, that, I think, it's probably the most important transfer of trust in the OR. For residents, it means establishing a reputation with that attending to be given autonomy to do certain things or to have a discussion about what they think should happen next." [Dr. Murphy] F

Few residents –mainly women– contemplated this three-dimensional dynamic of trust concerning their trust in attending as a clinician. Trainees will have greater trust in teachers who prioritize "patient's best interest" and act on behalf of the patient's recovery and wellbeing (Parsons 1991).

> "So, we got called and it was all like [the patient] was dying. And [the attending] wanted us to take [the colon] out to fix her problem and take care of her problem. But then the way that he suggested to do it didn't technically make sense and showed that he didn't clearly understand the anatomy or how he will actually do this procedure. And I feel [that attending]…was very aggressive with the family and unrealistic about how the problem could be fixed and how [the patient] could maybe be saved if she had this surgery….Then, she ultimately went to the OR three times, then bled, and he finally realized that all of this was futile. And she really never needed [the surgery]." [Dr. Stevens] F

The above story shows the impact of patient-centered decision-making on trainees' trust. Dr. Stevens shared her experience working with a male attending who she does not trust and respect anymore because he failed to provide the best care for a patient with a perforated colon. From her perspective, he did not approach the patient's family appropriately and conducted multiple surgeries that did not improve the patient's health. This attending's behaviors and decisions prompted Dr. Stevens to become skeptical of his medical decisions in future cases. Furthermore, this resident disagreed with the treatment approach her attending chose for the patient because it resulted in costly medical expenses for a family who lost their loved one.

Both attendings and residents mixed this three-part trust description with 'low harm' expectations, meaning that the resident will not put the patient in a dangerous position during the training process. Hence, the trust transferred from the patient to the resident via the attending is founded on patient safety. More attendings than residents,

especially men, talked about safety in their description of trust inside the OR. Below, Dr. Sloan and Dr. Blake associated trust with trainees' ability to lead or participate in surgeries without causing any harm or damage that could endanger the patient during the operation.

> "You know, knowing that the resident is not going to do anything so aggressive that, you know, you can't prevent them from having some disaster or complications. So, knowing that the resident is going to be careful enough through an operation. You know, handling the tissue. I'm not going to worry about them ripping a hole on a big artery or something like that. But basically, you know, trusting that they're not going to do something to harm the patient without me like having my hands on their hands and control everything they're doing." [Dr. Sloan]

> "I think you're trusting that the attending also has your interest a little bit at heart. That you also play a role in the way they do things and they're doing things. So, that you get to learn and you're trusting also that they'll let you do as much as you should or enough for you to learn. But they'll not to let you do anything dangerous. And for the attending, I think they need to trust you enough that you are not going to be reckless…" [Dr. Blake] F

Several attendings provided specific trustworthy behaviors associated with surgical safety: treating the tissue gently, showing good judgment (e.g., making the correct intraoperative choice, asking for help), being careful, and not operating aggressively. However, trainers who associated patient safety with trust said they were expecting the resident to not cause harm instead of avoiding it. They seemed to be on the watch for what residents might do wrong rather than what they did correctly:

> "Trust means that I have confidence in the resident to make safe decisions and operate safely. Not put the patient at harm, whether it's technically or management decisions. Yeah. That I think that they are able to…That they're prepared, number one. That they're safe and that they have some accountability." [Dr. Altman] F

In the quote above, Dr. Altman began describing her meaning of trust as her confidence in residents' safe decisions. She unpacked this broad interpretation with the phrase "Not

put the patient at harm," instead of providing examples of trainees' actions that can assure patient safety. These expectations resemble the pedagogical purpose of errors in medical education (Bosk 1979), which involves identifying mistakes where it is safe and using them as a learning experience (Peters and Peter 2007).

Even though patients seem like unanimated actors when they are under the effects of sedative medications, they play a vital role in a three-fold trust transfer. At least in pre-programmed surgeries, they are the ones who initiate the relationship with the attending by trusting their surgical and teaching skills. The minute the surgery starts, the attending must choose to transfer or not that trust to the residents when they hand over their patient to them. Meanwhile, the resident trusts that the attending will provide significant hands-on experiences with adequate supervision. These trust dynamics happen under the consideration of what is best for the patient's well-being and safety. Hence, the trust transfer between the attending and the resident is informed by shared notions of patient safety.

Ideal Trust vs. Trust Factors

In addition to meanings of trust, I asked attendings and residents to identify specific elements that influence their trust in the OR. These are specific behaviors and circumstantial factors that participants described with tangible details, instead of abstract notions of how trust should arise in general surgery training. I will present in this section trust factors by first contrasting them with the meanings of trust described in the beginning of this chapter. Given that technical skills constituted the most prominent

theme concerning trust factors, I will pay greater attention to this tangible determinant of trust. Then I will present other trust factors not observed in meanings of trust, including the resident's track record and understanding of knowledge or technical limitations.

Several trust factors overlapped with themes observed in meanings of trust, including technical skills, general or specific medical knowledge, and the patient. Technical skills seem to matter more as a trust factor, whereas medical knowledge was more frequently mentioned across attendings' meanings of trust. Attendings used technical skills as an immediate indicator of trust, given that they could "tell pretty quickly" [Dr. Hunt] what role residents will play in the surgery –leading vs. assisting– by how trainees choose and handle instruments and perform a task (e.g., dissection) with no to minimal feedback. See the following quote from Dr. Burke, in which he provides a hypothetical example of two residents with equal preparation and different technical skill levels to justify his view on trust factors:

> "There are some technical factors. To be honest, some people have better technical skills. So, two people may both have prepared equally coming into the OR, but one is just very deft with they're hands. They have, as we say, good hands. They can tie knots well. They can sew well. And the other, for whatever reason, they prepare, they practice, but their technical skills aren't as great. You know, basic underlining technical ability affects trust because it'll affect how much latitude I give them to carry on a particular task." Dr. Burke M

According to Dr. Burke, technical skills are not always directly related to trainees' level of preparedness. Talent or having "good hands" is not present in all residents, even when they invest the same amount of effort and preparation time. Therefore, when choosing to trust or not to trust residents in the OR, attendings tend to hand over instruments to trainees who demonstrate they can handle them and carry out the entrusted task efficiently and safely.

Although Dr. Burke did not link technical skills with any specific type of training or personal trait, Dr. Riggs associated it with abilities put in place by nature, suggesting that some people are born to be surgeons:

> "There are some people that are innately qualified to do surgery. I swear, there are some people who roll out of the womb with a knife and scissors on their hands. They really know how to work. They look at an operation and it makes sense to them. It's like a kid who is four years old, sits down [in front of] a piano, and the next thing you know they are playing Chopin. You know. I mean, who does that? There are some people that do that. [I knew someone who] was a like that. He was just a natural talent. So was [another surgeon]. Most people don't learn that way. Most people learn by repetition of learning concepts and operate within the boundaries of those concepts." [Dr. Riggs] M

Based on his experience, Dr. Riggs believes some people have an innate talent for surgery and compares them to a four-year-old child who suddenly plays a complex song after looking at a piano for the first time. Others do not have "the gift" and learn by repetition.

Among other trust factors, most attendings and residents mentioned trainees' track record, such as their past experiences with the other person or the number of times they have participated in surgical procedures. Within those references, both attendings and residents mainly focused on past experiences with the other person or –especially for attendings-– residents' OR experiences with other attendings. Consider the following quotes from an attending who explained how past experiences influence his trust:

> *"*So, I think, first and foremost, it's how well I know that resident. So, how much I've worked with them before. To know kind of where their abilities are and then the ability and that trust factor to know that they're not going to keep pushing forward if they get to a part where they're uncomfortable and they don't know exactly what they're doing." [Dr. Sloan] M

Like most surgeons who participated in this study, Dr. Sloan considers his previous interactions with residents and how many times he has worked with them to assess their technical abilities and whether or not they know when to stop if they feel uncomfortable leading specific portions of the surgery. Before trusting trainees, attendings need to know about their participation in similar surgical procedures. What was their role? What parts of the surgery did they lead? Were they successful? The majority of attendings said they use prior first-hand, meaning their own, experiences as a proxy of trust, and few consider their colleagues' interaction with trainees. If a resident did a good job carrying out a surgical task without causing unexpected complications and damages, attendings trust the resident will perform as she did in the past. When explaining how they rely on residents' track records to trust or not to trust, none of the attendings mentioned residents' medical knowledge. Instead, trainers primarily focused on whether or not the resident demonstrated efficient use of technical skills in the past.

Residents were aware of the influential role of their track record in the trust development process and expressed their intentions of avoiding mistakes, wishing not to come across as technically incompetent. They also knew their teachers discuss and share their experiences working with them inside and outside of the OR, thus informing residents' reputation in the program. Although not many attendings mentioned residents' general reputation as a trust factor, some explain how conversations between colleagues play a role in their trust. This behavioral pattern became relevant when I asked attendings to share a loss of trust anecdote. Three seemed to be telling the same story of a lying resident who eventually left the program:

> "Dr. Hayes: You were speaking about honesty– there was a resident who was asked to leave the program because he lost

complete trust from the program. That was in my eyes dishonesty.

Interviewer: Can you tell me a little bit more about that specific situation?

Dr. Hayes: Honestly, falsifying lab values when we needed to know them. Once [he had] done that, [we couldn't] trust [he's] reported patient symptoms. You can't trust them in the operating room at all.

Interviewer: This person actually changed the values of a patient's reports.

Dr. Hayes: So, my understanding is that he was asked what the labs values were. He did not know them personally, but he made up numbers that would be reasonable and expected. However, they were not. He did not know what they were. [Pause] I guess [it] is falsifying data.

Interviewer: You mentioned that this person got kicked out of the program?

Dr. Hayes: He was asked to leave the program. He was put on a leave and [Pause] I don't know the exact steps, but he was not allowed to do clinical care and got taken out." M

"Dr. Hahn: Someone said that they saw a patient and everything looked ok. Then, when I went to see the patient, things weren't fine, and there was no way that they actually have looked. So, lying. Right? Yeah. That's not going to go well for me.

Interviewer: What happened afterwards?

Dr. Hahn: So, the patient was fine, but we…It came to the light that this particular resident had a number of other similar situations with lack of full truth. I wasn't the only one with issues. It was actually the only time I had an issue with a resident. Like I said, it was brought to light. I only talked with another person about it, so I didn't take it furthers than just talking to the resident. But when we had this meeting, it kind of came to light that other people had a lot of problems. So, ultimately the resident left, but not because of my incident, but due to multiple things. Which shows I

> think it was the resident himself. It was a pattern of behavior." F

I heard this story from another attending who did not want to disclose much information because he was concerned about this resident's and his confidentiality. However, when I interviewed Dr. Hayes and Dr. Hahn, I identified a pattern in their stories; a resident who presented unverified and dishonest information and eventually left the program because many attendings could not trust him, especially in the OR. This story shows how rumors spread across the program and influence attendings' trust choices, particularly when facing lying behaviors, which, according to Dr. Burke, is an "unforgivable sin in surgery."

To avoid most surgical complications or "messing things up," residents ought to clearly understand their limitations as trainees. Have they mastered a technique? Do they know how far a tool can cut through tissue before damaging other organs, or what are the next steps of the procedure? If they run into abnormal anatomy, can they recognize it and know how to proceed in the light of unforeseen inconveniences? For attendings, it is much easier to teach a resident who can recognize her position as a learner and identify her technical and knowledge gaps. Hence, trustworthy residents are aware of their limitations and ask for help whenever they do not know what to do next or struggle with specific tasks:

> "…them showing me that they recognize their limitations and their weaknesses, and that they're ok saying, 'I don't know something.' Those things instill a lot of trust. Maybe more so if someone who knows everything or has the right answer all of the time before someone who says, 'I don't know' or 'I'm not comfortable' that instills a lot of trust*."* [Dr. Koracick]

In the quote above, Dr. Koracick explained that to gain trust, residents must show they are cognizant of their knowledge and technical limitations and ask for help when they cannot continue operating on their own. Although a more knowledgeable resident may gain more opportunities, this faculty will still have greater trust for trainees who are courageous enough to admit their limitations. Most interviewed attendings echoed his sentiment and almost all residents said they are aware of this trust factor:

> "One, you want to get as far as you can without needing help from them. So, if they, you know, let you go at a certain step, you want to complete as many steps as you can –that you feel comfortable doing– before they intervene again." [Dr. Blake]

As described by Dr. Blake, residents seek to actively participate in the OR and try to gain as many hands-on experiences as possible, while being cognizant of their limitations.

As explained earlier, getting the chance to lead portions of a surgery not only aids skill development but also influences attendings' trust because it shows trainees' technical skills. It is, however, difficult to identify that blurry line between residents' beliefs about what they can execute in the OR and what the attending will allow them to do. The profession comes with a myriad of unavoidable uncertainties, and the structure of medical training teaches physicians in training how to identify and work around them. In the cases of surgical residency and this study, the uncertainty will depend on whether or not both residents and attendings share similar opinions about trainees' level of participation in the OR for the sake of skill development and patient safety. In some circumstances, opinions are at opposite ends of the spectrum, and trust does not grow as expected:

> "…it frustrates me the most when people suggest that they are more of an expert in something, and they aren't. And they try to behave in such that they are capable to do these complex operations by themselves. There are

> some people that I worked with that probably could. But I think it is unrealistic to think that you have a larger skill set than somebody that has been doing this significantly longer than you." [Dr. Marsh]

In the quote above, Dr. Marsh shared his experience operating with trainees who, from his perspective, are trying to show unrealistic skills for a trainee and how their expectations affect the trust development process.

Different from meanings of trust, there are specific factors that influence attendings' trust in residents. While medical knowledge was more prominent in meanings of trust, technical skills stood up as the most relevant trust factor. Also, residents' track record and recognition of their knowledge and technical skill limitations emerged as relevant factors concerning attendings' trust.

CHAPTER 5

MM RESULTS

I will present in this chapter the results of the MM portion of this study. In the first section of this chapter, I will discuss the results from the quantitative analysis I executed using the rated surgical interactions between attendings and residents. For this analysis, I treated average attending entrustment as the outcome of interest and the resident's postgraduate year, number of surgeries previously done with the same attending, and the resident's gender as primary predictors. First, I will show basic statistics to provide a brief overview of the analytic sample employed in this portion of this study. Second, I will present the results of bivariate statistics determining the association between the outcome of interest, the main predictors, and other factors I will treat as control variables. Lastly, I will discuss findings from a series of linear regression models to determine whether or not there is sufficient evidence to confirm the hypotheses presented in the literature review of this study.

In what remains of this chapter, I will present several qualitative themes to explain the quantitative findings discussed in the first section of this chapter. First, I will discuss attendings' perceptions of the association between residents' postgraduate year and trust to provide context concerning the relationship between these two measures. Also, I will compare attendings' and residents' responses to highlight differences and commonalities. Second, I will describe the trust growing process from the perspective of attendings and residents and how trainers' and trainees' interactions change from their

first operation to subsequent surgeries together. I will use these themes to explain the quantitative findings regarding the association between the number of surgeries done with the same person and trust. Finally, I will present qualitative findings portraying the effect of residents' gender on attendings' trust and how they relate to the number of surgical interactions trainers and trainees have had.

Quantitative Results

Table 2 presents the means and percentages of all variables included in further statistical analysis. The analytic sample has a total of 105 observed surgeries, where 66% of the cases a female resident and 34% a male resident was present. The average attendings' entrustment for cases with male residents is 1.25 and 1.3 for female residents. The average postgraduate year of male residents who were observed in the OR is 3.17, meaning third-year, and 2.62 among female residents. Almost half of the female (46.38%) and male residents (44.44%) said they operated with the same attending more than 10 times when they were observed. Female residents reported being more familiar with their attendings than male residents. Similarly, attendings reported being more familiar with female residents than their male trainees.

Half of the cases in which female residents were present were categorized as the hardest one-third, whereas 42% of surgeries including a male learner were the easiest one-third. During the observed surgical procedure, more than one-third of male and female residents were at the beginning of a rotation. According to attendings and residents, residents participated in the procedure with active help in almost half of the

observed surgeries. Resident's postgraduate year, familiarity with the attending, and perceived autonomy in the surgical procedure were significantly associated with higher average attending's entrustment. The number of surgeries residents conducted with the same attendings, the attending's familiarity, and the attending's report of the resident's autonomy were also significantly associated with higher average attending entrustment. Compared to male attendings, female attendings experienced lower average attending entrustment.

Table 3 presents the estimates of linear regression models predicting average attending entrustment after adjustment for covariates. In model 1, none of the main predictors, i.e., postgraduate year, the resident's gender, and the number of surgeries done with the same attending were significantly associated with average attending entrustment, failing to support *Hypothesis 1.a,* and *Hypothesis 2.a.* In model 2, *Hypothesis 1.b* also remains without support since the interaction between resident's gender and postgraduate year was not statistically significant. However, a statistically significant interaction between the number of surgeries done with the same attending and resident's gender in model 3 suggests that the relationship between average attending entrustment and the number of surgeries a resident has done with the same attending differs by the resident's gender. This result is consistent with *Hypothesis 2.b.* Residents who said they operated with no help were more entrusted by their attendings (b=1.10 $p<0.05$, b=1.22 $p<0.01$, b=1.14 $p<0.05$, b=1.17 $p<0.01$). Based on the attending's report, residents who received passive help were more entrusted (b=0.69 $p<0.01$; b=0.67 $p<0.05$; b=0.70 $p<0.01$, b=0.62 $p<0.05$).

To interpret the observed interaction effect in model 3, adjusted marginal estimates of average attending entrustment by the number of surgeries and resident's gender are provided in Figure 5. They suggest that during first surgeries, attendings entrust female residents more than male residents. In subsequent surgeries, however, male residents gain rapidly in terms of attendings' entrustment and keep their gains for surgeries to follow in the future. Female entrustment, on the other hand, remains flat or even declines slightly with more surgeries.

Post-hoc regression models estimating average attending entrustment by the resident's gender exhibit a negative relationship between case difficulty and entrustment for female residents (b=-0.390 $p<0.05$, b=-0.719 $p<0.05$) [8]. In model 4 (Table 3), the interaction effect between case difficulty and the resident's gender is statistically significant. In Figure 6, adjusted marginal estimates of average attending entrustment by case difficulty and resident's gender suggest that in easy surgical cases, attendings entrust female residents more than male residents. In surgeries with greater difficulty, attendings entrust male residents more compared to female residents.

[8] Full results are available upon request.

Table 2.

Characteristics of the sample.

	Male resident (N = 36)	Female resident (N = 69)	p [1]
Average attending entrustment Mean (SD) [a]	1.25 (0.71)	1.3 (0.75)	
Resident PGY Mean (SD) [a]	3.17 (1.44)	2.62 (1.19)	***
# of surgeries with the same attending % [b]			**
1st time	2.8	7.3	
2-5 times	22.2	31.9	
6-10 times	30.6	14.5	
>10 times	44.4	46.4	
Resident's familiarity % [b]			**
Not at all familiar	11.1	1.5	
Slightly	36.9	15.9	
Moderately	25.0	46.4	
Extremely	0.0	36.2	
Attending's familiarity % [b]			***
Not at all familiar	0.0	5.8	
Sightly	22.2	15.9	
Moderately	47.2	36.2	
Extremely	30.6	42.0	
Case difficulty % [b]			
Easiest one-third	41.7	39.1	
Average	38.9	50.7	
Hardest one-third	19.4	10.1	
RNFA present % [b]	22.2	14.5	
Female attending % [b]	36.1	31.9	***
Resident rotation time % [b]			
Less than a week	33.3	30.4	
1-2 weeks	16.7	8.7	
3-4 weeks	25	30.0	
4-6 weeks	13.9	24.6	
>6 weeks	2.8	4.4	
Cross-covering	8.3	2.9	
Resident autonomy reported by the attending % [b]			***
Show and tell	25.0	34.8	

Active help	52.8	37.7	
Passive help	139	21.7	
No help	8.3	5.8	
Resident autonomy reported by the resident % [b]			***
Show and tell	27.8	26.1	
Active help	47.2	43.5	
Passive help	0.0	24.6	
No help	25.0	5.8	

Note: SD=Standard deviation. PGY=Postgraduate year. RNFA= Registered nurse first assistant.

[1] Significance of ANOVA or Pearson's correlation tests determining the association between average attending entrustment and the predicting variable.

[a] Pearson's correlation

[b] ANOVA

† p<.10, *p <.05, **p<.01, ***p<.001

Table 3.

Linear regression models predicting average attending entrustment (N=105).

	Model 1	Model 2	Model 3	Model 4
		Model 1+ PGY*resident's gender	Model 1 + # surgeries *resident's gender	Model 1 + case difficulty*resident's gender
	Coef. (SE)	Coef. (SE)	Coef. (SE)	Coef. (SE)
Resident's PGY	0.10 (0.08)	0.18 (0.13)	0.09 (0.09)	0.04 (0.07)
Female resident	0.10 (0.17)	0.55 (0.49)	1.30 (0.43) **	0.48 (0.22) *
# of surgeries with the same attending (ref=1st time)				
2-5 times	-0.16 (0.40)	-0.18 (0.37)	1.08 (0.38) **	-0.20 (0.38)
6-10 times	0.30 (0.41)	0.29 (0.38)	1.30 (0.44) **	0.38 (0.40)
>10 times	0.20 (0.42)	0.28 (0.41)	1.18 (0.42) **	0.23 (0.42)
Interactions				
PGY x Female		-0.15 (0.15)		
2-5 times x Female			-1.55 (0.55) **	
6-10 times x Female			-1.14 (0.60) †	
>10 times x Female			-1.15 (0.50) *	
Average x Female				-0.71 (0.32) *
Hard one-third x Female				-0.65 (0.49)

Resident's familiarity (ref=Not familiar at all)				
Slightly	-0.59 (0.48)	-0.64 (0.49)	-0.24 (0.45)	-0.59 (0.47)
Moderately	-0.59 (0.48)	-0.64 (0.50)	-0.36 (0.51)	-0.60 (0.51)
Extremely	-0.51 (0.55)	-0.58 (0.57)	-0.25 (0.62)	-0.48 (0.59)
Attending's familiarity (ref=Not familiar at all)				
Sightly	0.12 (0.30)	0.19 (0.37)	0.05 (0.32)	0.23 (0.37)
Moderately	0.08 (0.37)	0.07 (0.42)	0.02 (0.35)	0.17 (0.39)
Extremely	0.13 (0.42)	0.07 (0.47)	0.04 (0.43)	0.15 (0.45)
Case difficulty (ref=Easiest one-third)				
Average	-0.17 (0.14)	-0.23 (0.16)	-0.18 (0.16)	0.31 (0.26)
Hardest one-third	-0.25 (0.25)	-0.32 (0.23)	-0.22 (0.25)	0.09 (0.38)
RNFA present	-0.05 (0.16)	-0.05 (0.16)	-0.04 (0.18)	-0.02 (0.16)
Female attending	-0.14 (0.20)	-0.21 (0.23)	-0.13 (0.22)	-0.27 (0.23)
Resident rotation time (ref=Less than a week)				
1-2 weeks	-0.04 (0.28)	0.01 (0.29)	0.03 (0.27)	-0.02 (0.29)
3-4 weeks	-0.28 (0.19)	-0.23 (0.20)	-0.26 (0.17)	-0.24 (0.20)
4-6 weeks	-0.13 (0.20)	-0.05 (0.20)	-0.12 (0.21)	-0.09 (0.21)
>6 weeks	-0.26 (0.38)	-0.15 (0.42)	-0.21 (0.44)	-0.13 (0.46)
Cross-covering	0.004 (0.32)	0.08 (0.37)	-0.15 (0.33)	0.10 (0.38)

Resident autonomy reported by the attending (ref=Show and tell)				
Active help	0.23 (0.20)	0.26 (0.19)	0.22 (0.20)	0.17 (0.18)
Passive help	0.69 (0.26) **	0.67 (0.26) *	0.70 (0.26) **	0.62 (0.25) *
No help	0.52 (0.32)	0.50 (0.31)	0.57 (0.32) †	0.49 (0.32)
Resident autonomy reported by the resident (ref=Show and tell)				
Active help	0.33 (0.21)	0.35 (0.20)	0.34 (0.21)	0.36 (0.18) †
Passive help	0.33 (0.24)	0.35 (0.23)	0.31 (0.23)	0.35 (0.21)
No help	1.10 (0.44) *	1.22 (0.41) **	1.14 (0.46) *	1.17 (0.43) **
AIC	198.40	197.86	195.22	193.74
BIC	267.51	269.52	269.53	268.05

Robust estimators and 1000 bootstrap replications used.

Note: SE=Standard error. Coef.=Coefficient. Ref=Reference. PGY=Postgraduate year. RNFA= Registered nurse first assistant. AIC=Akaike information criterion. BIC= Bayesian information criterion.

† p<.10, *p <.05, **p<.01, ***p<.001.

Figure 5. Adjusted predicted values of average attending entrustment by resident's gender and number of surgeries done with the same attending.

Figure 6. Adjusted predicted values of average attending entrustment by resident's gender and case difficulty.

Qualitative Results

Postgraduate Year and Trust

According to the regression models discussed in the prior section of this chapter, there is no sufficient evidence to support the suggested positive association between resident's postgraduate year and average attending entrustment and the moderating effect of resident's gender over this relationship (See Table 3). The majority of interviewed attendings believed this institutional predictor does not influence their trust in residents inside the OR. Not all interviewed attendings had the same opinion about the association between residents' postgraduate year and trust. Yet, the majority said it is not an accurate predictor of influential trust factors (e.g., technical skills, preparedness) (See Chapter Three). Those who rejected the suggested association between residents' postgraduate year and their trust responded with one of the following phrases immediately: "not always," "to some degree," "not really," "not necessarily," or "I don't think so." Consider the following response from Dr. Lincoln:

> "No. Not necessarily, because I think each resident is in their own area as far as how much they've done, what their knowledge base is, how much experiences they've had in the OR, what their engagement with me may be, my prior knowledge of the resident, and how we interacted in the past. I would not say that every intern that comes in my OR gets to afford the same relationship of trust with me than a second or third year. Kind of depends on my prior interactions or perception of them." [Dr. Lincoln] M

Similar to other attendings, Dr. Lincoln does not allow residents' postgraduate year to inform his trust choice because he knows each resident, even though they are in the same program, experiences the process of training differently. Trainees' medical knowledge and technical skills vary, and it is more efficient and accurate to assess these

competencies through first-hand observations and individual interactions with them. Hence, first-time interactions with trainees mattered more than seniority because there is no guaranteed accuracy in the expected surgical proficiency based on the postgraduate year.

Some rotations require an additional set of skills that are only applicable to specialized surgical procedures, such as cancer, trauma, or transplant surgery. When residents transition into any of these specialties for the first time, regardless of whether or not they are junior or senior residents, they lack technical skills or are less likely to recognize the tools and approaches used in these rotations. In the following quote, Dr. Hahn explains how she will treat residents new to her service like interns, regardless of their postgraduate year:

> "No. Not really. The 2nd years are with us. So, a 5th year may stick their head in, and they have no clue. They'll be like, 'what's an [intraoperative specimen radiography system].' I mean, not necessarily. They may be technically better because they have years under their belt. But if I haven't had a 5th year ever operate with me, I'm going to treat them like an intern initially. You know, 'This is what I want. Can you do this? Ok, I did this, now show me. You do this.' Not necessarily with what we do. They may pick it up faster. So, they watched this case and then the next case they'll do it because they have 5 years operating under their belt, compared to an intern. But not necessarily. They're going to come in not knowing how to do a SAVI SCOUT [9]… So, they come in and they are like, 'What is this?' [Laughter] So, they're at the same level as an intern. In their extra couple of years, they haven't seen it and it's still new to them. But they may pick it up faster, just because they have that [extra experience] in them. They've been doing it longer. To pick up techniques and to pick up operations. They still are going to have to learn just like the intern." [Dr. Hahn] F

Like other attendings, Dr. Hahn does not treat residents' post-graduate year as a proxy of trust; she has seen senior residents in her service showing a lack of knowledge and skills

[9] A SAVI SCOUT is a breast cancer treatment approach for patients who choose to have a lumpectomy: a surgical procedure involving the removal of a potentially cancerous mass.

that are essential to the type of surgeries she regularly executes. Her specialty mainly treats cancer patients, and most of her surgeries aim to remove tissue affected by the disease. She frequently utilizes specific tools to measure the presence of cancer cells before and after removing the affected tissue, and most residents do not use nor know how to maneuver them until they rotate with her or her colleagues. For this reason, she treats all residents she just met like interns.

Although attendings did not believe residents' postgraduate year was a significant factor in their trust, some recognized its direct relationship with residents' time in the program and, consequently, the amount and level of participation they have had in the past. In the quote below, Dr. Sloan explains the relationship between resident's postgraduate year and the number of surgical experiences they have had throughout their training:

> "…in general, the further they are, then the more I've worked with them. But, I mean, just yesterday I did a very difficult and challenging operation with a [third year] general surgery resident, who happens to be very good and somebody that I've actually worked with quite a bit over the last several weeks, to where I felt comfortable doing this case with him. You know, the fellow that I would have been doing it with got a call to another emergency. So, when he finished that, he came back and said, 'Hey, I can scrub and help you with it?' and I said, 'No. We're good.' because we were moving along just fine. And it's probably because the resident I was operating with, even though he's a [third year], is technically very good. And I trust him too because he has been sitting in consults, reporting back, and he has never given me any reason not to trust his judgement or his abilities. So, even though he had four years or less training or five years less of training than the fellow did, it didn't feel necessarily different in that situation. Because I had enough experience with this [third year] resident. So, I'll let him do everything I would have left a fellow do – essentially." [Dr. Sloan] M

In Dr. Sloan's mind, there is a positive association between a resident's postgraduate year and how many times she has operated, especially with him. However, Dr. Sloan has had

experiences in which this institutional reference failed to predict residents' knowledge, skill proficiency, and medical judgment. The day before our interview, he conducted a complex surgery with a third-year resident whom he felt comfortable working with, even though the surgery could benefit from the advanced skills of a fellow. A fellow is "a physician in a program of graduate medical education accredited by the ACGME, who is beyond the requirements for eligibility for initial board certification in a surgical discipline" (American College of Surgeons 2021). Despite this resident's level of training suggested by his postgraduate year, Dr. Sloan decided to trust him because he knew from prior experiences that this trainee could outperform others in his cohort.

Most attendings who did not see residents' postgraduate years as a significant trust factor evaluate their prior experiences with trainees. They need to know how competent residents are, their general medical knowledge, their level of commitment to the patient, how they interact with OR staff, and their skill proficiencies. None of the attendings who suggested previous experiences after rejecting postgraduate year mentioned past interactions with other attendings as an alternative trust factor.

In addition to sharing their sentiments concerning the relationship between residents' postgraduate year and trust in them, several attendings provided hypothetical or real examples to justify their opinions:

> "I don't think so. I mean, I think it comes hand-in-hand that a fourth or fifth year is going to have done more of an operation than a second or third year. So, I think automatically –just because they've done more– I probably have more trust in them. But I think it doesn't necessarily have to do with [their] [postgraduate year]. I've had some [fourth years] who are technically better or have better judgement than a [fifth year]. So, I don't think it's necessarily year so much. It's how much experience they've had." [Dr. Altman] F

Although Dr. Altman recognizes the expected relationship between years of training and her trust in trainees, she has met younger residents with superior technical and medical judgment skills compared to a senior trainee. Both attendings and residents said that expectations vary by postgraduate year. These expectations influence the learning goals attached to each training phase described by the ACGME general surgery milestones.

> "But there are different expectations based on their [postgraduate year] level. Again, junior residents are still learning their way around the hospital. I mean those first couple of months of intern years you're in a new hospital. You're still finding where the bathroom is. Right? At that point I don't have the same expectations for those residents as I do even the same [postgraduate year] at the end of the academic year or more senior [postgraduate year] level [trainees] who have been around for a couple of years and should be at a higher level of training. So, I think that there is some, you know, differing expectations based on [postgraduate year]. Now, it can become quickly apparent if a resident is performing significantly above or significantly below those expectations. Which does happen from time to time." [Dr. Shepherd] M

According to Dr. Shepherd, attendings are aware of the difference in training expectations between junior and senior residents concerning their technical skills and how they navigate the hospital. He and other attendings use these training expectations to determine whether or not residents are under- or over-performing and choose how much they trust trainees based on their level of performance. Overperforming junior residents are more likely to gain greater trust from their trainers than the average surgical trainee in their cohort. Senior residents who are behind in their training would experience lower trust than those in their cohort who perform as expected or, in some cases, above-average junior residents.

Since residents' postgraduate year informs training expectations, the context of the surgery will influence attendings' trust in residents based on their postgraduate year, as explained by Dr. Stevens, who claimed that some surgeries are chief-level cases:

> "I think a lot of attending kind of have it in their mind before they even start the case, 'This is a chief level case. This is an intern level case.' So, regardless of who you are, I think a lot of them have it in their head, like, 'This is really a chief level case. So, I'm going to do much of it because I'm doing it with an intern.' So, I think it does make a big difference." [Dr. Stevens] F

Based on her experience, attendings regularly evaluate the complexity of the surgery and classify them as chief-level, i.e., senior-leader resident or intern-level procedures. This sorting mechanism is informed by performance expectations, and residents' postgraduate year predetermines who will be trusted based on seniority. However, as explained previously and demonstrated through Dr. Sloan and Dr. Shepherd's response, attendings may trust junior residents with senior-level cases if trainers know they can overperform peers in their cohort.

Unlike the attendings, all residents believed their postgraduate year influenced how much faculty surgeons entrusted them inside the OR. In their experience, this institutional reference indicates how many years of training and experience they have operating. Although the postgraduate year does not inform how many surgeries the resident participated in and which rotations she completed, it suggests where she has been and whether or not she actively participated in other surgical cases. Consider the following quote from Dr. Schmitt:

> "Because the number of the [postgraduate year] already tells the attendings how many years I've been practicing surgery here. So, it doesn't necessarily tell them exactly what rotations I've done, what attendings I have worked with. But it gives them the idea [of], 'Oh. [Dr. Schmitt] has only one year of experience or four years of experience. He should be ok to close the fascia by himself.' I think it affects [pause] what things they allow us to do in the procedure right of the bat." [Dr. Schmitt] M

Based on his experience, Dr. Schmitt has seen his postgraduate year informing attendings' estimates of how long he has been in the program and what tasks he should carry out on his own. However, he made the caveat that this institutional reference does not indicate which rotations he has been through and with whom he operated in the past. This seniority indicator provides a rough estimate of his experience in the program.

Even though the training relationship is between the resident and the attending, other members of the surgical staff influence the trust development process between trainers and trainees. Especially important are Advanced Practice Provides (APP), e.g., Registered Nurse First Assistants (RNFA). To some extent, surgical staff members influence the association between training seniority and trust because they have seen residents at different stages of their training and may believe there is a positive association between the trainee's postgraduate year and skill development. In the quote below, Dr. Murphy explained how she learned how other surgical staff members did not trust her when she was a junior resident:

> "Definitely, once people know what year you are and if your more senior they'll trust you more. I went and asked my chief resident that, when I was an intern, because when I was a medical student, I got to close a facia and then as an intern I wasn't. There's an RNFA that I was working with. Then I was like, 'How can I convince this RNFA that I can close facia?' And this chief resident [said], 'Basically, it's just because of your [postgraduate] year. That's the only reason why you're not being able or allowed to [it].'" [Dr. Murphy] F

In her story, Dr. Murphy shared how she struggled to participate in a surgical procedure because the RNFA did not allow her to lead tasks she was used to doing independently. Dr. Murphy believed she had the skills to carry out the needed surgical steps but was denied an opportunity to do so by people in the OR. She asked a senior resident why. Without mentioning any additional details about the situation, the older resident told her

the APP did not trust her because of her postgraduate year. Although my quantitative data provided no evidence indicating the effects of operating with an RNFA (See Table 2 and Table 3), this qualitative finding posits additional questions that need exploring in future research, e.g., is there an association between residents' postgraduate year and APPs' trust, especially for RNFAs? How does APPs' trust influence attendings entrustment?

To summarize the quantitative results concerning postgraduate year, attendings do not believe postgraduate year influences their trust in residents. In their minds, this institutional reference is not an accurate predictor of skill and knowledge proficiency, given that each trainee's experience is unique, and their learning habits and abilities differ. Instead, attendings consider their prior experiences with residents to inform their trust choices. Although trainees are expected to perform technical procedures and apply knowledge based on their postgraduate year, it is common to encounter people who can under- or over-perform training expectations. Hence, attendings will calibrate residents' participation in the OR using their observation of residents' skills and ignore their postgraduate year when choosing to trust or not them. In contrast to attendings, all residents in my study believed their postgraduate year affected their attendings' entrustment in them. They suggested that this is because postgraduate year as an institutional reference indicates how far trainees are in the program and the level of participation they had in prior surgical cases. Also, it suggests what kind of tasks they can carry out on their own and what role they will play in the procedure.

Number of Surgeries with the same attending and Trust

To capture the trust development process across time, I asked attendings and residents to describe their average experience operating with someone for the first time. Then, I asked them to compare that first surgical encounter with subsequent surgeries and highlight how the residents' role in the OR and their trust evolve across time. In this section, I will present findings from these two questions to explain the significant association observed in model 3 (See Table 3).

In first-time surgeries, residents and attendings know little or nothing about each other. Attendings may know whether or not residents can apply medical knowledge and how much they know about patients from their time together in morning rounds and night shifts; nevertheless, they are unaware of their surgical dexterities. On the other hand, residents do not know their attendings' surgical preferences, i.e., patient positioning, surgical approach, or training/teaching style. These factors create an "awkward first dance" environment, where both teachers and trainees are trying to identify each other's operating preferences and abilities while doing their best to work with the rest of the surgical team.

Some attendings try to gather information about the resident through assessments before and during the surgical procedure. As explained in the previous chapter, attendings will ask residents whether or not they did the surgery before, with whom, how much they participated, and their role in the surgery. Some attendings will discuss the case with the resident to see how well they understand the steps of the procedure and the purposes of each task. Depending on how well residents demonstrate their general and cases-specific

knowledge, attendings will "adjust" their teaching style and determine when is safe for them to participate in the procedure. See the quote below from Dr. Pierce:

> "If I'm with someone for the very first time, I always start with an interview –very informal– before the case. They are very simple questions, like 'Have you done this before? What's your plan? What do you want to use?' And I usually adjust my teaching style based on their level. But it usually starts with the interview. And then when we get the case started, I usually start the case and then, I'll hand it over to them pretty early on. If I can, I'll ask them what next steps are going to happen. If they answer correctly, I will continue to let them [lead] the case." [Dr. Pierce] F

Before conducting first surgeries with residents, Dr. Pierce likes to do an informal interview to learn about trainees' experiences in the OR and their role in those prior surgeries with other attendings. Additionally, she will ask them to discuss their operative plan to assess their preparedness. Once they start the case, Dr. Pierce will initially take the lead and hand over the instruments as early as possible to the trainee while considering the patient's wellbeing. As they move forward, she will continue the assessment by asking the resident to identify the upcoming steps of the surgery.

Others will notify residents at the beginning that they will not actively participate because they do not know enough to trust them, not even with tasks that are less likely to put the patient's life at risk. These attendings prefer to do the entire procedure on their own to show and tell trainees how they do the surgery. After this first demonstration, attendings hope residents will learn their operating style and imitate what they showed them in that first surgical encounter:

> "So, if it's their first time doing the case with me, I do a lot of demonstration. And then the next time I'll let them do kind of the more straightforward part of the case. Then, I really reserve the harder parts of the case until they've operated with me two or three times and on that same case and have kind of demonstrate it the ability to do so. Always with the caveat that if they are doing well, then they can proceed to the

> next part of the case that I may usually have planned on taking over." [Dr. Robbins] F

Like several other attendings, Dr. Robbins will lead the first surgery entirely and demonstrate to residents her operating style. Meanwhile, she envisions greater participation from her trainees in future procedures as they keep operating with her and exhibit progress in their training.

All residents said they often do the least when they operate with an attending for the first time, and they know why; attendings do not know them, and vice versa. To gather information on trainers' operating styles, trainees observe attendings' movements and techniques to learn their surgical preferences. As they watch their trainers lead surgical procedures, they also search for verbal and non-verbal cues to know when to step forward and play an active role in that and future procedures. Consider how Dr. Ross approaches his relationship with an attending when he meets them inside the OR for the first time:

> "If it's the first time with that attending, [I like] to be a little bit more passive, and kind of see what the attending likes and how he or she does things. I don't like to be in the first [interaction] super aggressive. Because that to me is not safe. I mean, I really like to see how they do it first and how they like things, kind of be a little bit on the side, [and tell them] 'Ok. Show me one time how to do it and then, next time, I can just do whatever you did.' You know what I mean? Like, the way they like it. For the first time with an attending, I am more on the side and kind of wait, see how the attending does things, and kind of go from there." [Dr. Ross] M

Although Dr. Ross is a senior resident and might have higher odds of being entrusted, he prefers to be a passive learner when he operates with attendings for the first time. He predominantly observes before doing anything or participates in minor tasks, a common strategy mentioned by female and non-white residents. Moreover, Dr. Ross keeps his distance because he prioritizes patients' safety over his technical advancement.

Even though all residents were hesitant to take the lead in first surgeries with an attending, they engaged in easy and harmless tasks, such as preparing the OR, draping [10] the patient, or marking the first incision area to show initiative. In the quote below, Dr. O'Malley explains how he will carry out minor tasks to show his interest in the procedure and his training and slowly grasp the "flow of the operation:"

> "But I'll try to [do] the stuff that I feel comfortable doing. From very basic portions –like [preparing the OR], draping, positioning [the patient], having the foley [catheter][11], [nasogastric (NG)] tube [12], and stuff like that. I would try to manage those myself. Unless I am told directly that I have to do it differently. You know, having the foley [catheter] or not having a foley catheter or NG tube is very important and I will double check with that attending. Other than that, I would just go with the flow of the operation, or I would follow the steps of the operation…unless my attending proactively tells me what to do or proactively does that portion of the operation without even offering me to do it. So, I kind of go with the flow, I would say." [Dr. O'Malley] M

Like most residents, Dr. O'Malley knows that, in first-time surgeries, he may not participate as much as in other subsequent operative opportunities. Hence, he slowly integrates himself to the team before starting the procedure and take an active role in safe tasks, such as positioning the patient, placing the drapes, and incorporating other cases-specific equipment (e.g., foley catheter). As explained in the previous chapter, when attendings see residents taking the lead in minor tasks, they identify enthusiastic behavior and desire to learn, which increases their trust in trainees. Therefore, residents should take part in small responsibilities during their first interaction with an attending – especially pre-operating tasks– instead of waiting to be called. Leading these small tasks shows residents' investment in their training.

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[10] When interviewees used the term "draping," they meant covering parts of the patient's body irrelevant to the surgical procedure.
[11] A tube for draining the bladder and preventing unexpected urine discharges during surgeries.
[12] A tube for carrying medicine or food through the patient's nose.

In subsequent surgeries, that "first dance" awkward feeling fades away because both residents and attendings reach a point where they know enough about each other's surgical dexterities and preferences. At this stage of their trust relationship, attendings have a general sense of what they can allow residents to do because they know trainees' technical and knowledge application capabilities. Residents who successfully demonstrate adequate decision-making skills and instrument maneuvering in first-time interactions are more likely to experience higher entrustment from their trainers in future surgical training interactions. Trainees have better odds of experiencing higher entrustment in the future when there are no intraoperative complications during their first surgery with an attending. Also, teachers assume residents know what to do because they should have "figured out" the teamwork dynamics of the OR and the flow of the surgery. Hence, first impressions channel the impact of first-time surgeries in the trust development process. Below, Dr. Robbins provides an average description of her training style and how residents' roles change across surgeries:

> "On subsequent surgeries, I would typically put the resident on the side of the table where they can do the first part of the procedure. I would say it's kind of a crucial part of stablishing the right plain and space. Then, a lot of times I will let them do the dissection, but I will [handle] the mesh placement. It can be kind of tricky and time consuming. Or I might do the mesh placement and the first push in the mesh placement where I kind of get it in the right place to then let them unfold it. So, it's things like that. They're kind of [doing] little steps. But if everything is going really, really well, then the resident can kind of keep proceeding. I think a good example was the other day when we had a patient who had a prior [hernia] repair and I really thought I was going to do most of the case or more of the case. But the resident was super safe, made really good decisions, and made progress." [Dr. Robbins] F

In contrast to first interactions, Dr. Robbins assigns an active role and asks the trainee to stand on the other side of the table or near her to lead crucial but safe tasks.

In Dr. Robbins's response, she used the example of an inguinal hernia repair surgery to illustrate how she would integrate residents in the process after seeing them operate with her. In this specific procedure, surgeons dissect the peritoneum, a membrane located in the abdomen, to place a surgical mesh –a thin woven sheet made of biological materials– to hold the tissue where the hernia is. Currently, this procedure can be executed with the help of minimally invasive tools (e.g., a laparoscopic camera). To place the mesh inside the patient's body, surgeons fold it at least two times to fit it through a narrow tube placed into one of the incisions made at the beginning of the surgery. After the mesh makes it through, the surgeon unfolds the mesh and places it where it is needed with an additional set of laparoscopic tools[13]. Based on my experienced observing surgeries for the quantitative data collection, attendings regularly entrust residents to unfold the mesh. In the case of Dr. Robbins, she will start entrusting residents with the unfolding of the mesh. If trainees keep displaying trustworthy behaviors, such as appropriate decision-making and skill progress, attendings will exhibit more entrustment behaviors.

Residents also felt that first-dance awkwardness sensation fading away because they learned the attendings' preferences. Moreover, it is easier for them to anticipate performance expectations that are not always clearly stated. At this point in the relationship, trainees will embrace assertive behaviors and take the lead, especially for relatively easy tasks (e.g., first incision), because they can foresee upcoming steps of the surgery. Some residents will even ask the surgical technician to hand over the instruments

[13] Laparoscopic procedures allow surgeons to operate inside the patient without the need for large incisions. To gain access, surgeons make some incisions in the patient's abdomen or pelvis and insert laparoscopic instruments to view the inside of the patient and conduct minimally invasive procedures.

to them because they can anticipate upcoming surgical steps and will know whether or not the attending is comfortable with this behavior.

> "I think sometimes, as every interaction progresses, they start trusting you more and more, just because they've operated with you, they've seen that you have the ability to follow instructions, that you have a good skill set, you know how to suture or tie knots, and all of that. But sometimes, if you're first impression wasn't great, I'll worry that that can sort of ink future interactions with them. I think, you know, they won't let you do as much. Because the first time you operated with them didn't go as well. And that's not necessarily the right way to go. Just because people improve. We all have good days and bad days. But I think that can also sometimes happen and it was just the first interaction. So, for the future ones, you really have to sort of make up for the first one by showing a lot of initiative and constantly trying to prove that you've improved." [Dr. Edwards] F

Dr. Edwards' response shows how attendings' trust grows because in second to fifth surgeries, they use their recollections from first-time interactions to predict residents' technical proficiencies and decision-making skills. To showcase the influential role of initial encounters, she explained how unsuccessful first impressions weaken the base of the trust development process and create barriers in the future. Examples of poor first-time impressions include inappropriate decisions –such as suggesting risky approaches– and intraoperative errors (e.g., cutting through critical structures). Trainers will be hesitant to entrust residents with tasks they have not mastered yet, especially when trainees lack technical skills they wish to engrave into their muscle memory. Interviewed attendings shared similar sentiments about the relevance of first-time interactions and how unsuccessful surgeries may put the resident at a disadvantage compared to others who started the trust relationship with greater participation due to positive surgical outcomes. Consider the quote below from Dr. Shepherd:

> "So, the resident that did a great job their first time is probably going to start off with a little bit more trust and little bit more autonomy than a

> resident who really struggled their first time. It may have been a huge strive in the interim and they hopefully do, and they're doing great at that point and quickly established that [pattern]. They've caught up and they are doing great or good. But that prior exposure and prior experience can definitely affect that [trust development]." [Dr. Shepherd] M

As explained by Dr. Shepherd, a successful first surgery with few complications and struggles pushes residents ahead in their training because they gain more trust and more participation in the future. On the contrary, trainees who stumbled in their first surgery or did not meet the expectations of their trainers are held back because they did not initiate the relationship with a positive first impression.

Whether or not a resident gains more hands-on experience in future procedures will also depend on their role in the first surgery. Were they assisting or just observing? Were there other learners in the room, especially senior residents? In the quote below, Dr. Blake explains how it is more difficult to develop trust when there are other learners in the room, especially chief residents who may need to participate in the case because they are closer to the end of their training.

> "I think it changes substantially and it changes more depending on the role that you played in that first surgery. So, if you were scrub-in into a case but did very little or there was also a chief scrubbing with you…Then that changes the relationship, unless you were the first assistant, and it was just you and the attending." [Dr. Blake] F

As a junior resident, Dr. Blake has seen herself struggling to gain trust or make a good first impression when she shared her training inside the OR with other learners who were further in their training. In these situations, seniors may gain more participation than juniors because they may have an advantage in the trust development process. They are more likely to be trusted by attendings who operated with them in the past and witnessed their growth as trainees.

In sum, the number of times a resident has operated with an attending matter in the trust development process. During first-time encounters, both attendings and residents know little or nothing about each other. Trainers do not know what intraoperative tasks trainees can carry out safely and successfully, and trainees are not aware of their trainers' teaching and surgical preferences. This absence of information leads to awkwardness and uncertainty. To initiate a fruitful relationship and ameliorate that uncomfortable sensation, attendings and residents slowly and carefully learn each other's skills the first time they operate together. In subsequent encounters, that awkward feeling slowly fades away as both trainers and trainees know each other more, and it becomes easier to predict the other person's future course of action.

Although there is no quantitative evidence supporting the relationship between prior surgical experience and attending's entrustment, my qualitative findings suggest great importance for surgical experience as a trust development factor. Moreover, the presented themes highlight additional factors that were not included in the quantitative analysis but could potentially influence the results discussed at the beginning of this chapter, such as the presence of other learners and their postgraduate year. Given that there is quantitative evidence supporting the moderating by residents gender of the association between prior surgical experiences and attending's entrustment, the upcoming section will examine gender as a moderator in the trust development process.

Gender and Trust

Female residents were mainly affected by potentially non-conscious gender biases influencing their training experience in the OR. Almost all participants recognized that

either themselves or others bring into the training milieu personal biases that influence their trust in female residents. These biases stemmed from an "all boys club" culture (Becker, 1961) and the "iron surgeon" (Cassell, 1998) stereotype. The excerpt below shows Dr. Deluca's immediate response to my question about trust and gender:

> "Interviewer: Do you think gender plays a role in the development of trust? And when I say 'gender.' I mean yours and [attendings'] gender.
>
> Dr. Deluca: Yeah! I definitely think so. I think gender, race, and cultural background. I think all of those things play a role, just like they do in any other interpersonal relationship. There's always implicit bias that come into play. Sometimes explicit bias, but I think that affects relationships because people gravitate towards certain people, whether be based on sex, gender, race, etc. For friendships, they're also going to gravitate towards other people for professional relationships. Even if in the operating room, I think entrustability and the ways in which an attending will trust a resident will be colored by their implicit biases of what the resident is capable of. I think that could be shaped by society's notions of 'Well if this is a **taller white man**, he might be able to naturally operate better than someone else.'" M

As a non-white male resident, Dr. Deluca believes his and other trainees' demographic markers significantly influence the trust development process through personal biases and favoritism towards specific groups of people. Hence, the image of the **taller white man** serves as a reference for defining capabilities and "innate surgical skills," placing female and non-white residents in a disadvantaged position (See Chapter Three) (Brumley 2018). Specifically for women, gender frames informed expected behavioral and performance responses based on general cultural beliefs of how individuals from a category are more likely to behave. Given that medicine, especially surgery, is a strong sex-typed profession and most physicians and surgeons today are men (See Figure 1), female residents seem

less competent than their male counterparts. Consider Dr. Pierce's experience with gender bias as a trainee:

> "Dr. Pierce: I would say in my experience in the last year, having residents, my gender has not played a role. I actually that felt my gender played a role when I was in the converse relationship, when I was the trainee.
>
> Interviewer: Can we go deeper into that specific case when you were the resident?
>
> Dr. Pierce: Sure. I was doing a case, a very difficult gallbladder with two female surgeons. One of them, I was doing the case with, and she asked her partner to come in a look at the anatomy because it was difficult. I, as the trainee, spoke up and said 'This is normal. This is ok. We should keep proceeding.' And no one listened to me. Then, my husband, who's also a surgical resident and trained at the same program as me, came into the room and looked at the anatomy. [He] said it looked good and both of them listen to him and preceded with the case." F

Even though Dr. Pierce, as an attending, did not witness the effects of her or trainees' gender in the trust development process, she experienced explicit bias from two female trainers as a resident while conducting a cholecystectomy, meaning a gallbladder removal. Initially, she was operating with one of the two female attendings, who thought the anatomy around the organ added more challenges to the surgery. Hence, she asked for her female colleague's opinion about the case, who agreed it was too complex. On the contrary, Dr. Pierce thought the anatomy was "normal." However, neither her trainer nor her colleague acknowledged her opinion. These two female attendings changed their mind when this resident's husband –another resident in the program– entered the room and disagreed with them.

Although Dr. Pierce was able to interpret this situation from a gender bias perspective, most residents cannot perceive gender bias due to the structure of surgical

training. Residents rotate individually or in small groups and often operate alone with an attending. On some occasions, they may share a case with a medical student or fellow. Yet, it is difficult to identify biases in these circumstances because these learners' performance expectations differ and are at different training levels. They may also do a case with another resident but still cannot distinguish whether or not they or other residents experienced greater or less trust due to gender biases because it is less likely to operate with someone from the same cohort. Yet they believe people, especially attendings and other surgical staff members, bring biases stemming from non-medical social frames. See Dr. Murphy's thought process after experiencing what could be a potential misconception of her skills due to gender bias:

> "Dr. Murphy: Well, I would say when I was an intern there was a vascular attending that I worked with, who was a younger junior faculty and a really good teacher. But also, one time told me, when I was doing a large extremity amputation, he –quote– was getting chest pain because I was operating too quickly. And that was because I was used to operating with another vascular surgeons who does a lot of extremities amputations very quickly. Like, within minutes. So, I was trying to work as quickly as possible to not get instruments taken away from me and then that attending was just like, 'You just have to slow down. I am not used to working with you and I have to see what you're doing. If you're tying knots over things that I can't even see what you're doing. I don't know what's going to happen and I can't protect you and this patient, unless I know what's happening.' So, that was definitely a hurtful experience because I was like, 'It sucks that somebody doesn't trust me' […]
>
> Dr. Murphy: Because I was not sure. I don't know if this happened because I'm a female resident or would a male resident have had the same experience? Because I just like wasn't really sure. It was a very confusing experience for me […]
>
> Interviewer: Do you think gender plays a role in the trust development process?

> Dr. Murphy: I don't know. I think it's tricky to say whether that happened because I was a female resident. I think that it can be more difficult for female residents to get trust in the OR. I think that can come from perceptions of what women in the OR are –quote– supposed to be like and what men –quote– supposed to be like… Because I talked to one of my co-residents about this and she is also a woman. And she has been told that she is too quiet and meek…So, I feel like we get in trouble no matter what. But I think that men can get in trouble for those things too. It's hard to know what the thresholds of that are. To be too meek in the OR or to be too proactive. I think that's where the nuance lies if you think men and women are treated differently [concerning] trust in the OR. It's whether we think that threshold is different. I think it's really hard to measure. Like I told you, that thought did cross my mind, 'Did this happened to me because I'm a woman?' Because I have been told that I'm –quote– aggressive in the OR before, for things that were not aggressive. Like draping a patient. So, that always makes me wonder. And it's always been by a male attending or fellow. It makes me think to myself, 'It's that because I'm a woman?'" F

Before I asked Dr. Murphy whether or not gender is an influential factor in the trust development process, she shared an experience in which she lost a male attending's trust. Throughout the entire interview, she described herself as a "promoter," meaning a trainee who is eagerly seeking participation in the OR, as opposed to a "preventor" or resident who prefers to passively contribute to the surgery and avoid intraoperative complications (Higgins et al. 2001). In this experience, she was operating with a young attending who became anxious because she was working too quickly and expressed his concerns by telling her he was experiencing chest pains. In the past, she received praises for operating fast. Hence, Dr. Murphy did not expect this reaction from the attending and interpreted this situation as a hurtful experience. After the procedure, she reflected on this situation

and wondered whether or not the attending trusted her less because of her gender and would he have treated a male resident differently.

When I asked Dr. Murphy whether or not she believed gender played a role in the trust development process, she revisited her experience with the attendings who did not trust her quick dexterities and gave me an inconclusive answer. She explained, however, that it was difficult to perceive gender bias in the OR because the threshold differentiating inequality of training and teaching choices differs across cases. Other residents shared Dr. Murphy's sentiment because it is common to operate with an attending without other learners from similar cohorts, and residents cannot compare their interactions with other trainees' experiences.

Further in her response, Dr. Murphy returned to her initial thought of whether or not she was misread during this and other interactions (e.g., "draping a patient") due to a discrepancy between her operating style and what others expect from a female trainee. Other interviewed female residents described themselves as passive learners; hence, her training approach differed from other women in surgical training. Given that she was aware of her unique operating style "for a woman," she discussed her experience with one of her female co-residents, who, from other people's perspective, is "too quiet and meek." Throughout this conversation, Dr. Murphy noticed that women run into issues in training regardless of how they work.

Although most participants were unsure whether or not trust in general surgery training differed by gender, many believed attendings, including themselves, brought into the OR personal biases and might trust female and male residents differently. These biases arise from gender stereotypes people use to predict how the other person will

perform and behave within a case. Women were seen as less capable than men, and those performance estimates limited their opportunities to gain hands-on experiences inside the OR. Most attendings were unaware of their personal biases, and residents could not tell whether or not they or other trainees were trusted differently because of their gender. This evidence explains why most participants could not tell whether or not gender biases generate trust disparity in surgical training. In the following section, I will present further qualitative findings to exhibit the role of stereotypes and homophily in surgical training trust.

Stereotypes and Homophily

When analyzing the sample of attendings and residents who participated in the interviews, there was no clear trend in the beliefs about the role of gender in the trust development process. My qualitative sample was evenly split between people who believed gender mattered, those who did not think it mattered, and others who could not provide an answer. Yet, most attendings believed gender did not matter, while most residents said they did not know how to answer my question. Several attendings who could not tell whether or not gender played a role in the trust development process thought they might unconsciously trust male and female trainees differently because of unacknowledged biases. As observed by a small group of attendings and confirmed by a couple of residents, attendings' personal biases influenced their expectations for residents. Particularly male residents were seen as overconfident, while females were seen as underconfident:

> Dr. Robbins: I think that, in my experience, I've certainty been biased. I think that male residents tend to over trust their abilities

> and be overconfident of their abilities and female residents tend to be underconfident of their abilities.
>
> Interviewer: Why do you think that?
>
> Dr. Robbins: You know, I think it may have something to do with the idea of male bravado, in that they feel like they should be capable of doing this because maybe it's that kind of culture around the US that we're [in]. They have a hard time asking for help or admitting weaknesses. And I don't necessarily think that deep down in the inside they feel more confident. I think that they just feel less able to ask for help or show that they are not confident…Whereas female residents, for whatever reason, seem to be less confident of their skills. To some extent, I can think of female residents that when I operated with them in the past I had to be like, 'Do it! You can do it! Just keep working! Keep pushing harder! Push! Push! Push!'" F

Dr. Robbins is aware of her gender biases and perceives a dichotomy of confidence between male and female residents. Men are more likely to show behaviors associated with overconfidence, such as not admitting their weaknesses and being reluctant to ask for help when a procedure requires skills beyond their abilities. She associated these behaviors with a "male bravado" culture, meaning a masculinity discourse that assumes men are always capable, especially in surgery. On the contrary, female residents go into the OR with under confidence and exhibit signs of not trusting their skills. Because of this recurring issue, Dr. Robbins believed she had to pressure women into trusting their abilities to complete a surgical task. Likewise, Dr. Karev has seen a difference in confidence between male and female residents and calibrates his teaching based on this view about gender and trust:

> "Lack of confidence and overconfidence as a correlate [of trust]. Anecdotally –I don't mean to generalize– I feel that women tend to be on the lower confidence realm, whereas men tend to be on the overconfidence realm. And I find myself constantly trying to readjust those perceptions. I intentionally go into minor interactions with residents of each gender with

> that lens. So, with the women, I'll always start my interaction at least trying to build confidence. And with the men, I'll always start my interactions trying to appropriately calibrate them less on that…I'll probably teach them a little bit differently. I don't know. But if I do [approach] men and women differently, I think having that change in perception definitely impacts how I train them." [Dr. Karev] M

Dr. Karev initiates his interactions with male and female residents differently because, in his experience, there is a difference in confidence between men and women. With female trainees, he will try to build their confidence. With men, he will tone down their overconfidence. Even though he implements this strategy without intentionally putting one gender group at a disadvantage, he recognizes the possibility of training men and women differently while calibrating their confidence up to a teachable level.

In addition to gender stereotypes about confidence, surgeons are more likely to trust those who share common demographic markers with them. For example, men are more prone to trust other men. A couple of attendings said they preferred to work with residents with whom they shared their gender identity. Having commonalities adds comfort to an awkward interaction in the OR with somebody an attending does not know. Consider the following quote from Dr. Koracick, a non-white male attending:

> "Well, I think people are more comfortable with individuals that are similar to them. So, I think it's human tendency to be comfortable around [people like you] and to be in an environment that is homogeneous. So, whether that's homogeneous based on where you grew up, where you were trained, your race and ethnicity or gender. And so, when you're in an environment where there's a lot of different people, different perspectives, and different genders, I think you have to find that common ground in other ways. So, if I was around a bunch of [non-white] males from [the Northeast], and [mid-age] I'll be pretty comfortable. It would be pretty easy to interact with [others.] But if I'm in an environment where I'm the only [non-white] male, who is [mid-age], and everyone else is 25, it's hard to sort of find that common ground [or] that commonality. So, we have to work a little bit harder to find that common ground by finding other things that we have in common. It's just hard to build that relationship and eventually develop trust. So, gender it's one

> [factor] that I think that plays in [the trust development process].” [Dr. Koracick] M

According to Dr. Koracick, people are more likely to search for others with not just the same gender, but also age and racial background, to feel comfortable and entrust them their patients. To build a trust relationship with an unknown person, people search for common grounds. A usual starting point is demographics. Are they male or female? What is their race and ethnicity? How old are these people? If an attending, as a trustor, is unable to find commonalities through these visible characteristics, it will require extra work to build a trust relationship. Beyond attendings preferences, trainees and trainers will build a relationship by discussing non-medical topics as a strategy for building rapport during their first surgery together. Talking about ordinary topics eases the tension of the situation and the pressure of having another human being’s life at risk. Moreover, it helps both trainers and trainees build a relationship through shared interests. Although talking about non-medical topics helps initiate camaraderie between residents and attendings, it may also reduce some residents’ chances of developing trust. A couple of trainees saw these topics for building rapport as a possible gender stratifying factor in the trust development process.

> “…how rapport is built at the beginning of a case. I mean, I heard when female attendings start talking with female staff in the room about female specific problems. Things like having long hair in the OR and what they do with it. I can’t participate in those discussions, and I don’t get to build the rapport like other people do. Just like if I know something about video game and I’m talking about that with one of the female co-workers, but someone else doesn’t know about that, it means they can’t join in and get that bond and relationship building experience.” [Dr. Schmitt] M

In Dr. Schmitt experience, sometimes attendings will chat about topics that are commonly discussed by a specific gender group. In the OR, people will develop

conversations around mundane topics that are not related to medical training or the patient. On some occasions, these topics are more attractive or applicable to one gender.

One of Dr. Schmitt's examples was hair length and how to deal with it inside the OR. Every person on the surgical floor, meaning the space inside and outside the OR, must cover their head with either a hair net or surgical cap to avoid bacterial contamination. I faced multiple issues with this requirement with my long straight hair when I was rating surgeries for the quantitative strand of this study. Hairnets were accessible to everyone who had permission to walk into the surgical floor, but it was difficult to keep my hair tucked it. Surgical staff members with long hair, mainly women, wore surgical caps and gave each other tips to secure their hair and prevent accidental exposures.

Although Dr. Schmitt initially explained how he cannot build rapport when women talk about topics he cannot relate to, he does not discard female residents' disadvantaged position in a masculine conversation. Consider the following excerpt from Dr. Blake:

" Dr. Blake: I think a lot of it can also be related not to things that happen in the OR directly but to conversations around – let's say– football or stuff that allows males to bond and females are not necessarily part of.

Interviewer: So, you're saying that there are occasions in which males may talk about specific male driven topics that women don't feel part of or is it that they're not allowing you to be part of the conversation.

Dr. Blake: No. I think it's the first.

Interviewer: So, you don't feel you fit in the conversation?

Dr. Blake: Right." F

Dr. Blake believes women cannot join conversations about topics mainly associated with masculinity, for example, football. As explained by Dr. Schmitt, female residents may lose the opportunity to build relationships with attendings when they do not fit into these conversations. Consequently, it will be more difficult for them to gain trust and might need to invest more effort than their male co-residents to initiate and prolong their relationship with trainers.

In the OR, gender stereotypes influenced attendings performance expectations for male and female residents, triggering their personal biases. Men seem overconfident in their intraoperative skills; women are seen as shy and doubtful of their abilities. Furthermore, attendings are more likely to trust trainees with whom they share demographic markers (e.g., gender, race), thus, adding additional barriers to the trust development process for trainees from minority groups. Although seen as harmless, trainers may chat about non-medical topics, such as popular culture, that are more appealing to one gender group than another and unintentionally exclude those who cannot join the conversation. These stereotypical references, tendencies towards trusting others with shared characteristics, and gendered conversation topis influence the trust development process and place female residents at a disadvantage, especially when initiating a relationship with attendings. These qualitative findings explain previous quantitative results by depicting an unstable trust development process for women and a steadier growth of trust for male residents across the number of surgeries they have done with the same faculty (See Table 3, Model 3).

To summarize, qualitative themes support previously discussed quantitative results by showing that biases stemming from gender stereotypes, gendered conversation

topics, and homophily interfere with female residents' chances of benefiting from multiple interactions in the OR with the same attending. Since surgery is a male-dominated medical domain (See Figure 1), female trainees' unequal experience with the trust development process may stem from unfavorable training interactions during their first surgery with an attending. Even though qualitative and quantitative results concerning the association between resident's postgraduate year, the number of times a trainee has operated with the same trainer, and attending's entrustment did not agree, qualitative themes discussed in this chapter indicated which covariates might be missing in the regression models.

CHAPTER 6

DISCUSSION AND CONCLUSION

The focal point of this dissertation project was to explain the role of trust in surgical residency and determine whether intraoperative entrustment is a stratification mechanism responsible for the underrepresentation of female surgeons in the US (Association of American Medical Colleges 2019a). This dissertation incorporates gender framing theory (Ridgeway 2009, 2015; Ridgeway and Smith-Lovin 1999) and the encapsulated interest model (Hardin 2001, 2002) in surgical residency to meet five research objectives. First, it tests the association between surgical resident's postgraduate year and the number of times trainees have operated with the same attending and faculty entrustment. Second, it determines whether the association between resident's postgraduate year, prior surgical encounters with the same attending, and faculty entrustment differ by resident's gender. Third, it identifies a shared definition for intraoperative trust among general surgery residents and attendings and behaviors that often encourage entrustment among surgical attendings. Fourth, it examines the relationship between resident's postgraduate year and the number of times trainees have operated with the same attending and entrustment through attendings and residents' points of view. Fifth, it identifies factors driving the difference in faculty entrustment between male and female residents.

Drawing on observations of surgeries and their rating with the OpTrust tool (Sandhu, Nikolian, et al. 2018), an instrument designed to assess entrustment during surgery, disparities between female and male residents were identified. In their first surgery, attendings entrusted female residents more compared to their male counterparts. By their second to the fifth operation, female residents experienced less entrustment, whereas male residents rapidly gained greater entrustment from their trainers. Resident's postgraduate year was not significantly associated with attending's entrustment. This finding suggests that how far residents were in their training, i.e., intern, junior, or senior resident, did not influence attendings' entrustment behaviors. However, operating with the same person mattered for male and female residents in different ways. In the following section, I will further discuss these quantitative results with the themes yielded by the qualitative strand of this MM study. As I review each quantitative finding, I will explain the significant and non-significant results from the estimated regression models with qualitative themes.

MM Integration Findings

The observed non-significant association between average attending entrustment and resident's postgraduate year is explained by this institutional reference's lack of accuracy for estimating trainee's skill proficiency and level of medical reasoning. In agreement with the quantitative findings, qualitative results indicate that attendings do not allow the resident's postgraduate years to influence their trust in trainees (See Figure

8). Attendings tend to use residents' postgraduate year as an initial reference to gain an estimate of trainees' prior experience in the OR and technical competencies. However, most interviewed attendings for this study thought this institutional reference was an inaccurate proxy of proficiencies and did not limit their trust decisions to this indicator of seniority. In their experience, attendings have met junior residents with the expected competencies of a senior trainee and older residents who are behind in their training. Trainers believe surgical trainees experience residency differently and learn how to apply surgical approaches and tools at different paces; these uncontrollable factors create a heterogeneous pool of skills within cohorts.

In the case of specialized rotations, e.g., cancer, transplant, and trauma surgery, residents' postgraduate year play a lesser role in attendings' trust decisions because trainees encountered procedures and tools they rarely used in other rotations. Unless residents have had prior experience in these rotations, attendings set their initial trust to the minimum regardless of trainees'' seniority. Thus, a junior resident with more experience in these rotations may gain greater faculty entrustment than a senior trainee who just started rotating through this service.

With respect to the observed non-significant relationship between the number of surgeries a resident has done with an attending and average faculty entrustment, qualitative results suggest a different story (See Figure 7). Almost all attendings and residents who participated in the interviews agreed that attendings' trust is related to the number of surgeries they conducted with trainees. It is common and sometimes expected for residents not to lead surgical procedures when they operate with an attending for the

first time. Since attendings do not know what residents can handle or their level of technical skills, it will be unlikely for them to allow trainees to carry out tasks on their own.

To better know new residents rotating in their services, attendings informally interview them before and during their first and subsequent surgeries. They often ask trainees to explain the surgical procedure they are about to perform to assess their knowledge about the operation and the patient's medical history and discuss the most important caveats of the case. In addition to these topics, attendings also ask residents whether they have done a similar surgery with another trainer and what role they played in those cases, i.e., whether they assisted or actively operated. Few attendings said they ask questions unrelated to surgery or medicine to build rapport with residents, for example, where a resident earned her previous degrees or whether she appreciates specific popular culture commodities (e.g., movies).

Meanwhile, residents know their participation in their first-time surgeries will be minimal. Hence, they do their best to give a memorable impression by participating in small and safe tasks, such as covering parts of the patient's body that are unrelated to the procedure –or draping–, setting the instruments, or marking the spot where the attending will do the first incision. Engaging in these activities shows initiative and interest in gaining their trainers' trust and becoming a member of the surgical team without risking intraoperative complications. Given that the resident-attending relationship rests on hierarchical interaction dynamics, residents must carefully avoid disrespecting their trainers' role in the OR (Bosk 1979; Wallenburg et al. 2013, 2015). Thus, carrying out

these small makes trainees seem eager to learn and participate without harming the patient or challenging the attending's authority in front of other surgical staff and trainees, i.e., anesthesiologists, medical students, fellows, nurses, and clinical support staff (e.g., laboratory technicians).

Even though engaging in minor tasks helps residents gain attending entrustment when they cannot do much, sometimes this strategy is futile. Nowadays, most residency programs, including surgery, train medical doctors using a team-based learning approach to cultivate group-level skills, including teamwork and communication (Dedy et al. 2013; Dunn et al. 2007). Hence, trainees are encouraged to participate in the care of patients together and share responsibilities to cultivate group morale and reduce morbidity and mortality for patients. In surgical residencies, attendings invite more than one trainee into the OR to have extra hands to carry out the surgery while teaching them the procedures and teamwork in healthcare (Wakeman and Langham 2018). Although this training model encourages teamwork dynamics, it may put some residents, especially junior residents who just met an attending, at a disadvantage in the trust development process.

Since trainers often interact more with trainees who are further in the residency program (Bosk 1979), junior residents may not get the chance to give a memorable impression and initiate a robust trust relationship by helping with minor tasks during first-time surgeries. For this reason, the presence of other learners during first-time surgeries may interrupt the attending-resident trust relationship. For example, residents who shared a learning experience in the OR with other more advanced trainees did not

experience greater entrustment in future surgeries because they could not initiate the trust process with the attending.

These qualitative findings suggest that the lack of statistical significance between average attending entrustment and the number of times they operated with a resident might be due to absent covariates in the regression model. These qualitative themes indicated which confounding variables may be missing in the model and are worth collecting and exploring in the future. The estimated regression models did not include the presence of other learners and their seniority. Although each model controlled for residents' autonomy, this variable captures the role of residents regarding their interactions with the attendings and not their relationship with other people in the OR, especially other learners. Future scholarship should incorporate these measures to determine the effect of other learners in the trust development process.

The significant interaction between the number of surgeries done with the same attending and the trainer's entrustment can be explained by two qualitative themes combined: impressions during the first surgery and gender biases. As previously shown in Chapter Four, almost all interviewees argued that healthcare providers, including themselves, bring into the OR personal biases they might not be aware of when interacting with residents. These biases are the product of stereotypical assumptions; male residents are often seen as overconfident, while female trainees are perceived as underconfident. Given that the medical ethos suggests that physicians, especially surgeons, must be precise and sure in their movements and decisions (Cassell 1998; Lober 1993; Riska 2001a), these assumptions about residents' confidence disturb the trust

development process for female residents at the beginning of their relationship with trainers.

According to gender framing theory, when people meet individuals for the first time, they assign gender categories, predominantly in their binary form, before exchanging words in less than a second (Ridgeway 2009). In the US, gender is one of the first frameworks people employ for assigning categories to other social actors they expect to share a social interaction or long-term relationship (Ito and Urland 2003). This gender categorization process activates stereotypes in social actors' minds and may trigger discriminatory behaviors in work environments where one gender group seems to fit better than others (Ridgeway and Smith-Lovin 1999).

As a strong sex-type milieu, medicine, especial surgery, is highly susceptible to biases against women doctors that are equally influential in training environments (Anspach 2010; Jenkins et al. 2021; Lober 1993). In this study, qualitative results suggest that attendings are prone to trust male residents more as they seem more confident compared to females. According to quantitative results, female residents do not benefit as much as their male peers from their repeated interaction with the same attending in the OR. Given that these biases arise in first-time interactions, assumptions about women put female residents at a disadvantage in the trust development process, while men gain more trust as they operate more with attendings.

In addition to the role of gender stereotypes, the significant interaction between residents' gender and the number of surgeries they have done with the same attending can be explained by trainers' disposition to trust people with whom they share demographic

traits. For example, male attendings tend to trust male residents more compared to female trainees. Theories on categorical trust posit greater trust predispositions among social actors who share membership in a group (e.g., age, race, nationality) (Zucker et al. 1995). Homophily, meaning the tendency to seek others with similar traits (Lazarsfeld and Merton 1954), encourages trust between group members because of favoritism (Foddy, Platow, and Yamagishi 2009) or expected behavioral choices associated with shared backgrounds (Lewicki and Bunker 1996; Smith 2010).

Although 62% of residents in the program selected for this study were women, 72% of attendings teaching in the same program were men. Since there are fewer female attendings, female trainees are less likely than their male peers to operate with someone who is predisposed to trust them at first glance because of a shared gender background and gendered experience in the healthcare system (Riska 2001a). Also, qualitative themes show that attendings often talk about non-medical matters to build rapport with residents. Frequently, their conversation topics are more appealing to one gender group compared to another. Since most attendings are male, female residents may not be able to benefit from these conversations. The underrepresentation of female surgeons in teaching hospitals is a double-edged sword contributing to the perpetuation of gender imbalance in surgery.

The encapsulated interest model suggests that people use information about others to anticipate their future behaviors and make a trust decision (Hardin 2002). This thought process can be based on the other person's competencies and abilities to fulfill the task trustors are expecting in exchange (Sztompka 1999). If a trustor does not believe a trustee

has the skills to fulfill the entrusted task, she will be less likely to trust the other person. On the other hand, gender framing theory suggests that gender biases trigger stereotypical assumptions about men and women's culturally expected behaviors and, consequently, their capabilities in an occupational milieu, especially in (surgical) training (Ridgeway 2009).

By combining these two theoretical frameworks and applying them to the results of this study, I argue that attendings are more likely to trust women with easy surgical cases because gender biases encourage them into believing that female residents are not confident enough to carry out more difficult surgeries. Meanwhile, these same biases might be prompting attendings to think that men are more confident, thus earning male residents greater entrustment in more complex surgeries. Hence, the significant interaction between case difficulty and resident gender is in part explained by attendings' biases encouraged by stereotypical assumptions about trainees' confidence.

These MM findings suggest that trust in general surgery training is not directly related to the resident's postgraduate year because attendings do not believe it is an accurate predictor of trainee's surgical competencies. Instead, trainers reflect on their prior experiences with learners to inform their trust choice and determine which parts of a surgery the resident can carry out independently or with their help. Trainees hope to make a memorable impression when they operate with an attending for the first time to earn greater participation in future surgeries. Although attendings expect residents to do little during their first surgery together, trainees are aware of these conditions and try to make a good impression by engaging in minor activities. These tasks, also known as safe

activities, such as preparing the patient and setting the instruments, show trainers have initiative and are eager to learn and participate in the OR. Nevertheless, trainees' effort to make a good impression may not be effective when other learners share these training experiences, especially when other residents assume a more active role. For female residents, this first impression may put them at a disadvantage as gender stereotypes make them seem less confident compared to their male counterparts. Attendings may be reluctant to trust women in future or complex surgeries because they believe female trainees may not have the competencies to assume an active role or lead an entire surgical procedure.

In addition to qualitative findings that resonate with the results from the quantitative strand of this MM study, I identified additional themes about the role of trust in surgical residency from the interviews. In the following sections, I will review these themes in the light of several sociological theories. Also, I will contrast residents' and attendings' meanings of trust to highlight training challenges and present a theoretical model of trust including the role of the patient.

QUANT Data	QUANT Categories	Pilar building themes	QUAL Categories	QUAL Codes
Model 1: Resident's postgraduate year is not a significant predictor of average attending entrustment.	Resident's seniority is not an indicator of trust.	Attendings do not allow residents' postgraduate year to inform their trust decisions because it is not an accurate predictor of skill proficiency.	Attendings do not allow residents' postgraduate year influence their trust.	"No. Not necessarily, because I think each resident is in their own area as far as how much they've done, what their knowledge base is, how much experiences they've had in the OR…"
			Some rotations require specialized tools and approaches that residents are new to when joining these services for the first time.	"So, a fifth year may stick their head in, and they have no clue. They'll be like, "what's an [intraoperative specimen radiography system]."
			Although there is an	"…just yesterday I did

Figure 7. Pillar integration process MM joint display.

			inherent association between postgraduate and skill proficiency, attendings have worked with trainees whose performance is beyond what their postgraduate year suggests.	a very difficult and challenging operation with a [third year] general surgery resident, who happens to be very good and somebody that I can work with."
Model 3: The interacted effect between numbers of surgeries a resident has done with an attending and resident's gender was significantly associated with average attending entrustment.	Female residents did not benefit as much as their male counterparts from repetitive encounters with the same attending in the OR.	First impressions have an important role in the trust development process and it is when most likely gendered stereotypes inform attendings' understanding of residents' capabilities. Female residents are stereotypically seen as under confidence and these assumptions put them at a disadvantage.	First surgeries are highly influential in the trust development process.	"I think sometimes, as every interaction progresses, they start trusting you more and more, just because they've operated with you…But sometimes, if you're first impression wasn't great…Because the first time you operated with them didn't go as well."

Figure 7. Pillar integration process MM joint display (Cont')

Model 4: The interacted effect between case difficulty and resident's gender was significantly associated with average attending entrustment.	Female residents gain greater faculty entrustment when they participated in easy surgical cases, whereas male residents experienced greater faculty entrustment in complex surgeries.	Gender stereotypes make female residents seem less suitable for complex cases.	Stereotypically female residents are seen as underconfident.	"Lack of confidence and overconfidence, actually, as a correlate [of trust]. Anecdotally –I don't mean to generalize– I feel that women tend to be on the lower confidence realm…"

Figure 7. Pillar integration process MM joint display (Cont')

Ideal Meanings of Trust in Surgical Residency

First and foremost, attendings and residents' ideal meanings of trust are based on the idea of preparedness. In other words, residents who seem prepared gain greater trust from their trainers. Trainees who thoroughly studied and regularly practiced surgical techniques (e.g., suturing) outside of the OR earn greater faculty entrustment and are more likely to participate in surgical procedures. Attendings expect trustworthy residents to have mastery over general medical knowledge or case-specific knowledge and technical skills. Residents who read ahead about the surgery and the patient's medical history and studied the rationale for each surgical step gain greater entrustment from trainers. Trainers afford them opportunities to participate in critical steps of the surgery. Also, residents with well-developed dissecting, suturing, and instrument-maneuvering skills are more trustworthy than trainees who have not mastered these dexterities and are still learning.

Attendings and trainees' descriptions of trust concerning what they expect to occur in the OR resemble Hardin's (2002) encapsulated interest model. In this model, A trusts B to do X. In surgical training, "A" is the attending, "B" is the residents, and "X" is making the right decisions and moves during the surgery. As suggested in the encapsulated interest model, attendings observe their trainees and assess their knowledge and technical proficiencies to gain initial information and predict trainees' future actions during the surgical procedure. If a resident shows comprehension of the surgical approach she is about to participate in and knowledge of the illness status of the patient, her trainer will expect her to apply safe medical judgment and precise surgical dexterities. Hence, trust in general surgery training functions as a mechanism to predict residents'

performance based on the information attendings gather when assessing their preparedness (Sztompka 1999, 2003, 2006).

Even though trainers and trainees viewed preparedness as a factor in trust, they had different understandings of what means "to be prepared." In their ideal definitions of trust, attendings predominantly associated this psychosocial factor with residents' conceptual knowledge (e.g., anatomy) and ability to understand the rationales of surgical procedures. On the other hand, residents constructed their meanings of trust around technical competency.

In medical education and training, learners should master conceptual and procedural knowledge and technical skills and successfully apply them in healthcare. Medical trainees often read and study from textbooks to gain conceptual knowledge and develop procedural knowledge and technical skills through hands-on learning experience with patients (Schmidmaier et al. 2013). According to results yielded in the qualitative portion of this study, surgical trainees often believe that attendings solely seek to assess their technical skills, thus undermining the crucial role of conceptual and procedural knowledge at the start of their trust relationship. The incongruency in meanings of trust between trainers and trainees may disrupt the trust development process, as residents may initially try to gain their trainers' trust through tangible actions, i.e., dissecting and suturing. Meanwhile, attendings seek to learn about their preparedness through abstract trust indicators, such conceptual and procedural medical knowledge.

Modern Training Formats and Role Modeling

Most attendings assume residents lack experience and, to some extent, knowledge about the surgical procedures they execute with them. Meanwhile, trainers see themselves as examples trainees ought to emulate to become successful surgeons. Therefore, residents are more likely to be trusted when they model their attendings' operative style and decision-making. Initially, the socialization process in medical training was based on role modeling as medical trainees learned how to provide care from their mentors (Becker 1961). Residents learned to behave like doctors by assimilating their mentors' behaviors and strategies to diagnose and treat illnesses and injuries (Wallenburg et al. 2013). For many years, this was the learning format all medical training programs employed to secure the exclusivity of medicine as a profession and prestige in the healthcare system (Bosk 1979; Freidson 1970a).

Nowadays, agencies overseeing the quality of medical education, such as the ACGME, are requiring residency programs to use training models with fixed learning goals according to "best practice" guidelines and assessment tools to make the teaching and evaluation process more transparent, objective, and compatible (Timmermans and Chawla 2009). The ACGME provides a set of milestones to certify trainees' skill acquisition in their learning progress. For surgical residency, these milestones include a list of technical skills residents ought to master at the end of each rotation and a suggested number of surgical cases residents must have participated in by the end of each year they have been in training (Brasel et al. 2019). Similar to a classroom setting, attendings report to the ACGME residents' progress through a rubric with multiple criteria for each case they do together. With the introduction of this training format and

assessment tool, attendings are losing their position as the benchmark for "best practice" and becoming the person in charge of reporting trainees' achievements (Wallenburg et al. 2015).

Interviewed participants did not mention this standardized training format, evidence-based practice guidelines, or the ACGME milestones when they shared their trust definitions. This finding suggests that trust stemming from performance expectations is primarily informed by how well residents assimilate attendings' operating styles and not by standardized learning goals. Prior research shows that attendings do not favor these training formats and assessment tools. Some trainers may not provide accurate information on residents' progress as these assessment tools solely capture progress on a fixed list of skills (Wallenburg et al. 2015). These attendings believe perfect scores do not prompt trainees into investing more effort in their learning. The absence of these milestones in attendings and residents' trust meanings may reflect a potential lack of support for this training format. Since the scope of this study did not allow me to explore this issue, future research should inquire whether attendings and residents consider the ACGME milestones during the trust development process and how their application of these suggested training goals differ.

Across rotations, residents interact and develop trust relationships with different attendings who often conduct similar surgical procedures using diverse approaches. For example, the purpose of a cholecystectomy is to remove the gallbladder by first separating this organ from the liver. Not all attendings agree on a single method to complete this step (Gomes et al. 2017). During the interviews, some attendings shared their preference over an approach for conducting this type of surgical procedure; pulling

the tissue around the organ because it is less likely to result in further complications, instead of using electrosurgical instruments and burning the tissue to ease the detachment.

This lack of consensus on surgical approaches may deter the trust development process. Since they participate in different cases and experience various training styles, trainees are likely to gain mastery over specific operative styles they learned when conducting surgeries with specific attendings who happened to teach certain techniques. Given that attendings expect residents to follow their example, namely, model their operative style, the hierarchical structure of the relationship forces trainees to temporarily abandon the techniques they learned in past interactions with other trainers. Showing these mastered techniques might not help them exhibit their surgical competencies when operating for the first time with an attending who chooses a different operative approach. Hence, during their first surgery with an attending, residents who mastered or developed a preference over a specific method often do not show what they learned and practiced with the previous trainees. Instead, they observe their new trainer and embrace their operative style. Several interviewed residents touched on this issue when explaining how they use first-time encounters as an opportunity to identify attendings' surgical preferences and abstain from showing what they know. Therefore, residents' level of preparedness gained through prior experiences with other teachers may not give them an advantage in new training relationships.

3D Trust

Patients are under the effects of sedative medications during the surgery. Nonetheless, patients seemed to play a significant role in the trust relationship during surgical training. More than the resident's training experience, patients' wellbeing and lives depend on the procedure. This is especially true for patients battling a terminal illness (e.g., cancer). Additionally, patients assume the greatest risk, i.e., death. Attendings and residents were acutely aware of this risk for patients and included the role of the patient in their meanings of trust. They described a three-dimensional trust relationship I named a *3D trust* model.

Figure 8. 3D trust model.

As shown in Figure 9, the trust relationship between attendings and residents precedes their interactions in the OR and it starts with the patient. Trainers and trainees recognize that when a patient chooses whether or not to have a previously planned surgery, trust in the attending surgeon's abilities to make appropriate decisions as physicians and teachers is a substantial factor. After initiating trust relationships with patients, attendings decide whether or not to pass on that trust to residents while the patient is under sedative medications and no longer making active trust decisions on her own.

The foundation of the initial transaction in the three-dimensional trust relationship in surgical residency rests on the surgeon's understanding of what the surgical team can do to better the patient's health and what intraoperative course of action will result in the fewest risks to the patient's safety. Attendings make trust choices regarding trainees' participation in surgeries in accordance with the patient's needs to overcome an illness or an injury and how much residents can contribute to this goal without exposing the patient to unnecessary risks. As trainers, attending surgeons are responsible for their residents' actions. Hence, attendings are accountable to patients and their families for each intraoperative error caused by the resident. When attendings believe a resident is likely to jeopardize patient safety because she is focusing solely on gaining knowledge and developing technical skills, as opposed to attending to the particulars of the surgery at hand, trainers will prioritize the patient's needs and not allow the resident to operate. Therefore, notions of patient safety in surgery inform attendings' course of action in the transfer of trust between the patient and the resident.

While this trust transaction happens, residents also decide whether or not to trust attendings as healthcare providers and their teachers. Patient safety principles also informed residents' tendencies to trust attendings. Trainees were more likely to trust trainers who allowed them to participate in surgeries only when it was safe enough for them to practice their skills, even when they were prepared for the case. For example, hernia repairs are relatively easy surgical procedures; however, this surgery can be more challenging when an irregular case is present. Some bodies may have abnormal anatomies that increase the complexity of the surgery and the risk of injuring the patient. A resident can be prepared to lead an average hernia repair, but not necessarily when the

patient has anatomical abnormalities. Thus, a trainee's sense of patient safety and, consequently, trust in her trainer will be based on whether or not she believes the attending made safe choices for the patient. This factor is above and beyond the resident's level of preparedness.

Moreover, some residents also argued that their trust depended on whether they believed attendings were choosing the best treatment option for the patient. This trust decision process was more commonly described among senior residents, predominantly women, who had enough experience and knowledge to judge their trainers' decisions inside and outside the OR. Therefore, what residents consider safe for the patient determines their choice of trusting their trainers.

Successful recovery in any healthcare setting is influenced by patients' trust in their providers' competencies and responsibilities (Birkhäuer et al. 2017). As patients put their health in the hands of physicians, they experience a sense of apprehension and contingency by exposing their lives to medical treatments that may or may not result in desirable health outcomes (Hall et al. 2001; Mechanic 1996). Well-established scholarship posits trust as a noteworthy determinant of patient compliance (Hojat et al. 2010), satisfaction (Liu et al. 2021), continuity of care (Baker et al. 2020), physical health and mental health (Armstrong et al. 2006). Few studies explored the role of patients trust in training settings. For example, Bonds et al. (2004) assessed patient trust in primary care residents and found higher patient trust in scenarios where the patient and the attending shared gender identities. In the light of the results presented in this study, future scholarship should thoroughly examine trainees' relationship with patients to identify

significant factors in this type of trust that could prompt greater attendings' trust inside the OR.

Minorities in Surgical Residency and Trust

Prior research and theories on medical education suggest that the training environment rests on a medical ethos that reproduces assumptions about physicians' vital traits, including total availability and physical and mental endurance (Becker 1961; Bosk 1979). Culturally, femininity or "being female" is associated with opposite behaviors and skills, for example, caregiving and empathy (Cassell 1998; Lober 1993; Ridgeway 2015; Riska 2001a). Recent studies found unequal training experiences –especially in residency– between male and female medical apprentices due to unfitting feedback from trainers (Mueller et al. 2017), sexual harassment (Babaria et al. 2012), skill undermining (Brewer et al. 2020), and limited access to networking resources for women (Anspach 2010).

During the interviews, a couple of attendings and residents said they believed trainers are likely to trust female and male residents differently because of cultural assumptions about which gender group is more deserving of the profession and has innate surgical skills. Although some attendings did not talk about natural surgical dexterities when they were asked about the role of gender in the trust development process, they did mention that some residents seem to be born to be surgeons. This comment implies that some people naturally have higher odds of succeeding in medicine, especially in surgical specialties.

In the US, almost three-quarters of medical trainees are the second- or third-generation medical school graduates in their families and come from households with high socioeconomic status (SES) (Youngclaus and Roskovensky 2018). Unlike this majority, first-generation or low SES graduates are more likely to struggle in training because of unequal access to networking and pre-medical training resources associated with academic success in medicine (Brosnan et al. 2016). Parents with established medical careers may expose their offspring to early socialization experiences: bringing them to their workplace or introducing them to their colleagues, and invest in educational experiences and materials to increase their children's chances of achieving a career in medicine (Brosnan 2009; Jenkins et al. 2021). Hence, trainees from families with physicians might be better at "playing the game" or knowing the requirements to succeed in medical school and postgraduate training.

Other studies argue that gender, racial, and ethnic minorities who were historically deprived of pursuing a medical career feel they do not fit in medicine because they may be discouraged from pursuing this career path and face additional training challenges (Bassett et al. 2018; Southgate et al. 2017). Consequently, women, racial and ethnic minorities, and medical trainees from low SES backgrounds are more likely to initiate their careers at a disadvantage compared to White men from affluent households. These findings challenge assumptions about innate surgical skills often associated with hegemonic gender, racial/ethnic, and social class groups. Future scholarship ought to examine early life experiences and educational barriers among these minorities in surgical training to determine whether specific groups of residents are more likely to show outstanding skills due to nature or life course social determinants.

Even though this study did not aim to explore the role of race and ethnicity in the trust development process, qualitative findings suggest that non-White medical trainees are less likely to be trusted in the OR. With the publication of the Flexner Report, most medical schools that admitted racial and ethnic minorities were shut down as they did not meet the guidelines suggested in this historic document (Flexner 1910; Riska 2001a). In combination with segregation laws, this event diminished opportunities to pursue a career in medicine for Blacks or African Americans and other racial and ethnic minorities (Laws 2021). Even though medical programs are enrolling more racial and ethnically diverse medical trainees, non-White medical apprentices are marginalized (Lett et al. 2019). In 2018, 56.2% of active physicians in the US identified as White. Only 5% of medical doctors in the US identified as Black or African American, 5.8% as Hispanic, and 17.1% as Asian (Association of American Medical Colleges 2019b). Hence, the cultural image of a physician is still predominantly associated with White people, particularly men. As most physicians, particularly surgeons, are White men, residents of color may struggle to gain trust from attendings who might be more prone to trust trainees with similar racial and ethnic backgrounds (Foddy et al. 2009; Lewicki and Bunker 1996; Smith 2010).

Further scholarship should explore the role of race in intraoperative trust to identify training inequalities in surgical residency and under which condition attendings' racialized biases play a role. This study showed training inequalities between male and female residents but did not include enough racial diversity to observe racial and ethnic patterns. Studies with more diverse samples are needed to establish whether or not non-White female residents experience greater challenges in training and struggle more in the trust development process, compared to their White female and non-White male

counterparts, as suggested by Crenshaw's intersectionality theory (2017). Therefore, research on racialized intraoperative trust must consider the intersection of gender bias and racial bias in surgical training.

Limitations

Although this study yielded compelling findings, it is important to interpret them under the consideration of serval limitations. First, results from both strands of this study were based on small sample sizes from one institution. Therefore, findings cannot be generalized to a larger population of attendings and residents and may not show the experiences and beliefs in surgical training across programs in the US. Second, even though raters received equal training, there is still a chance they assessed the cases differently due to where they stood, what they paid attention to, and how they judged the interaction. In addition, subjects may modified their behavior due to the presence of a rater (Jones 1992), even though the effects of being watched on their behavior most likely faded away as physicians continue operating (Hauge, Wanzek and Godellas 2001).

In addition to issues about generalizability, the size of the sample employed in the quantitative strand of this study did not provide enough statistical power to explore the combined effects of three predicting variables over attending's entrustment. For example, the results discussed in Chapter Five indicated that female residents experienced higher faculty entrustment when they engaged in easy surgeries, whereas males gained greater entrustment in difficult surgical procedures. Although this finding suggests that the characteristics of surgeries play a role in unequal training between male and female residents, I could not account for the combined effect of residents' gender, case difficulty,

and postgraduate year. Most female residents in my sample were in their first or second year of residency. They possibly experienced lower entrustment because highly complex surgeries require skills that junior residents typically lack but seek to learn. Hence, future studies with larger samples ought to explore the combined effect of all key predictors tested in this study to determine whether women and men experience different levels of trust in complicated surgical cases due to their seniority.

For the qualitative strand of this MM study, most attendings and residents were recruited using convenience sampling through personal networking. Given that all recruited subjects shared the work environment at a single institution, some participants may not have disclosed information relevant to this study due to concerns about a potential breach of confidentiality. Even though I thoroughly explained the strategies to maintain the data confidential, several respondents provided vague responses. For example, one attending hesitated to share detailed descriptions of his experience with one resident because he was concerned about the trainee's reputation.

I purposely recruited two mutually exclusive groups of subjects, i.e., surgery residents and attendings but it was difficult to gather two demographically diverse samples because not many trainees and trainers are gender, race, or ethnic minorities. Concerning gender, most residents were female, while the majority of attendings were male. The qualitative sample for this MM study was predominantly White. This is of note when we consider the location of the institution where the study took place in the US South, where the majority of the population is Black. The lack of diversity by gender, race, and ethnicity is a limitation of this research project; at the same time, it highlights

the severity of the underrepresentation of gender, racial and ethnic minority in medicine, especially in surgery.

Findings from both strands of this MM research study were based on cross-sectional data. Most pairs of trainers and trainees were rated in the OR only once. Few pairs were rated more than once – up to four times – during the data collection phase of this study. Even though a longitudinal approach would have provided evidence to determine inequalities in the trust development process over time, rated surgical cases for the quantitative strand of this study were not classified by the time in which specific pairs of attendings and residents met in the OR. Also, pairs were equally not observed and rated as cases were selected through a convenient sample scheme.

During the qualitative interviews, attendings and residents might not have provided honest responses to some of the questions associated with gender and trust. Interviewees might have wanted to highlight their altruistic selves rather than disclosing their true beliefs and experiences concerning sensitive topics discussed in the interviews. Hence, their responses might have been subjected to social desirability bias (Grimm 2010). For example, men might have abstained from sharing their tendencies to trust men more with me because they would not have to wanted disclosed discriminatory behaviors and beliefs to a female interviewer like myself. On the other hand, women might have avoided talking about instances in which they were exposed to or witnessed gender bias in training to blend-in a predominantly masculine culture of medicine (Becker 1961; Riska 2001a).

Finally, some respondents may have experienced or witnessed gender bias and did not share this information as they might not have interpreted the situation through a

gender frame. As shown in the results, most participants said they were unsure whether gender played a role in the trust development process (See Chapter Four). Unlike other educational milieus, surgical residency is a highly isolated training experience. Residents rotate with different attendings throughout their training, and when they conduct surgeries together, they often are the only learner in the room. In some cases, they may share the experience with other medical apprentices who are at different stages of their training (e.g., medical students, older or younger residents, fellows). Thus, residents typically lack reliable reference to compare their experience and identify gender bias.

This study demonstrates that trust in surgical residency is a nuanced and complicated social phenomenon, with gender being one factor playing a role. Other elements in the training process are likely relevant to faculty entrustment but were beyond the scope of this study. These factors involve the patient, non-physician members of the surgical staff, and other actors or institutional structures that are yet to be identified and studied. Future scholarship should explore the interplay of these and other unknown factors informing trust.

Scholarly and Policy Implications

Despite its limitations, this study meaningfully contributes to the growing body of sociological research on women's disadvantaged position in the healthcare system (Anspach 2010; Lober 1993; Riska 2001a) by focusing on medical training. It suggests that further attention should be paid to training factors contributing to female physicians' unequal pay and limiting their chances of climbing up in their profession. This study also

contributes to a re-emerging line of sociological scholarship on medical education (Jenkins et al. 2021). It is particularly relevant to scholarship exploring gender stratification in medical training that seeks to identify which factors are contributing to the underrepresentation of women in medicine (Babaria et al. 2012; Brewer et al. 2020; Mueller et al. 2017).

Like women in other professions, female physicians are subject to a gender wage gap. Compared to prior decades, more women are pursuing a medical career today. Nevertheless, women physicians are still less likely to receive training from prestigious specialties (e.g., neurosurgery) and get promoted to leadership roles (e.g., department chief) compared to male colleagues (Anspach 2010). Gender stereotypes in medical training contribute to women's disadvantaged position in the healthcare system through gender stratification and segmentation mechanisms. Female physicians get excluded and guided towards less prestigious specialties because of their perceived lack of medical –masculine– traits (Association of American Medical Colleges 2017; Babaria et al. 2012). This situation is similar to the legal profession, where most women specialize in highly feminized practices (e.g., family law) because they seem not sufficiently aggressive for law realms dominated by men (e.g., criminal law) (Bolton and Muzio 2007). Gendered expectations concerning medical specialties enhance the training quality delivered to male trainees and contribute to women's unequal opportunities to succeed in medicine (Babaria et al. 2012; Brewer et al. 2020; Mueller et al. 2017). Therefore, there is a need to continue exploring the medical training experience to identify factors in the medical socialization process associated with female physicians' –particularly surgeons'– disadvantaged position in the healthcare system.

Factors driving the underrepresentation of women in medicine can also be understood through the analogy of the *leaky pipeline* (Pell 1996). Originally formulated to explain the lack of gender and racial diversity in science, technology, engineering, and mathematics (STEM), this concept illustrates barriers in academia inhibiting women and people of color from achieving prestigious career opportunities (Resmini 2016). The analogy suggests that the current structure of the academic game perpetuates the presence of stratifying mechanisms that contribute to the progressive loss of talented minorities for senior roles in STEM. Compared to White men, gender and racial minorities have lower odds of employment as graduate assistants or postdoctoral researchers, being highly recommended by prior employers, becoming independent primary investigators, acquiring funding to support research, being listed as first or last author in a published manuscript, and receiving an award within their discipline (Grogan 2019). Unequal access to networking and career advancement for women is mainly triggered by gender biases. As this study shows, gender bias also operates in surgical residency, putting female trainees at a disadvantage. Hence, this interrelation factor in OR training may act as a 'hole in the pipeline,' eventually driving away competent female physicians and keeping them from advancing toward leadership roles (e.g., department chair) or prestigious specialties (e.g., neurosurgery) in medicine (Anspach 2010; Association of American Medical Colleges 2019a; Grogan 2019; Lober 1993).

Outside of sociological research on medical education, these findings support a long tradition of empirical research on trust in social sciences. It is especially relevant to the area of trust within hierarchical relationships (Cook 1992; Cook, Cheshire, and Gerbasi 2020; Cook and Yamagishi 1992; Farrell 2004; Miller 2001). Trust has been

debated as a problematic but critical phenomenon enabling social exchanges in a range of relationships encountered in everyday life, such as teacher-student, doctor-patient, employer-employee, etc. This study responds to recent requests for cutting-edge scholarship on trust for specific social exchanges (Cook and Santana 2020) because trust often operates differently within different types of social relationships. It incorporates quantitative and qualitative methods into a sequential explanatory mixed methods approach (Creswell and Plano Clark 2018) and a sophisticated tool designed to quantitatively capture trust behaviors in general surgery training (Sandhu, Nikolian, et al. 2018). Furthermore, this study offers a new perspective on gender stratification in medical training by positing trust as a relevant factor contributing to the unequal quality of training alongside other socialization elements identified in prior scholarship (Babaria et al. 2012; Beagan 2005; Brewer et al. 2020; Brosnan 2009; Jenkins 2020; Jenkins et al. 2021; Mueller et al. 2017; Olsen 2019).

Although prior interventions mainly focused on curriculum revision and adaptation, these initiatives have resulted in little to no successful improvements (Hafferty 1998). Sociological scholars invested in medical education research recommend implementing policies at the social level to achieve successful changes in medical training. Medical curriculum reforms frequently aim to change educational standards by modifying learning mechanisms in the *formal curriculum* (e.g., textbooks, syllabuses), meaning 'what is taught, instead of what is learned.' According to Hafferty and Castellani (2009), in medical training, there are two other types of curricula influencing physicians' medical identity: *informal* and *hidden*. The former represents interpersonal interactions (e.g., rules stated by faculty), while the latter represents

structural factors (e.g., hospital rules). Together, these types of curricula influence the educational experience of medical apprentices and their competencies after completing their training.

Initially, theories on the informal and hidden curricula aimed to critique the structure of medical training and suggest more effective approaches to mitigate social determinants of health stemming from what physicians learn during their training (Hafferty 1998). However, recent scholarship suggests that the interpersonal interactions in training informed by the informal curriculum affect the educational experiences of some trainees. Racial and ethnic minority medical apprentices experience more burdens and stress during their training. For instance, trainers may ask minority trainees to teach units on health disparities (Olsen 2019). Unequal interrelations between trainers and minority medical apprentices have relevant implications for training quality and outcomes and contribute to stratification in medical education. (Jenkins et al. 2021). Strategies to diminish training inequalities should target interrelation factors in the trainer-trainee relationship.

Policy work in surgical training ought to put in place intervention projects focused on improving communication channels between attendings and residents and diminishing the role of gender stereotypes in faculty entrustment during surgical training. For example, to diminish the effects of gender bias in training, attendings can study techniques to efficiently learn about their residents' competencies and avoid stereotypical judgement when making their trust choices inside the OR. Following regulatory focus theory, Higgins et al. (2001) devised a personality assessment to categorize residents' and attendings' surgical, training, and teaching orientation. The test aims to increase

participation in the OR and help trainers and trainees anticipate each other's goals for each surgery. Attendings and residents who use eager means to engage in new tasks fall under the promoter category; trainers and trainees who are more vigilant and concerned about patient safety are preventors. Integrating this tool to facilitate the trust development process between residents and attending might support impartial strategies to anticipate trainees' behaviors and competencies and contribute to more fair opportunities to participate in surgical procedures for minority residents, especially women (Ji et al. 2020).

In addition to working with attendings, policies must also help residents better understand stereotypical biases and how they affect their training. As discussed earlier, most female residents did not know if their gender influenced their attendings' entrustment because they could not compare their training experience with the experience of their male counterparts. Medical education experts ought to collaborate with agencies and offices that oversee diversity, equity, and inclusion in training and inform residents about biases associated with gender, racial, and ethnic stereotypes. With these initiatives, trainees will learn to identify behaviors prompted by biases and strategies to prevent unequal training in the OR. Also, residency programs should provide additional support resources (e.g., counseling, anonymous complaints) to address problems caused by these biases and monitor the quality of training across rotations.

Although limited research explores the health benefits of increasing the proportion of female physicians in the workforce, the literature suggests this strategy could help improve postoperative and population health outcomes more generally. Decades of research on patient-physician relationships indicate that male physicians are

less likely to attentively listen to female patients' accounts of their symptoms compared to male patients and often interrupt them at any point of their conversations (West 1984). Moreover, male physicians usually prefer treating male patients, while female patients have higher tendencies to report that their male physician has trivialized their concerns (Elderkin-Thompson and Waitzkin 1999). In contrast, female physicians are more likely to engage in deeper relationships with patients and display more empathic behaviors (Riska 2001b). It is noteworthy that female patients are more likely to comply with and follow female physicians' recommendations compared to male physicians (Bonds et al. 2004). Compliance plays a significant role in surgical care and is especially important among female patients as they tend to have increased risk of postoperative complications compared to their male counterparts (AAl-Taki et al. 2018; Myles, Hunt, and Moloney 1997). Increasing the number of female surgeons in the healthcare force could lower patients' odds of experiencing postoperative complications and consequently developing fatal comorbidities (AAl-Taki et al. 2018). This implication could be especially relevant for women, as they may be more compliant and comfortable with a female surgeon compared to a male surgeon.

Conclusions

It is exciting to know women outnumbered men in US medical schools for the first time in 2019 (Searing 2019); yet, during that same year, sixty-four percent of physicians and more than three-quarters of surgeons in the US were men (Association of American Medical Colleges 2019a). A re-emerging line of research posits that

socialization factors in medical education prevent female trainees from receiving the same quality of training as their male counterparts (Babaria et al. 2012; Brewer et al. 2020; Jenkins et al. 2021; Mueller et al. 2017). As they move along in their residency training, women experience additional obstacles, such as less clinical participation in inpatient care (Anspach 2010). These challenges slow down the process of gaining and improving core medical skills residents will employ throughout their careers as independent physicians and may hamper their chances of achieving a successful career in medicine.

On the other hand, recent medical education research posits trust as a noteworthy driver of intraoperative participation in surgical residency (Sandhu et al. 2017). Attending entrustment inside the OR affects trainees' hands-on experiences in surgeries (Sandhu, Thompson-Burdine, et al. 2018). Residents who gain fewer hands-on experiences across surgical procedures are less likely to feel prepared after completing their training because they did not have enough room to develop and strengthen foundational surgical skills, such as dissecting and suturing (Napolitano et al. 2014).

According to this study, attending surgeons bring personal biases into their relationships with surgical residents. Gender biases take the form of stereotypes and assumptions about female residents' confidence and skills as surgeons in training. Even though trainers are unaware of these biases or may see them as harmless guesses, these stereotypical references limit female trainees' participation in surgical procedures and how much they will be entrusted in future interventions in the OR. Moreover, female residents may gain little or no participation in surgical cases requiring highly sophisticated techniques and approaches when trainers believe females do not have the

skills and confidence to lead procedures. As women have fewer chances of actively participating in surgical procedures, they are held back in their training compared to their male counterparts Consequently, women may have to invest more effort to participate in surgeries and meet training expectations set by the ACGME (Brasel et al. 2019). Thus, intraoperative gendered trust in general surgical training should be treated as a stratification mechanism contributing to the underrepresentation of women in surgery in the US. It is critical to understand the role of stereotypes and biases in surgical residency for developing policy interventions to align male and female residents' training, provide equal mobility opportunities in medicine, and increase the representation of female surgeons across the US.

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APPENDIX A

POST INTERVIEW QUESTIONNAIRE

Part 1. Faculty Handout.
Name:
Date:
Resident Name:
Case #:

Please select the best answer.
Before today, how many times have you performed any operation with this resident?
☐ First time ☐ 2-5 times ☐ 6-10 times ☐ >10

Before today, how many times have you performed this operation with this resident?
☐ First time ☐ 2-5 times ☐ 6-10 times ☐ >10

Overall, how familiar are you with this Resident?
☐ Not at all familiar ☐ Slightly familiar ☐ Moderately familiar ☐ Extremely familiar

Rate the level of difficulty of this case. ☐ Easiest one-third ☐ Average ☐ Hardest one-third

Was there an intra-operative emergent complication? ☐ Yes ☐ No

Select your level of participation during the most critical portions of the case.

1	2	3	4
Show and Tell	Active Help	Passive Help	No Help
Faculty performs the case while explaining actions and decisions. Resident actively assists.	Faculty directs the flow of the case, guides resident through steps. Resident performs actual steps of the operation.	Faculty actively assists, guides resident decision making. Resident moves from step to step and controls flow of the case.	Faculty observes to maintain safety, answers questions. Resident performs the case with minimal assistance.

Part 2. Resident Handout
Name:
Date:
Faculty Name:
Case #:

Please select the best answer.
How long have you been on this rotation? ☐ Less than a week ☐ 1-2 weeks ☐ 3-4 weeks ☐ 4-6 weeks ☐ More than 6 weeks ☐Cross-covering (I am not on this rotation)
Before today, how many times have you performed any operation with this attending?
☐ First time ☐ 2-5 times ☐ 6-10 times ☐ >10

Before today, how many times have you performed this operation with this attending?
☐ First time ☐ 2-5 times ☐ 6-10 times ☐ >10

Before today, how many times have you performed a similar operation?
☐ First time ☐ 2-5 times ☐ 6-10 times ☐ >10

Overall, how familiar are you with this Faculty member?
☐ Not at all familiar ☐ Slightly familiar ☐ Moderately familiar ☐ Extremely familiar

Rate the level of difficulty of this case. ☐ Easiest one-third ☐ Average ☐ Hardest one-third

Was there an intra-operative emergent complication? ☐ Yes ☐ No

Was a Registered Nurse First Assistant present? ☐ Yes ☐ No

Select the level of Attending participation during the most critical portions of the case.

1	2	3	4
Show and Tell	Active Help	Passive Help	No Help
Faculty performs the case while explaining actions and decisions. Resident actively assists.	Faculty directs the flow of the case, guides resident through steps. Resident performs actual steps of the operation.	Faculty actively assists, guides resident decision making. Resident moves from step to step and controls flow of the case.	Faculty observes to maintain safety, answers questions. Resident performs the case with minimal assistance.

APPENDIX B

INTERVIEW GUIDE

INTERVIEW GUIDE FOR RESIDENTS

1. Describe to me your job as a resident.
    a. What are your duties and responsibilities?
        i. What do you do during a typical day on your job?
        ii. What parts of the job do you enjoy?
        iii. What parts of the job do you not enjoy?
    b. How would you describe your relationships with attendings?
    c. What are you looking for in a relationship with any attending?
    d. What are some of the challenges in your training?
2. What does trust mean to you in the OR? Provide your personal definition.
    a. How you use trust when you are conducting a surgery with an attending?
    b. What influences your trust when conducting a surgery with an attending?
    c. How do you let an attending know that you are trustworthy?
    d. What prompts you to trust or not trusting an attending?
    e. How attendings let you know that they are trustworthy?
        i. How do you feel about these behaviors?
3. What helps you build a trustworthy relationship with your attendings in the OR?
    a. Describe your usual experience operating with any attending for the first time.
        i. How did it differ from subsequent surgeries, for example, the second surgery?
    b. How would your postgraduate year (PGY) influence attendings trust in you in the OR?

    c. Is there anything else about you that might influences their trust in you?

4. What would deteriorate your trust relationship with an attending in the OR?
    a. Can you tell me about a situation in which you lost an attending's trust or vice versa in the OR?
        i. What happened afterwards?
    b. Do you think gender plays a role?
5. How the Covid-19 pandemic affected your training?
    a. What specific rules or regulations where implemented?
        i. How they affected your training?
    b. What are your concerns in regards of your training?
    c. Is there anything else about the Covid-19 pandemic you wish to share? For example, your workflow in the Operating Room.
6. What advice would you give to other residents?
7. Is there anything else we haven't talk about?

Demographics:

Age: _____

Gender: [Male Female]

Postgraduate year (PGY): _____

Are you planning to pursue a fellowship? Which?

INTERVIEW GUIDE FOR ATTENDINGS

1. Describe your job as an attending?
    a. What are your duties and responsibilities?

i. What do you do during a typical day on your job?

ii. What parts of the job do you enjoy?

iii. What parts of the job do you not enjoy?

b. Describe your relationships with residents?

c. What are you looking in a relationship with any resident?

d. What are some of the challenges in your teaching?

2. What does trust mean to you in the OR? Provide your personal definition.

a. What is the role of trust when you are conducting a surgery with a resident?

b. What influences your trust when conducting a surgery with a resident?

c. How do you let a resident know that you are trustworthy?

d. What prompts you to trust or not trusting a resident?

e. How residents let you know they are trustworthy?

i. How do you feel about these behaviors?

3. What helps you build a trustworthy relationship with your residents in the OR?

a. Describe your usual experience when you operate with a resident for the first time.

i. How does it differ from subsequent surgeries, for example, the second surgery?

b. How would your teaching position influence residents' trust in you in the OR?

c. Is there anything else about you that you think influences their trust in you?

4. What would deteriorate your trust relationship with your trainee' in the OR?
    a. Can you tell me about a situation in which you lost a resident's trust or vice versa in the OR?
        i. What happened afterwards?
    b. Do you think gender plays a role?
5. How the Covid-19 pandemic affected your teaching?
    a. What specific rules or regulations where implemented?
        i. How they affected your teaching?
    b. What are your concerns in regards of your trainees' learning?
    c. Is there anything else about the Covid-19 pandemic you wish to share? For example, your workflow in the Operating Room.
6. What advice would you give to other attendings?
7. Is there anything else we haven't talk about?

Demographics:

Age: _____

Gender: [Male Female]

Teaching position: _____

Where and when you did your residency and/or fellowship?

APPENDIX C

IRB APPROVAL LETTER

TO: Colon-Lopez, Alejandra

FROM: University of Alabama at Birmingham Institutional Review Board
Federalwide Assurance # FWA00005960
IORG Registration # IRB00000196 (IRB 01)
IORG Registration # IRB00000726 (IRB 02)
IORG Registration # IRB00012550 (IRB 03)

DATE: 08-Aug-2020

RE: IRB-300004910
Gendering Trust in General Surgery Training

The IRB reviewed and approved the Revision/Amendment submitted on 03-Aug-2020 for the
above referenced project. The review was conducted in accordance with UAB's Assurance of
Compliance approved by the Department of Health and Human Services.

Type of Review: Expedited
Expedited Categories: 5, 6, 7,
Determination: Approved
Approval Date: 08-Aug-2020
Expiration Date: 07-Aug-2023

Although annual continuing review is not required for this project, the principal investigator is
still responsible for (1) obtaining IRB approval for any modifications before implementing
those changes except when necessary to eliminate apparent immediate hazards to the subject, and (2) submitting reportable problems to the IRB. Please see the IRB Guidebook for
more information on these topics.