Perceptions of Collaboration with a Doctor of Clinical Laboratory Science

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ABSTRACT

PERCEPTIONS OF COLLABORATION WITH A DOCTOR OF CLINICAL LABORATORY SCIENCE

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College of Health and Human Sciences
Northern Illinois University, 2020
Sherrill Morris, Co-Director
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Every person in America seeks medical care at some point, trusting and relying on highly educated healthcare professionals and sophisticated technology to solve their medical problems. The majority of clinicians rely on laboratory testing to provide insight into a patient’s illness. Unfortunately, the appropriate laboratory tests are not always ordered correctly during a patient’s initial visit. A study that examined 15 years of inappropriate test utilization indicates that, on average, 20.6% of lab tests were ordered when they weren’t needed and 44.8% of lab tests that were needed were not ordered. This is considered a medical error that can lead to financial waste, psychological distress, delayed diagnosis, or even death. In fact, medical errors are the third leading cause of death in the United States. The number of laboratory tests available has more than doubled over the past 20 years, giving clinicians at least 3,500 tests to choose from. Evidence is accumulating that clinicians are struggling more with not only selecting the appropriate laboratory test(s) but also correctly interpreting the results. Healthcare providers are recognizing the value of working as interprofessional teams to ensure that no aspects of a patient’s illness are overlooked. A new, advanced-practice medical
laboratory professional, the Doctor of Clinical Laboratory Science (DCLS), is now available to provide consultation to clinicians and assist them with the ordering and interpretation of diagnostic laboratory tests. This qualitative research project explored the perceptions that clinicians have about medical laboratory professionals and how perceptions change after collaboration with a DCLS. These findings provide insight about an unexplored area of healthcare research and support the need for future study of the efficacy of including laboratory expertise in patient care.
PERCEPTIONS OF COLLABORATION WITH A DOCTOR OF
CLINICAL LABORATORY SCIENCE

BY

LEAH AMES
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A DISSERTATION SUBMITTED TO THE GRADUATE SCHOOL
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE
DOCTOR OF PHILOSOPHY

COLLEGE OF HEALTH AND HUMAN SCIENCES

Doctoral Co-Directors:
Sherrill Morris
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ACKNOWLEDGMENTS

This project would not have been possible without the support of so many people. Many thanks to my committee co-chair, Dr. Sherrill Morris, for her guidance, feedback, and patience in making sure I crossed the finish line. Thank you to my co-chair and advisor, Dr. Jeanne Isabel, who has been my academic colleague for many years and encouraged me towards tackling this endeavor. In addition, I would like to thank committee members Dr. Manju Daniel and Dr. Renee Hodgkins for their time, contributions, and support of this project.

Thank you to Dr. Beverly Henry, who served as my advisor for a good part of this journey, and my sincerest gratitude goes to Dr. Brandy Gunsolus, the first Doctor of Clinical Laboratory Science graduate in the nation. Without her support and assistance, this project would not have been possible.

I would also like to acknowledge the loss of Laura Beamer, PhD, DNP, RN, AOCNP, AOCNS, FNP-BC. While she only served on my committee for a short time, her contributions were significant in guiding me to be a stronger researcher and academic writer.
DEDICATION

This dissertation is dedicated to my children, Samantha, Jessica, and Derek. They were often confused trying to understand how their mother was a scientist, a teacher, and a student all at the same time. I would smile and giggle when they asked me what “job” I did today. Though they currently may be too young to fully comprehend the significance of this endeavor, I hope they grow to realize they also possess the potential to accomplish anything they set out to do.
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CHAPTER 1

INTRODUCTION

Background

The United States’ healthcare reimbursement system has been a controversial topic for decades. Affecting every citizen, the Centers for Medicare and Medicaid Services (CMS) indicates that total healthcare spending in 2017 reached nearly $3.5 trillion and estimates that by 2026 that cost will grow to $5.7 trillion (Cuckler et al., 2018). The CMS also indicates that healthcare expenses for 2017 accounted for 18.1% of the United States’ gross domestic product (GDP) and projects that the GDP will account for 19.7% by 2026 (Cuckler et al., 2018). In addition it was estimated that measurable medical errors that harmed patients totaled approximately $17.1 billion in litigation in 2008 (Van Den Bos et al., 2011). This price tag does not account for the devastating and emotional loss of life and medical harm that can also be the result of medical errors. In the United States, medical errors are the third leading cause of death (Makary & Daniel, 2016).

A specific type of medical error, known as a diagnostic error, is highlighted in a seminal report from the National Academies of Sciences (2015). These errors can have financial consequences, can lead to negative health outcomes and psychological distress, and are considered to be the next frontier in patient safety (Newman-Toker & Pronovost, 2009). Diagnostic errors occur within the time frame, known as the diagnostic process, between when
a patient first seeks medical attention from a clinician and when treatment begins. Every patient
who seeks treatment from a healthcare practitioner is subjected to the diagnostic process;
patients run the risk of being a victim of a medical error due to diagnostic uncertainty, which is
defined as the “subjective perception of an inability to provide an accurate explanation of the
patient’s health problem” (Bhise et al., 2018, p. 103). Medicine is considered an imperfect
science, and therefore, it is impossible to rule out all aspects of uncertainty. All healthcare
practitioners must be cognizant of the potential for the uncertainty that is defined by the limits
of their knowledge (Wang & Chan, 2015).

A recent systematic review pertaining to primary care indicates that while many
publications acknowledge the presence of diagnostic uncertainty, most provide
recommendations of how to reduce the uncertainty instead of how to manage it (Alam et al.,
2017). According to the medical uncertainty principle, there are two main goals that are
somewhat mutually exclusive (Sonnenberg, 2001, p. 3247):

1. Complete understanding of the disease process can be obtained only through
   unrestricted testing that exposes a patient to high risks and discomfort. In the
   extreme, the physician may acquire all relevant knowledge through a postmortem
   examination.

2. On the other hand, a patient untouched by any test procedure maintains a health
   status unaffected by the diagnostic process, but the physician also remains
   completely ignorant about the nature of the disease.

Sonnenberg (2001) asserted that it is necessary to find a balance between eliminating
uncertainty through an extensive diagnostic workup and compromising a patient’s health in the
process. Finding this balance is crucial in order to enable healthcare practitioners to manage diagnostic uncertainty.

Laboratory tests play a large role in reducing medical uncertainty and guiding medical decisions within the diagnostic process. Diagnostic testing has become an essential component of standard medical practice, and there are various reasons why a healthcare practitioner orders testing (Berger, 1999b; Wolcott et al., 2008). Previous literature reviews have identified generalized reasons for ordering tests and include the following (Houben et al., 2010; Sood, Sood, & Ghosh, 2007; Whiting et al., 2007):

- To exclude disease and reduce diagnostic uncertainty
- To confirm diagnosis and determine treatment
- To reassure patients at their request
- To monitor disease
- To avoid litigation
- To provide the healthcare practitioner clinical experience and confidence in his or her clinical judgment

Unfortunately, any of these reasons for ordering laboratory tests can be harmful to a patient if tests are not properly regulated. For example, while not technically considered a diagnostic error, overdiagnosis is a growing concern of rising healthcare costs, overtreatment, and thus the associated risks and harm sometimes caused by overtreatment (Welch & Black, 2010). Overdiagnosis has been defined as the correct diagnosis of a disease that will not affect a person during his or her lifetime (Gawande, 2015). Overdiagnosis makes people unnecessary patients by identifying abnormalities that are never going to cause harm (Brodersen et al., 2018). Gawande made a distinction between diagnostic error and overdiagnosis, indicating that
the latter is attributed to the growing practice of overtesting due to an intolerance of diagnostic uncertainty and a healthcare practitioner’s fear of missing something significant. Overdiagnosis ultimately causes more harm than benefit, both financially and physically (Brodersen et al., 2018). Gawande (2015) described the removal of benign thyroid nodules as an example of overdiagnosis. These nodules are often found while investigating various patient complaints. Benign thyroid nodules have been shown to have few or no long-term effects on patients, yet they have become a new health focus for the healthcare practitioner, with additional monitoring for future nodules and potential surgeries to remove the nodules (Gawande, 2015). Another example is the detection of harmless pulmonary emboli while investigating cases of pleural effusion or pneumonia (Wiener, Schwartz, & Woloshin, 2013). With the advances and sophistication of high-resolution computerized tomography (CT) technology, small subsegmental pulmonary emboli may be detected, but they do not require treatment (Wiener et al., 2013). Overtesting, or excessive testing, has been linked to defensive medicine and medical liability (Hoffman & Kanzaria, 2014).

Laboratory testing and diagnostics is a part of the clinical pathology division of the medical system. Also known as laboratory medicine, it is a medical subspecialty that focuses on the testing of human body specimens such as blood, bone marrow, skin scrapings, urine, body fluids, and many other specimen types. While the examination of human specimens can be traced back to 300 BC when Hippocrates suggested examining urine to diagnose disease, the specialization of the laboratory profession began in the early years of the 20th century (Berger, 1999a). By 1922, physicians had voiced their concerns that technical assistants were needed to tend to laboratory responsibilities, freeing up the physicians to continue their daily practice (Berger, 1999b). By 1928, the American Society for Clinical Pathology (ASCP) established
recognition and credentials for the medical technologist (American Society for Clinical Pathology, 2018a; Berger, 1999b).

Today, medical laboratory scientists, historically referred to as medical technologists, are the professionals responsible for the diagnostic test results that are provided to healthcare practitioners throughout the world. They are considered a hidden profession because this group of healthcare professionals rarely has face time with the ordering healthcare practitioners, patients, or families (Rohde, 2014). Medical laboratory professionals are the experts in diagnostic laboratory testing. Their academic education generally consists of either an associate of science degree (medical laboratory technician, MLT) or bachelor of science degree (medical laboratory scientist, MLS), and sometimes advanced degrees (American Society for Clinical Pathology, 2020). They are also required to participate in an intensive clinical rotation at a hospital, working alongside senior medical laboratory professionals (American Society for Clinical Pathology, 2020). Each laboratory professional develops into a specialist within his or her area of the clinical laboratory. If there are questions as to which diagnostic test should be performed to best assess a patient’s status, or if there are questions regarding the results of a diagnostic test, laboratory professionals serve as a reliable source of information and consultation (Bangia, 2017; Futrell, 2013).

Physicians are not responsible for analyzing their radiology and pathology reports (Futrell, 2013). A licensed or certified specialist in those areas provides the result interpretations to the physicians. Laboratory results should not be treated differently. In a medical student’s four-year academic curriculum, students complete 100+ hours of anatomic pathology as compared to an estimated average of only 10 hours on appropriate medical laboratory test selection and correct interpretation, and yet physicians rely on diagnostic tests
daily without consultation with experts (Laposata, 2014; Smith, Kamoun, & Hickner, 2016; Wians, 2009). The Centers for Disease Control and Prevention (CDC) has identified the following problems associated with incorrect test selection and result interpretation and has supported research to address these issues (Centers for Disease Control and Prevention, 2018a, 2018b; Futrell, 2013):

- Difficulty choosing lab tests due to large compendium (Hickner et al., 2014)
- Inconsistency in test names (Passiment et al., 2013)
- Inconsistent guidelines for test usage (Meidani, Farzandipour, Farrokhian, & Haghighat, 2016; Rubinstein et al., 2018)
- Lack of training in lab medicine during medical school (Smith et al., 2016)
- Limited knowledge of laboratory functions and structure (Smith et al., 2016)
- Lack of education for growing molecular test options (Riley, Procop, Kottke-Marchant, Wyllie, & Lacbawan, 2015; Rothenberg, 2015)

With regard to these issues identified by the CDC, laboratory professionals can actively participate in diagnostic stewardship that involves modifying the ordering, performing, and reporting processes of diagnostic testing (Morgan, Malani, & Diekema, 2017). In the laboratory field, these processes are known as the preanalytic, analytic, and postanalytic stages of the diagnostic process. As a part of the preanalytic stage, medical laboratory professionals have the knowledge to help guide healthcare practitioners in selecting the appropriate diagnostic tests based on a practitioner’s suspected diagnosis (Bangia, 2017; Taylor, Thompson, Genzen, Hickner, & Marques, 2017). Also part of the preanalytic stage, laboratory professionals have the knowledge to demonstrate patient advocacy by rejecting specimens that are collected or handled improperly in order to prevent poor-quality or inaccurate results from being reported
Moreover, laboratory professionals can also help with the interpretation of the tests and provide consultation about whether additional testing is recommended in the postanalytical stage of the diagnostic testing (Dighe, Soderberg, & Laposata, 2001; Morgan et al., 2017). These efforts and collaboration would assist not only in reducing unnecessary testing but also in reducing overdiagnosis by focusing the scope of the diagnostic testing on the suspected diagnosis (Chiolero, Paccaud, Aujesky, Santschi, & Rodondi, 2015). As it stands currently, the expertise of the MLS is underutilized (Futrell, 2013).

The CDC and Clinical Laboratory Integration into Healthcare Collaborative (CLIHC, with support from the Altarum Institute) partnered on a national survey to explore the degree of uncertainty experienced when ordering and/or interpreting laboratory tests (Hickner et al., 2014). The participants of the study were family medicine and general internal medicine physicians, and the survey explored challenges that the participants faced regarding laboratory diagnostic testing and solutions to improve test utilization (Hickner et al., 2014). Results indicate that the responding participants (n = 1,217) reported an average of 80.9 patient visits per week and ordered diagnostic lab tests for approximately 31.4% of those patients (Hickner et al., 2014). While ordering, the physicians indicated that they were uncertain about which tests they should order for 14% of those patients who required labs (Hickner et al., 2014). Additionally, the physicians indicated that they were uncertain about interpreting the results for 8.3% of the patients (Hickner et al., 2014). While these numbers may seem small, there are more than 500 million primary care physician visits each year (National Center for Health Statistics, 2015). These numbers suggest that potentially 23 million patients may fall victim to the consequences of inappropriately ordered or interpreted laboratory results (Morgan, 2018; National Center for Health Statistics, 2015). Inappropriate diagnostic testing includes
overutilization or overordering of tests that are not clinically indicated, underutilization of tests that are clinically indicated but not ordered, inappropriate repeat testing, and incorrect orders (i.e., specific testing that was desired but ordered incorrectly using the laboratory interface software). A multidatabase systematic review was conducted on published studies between 1997 and 2012 to identify articles about inappropriate test utilization (Zhi, Ding, Theisen-Toupal, Whelan, & Arnaout, 2013). Results from this review indicate overall mean rates of over- and underutilization of 20.6% and 44.8%, respectively (Zhi et al., 2013). A study was conducted to determine whether extra healthcare practitioner education to promote cost and waste awareness and the use of job aids would reduce unnecessary testing. Unfortunately, results indicate that these efforts did not have a profound effect on reducing the overall ordering of the most common, routine testing at the facility (Melendez-Rosado et al., 2017).

The responsibilities of medical laboratory professionals have evolved and expanded over the past 90 years in order to stay abreast of the increased volumes and complexity of the ever-changing technology (Bangia, 2017; Rothenberg, 2015). The number of laboratory tests available has more than doubled to at least 3,500 tests over the past 20 years (Hickner et al., 2014). In response to the call for improved patient safety, higher quality of care, and evidence-based medicine, laboratory professionals are making concerted efforts to offer their expertise about appropriate test utilization (Bangia, 2017; Eamranond et al., 2017). The American Society for Clinical Laboratory Science (ASCLS) and the ASCP are two professional organizations that support and drive the laboratory profession. Both the ASCLS and the ASCP are contributors to the Choosing Wisely campaign, an initiative supported by the American Board of Internal Medicine (ABIM) with the intent to promote a national dialogue to avoid unnecessary medical tests, treatments, and procedures (American Board of Internal Medicine,
The overall goal of Choosing Wisely is to identify the right test, at the right time, for the right cost, to better serve patients. The ASCLS and the ASCP provide guidance to Choosing Wisely in order to reduce laboratory testing that is commonly ordered but not always appropriate. When these recommendations are applied, they can result in higher quality care, lower costs, and a more effective use of the medical laboratory (American Society for Clinical Pathology, 2018b).

Both the ASCLS and ASCP are currently involved in partnering with the CDC on collaborative initiatives such as the CLIHC and the Laboratory Medicine Best Practices (LMBP). The CLIHC was established by the CDC’s Division of Laboratory Systems to investigate significant gaps in services provided by clinical laboratories. The overarching goal was to develop solutions to optimize laboratory services in order to provide better patient care (Centers for Disease Control and Prevention, 2018a). The current focus of the organization is on improving the utilization of laboratory services to reduce diagnostic and treatment errors (Laposata, 2014; Taylor et al., 2017). The LMBP is an evidence-based initiative to identify best practices for quality improvement in laboratory medicine (Centers for Disease Control and Prevention, 2006; Christenson et al., 2011). This collaboration is an effort to encourage more laboratory professionals to conduct clinical research, to establish evidence-based practices (EBPs) for laboratory professionals to improve quality in the diagnostic process, and to recognize medical laboratory professionals as key partners in healthcare policy discussions and decision making that are related to laboratory services. The LMPB initiatives are significant enough that EBP methodology is being applied in laboratory science educational curricula (Landin, 2013). The LMBP initiatives align with several recommendations made by the Committee on Diagnostic Error in Healthcare (National Academies of Sciences, 2015). These
recommendations, which have already been applied in other healthcare disciplines, speak to laboratory professionals and the contributions they can make in improving the diagnostic process. Some of these recommendations include the following:

- Development of appropriate-use criteria for diagnostic testing (American Board of Internal Medicine, 2018b)
- Development of guidelines for diagnostic impact on patient outcomes (Freedman, 2015)
- Development of guidelines that inform healthcare practitioners about the role of diagnostic tests and how these tests can influence the path of care and health outcomes (Gopalakrishna et al., 2014)
- Provision of current, reliable sources of information regarding diagnostic testing for patients (American Association for Clinical Chemistry, 2019)
- Development of checklists to improve the diagnostic process (Graber et al., 2012, 2014)

The demands for EBP and patient-centered care are placing new stresses on healthcare practitioners and patients. Since the 1970s, there has been a rapid increase in the number of published scientific articles on health (Institute of Medicine, 2013). With regards to EBP, this abundance of research makes it difficult for healthcare professionals to keep up with the breadth and depth of knowledge in their specialties (National Academies of Sciences, 2015). Additionally, the rising complexity and number of options for diagnostic testing, treatment, and prevention, combined with clinician time constraints and cognitive limits, have contributed to the reduced ability of single healthcare practitioners to provide the best care for their patients.
To combat these barriers to high-quality patient care, the healthcare system has made strides towards assembling teams of healthcare professionals so that patients can benefit from a broader range of resources and expertise (Gittell, Seidner, & Wimbush, 2010). Working together in teams requires commonalities among the various healthcare professions. In a review of literature regarding team processes conducted by members of the Best Practices Innovation Collaborative of the Institute of Medicine (IOM), five principles of team-based care were identified: shared goals, clear roles, mutual trust, effective communication, and measurable processes and outcomes (Mitchell et al., 2012). Addressing several of these principles, a program called TeamSTEPPS (Team Strategies and Tools to Enhance Performance and Patient Safety) was released by the Agency for Healthcare Research and Quality (AHRQ) in 2006. This program was developed in collaboration with the Department of Defense and is scientifically rooted in over 20 years of research and lessons learned from the application of teamwork principles identified in high-reliability organizations and crew resource management. TeamSTEPPS was designed to optimize patient outcomes by improving teamwork skills and communication among healthcare professionals (King et al., 2008). TeamSTEPPS training uses a variety of methods to facilitate active learning: lecture, videos, group activities, and simulations (Agency for Healthcare Research & Quality, 2019b). The TeamSTEPPS program is designed to provide a set of teamwork tools that can be applied to any clinical setting (Agency for Healthcare Research & Quality, 2019a; King et al., 2008). While there are no published reports on which health professions are conducting TeamSTEPPS training, recent conference proceedings indicate that information regarding TeamSTEPPS has been introduced to medical laboratory professionals (Ames, Moore, & Taylor, 2018; Bostic, Brown, & Hodgkins, 2019; Hodgkins, 2016). By exposing the laboratory profession to TeamSTEPPS, the
intent is to bridge communication gaps between other healthcare professions that may already be using these communication tools and practices.

Good communication is essential for diagnostic management teams (DMT). The composition of a DMT includes experts who “focus on the correct selection of laboratory tests and the interpretation of complex test results in a specific clinical field” (Laposata, 2017, Concept of Diagnostic Management Teams section, para. 4). Besides contributing to collaborative efforts such as the LMPB, CLIHC, and Choosing Wisely, DMTs are another vehicle for incorporating the voice of educated and skilled laboratory professionals on interprofessional teams. The concept of the DMT was conceived to help treat coagulation disorders by Michael Laposata, M.D., Ph.D., in 1984 when he was a first-year resident at Washington University in St. Louis (Govern, 2013). It was not until he joined Vanderbilt University in 2008 that the details defining a DMT for coagulation disorders started to gain traction at Vanderbilt University Medical Center. A coagulation DMT was established in 2010, followed by the launch of a hematopathology DMT in February 2011 (Govern, 2013). Afterwards, the clinical utility and cost effectiveness of the DMT led to its escalation in popularity and recognition. In 2014, Dr. Laposata moved to the University of Texas Medical Branch (UTMB) and fostered the development of additional DMTs (Clifford, 2016). Adding significance and further support for the impact of DMTs on patient care, in 2015, the National Academy of Medicine endorsed the formation of DMTs to address diagnostic errors (National Academies of Sciences, 2015). Additionally, the inaugural Diagnostic Management Team Conference, produced by the Department of Pathology at UTMB, convened in February 2017 and has become an annual event. In fact, it is one of the fastest growing events in the clinical laboratory industry according to Dark Daily, an online briefing publication specifically focused
on current trending topics affecting the clinical laboratory and anatomic pathology fields (McBride, 2018). The Diagnostic Management Team Conference focuses on the benefits of DMTs and how they optimize laboratory services through the reduction of overutilization of laboratory tests and underutilization of laboratory results.

Working and training together as a team, such as a DMT, were among the recommendations made by the IOM in its seminal report entitled *To Err Is Human: Building a Safer Health System* (Institute of Medicine, 2000). The report emphasizes that people often work together in small groups in healthcare when caring for a patient (i.e., oncology teams, end-of-life care, pediatric cases, etc.). This concept of working in interdisciplinary teams was emphasized again by the IOM in its second report in 2003, entitled *Health Professions Education: A Bridge to Quality* (Institute of Medicine, 2003). Directed at healthcare-professional educators, the report stresses that the reform of health professions education is essential to enhance patient safety and the quality of healthcare in the United States. The report highlights the interdisciplinary nature of medical teams and the need to incorporate interprofessional training and practice as a core competency within healthcare-professional education. Accrediting bodies and professional organizations such as the American Association of Colleges of Nursing (AACN), the National Accrediting Agency for Clinical Laboratory Science (NAACLS), and various medical schools have aligned with the IOM by recognizing that interprofessional collaboration and practice (IPCP) are essential components of healthcare-professional education and have included interprofessional components in their curricula (American Association of Colleges of Nursing, 2008; The National Accrediting Agency for Clinical Laboratory Sciences, 2018; West et al., 2016).
In order to meet the changing needs and demands for interprofessional competencies in healthcare-professional education and clinical practice, the medical laboratory profession, with support from the ASCLS, researched and created a clinical laboratory doctorate degree (McCulloch, 2014). The Doctor of Clinical Laboratory Science degree fills a gap in the clinical workplace by facilitating collaboration between healthcare practitioners who use laboratory testing and the laboratory professionals with the subject-matter expertise (Hunter, 2012; Montoya, Kimball, & Kimball, 2009). The Doctor of Clinical Laboratory Science degree recipient (DCLS) serves as a more accessible and prominent liaison for the laboratory in diagnostic-result consultation and appropriate test utilization and can assist with reducing medical errors associated with the diagnostic process (American Society for Clinical Laboratory Science, 2012; Hunter, 2012). In May 2018, the first DCLS entered the clinical workforce. Research pertaining to the efficacy of this new team member and consultant in healthcare is still in the early collection phase; however, preliminary findings were presented at the ASCLS 2018 annual meeting in Chicago, Illinois. Results, indicate that the single DCLS had provided approximately $628,493 in cost savings as a consultant over a 9.5-month period through the reduction of inappropriate test ordering, discontinued inappropriate antibiotic therapy, decreased patients’ hospital length of stay, and increased correct test interpretations (Fydryszewski & Gunsolus, 2018). All of these contributions of a DCLS provide increased patient safety and overall decreased healthcare costs for both the patient and the healthcare system. Practitioners’ perceptions of collaboration with a DCLS have yet to be explored due to the novelty of the DCLS role.
Theoretical Base for Research

Many of the recommendations to implement and sustain interprofessional collaborative practice (IPCP) revolve around the intergroup contact theory (ICT) that suggests that under appropriate conditions, interpersonal contact is one of the most effective ways to reduce prejudice between groups (e.g., in-groups and out-groups; Allport, 1954; Everett, 2013). Four processes of change are proposed by the ICT: (a) learning about the out-group, (b) changing behavior, (c) generating effective ties, and (d) in-group appraisal (Pettigrew, 1998). With these change processes in mind, effective interpersonal-contact groups require a nurturing environment in order to be successful. For example, the groups should be exposed to each other with support at an institutional level, be within a co-operative atmosphere, be treated as equals in status, and be in pursuit of common goals. These common goals should be of a superordinate nature (i.e., a goal that is shared by all but is not discipline specific). This form of contact has been used successfully in previous interprofessional interventions to improve intergroup attitudes and reduce prejudice (Ateah et al., 2011). Consequently, while Allport (1954) proposed that the best way to reduce hostility, and thus stereotyping, among different groups was to bring the groups together, he also argued that contact alone is not enough.

Barriers to IPCP have been identified as resulting from difficulties establishing trust, instituting communication, and having mutual respect from autonomous professionals (Colyer, 2004). In an observational study regarding healthcare teams, it was noted that in times of need, members sought specific members of the team. When asked why they chose those members, the reason indicated was trust (Coyle, Higgs, McAllister, & Whiteford, 2011). Multiple opportunities for contact and working together on shared goals are necessary to provide the
time and experience together that are needed to build trust that is, in turn, established through demonstrating reliability. Coyle et al. (2011) argued that “learning to trust meant that participants had to have sufficient empathy with their colleagues to believe that they were working to capacity, that all were pulling their weight” (p. 49) and that being reliable meant that the work was completed within a stated time frame. In short, the participants built trust with each other through being reliable on multiple occasions. Additionally, consistently choosing to work with colleagues who have demonstrated reliability provided the opportunity to better understand each other’s roles and supports Reis and colleagues’ theory of familiarity, a core concept of interprofessional attraction and social interaction (Reis, Maniaci, Caprariello, Eastwick, & Finkel, 2011). Reis et al.’s theory suggests that repeated exposure to a stimulus increases the liking of that stimulus. The theory also assumes that the repeated exposures are positive experiences that, in time, provide opportunity to gain an acquaintance with and establish important collaboration characteristics such as trust, communication, and reliability (Reis et al., 2011).

Another theory that strongly correlates with successful teamwork is relational coordination (RC). This theory focuses on processes of communicating and relating for the purpose of complex-task integration (Gittell, Godfrey, & Thistlethwaite, 2013). RC is a coordination of teamwork supported by relationships created through shared goals, shared knowledge, and mutual respect (Gittell, 2006). It is no coincidence that key components of RC are nearly identical to the interprofessional competencies described by organizations such as the Canadian Interprofessional Health Collaborative and the US-based Interprofessional Education Collaborative (IPEC); RC and interprofessional collaborative practice have much in common (Canadian Interprofessional Health Collaborative, 2010; Interprofessional Education
Collaborative, 2011). Originally identified as a part of the airline industry in the 1990s, RC promotes high-performance relationships through motivation, teamwork, and co-ordination among team members (Gittell, 2003). According to Gittel et al. (2013), “RC is measured as a network of communication and relationship ties among workgroups engaged in a common work process” (p. 210). An aviation example is demonstrated by the teamwork and co-ordination required for an on-time flight departure. RC easily translates to healthcare because patient care is highly interdependent, time constrained, and very uncertain at times, much like the airline industry. An example in healthcare is the co-ordination required in transferring a patient from an operating room to an intensive care unit. Various healthcare professionals are involved in each of those settings, yet a continuity of care must be preserved in the hand-off of the patient and in the future medical processes. RC can apply to various levels of a healthcare organization: between individuals, among team members, and even at organizational levels. Ultimately, the core values of both interprofessional collaborative practice and RC focus on the best possible patient care through optimal communication of all participants at every level of the process. This can only be achieved through shared goals, shared knowledge, and mutual respect across professional boundaries (Gittell et al., 2013).

ICT and RC theory share a foundational requirement that adequate time is necessary to develop relationships and establish trust, respect, and familiarity. Introducing and practicing interprofessional competencies at the academic level helps create a strong foundation for acceptance of and willingness to have IPCP in the workplace (Margalit et al., 2009; Michalec, Giordano, Arenson, Antony, & Rose, 2013). Currently, there are few publications that include medical laboratory science students in interprofessional education (IPE) activities and the reasons for this are not entirely clear and deserve further research. One possible explanation is
the level of training the laboratory science students have at the time of the IPE activity. If the students are in the early stages of their program, it may be difficult “to participate fully in collaborative practice if the student is not confident in his or her own skills” (Bainbridge & Purkis, 2011, p. 29). The absence of laboratory science students’ participation in IPE makes it difficult to demonstrate to other participants the specialized knowledge and expertise that medical laboratory professionals possess and can contribute to an interprofessional healthcare team. Additionally, the structure of the IPE activity may require the laboratory science students to serve in a more consultative role, which again may prove challenging for a student. Thus, the timeline for laboratory professionals to start building trust and rapport with other healthcare practitioners during IPE is also negatively impacted. Without proper IPE exposure, it is possible that by the time healthcare-profession students graduate and begin their new roles in the healthcare system, laboratory medicine has already become an afterthought, a so-called magic black box into which specimens are deposited and from which computer-derived results emerge that can be shared with a patient. There is the expectation that when lab tests are ordered, accurate results are delivered in a reasonable amount of time. Very little thought may be given to the complexity of the diagnostic process as a whole and the integral role that laboratory professionals have in that process (National Academies of Sciences, 2015).

Justification of the Study

In May 2018, the medical laboratory profession recognized the first DCLS in the nation, a graduate of Rutgers University. As stated in a position paper published by the ASCLS (2016), it is anticipated that this advanced-practice medical laboratory professional will deliver “cost savings to the health care system by providing valuable and reliable clinical-based knowledge
regarding laboratory testing that fosters accurate and timely diagnoses and treatment” (Background section, para. 2) in addition to having a positive impact on patient outcomes and safety. In the hospital, the DCLS has a visible and accessible position while participating in hospital rounds and serving on DMTs. This is in significant contrast to laboratory professionals typically being hidden in the basement of the hospital. The DCLS, serving as a liaison for the laboratory profession, will help reduce uncertainty and facilitate accuracy when a clinician must decide which is the best laboratory test to order and how to best interpret the result (Rohde, 2014; Rohde, Falleur, & Ellis, 2015). Research is needed to determine how collaboration with a DCLS may change the perception(s) that healthcare practitioners have about medical laboratory professionals, the expertise they have to offer, and how a DCLS can help reduce diagnostic errors.

Problem Statement

The increased emphasis on IPCP is motivated by the benefits provided to patients and the healthcare system, but limited research has explored the reasons why medical practitioners rarely seek consultation with laboratory professionals when uncertainty arises regarding laboratory tests and interpretation. Understanding the perceptions that healthcare practitioners have regarding medical laboratory personnel as a resource for ordering and interpreting laboratory tests and how those perceptions change after collaborating with a DCLS will provide evidence that supports necessary change in IPE, collaborative workshops, and clinical practice to establish and sustain familiarity and rapport between healthcare practitioners. Ultimately, these changes will contribute to the reduction of medical diagnostic errors.
Purpose and Research Questions

The purpose of this qualitative study was to examine perceptions that healthcare practitioners have about medical laboratory professionals as a resource for ordering and interpreting laboratory tests and how those perceptions change after working with a DCLS. Through personal interviews, I hoped to discover whether these perceptions serve as barriers for routine collaboration regarding diagnostic testing. By identifying the perceptions that exist and understanding their origins, solutions can be formulated to improve the professional collaborative relationships between healthcare practitioners and medical laboratory professionals.

Hickner et al. (2014) conducted a study about how primary care physicians overcame challenges associated with ordering clinical laboratory tests and their interpretation. In categorized questions of how often physicians contact laboratory professionals for help, responses of never ranged from 9.7% to 47% (n = 1,768) and were dependent on the reason a physician would need to contact a laboratory professional (Taylor et al., 2017). My research builds on the work of Hickner et al. by exploring the reasons why physicians responded that they never contacted the laboratory when confronted with a challenge pertaining to ordering clinical laboratory tests and interpreting results. Therefore, the overarching research questions for this study are as follows:

- What perceptions do ordering healthcare practitioners have about medical laboratory professionals?
- What factors influence those perceptions?
In working with a DCLS, in what ways, if any, do healthcare practitioner perceptions change?

Definitions

- American Society for Clinical Laboratory Science (ASCLS)—a national professional organization that represents medical laboratory technicians and scientists. Formerly known as the American Society for Medical Technology (ASMT).
- Clinical Laboratory Integration into Healthcare Collaborative (CLIHC)—established by the Centers for Disease Control and Prevention’s Division of Laboratory Systems to study important gaps identified in clinical laboratory quality systems and to develop solutions to optimize the effective use of laboratory services for better patient care.
- Doctor of Clinical Laboratory Science (DCLS)—advanced-practice medical laboratory professional at the doctorate level.
- Laboratory Medicine Best Practices (LMBP)—sponsored by the Centers for Disease Control and Prevention’s Division of Laboratory Systems, an initiative to address the needs for systematic, comprehensive, multidisciplinary, and transparent approaches to identifying, evaluating, and recommending the best practices for laboratory testing.
- Medical Laboratory Scientist (MLS)/Clinical Laboratory Scientist (CLS)—different academic programs and certifying agencies use different terminology; however, these are equivalent terms for an educated and trained professional who works in the
medical/clinical laboratory performing diagnostic testing and who has earned a Bachelor of Science degree. Eligible for professional certification by taking a national exam. Licensure is required in some states.

- Medical Laboratory Technician (MLT)—an educated and trained professional who works in the medical/clinical laboratory performing diagnostic testing and who has earned an Associate of Science degree. Eligible for professional certification by taking a national exam. Licensure is required in some states.

- National Academy of Medicine (NAM)—formerly the Institute of Medicine (IOM) and one of the three academies that make up the National Academies of Sciences, Engineering, and Medicine. It is a private, nonprofit institution that works outside of the government to provide objective advice on matters of science, technology, and health.

- Practitioner/Clinician—an educated and licensed healthcare practitioner who is legally able to order diagnostic laboratory tests for a patient.

Summary

This research investigated perceptions that ordering practitioners have regarding medical laboratory personnel as a resource for ordering and interpreting diagnostic laboratory tests. Until recently, the contributions of a DCLS as an interprofessional team member have only been theoretical. This research provides valuable information on the actual impact that a DCLS has as a collaborator on an interprofessional medical team as described by practitioners currently working with a DCLS.
CHAPTER 2

LITERATURE REVIEW

Since the IOM’s report *To Err Is Human: Building a Safer Health System* in 2000, a significant amount of literature has been published about IPE and IPCP to support the IOM’s mandate that professions that work together should train together. A review of the literature was conducted to determine whether medical laboratory professionals have been included in initiatives such as IPE events in academia and IPCP activities in the clinical setting. Additionally, the literature was reviewed to determine whether there are any publications that address perceptions held about medical laboratory professionals.

Interprofessional Education

While there are many publications that investigate the utility and benefits of IPE and professional workshops, ones with laboratory professionals as participants are not prevalent. Beard, Robertson, Semler, & Cude (2015) conducted a study of interprofessional simulation involving nursing and medical laboratory science students. The research reported a culmination of results gathered through three semesters of repeating an IPE activity with various groups of students. One survey question asked participants if they felt it was important to work well with practitioners from other healthcare professions. Results for this question increased from a mean of 5.52 pre-IPE activity to a mean of 5.54 post-IPE activity ($p$ value = .035). Also of interest from the study is that when a group of laboratory students was asked if students in other
healthcare professions think highly of their chosen profession, laboratory science student scores decreased from 85% pre-IPE activity to 69% post-IPE activity. Other statistics from the multiple-semester data collection reveal equivalent results, indicating that at an undergraduate educational level, laboratory science students feel undervalued and underutilized compared to their nursing partners in the IPE activity.

Another study involving laboratory science students exclusively (n = 5) explored how they perceived and conceptualized IPE through exposure to IPE activities during their clinical education rotation (Salazar, 2017). The students participated in several interprofessional service activities with other healthcare-profession students at a university hospital. The qualitative study identified four main themes from the student interviews, student clinical journals, and student learning journals: (a) hierarchal environment, (b) mutual respect, (c) forming and maintaining an identity, and (d) sharing content knowledge. While professional hierarchy was initially identified as a barrier, it was noticed that increased interprofessional exposure contributed to the removal of this barrier as the laboratory science students were given opportunities to increase their contribution to the IPE activities. Student interviews and journal entries indicate that the laboratory science students perceived a lack of respect from the other IPE participants who were also students in other healthcare-professional programs. This lack of respect, presumably, was attributed to a lack of knowledge that these participants had about medical laboratory professionals. The laboratory students also indicated that the other participants did not seem to recognize the laboratory profession as having a contributing role on a healthcare team. The study indicates that this perception was also reduced as the IPE activities progressed. The laboratory students also described how surprised the other healthcare-profession students were at their level of knowledge. The sharing of content
knowledge in the IPE activity provided self-confidence and gratification for the laboratory students and assisted in the laboratory profession gaining acceptance as having a useful place on a healthcare team. Despite its small sample size, the study conducted by Salazar (2017) confirms that misconceptions about the laboratory profession and lack of awareness about what laboratory professionals can contribute can be a barrier that prevents inclusion of these professionals on interprofessional teams.

Since 2011, Northern Illinois University (NIU) has hosted an annual interdisciplinary case study event designed to discuss issues related to providing quality healthcare to patients (Isabel & Morris, 2015; NIU College of Health and Human Sciences, 2019). The event is grounded in the four competency domains established by the IPEC: values/ethics, roles/responsibilities, interprofessional communication, and teams/teamwork (Interprofessional Education Collaborative, 2011). Students and faculty from audiology, counseling, dietetics, medical laboratory science, nursing, physical therapy, rehabilitation counseling, and speech-language pathology are invited to attend. In one published account of the event, Morris, Vanetten-Kahl, and Prange (2017) described 180 students and 20 faculty attendees seated in teams of seven to eight per table for small-group discussions. Each team included at least one member from each of the health professions; however, limited numbers of rehabilitation counseling and medical laboratory science attendees resulted in only one or the other of these professions per group. In each of the 26 small groups, attendees from each discipline described their professional responsibilities, and the history of the patient case study was presented. Attendees from each health profession identified concerns regarding the patient’s case that reflected their scope of practice. Each group responded to the concerns in a team format, with individuals speaking their own thoughts and listening to what attendees from each discipline
had to contribute. When the event concluded, 20 (six students and fourteen faculty) of the 26 small-group table facilitators responded to a survey. One survey question asked how their competency level to maintain a climate of mutual respect and shared values changed after working with individuals from other professions. Addressing the interprofessional competency domain of values/ethics, 70% (n = 14) indicated that they felt more competent about working with practitioners from other health professions (Morris, Vanetten-Kahl, & Prange, 2017). The attendees were asked to explain their rating, and these comments resulted:

- “I felt that I learned so much more about other professions and how we can collaborate when working with an individual.”
- “It was interesting to get more detail about other disciplines.”
- “I gained substantial understanding of the dietetics and MLS [medical laboratory science] groups.”

Results for the second interprofessional competency domain, roles/responsibilities, were similar in that 60% (n = 12) indicated that attendees felt more competent about using the knowledge of one’s own role and those of other health professionals to appropriately assess and address patient and population needs. Again, the attendees were asked to explain their rating, and the following comments resulted:

- “There is a lot of information that goes into other professions, and one event in my opinion is not enough to become truly acquainted with these disciplines although the event provided a great introduction to interdisciplinary services.”
- “The panel discussion really had a lot of information that showed the distinction between professions in terms of roles. However, I can also see how when working
with an individual who has an injury or a disability, they can benefit when seeing
different health professionals.”

For the competency domain of teams/teamwork, 50% of the attendees felt that their competency increased, and one respondent commented that h/she “got to connect with other students in other programs and learn first-hand how their services contribute to the care of the patient” (Morris et al., 2017, Table 4). The majority of the attendees indicated that they had no change in competency for the domain of interprofessional communication, and the researchers attributed this to the fact that communication skills are already an important element for each of the healthcare professions. Morris et al. (2017) noted that while the collected responses of the post-event survey were not coded to identify student (n = 6) vs. faculty (n = 14) attendee responses, more than six reported that they felt their competency increased in two of the domains, which indicates that the event provided faculty the opportunity to improve their interprofessional competencies. Thus, the researchers highlighted the value of engaging in IPE activities throughout one’s career (Morris et al., 2017).

A poster submitted to the 2020 Illinois Speech Language Hearing Association Convention highlighted NIU’s annual interdisciplinary case study event (Sandoval & Morris, 2020). This event had 223 student attendees, a 124% increase from the 2017 event. Though the exact number of medical laboratory science students was not published for the 2017 event, the researchers suggested there were approximately six to eight laboratory science students that year based on the descriptions of how the groups were formed. The 2020 event had 26 medical laboratory science students participate—again, an increase from the 2017 event. Responses were coded into thematic categories, and several were similar to those reported in 2017 (Sandoval & Morris, 2020):
• Increased knowledge of discipline scopes of practice
• Increased appreciation of interdisciplinary approach and collaboration
• Increased knowledge of discipline-specific terminology
• Improved confidence to work with other professionals

Of note, the attendees indicated ways they would apply to their career the knowledge gained from the event. The responses included a desire to collaborate with other professionals and also a gain in confidence and knowledge about when and to whom a patient should be referred. The researchers indicated that a limitation to the 2020 event was the inability to determine whether such interprofessional events have long-term effects; thus, a longitudinal study is needed to collect this data.

Interprofessional Collaboration and Practice

Though not as prevalent as in other health professions, there is evidence of IPCP initiatives involving laboratory professionals. In 2016, the University of Kansas Medical Center (KUMC) developed the Foundations of Interprofessional Collaboration (FIPCP) program that utilizes the communication tools from TeamSTEPPS in concordance with the interprofessional competencies described by the IPEC (Agency for Healthcare Research & Quality, 2014; Jernigan et al., 2016). Laboratory science students were included in this program that has an overarching goal for participants to increase their knowledge of other professions, define roles on healthcare teams, and use TeamSTEPPS tools to communicate between healthcare team members. Information regarding this IPCP was shared with laboratory professionals in a poster session at the 2016 ASCLS Annual Meeting in Philadelphia, PA (Hodgkins, 2016). This pilot program consisted of two half-day events where Day 1, the Level 1 foundation program (n =
636 attendees, including 12 laboratory science students, involved an introduction to the TeamSTEPPS terminology and teamwork strategies, and on Day 2, the Level 2 foundational program (n = 424 attendees, including 10 laboratory science students), attendees applied these new skills in case studies and live-action role playing. Surveys measuring overall event satisfaction and participant ratings about the following categorized statements were completed by attendees at the end of each day’s activities:

- Values & Ethics: This activity enhanced my appreciation of the shared values of interprofessional teamwork
- Roles & Responsibilities: This learning activity increased my knowledge of another profession/s
- Communication: This activity improved my knowledge and/or skills in interprofessional communication
- Teams & Teamwork: Learning with students from other professions was valuable

Results show that after Day 2, satisfaction ratings decreased for most professions, including laboratory science students. The researchers attributed these results to Day 2 being more clinical case based; the students at this stage in their education may not have felt confident about their knowledge to adequately contribute and/or may not yet have understood their role in contributing to a healthcare team (Hodgkins, 2016). At the end of the two days, several attendees commented about the laboratory science students and indicated a new awareness for the profession:

- “I learned that there was a laboratory science degree program at [KUMC]. I didn’t know what education was required for such a role.”
• “I never considered the people in the laboratory as being a part of the team. I can see the value it would have to call down there about certain tests and make sure the right one is getting ordered.”

• “Learned a lot about the CLS program and how they can help in clinical care, not just lab work.”

The researchers suggested that while it may be difficult for laboratory science students to adequately represent their knowledge and capability for clinical case studies at such an early stage in their career, increasing visibility and awareness of the laboratory profession at the academic level is crucial to assist in the integration of medical laboratory professionals into interprofessional healthcare teams in the clinical workplace (Hodgkins, 2016).

S. D. Jernigan et al. (2018) reported on KUMC’s learner outcomes from the second full year of the Level 1 foundational program. Seven hundred fifteen participants from 13 health professions participated, 18 of whom were clinical laboratory science students (Jernigan et al., 2018). Results were similar to the pilot studies: 95.4% of the participants who answered the post-event survey (n = 558) indicated that the learning activity increased their knowledge of another profession. Unfortunately, no individual statistics or responses were provided that were directed at, about, or attributed to the laboratory science students; however, the researchers stated in their conclusions that outcomes from the Level 1 program may serve as a useful starting point for foundational IPE programs, especially if subsequent IPE programs are available to reaffirm and sustain collaborative behavior (Jernigan et al., 2018).

In the fall of 2016, KUMC launched a Level 3 simulation IPE to practice the TeamSTEPPS communication tools and IPEC competencies learned in the Levels 1 and 2 foundational programs. The Level 3 simulation included only six health professions: clinical
laboratory science, health administration, nursing, respiratory therapy, medicine, and pharmacy (Hodgkins et al., 2020). It is significant that clinical laboratory science students were included at KUMC because 13 health professions were involved in the Levels 1 and 2 programs. A study that evaluated IPE in American medical schools reports that 93% of collaboration activities in the schools that reported (n = 14) involved primarily nursing and medicine discipline (West et al., 2016). Pharmacy was involved with IPE at 57% of the schools and a category of Other, comprised of multiple disciplines (i.e., occupational therapy, radiation therapy, physical therapy, and several others), participated in IPE at 64% of the schools. Clinical laboratory science was not mentioned or included in the Other category as participating in IPE despite the significance and necessity of laboratory results in daily patient care. The KUMC Level 3 simulation IPE provided a real-life environment for attendees to demonstrate their communication and teamwork skills acquired in the Levels 1 and 2 programs. Satisfaction survey results from the attendees post-activity reflected 100% satisfaction from the nursing students, 92.3% satisfaction from both the clinical laboratory science and pharmacy students, 88.9% from the respiration therapy students, 85.7% from the health administration students, and 84.5% from the medicine students (Hodgkins et al., 2020). The KUMC Level 3 event demonstrated that simulation IPE can be successful with disciplines outside of nursing and medicine. Expanding simulation IPE to include healthcare practitioners not commonly found at a patient’s bedside expands professional awareness and understanding of additional healthcare roles and contributions. This simultaneously adds diversity to the team composition and provides more comprehensive care.

In addition to campus-wide interprofessional events such as the one previously described, there have also been recent conference presentations that describe interprofessional
process improvements involving laboratory professionals as key team members. Dr. Eugenio Zabaleta presented results of a project involving collaboration between nursing and laboratory professionals at the ASCLS Annual Meeting in 2017. This project described how nursing often serves as a bridge between the laboratory and practitioners and that development of a collaborative and healthy relationship between nursing staff and laboratory professionals provides better patient care. Dr. Zabaleta indicated that his process improvements between nursing and laboratory professionals all had the same foundational components (Zabaleta, 2017a):

- Order support—consulting to ensure the correct test is ordered the first time
- Education—providing enough background information to understand the problem(s) and proposed solution(s)
- Patient advocacy—ordering the right test the first time prevents overutilization of unnecessary tests and patient distress (mental, physical, or financial)
- Interpretation—providing clarity and understanding about the results and the significance of a critical result
- Infection-control initiatives—immediately notifying the correct personnel in order to prevent the spread of infection whenever critical results indicate high risks of infecting other people

Results of the project with nurses reveal how teamwork strengthens the healthcare system to provide higher quality, more efficient care and increased patient safety while containing costs (Zabaleta, 2017a). Dr. Zabaleta made another presentation at the American Association for Clinical Chemistry annual meeting in 2017; he described how improved laboratory test utilization can improve outcomes and reduce costs. He highlighted that laboratory professionals
are the lab test experts and that fostering collaborative relationships between practitioners and laboratory champions led to positive results in improved test utilization, increased patient safety, and reduced inappropriate laboratory testing and diagnostic costs (Zabaleta, 2017b). Dr. Zabaleta’s presentations also affirm that laboratory professionals add value to interprofessional healthcare teams and can create positive impacts on patient care if given the opportunity to participate.

Institute for Quality in Laboratory Medicine

To date, there does not appear to be any published research that has investigated perceptions of medical laboratory professionals held by other healthcare practitioners. However, in 2006, the Institute for Quality in Laboratory Medicine (IQLM) published a series of articles intended to highlight issues and controversial topics within the field of laboratory diagnostics that may have multiple points of view. In the first article, the IQLM asked a physician to list the top five items that irritate him about the laboratory (Butterly & Horowitz, 2006). The physician listed the following topics:

- Failure to provide useful information to help interpret a test result
- Lack of standardized reference ranges and units of measures for tests
- Development of laboratory policies that interfere with patient care
- Conduction of the wrong test
- Miscellaneous items consisting of changes in reference range, assay methodology, or specimen requirements without notification or explanation; turnaround times that are perceived as too slow; and failure to recognize test orders that require immediate attention
A pathologist was chosen to represent the laboratory and respond to the physician’s concerns. The pathologist’s title and biography indicated that he was a consulting pathologist and educator, but not directly working in a clinical laboratory. The results from the discussion are enlightening, and a reader can discern some inadvertent misconceptions due to a lack of communication. While this article is an excellent example of the type of dialogue that should be occurring between physicians and laboratory professionals, the results would have contributed more to the literature if the responses to the physician’s concerns had been from a MLS directly employed in a clinical laboratory instead of a pathologist.

Another article in the series by the IQLM addresses relationship struggles between laboratory and nursing professionals that affect the quality of care. This article was initiated by a laboratory professional and itemizes five areas of concern that laboratorians have in working with nursing staff (Kurec & Wyche, 2006). A laboratory professional described his concerns, and a nursing professional was provided the opportunity to reply. The laboratory professional had a Master of Science degree in laboratory medicine and certification in laboratory management through the ASCP. His education and background provided added value for the article because he was a credentialed laboratory professional. The nursing portion was written by a Registered Nurse with a Master of Science in Nursing degree who was employed as a nursing department head at a hospital. The article addresses topics such as laboratory results, technical concerns, salaries, professionalism, poor turnaround times, response time, and the inability to co-ordinate multiple tests for the same patient, and the IQLM asked both professionals to propose solutions to the identified issues. Solutions expressed by both professionals include improved communication, improved recognition of skills and expertise, and respect for each other’s profession (Kurec & Wyche, 2006). The proposed solutions were
realistic and echoed topics commonly covered in interprofessional core competencies (Canadian Interprofessional Health Collaborative, 2010; Interprofessional Education Collaborative, 2016). These two articles from the IQLM address misunderstandings affiliated with the laboratory, but not explicitly about perceptions regarding laboratory professionals.
CHAPTER 3

METHODS AND DESIGN

This qualitative study sought to discover perceptions healthcare practitioners have regarding medical laboratory professionals, the factors that influence those perceptions, and how those perceptions change after working with a DCLS. Qualitative research involves actual conversations related to first-hand experiences in order to obtain a better understanding of an individual’s experiences, perceptions, attitudes, and beliefs, as well as the meaning the individual attributes to those experiences and perceptions. Most importantly, qualitative methods strive to understand those experiences and perceptions within each participant’s unique set of circumstances (Creswell, 2014). This methodology is appropriate for this study because each healthcare practitioner (participant) is faced with a unique situation when providing personalized care to their patients. Specifically, they must scrutinize the details of each patient’s case when deciding the appropriate diagnostic testing to order. Yin (2016) asserted that qualitative research embraces the contextual conditions of a person’s life, which include the institutional, social, cultural, and environmental conditions of the participant, that are all potentially instrumental in the diagnostic decision-making process of patient care. Using a retrospective pre-post evaluation approach, the overarching research questions for this study are as follows:

- What perceptions do ordering healthcare practitioners have about medical laboratory professionals?
- What factors influence those perceptions?

- In working with a DCLS, in what ways, if any, do healthcare practitioner perceptions change?

This research used thematic content analysis as described by Green and Thorogood (2018) as an exploratory approach to learn what practitioners think about laboratory professionals as a resource for the diagnostic process and whether those perceptions change after working with a DCLS. Because there is currently only one DCLS practicing in the United States, this area of research has not yet been explored. According to Creswell (2014), “If a concept or phenomenon needs to be explored and understood because little research has been done on it, then it merits a qualitative approach” (p. 20). Thematic content analysis is a useful approach for presenting key elements of participants’ accounts (Green & Thorogood, 2018).

Ethical Considerations

Prior to initiating this study, I obtained approval from the Institutional Review Board (IRB) through NIU, recorded as IRB Protocol #HS20-007 (Appendix A). The intent of this research was to interview practitioners who have worked with a DCLS. The only practicing DCLS at the time was employed at the Augusta University Medical Center (AUMC); therefore, the IRB at Augusta University (AU) was contacted to determine whether additional paperwork or approval was necessary to conduct this study. An IRB application containing the approved IRB paperwork from NIU was submitted through www.IRBnet.org as instructed by AU’s IRB coordinator. After review of the materials submitted, AU determined that because their employee, Dr. Brandy Gunsolus, was only assisting with recruitment and that an AUMC employee was not engaged in the research, additional IRB approval was not necessary from
AU. NIU’s IRB was notified of this decision, and I was advised that the project could commence. All participants were required to review and sign consent forms prior to participating in this study. The informed consent document (Appendix B) included an explanation of a participant’s role in the research and their rights with respect to the study. The consent document informed the participants that they had the right to withdraw from this study at any time but that I could retain any data up to the time of withdrawal. The participants were also asked to sign a non-disclosure document (confidentiality agreement; Appendix C) to protect the validity of the data by dissuading them from discussing aspects of this study with other potential participants or with other colleagues at the AUMC. I emailed each participant copies of the consent form and confidentially agreement, although both forms were also available as an online option through NIU’s Qualtrics software as a matter of convenience for the participants. These signed forms were collected from the participants prior to the start of the interviews. In order to reduce the possibility of breach of confidentiality, participant identifiers were not saved in the research data file. Instead, codes were assigned as file names, and pseudonyms were given to all interviewees to protect participant privacy.

Recruitment

Purposive sampling was used and identified participants who were best able to answer the research questions (Creswell, 2014). The target participants included a sampling of practitioners responsible for ordering diagnostic tests who had also collaborated with a DCLS. There was no discrimination factor of age, gender, years of practice, or the discipline/specialty (i.e., primary care, nurse practitioner, resident, attending physician, chiropractor, etc.) of the participants.
Recruitment of participants was done with the assistance of Dr. Brandy Gunsolus, the practicing DCLS at the AUMC. She reached out to colleagues via email using the recruitment letter approved by NIU’s IRB (Appendix D). The practitioners who expressed interest in participating replied to Dr. Gunsolus’s email, which was then forwarded to me. Next, I contacted the participants via email, reconfirmed their interest in participating, and then corresponded as needed to determine an interview date and time. Thirteen practitioners initially responded indicating interest in participating. One withdrew due to time constraints. Another completed the online consent and confidentiality forms but did not respond to scheduling emails despite multiple attempts. One participant responded to Dr. Gunsolus that s/he was interested but not available until late October. That participant also did not respond to multiple outreach emails sent at the beginning of November to reconfirm their interest in participating. Thus, I successfully recruited 10 participants for this study.

Participant Description

Table 1 displays the demographic information collected from the participants, listed alphabetically by specialty. This data assisted in determining whether similar results were generated by participants with similar demographics. Despite the purposive sampling of 10 practitioners, all participants held Doctor of Medicine degrees, and the group reflected adequate diversity when comparing years of practice, current level of practice, degree(s) obtained, and the perspective they represent given their role at the AUMC.
Table 1

Demographics of Study Population

<table>
<thead>
<tr>
<th>Pseudonym</th>
<th>Perspective</th>
<th>Gender</th>
<th>Age range</th>
<th>Specialty</th>
<th>Degree</th>
<th>Years in clinical</th>
<th>Level of practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sue</td>
<td>Administrator</td>
<td>F</td>
<td>36-46</td>
<td>Cardiology</td>
<td>MD</td>
<td>6-10</td>
<td>Attending</td>
</tr>
<tr>
<td>Chris</td>
<td>Administrator</td>
<td>M</td>
<td>47-57</td>
<td>Emergency medicine</td>
<td>MD, MBA, FACEP</td>
<td>16-20</td>
<td>Attending</td>
</tr>
<tr>
<td>Ken</td>
<td>Faculty</td>
<td>M</td>
<td>47-57</td>
<td>Family practice</td>
<td>MD</td>
<td>16-20</td>
<td>Attending</td>
</tr>
<tr>
<td>Will</td>
<td>Faculty, administrator</td>
<td>M</td>
<td>47-57</td>
<td>Family practice</td>
<td>MD, MBA, FAAFP</td>
<td>21-25</td>
<td>Attending</td>
</tr>
<tr>
<td>Ann</td>
<td>Resident</td>
<td>F</td>
<td>25-35</td>
<td>Family practice</td>
<td>MD</td>
<td>1-5</td>
<td>Resident</td>
</tr>
<tr>
<td>Ben</td>
<td>Resident</td>
<td>M</td>
<td>25-35</td>
<td>Family practice</td>
<td>MD</td>
<td>1-5</td>
<td>Resident</td>
</tr>
<tr>
<td>Sarah</td>
<td>Resident</td>
<td>F</td>
<td>25-35</td>
<td>Family practice</td>
<td>MD</td>
<td>1-5</td>
<td>Resident</td>
</tr>
<tr>
<td>Sam</td>
<td>Pathologist</td>
<td>M</td>
<td>58-68</td>
<td>Pathology</td>
<td>MD, PhD, MBA, FCAP, ≥31</td>
<td>231</td>
<td>Attending</td>
</tr>
<tr>
<td>Brad</td>
<td>Pathologist</td>
<td>M</td>
<td>47-57</td>
<td>Pathology</td>
<td>MD</td>
<td>6-10</td>
<td>Attending</td>
</tr>
<tr>
<td>John</td>
<td>Faculty</td>
<td>M</td>
<td>25-35</td>
<td>Pulmonary and critical care</td>
<td>MD</td>
<td>1-5</td>
<td>Attending</td>
</tr>
</tbody>
</table>

Data Collection

Participants were given a choice to have their interview conducted in person or via telephone or teleconference (using AdobeConnect/Zoom/Skype/WebEx), but all participants chose to be interviewed via telephone. Two digital audio recorders were used to capture data during the interviews, with one used as a second means for collecting data in case the primary device malfunctioned. The participants were informed that their completed consent and confidentiality forms were received; however, verbal consent to be recorded was reaffirmed at the start of each interview. The semistructured interview guide (Appendix E) consisted of a set
of predetermined, open-ended questions guided by the research questions which allowed me to follow threads that occurred within the dialogue (Kvale, 2007). Any field notes I took during the interviews were converted into more detailed notes immediately after each interview to prevent loss of meaning (Yin, 2016). The predetermined interview questions were reviewed by my dissertation committee to ensure neutrality and focus regarding the primary goals of the research (Creswell, 2014). All recordings, transcriptions, field notes, and analytic memos were maintained on an encrypted flash drive in a secure location. The data will be destroyed after 5 years.

Data Analysis

In qualitative studies, the investigator essentially serves as the research instrument (Yin, 2016). Interviews were transcribed verbatim by a professional transcription company immediately after each interview was concluded. Turnaround time for the completed transcriptions ranged from 12 to 24 hours depending on the day and time of submission. I reviewed each transcript against the original recording for accuracy. The revised transcripts were completely deidentified of all information other than what was disclosed during the actual interview.

In-depth data analysis consisted of a system of open coding to capture the meaning of what the participants described. Coding of the data was completed by myself and one additional researcher who is a doctoral student at Concordia University. The graduate student completed all qualitative research methods courses required by her doctoral program, and her participation as a secondary coder was approved by NIU’s IRB. For the primary analysis and the first cycle of coding, we used the splitting technique, which is defined as line-by-line
coding of a transcript (Saldaña, 2016). We applied a combination of structural and holistic coding as described by Saldaña (2016) to create an inventory of topics and to identify overall concepts and ideas suggested by the data; 88 codes were identified. Several rounds of reviewing and coding were conducted independently by each coder. After independent coding was completed, we met in person multiple times to assess the appropriateness of the labeled data. With each review, codes were cross-checked and revised until consensus and intercoder agreement were developed. An example of how we applied structural coding to a research question is depicted in Figure 1.

Figure 1. Structural Coding Example
A second phase of analysis was completed using thematic content analysis, as described by Green and Thorogood (2018), to look for categories, themes, and patterns that emerged from the first cycle of coding. As a method to organize the data and assist in identifying themes, we employed pattern coding, which is a second-cycle coding method (Saldaña, 2016). Pattern codes are explanatory or inferential codes that help identify an emergent theme. This process draws on the first-cycle codes and result in a more meaningful unit of analysis. We worked collaboratively over multiple sessions to identify the themes through patterns that arose from the data. Figure 2 depicts how several first-cycle codes led to the identification of a major theme in the data.

Figure 2. Pattern Coding Example
QSR NVivo 12 Plus software was utilized during the second phase of analysis to assist with the processing of categories, themes, and patterns through the use of word searches and queries. The transcripts in the software were coded using the lumping method, which allowed for larger units of data, such as full paragraphs, to be coded as a whole (Saldaña, 2016). This was a benefit when extracting data because the context of a participant’s meaning was not lost. Additionally, it allowed us to visualize the presence of multiple inferences within the same text as described by a participant. Figure 3 shows the visual aid provided by NVivo to identify a passage with multiple inferences. For this example, three themes identified by this participant’s comments were targeting clinician needs, positive perception of DCLS, and accessibility. A member of the dissertation committee reviewed the collective results of both coders. This multistep process of analyzing, reviewing, and organizing the data provided rich and meaningful results pertinent to the research questions of this study.

Doctor:
We all have very, very. I think I speak for everybody in our residency program, we all have very warm feelings towards what she does. Because she makes herself super available, and the way that she lectures and explains this to us, it’s like... what she’s explaining makes us feel like more confident physicians, which is what we’re all wanting to do, especially as interns. So it’s amazing. And the topics that she would hit on were high yield things, and sometimes it was things that we had no idea about and it was mind-blowing. Or sometimes it was things that we had questions about, but she would already know the most common questions, I guess, or obstacles when ordering certain diagnostics or laboratory tests. So she’s been great from the get go.

Doctor:
And every time I’ve messaged her, she’s been super prompt and everything. If I ever message her about something on the inpatient or outpatient side, so very accessible, very knowledgeable, and then makes me just overall feel more confident when I’m ordering certain tests. So that’s been great to be exposed to from the beginning of residency.

Figure 3. NVivo Coding Example
Limitations

Qualitative inquiry lends itself to a human factor, which serves as both a strength and a weakness (Patton, 2014). With me serving as the main instrument for this study, there was a risk of researcher bias through my data collection and reporting (Maxwell, 2013). Measures were taken to reduce this bias by including a second coder for the data analysis. The second coder had no affiliation with a healthcare profession nor had any preconceived knowledge about the Doctor of Clinical Laboratory Science degree. Additionally, qualitative approaches cannot be generalized to larger populations with the same degree of certainty as quantitative research because findings are not tested to determine whether they are statistically significant or due to chance (Ochieng, 2009).

Assumptions

A basic assumption of this study was that the participants presented their honest perceptions in a way that accurately reflected their personal beliefs rather than what they thought I wanted or expected. Qualitative studies lend themselves to a risk of social desirability bias. It may be a personality trait of some participants to answer questions in a way that may be viewed as more socially acceptable rather than what their true answer would be (Rubin, 2009).

A second assumption was that the participants identified and described their perceptions of medical laboratory professionals with some degree of accuracy despite any passage of time and exposure to new experiences through working with a DCLS. This method of retrospective pre-/post-evaluation has been shown to be successful in the design of health studies (Malagon-Maldonado, 2016).
Researcher Role

I have worked in the field of medical laboratory science for 15 years, have served as faculty for laboratory science programs for the past nine years, and am a master trainer of the TeamSTEPPS program. Because of these experiences, I may be considered an insider with respect to this study. I understand technical language pertaining to the laboratory tests which the participants discussed and have previously been exposed to general frustrations that practitioners have experienced regarding test ordering and result interpretation. There was no conflict of interest regarding participants because none of them are affiliated with the healthcare system where I am employed. Additionally, I am not familiar with the participating DCLS on a personal level. There have only been formal conversations, primarily through e-mail, in order to set up this research.

I understand that while participants may describe negative experiences in dealing with a medical laboratory, the overarching goal of this research was to understand the context, underlying causes, and environmental details pertaining to those experiences. Despite my career experiences, I had no contact with the participants prior to the interviews (other than a phone or e-mail conversation to set up the interview), and I have not worked with a DCLS in the clinical workplace.

Summary

The data obtained from this study provide valuable insight from the perspective of healthcare practitioners on the efficacy of the new DCLS team member and how perceptions change after collaborating with a DCLS in clinical practice. Because there was only one
practicing DCLS in the nation at the time of this study, the participant sampling was purposive
and limited. It is acknowledged that this research cannot be generalized to all clinical facilities
or healthcare practitioners; however, the information gathered may serve as a foundation for
additional research in this area.
The purpose of this qualitative study was to discover what perceptions healthcare practitioners have regarding medical laboratory professionals, the factors that influence those perceptions, and how those perceptions change after working with a DCLS. Descriptive responses from the participants provided answers to the research questions and also gave insight about the efficacy of the new DCLS professional employed in a teaching hospital. The primary data analysis used first-cycle coding methods described by Saldaña (2016) that required multiple reviews until a consensus was developed between myself and a second coder. This first phase yielded 88 codes. The second phase of analysis used thematic analysis as described by Green and Thorogood (2018) in which we identified four main themes that were considered significant to the study. This chapter is organized into subheadings for each of the themes presented as evidence that supports the research questions. Figure 4 is a summary of the four main themes identified.
To facilitate the understanding of the themes and how they were derived from the data, this chapter is organized into two main sections. The first section identifies perceptions the participants had about medical laboratory professionals based on their experiences prior to working with a DCLS. Two of the factors that influenced perceptions, knowledge of the laboratory profession and a participant’s desire to learn, were simultaneously discovered through the participants’ descriptions of their lived encounters.

The second section focuses on the participants’ experiences after working with a DCLS and how their perceptions of medical laboratory professionals changed based on how the DCLS addressed factors that influence perceptions. The second pair of factors, accessibility and rapport, were recognized as themes during the post-DCLS data analysis and are discussed in the second section of this chapter.

Figure 4. Themes Identified as Factors Contributing to Perceptions of Laboratory Professionals

<table>
<thead>
<tr>
<th>Factors Contributing to Perceptions of Laboratory Professionals Pre-DCLS Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Knowledge regarding the laboratory profession as a whole; education and</td>
</tr>
<tr>
<td>credentials</td>
</tr>
<tr>
<td>a. Role clarity of medical laboratory professionals (awareness of the</td>
</tr>
<tr>
<td>knowledge and skills laboratory professionals possess and what they</td>
</tr>
<tr>
<td>can contribute to patient care or how they can assist practitioners)</td>
</tr>
<tr>
<td>b. Knowing how to connect with the best person in the lab to get the</td>
</tr>
<tr>
<td>desired answers (lab hierarchy/structure)</td>
</tr>
<tr>
<td>2. Desire to learn and build confidence as a practitioner</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Factors Contributing to Perceptions of Laboratory Professionals Post-DCLS Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Rapport with a laboratory professional</td>
</tr>
<tr>
<td>a. Repeated positive experiences</td>
</tr>
<tr>
<td>b. Relationship development (passive vs. proactive)</td>
</tr>
<tr>
<td>c. Interfacing at the practitioner level</td>
</tr>
<tr>
<td>d. Targeting practitioner needs</td>
</tr>
<tr>
<td>4. Accessibility of a laboratory professional for consult</td>
</tr>
<tr>
<td>e. Physical Proximity</td>
</tr>
<tr>
<td>f. Visibility</td>
</tr>
</tbody>
</table>

To facilitate the understanding of the themes and how they were derived from the data, this chapter is organized into two main sections. The first section identifies perceptions the participants had about medical laboratory professionals based on their experiences prior to working with a DCLS. Two of the factors that influenced perceptions, knowledge of the laboratory profession and a participant’s desire to learn, were simultaneously discovered through the participants’ descriptions of their lived encounters.

The second section focuses on the participants’ experiences after working with a DCLS and how their perceptions of medical laboratory professionals changed based on how the DCLS addressed factors that influence perceptions. The second pair of factors, accessibility and rapport, were recognized as themes during the post-DCLS data analysis and are discussed in the second section of this chapter.
Section 1: Prior to Working with a DCLS: Factors Influencing Perceptions

Knowledge of the Laboratory Profession

Perceptions are the products of a person’s values, beliefs, and experiences which reflect their understanding of something (Pickens, 2005). Healthcare practitioners rely daily on the results of laboratory testing in order to guide treatment for their patients. Despite the frequent use of the laboratory test as a diagnostic tool, the data from the interviews indicates that some participants may not have given a lot of thought to the processes that occur between ordering a test and receiving the results. This is evident in a response from Chris, who is an attending physician and a hospital administrator. He discussed residents in training and their tendency to order lab tests without thinking of what may be happening behind the scenes:

They go over to the keyboard, they hit a few keystrokes, and magically an hour or two later a result pops up, and they go, well that was great, that was easy, and let me order another. They don't, they have no clue that there was a nurse that was dripping sweat or a phlebotomist that was struggling to find a vein on this patient, had to stick them four times, or whatever it is. Or that the transport cost or the reagent reordering or the lab tech that was, you know, doing all of these things to process the specimen and review the results. And then in some cases, even having to manually enter it into the computer, and they're just oblivious to all of that.

If healthcare practitioners are not giving much thought to the details associated with laboratory testing, they are essentially overlooking a core component of the diagnostic process. The Committee on Diagnostic Error in Healthcare developed a conceptual model (Figure 5) to encompass all of the components in the diagnostic process (National Academies of Sciences, 2015). The model recognizes that medical laboratory professionals play a central role as they aid healthcare practitioners in diagnosing and monitoring patients. The answers from the participants suggested that an understanding about contributions and daily responsibilities,
defined as role clarity, appeared to be a factor in practitioners’ perceptions of medical laboratory professionals.

Figure 5. The Committee on Diagnostic Error in Healthcare’s Conceptualization of the Diagnostic Process (National Academies of Sciences, 2015)

A lack of role clarity was substantiated when the participants were asked how familiar they were with the laboratory profession. The 10 participants reflected a variety of perspectives for this study, such as faculty members, hospital administrators, and pathologists (refer to Table 1). The participants also encompassed five medical specialties and ranged from first-year residents to veteran physicians. Of note, pathologists generally have more contact with the laboratory than other healthcare professionals. They are responsible for overseeing the testing that is performed in the lab; therefore, I expected their knowledge of the laboratory profession
to be higher in comparison to the general practitioners. When I asked the participants how familiar they were with the professionals responsible for the diagnostic laboratory testing, the residents (Ann, Ben, and Sarah), who had a minimal amount of working experience as compared to their colleagues, seemed to know the least:

Ann: Honestly, not very…. if I have a question, or if they have a question, we'll contact each other. But I really don't honestly have much information about the training that they've had, the education that they've had that's been required, things like that. That I'm definitely ignorant to.

Ben: I know they have an important job. I just don't know what exactly they do in their day-to-day operations.

Sarah: I’m not very familiar with them.

Even the attending physicians admitted to knowing very little about the laboratory profession.

John: Very, very little. I know almost zero.

Ken: Okay, broadly speaking, certainly I can't say I've had a lot of personal experience other than, you know, certainly in med school, I would go to the phlebotomy lab when we had downtime and learn kind of the draw process, which is probably, kind of…that first frontline to getting into the lab, so to speak. But most of my understanding or experience with what they would do on a day-to-day basis from the folks who are working in the lab would have been, I would assume to have been, fairly equivalent to the things that I would have done in undergrad as …. you know, doing research…. I think I have a pretty good appreciation of the different, generally speaking, of the different roles folks have. I think sometimes from the clinician's standpoint, it's occasionally a little harder for me to think about: okay, I got to call this section of the lab versus that section of the lab.

Sue: I would say probably really moderately low to moderately, actually. Because even I guess as far as, like, a lab tech versus the different roles in there, I'm actually not sure what certificate, education, and experience you need to fill different roles in the lab. So probably not that much, actually.
As for the pathologists’ responses, as I expected and indicated, they were more knowledgeable about the laboratory profession. Brad even mentioned his peripheral participation in the AUMC’s clinical laboratory science (CLS) program:

I guess it varies to some extent in different parts of the laboratory. I’m most in contact with the professionals in the blood bank and so I know their credentials quite well. It’s a little bit of a learning area when I go for other parts, but I’ve never been disappointed. Whenever I go and talk directly to someone in any part of the lab, like I go frequently to hematology, and just anyone, any technologist at the bench has always been very useful and helpful, immunology the same. I do involve myself a little bit or at least peripherally in our CLS program and so I know from sitting on meetings there that I do know some of the needs and credentials of laboratory professionals that way.

The participants’ lack of role clarity and familiarity with the laboratory profession was echoed in the deficiency of knowledge about the education requirements needed to work in the lab. When I posed this question to them, several participants hesitated before answering. The reason for their pause was unclear. I assured them that there was no right or wrong answer and that their response should be based solely on their experiences and interactions with laboratory professionals. After the reassurance, I received the following responses:

Ben: I would expect undergraduate and definitely some kind of postgraduate research or a post-graduate [inaudible], some kind of certification as well as a high school diploma. But actually directing and running the lab, I expect some undergraduate, maybe like a PhD or some kind of graduate study to know what’s going on.

Brad: I would expect initially a fairly good fundamental knowledge in at least in the specialty that they’re primarily responsible for, but also hopefully a very good practical knowledge at the bench, and really there’s no substitute for experience seeing things as they happen and troubleshooting. So I guess the more senior laboratory professionals are, definitely I would say, often a better resource than someone who’s fresh from schooling. I see them in the master’s degree level most primarily. Even if they don’t have a master’s degree but by degree of experience, I see them at that level.

Ken: So just in general, I mean I couldn’t tell you what the specific organizational bodies are, but I would expect that individuals employed in those environments would have hopefully more than the minimum educational requirements that would be required to do the job. But also the license, of course the licensing, you probably have
to do that, but whatever professional credentials that would be offered by their professional societies, just so that there's an understanding or expectation that they've met at least the minimum standards to be proficient. Unfortunately, I just don't know the ins and outs in terms of the specifics. Obviously, I would expect that a cytotechnologist is going to have different credentialing requirements, educational requirements, and so on, than a person who's running some of the analytic machines versus someone who's doing more microbiology things. So I would certainly expect that within those individual domains that they would have specific credentials from their accrediting bodies, whatever they may be, which I do not know what they are.

Sarah: Well, I would expect them to have basic medical education. I think understanding basic medical illnesses, diagnosis, pharmacology, I think that's all very relevant to understanding lab testing, the appropriateness and when they're needed to be ordered. I mean, there's different levels. There's people that are in the lab that are solely techs that deal with samples, and I don't expect them to have as much education as someone who's going to be, per se, a DCLS that's going to have to go through residency and actually have to work with physicians and see and [in] what settings it's appropriate to order certain labs. So I guess there would be different levels as to what type of personnel would need to have different types of training.

Will: I think for most of them it's a bachelor's-level degree.

Many of the responses included the phrase “I would expect,” which suggests that participants honestly did not know what types of credentials or education requirements are necessary for working in the laboratory. Professional autonomy has allowed for each healthcare discipline to be responsible for its own educational and credentialing requirements. So I was not surprised that the participants could not provide confident and accurate responses. I recognize that it is not a requirement for one healthcare profession to have knowledge of another profession’s educational and training requirements; however, this lack of awareness may encourage unfounded opinions of another profession based on minimal experiences. Only one participant mentioned the probable need for licensing of laboratory professionals, which is a requirement in the state of Georgia, the location for this study. To be eligible for a license, laboratory personnel must have at least an associate degree with a minimum number of biology
and chemistry courses, plus be board certified by a professional society such as the ASCP or
the American Medical Technologists. Licensing of laboratory professionals is not a federal
regulation; rather, it is determined by each state. Currently, Georgia is one of 11 states that
require licensure of laboratory professionals.

The answers to the previous questions reveal that several of the participants exhibited
an awareness of different levels of laboratory hierarchy by using descriptions such as front-line
staff, bench technologists, supervisors, and senior lab professionals:

Brad: Whenever I have an immunology question, I’d go to the main director of
immunology. With the hematology question, I’d go to the supervisor in hematology.
Obviously, in transfusion medicine, I would go to some of the senior lab professionals
there.

Sam: Sometimes there are things that are beyond [the] expertise of the folks at the
bench level.

Sue: Sometimes the front-line staff are very helpful….

However, despite any intuition the participants had about different roles or professional levels
that exist in the laboratory, the fundamental lack of role clarity and knowledge regarding the
profession as a whole created challenges when participants contacted the laboratory for
assistance.

With the exception of the pathologists, all participants admitted they had had difficulty
ordering laboratory tests at one time or another, whether it was because they were not sure of
the best one to choose or they had trouble ordering it in the computer system. When I asked
how they addressed these difficulties, the participants identified five main approaches: use
online resources (specifically www.uptodate.com), call the lab, consult a colleague (i.e., senior
staff member or specialist), consult a professional society’s published guidelines (such as the
American Academy of Family Physicians), and use mental algorithms derived from experience. I inquired about their experiences contacting the laboratory and asked if they found laboratory professionals to be a helpful resource. Again, I received mixed answers. Some participants connected with laboratory professionals who were helpful, but others experienced challenges in obtaining answers to their questions.

Brad: Oh, absolutely yes…yeah, I definitely valued all the people that I… In the HLA lab, I would often seek counsel there, and I still do on occasion if there's a direct need in a specific area. But yeah, one of the things I realized fairly early on as a resident was what a resource the medical laboratory professionals are.

John: The first 7 to 12 times that I [called], I did have to get passed around from one number to another. Now I know them pretty well, so I just call down there and say, Hey, I need to talk to hematology, anatomic pathology, whoever it may be, and I get there pretty quickly. That was at first an issue, and I think that was mostly because I didn't even know who I was asking to speak to. This is my question, who do I talk to, and they're like, Hold on, let me pass that along. But once I figured out the general base of my questions, I know who to contact specifically.

Ken: Yeah, so usually if it was an issue, if I was in [the] clinic, I would just go to our techs that we have in our clinic, and they would be able to go through the Pack manual and typically answer the questions that I had at that point. That's usually where that information would be, if they didn't know it automatically, off the top of their head. And then I think the other times that I've had a need to communicate with them, I've always found them to be helpful. I mean, typically it comes up with doing follow-up testing on, say, an aberrant urine drug screen or something, so if I would call the tox lab, …I've always found them to be very responsive and very helpful.

Sam: Yeah, I do that on a regular basis. As I said, I am a laboratory person, I practice clinical pathology. I go to … I physically visit all the sections on a fairly regular basis, and if there is anything that seems out of whack, I'll go talk to them. Whenever we introduce a new test, change a method, or take out the test, I consult with the relevant supervisors. Oh man, they save my life, make my life so much easier…. Sometimes there are things that are beyond [the] expertise of the folks at the bench level.

Sarah: Most of the time, it was kind of difficult because since they're in the lab, they don’t want to give direct information on guiding physicians’ decision[s]. So it was kind of standoffish. In addition to that, sometimes my questions had to do with ordering in the system, and they didn't know how to place the order and couldn't really help me with that.
Sue: So I do think that depends. And this is just in general. I know that just like calling to just the micro lab or calling to the chemistry lab, sometimes the front-line staff are very helpful, other times they're very busy or they may really not understand the question that we're trying to ask.

Will: We would call others in the lab, but there was.... You would depend on who was working that day, and they had varying degrees of experience and knowledge to be able to help.

Of interest are Ken, who has laboratory professionals directly available to him in his clinic, and the pathologists Brad and Sam, who all described their experiences positively about laboratory professionals as a helpful resource; however, all three of them have had more direct exposure and work experience with lab professionals as compared to the other participants, so it is difficult to generalize their opinions. The remaining seven participants’ descriptions of laboratory professionals as a helpful resource were slightly negative. While perception is never objective, the old adage “perception is reality” helps explain how negative experiences can produce negative perceptions. In fact, negative emotional memories have been shown to retain more accurate details than nonemotional ones (Kensinger, 2007), and given the daily responsibilities of healthcare practitioners, one could argue that patient care can be emotional.

In summary, for those participants who had more familiarity and/or direct work experience with laboratory professionals, perceptions of laboratory professionals as a helpful resource were generally more positive.

The other seven participants described their frustrations with laboratory professionals due to the inability to get answers in a timely fashion. For example, Sue indicated that the frontline professionals in the lab who answered the phone seemed very busy or did not understand her questions. John indicated that he got passed around from 7-12 times before getting the help he needed. Sarah stated that laboratory professionals don’t want to give
physicians direction to guide decision making, which felt standoffish, while Will said that his success at getting answers depended on who was working that day. Time is a limited resource for healthcare practitioners, and the frustrations described by these participants (who do not possess increased knowledge and/or direct work experience or familiarity with laboratory professionals) suggests that they felt that their time was wasted when they couldn’t get the answers they needed, which contributed to overall negative perceptions of laboratory professionals as a helpful resource.

**Desire to Learn and Build Confidence as a Practitioner**

Healthcare practitioners seem to be slowly acknowledging their limitations when it comes to diagnostic testing (Marques, Hickner, Thompson, & Taylor, 2014; Wians, 2009). When physicians were asked in a survey how the MLS could assist primary care providers, assistance with test selection and result interpretation were specifically mentioned (Marques et al., 2014). This study’s participants confirmed this to be true when they disclosed their efforts to reach out to laboratory professionals for assistance. However, the data also reveals that healthcare practitioners do not just want quick answers. They wanted to learn from their questions and apply their newfound knowledge to future practices. Examples of participants’ desire to learn came to light when I asked how they felt when someone brought to their attention that their orders included an incorrect or inappropriate test. If a participant could not relate to the question, I posed it to them as a hypothetical situation. Responses were positive and specifically identified this type of a situation as a learning experience, especially from the participants who were residents (Ann, Ben, and Sarah) still in their early years of being a
healthcare provider and interested in building their confidence by making good decisions for their patients:

Ann: Oh, I feel great about it because it helps me just learn what I should do the next time, or see... it's like a learning experience, too. And then sometimes if you're confident about why you ordered it, then you just simply explain the clinical situation, and they're like, Oh. Okay. Gotcha, if they think it's not appropriate for some reason. But a lot of times it's good, it helps clarify why we should be doing something. Like the next time we order it, we won't make that mistake, or we'll feel a little bit more confident ordering it because usually the messages we get back are when we're ordering something we usually don't order. So that can be very helpful.

Ben: Oh no, I don't feel caught off guard or anything, you make mistakes like everybody. But I'm just like, so first, a little confused. Then I'm like, okay, then I feel pretty good and get valuable education too. And then I just feel relief. Yeah. And over all I just feel good. You know what I mean? A little bit surprised at first, but after I learned the reasoning, I feel a whole lot better because I've learned something about doing it the right way.

Brad: Well, it would be humbling, I think. But I think I see everything as a learning experience, and hopefully if I make a mistake, I can learn from that and try and make a better decision the next time.

Sarah: …as far as myself, I, I get happy because you know the way you learn is from trial and error, and when people actually bring…a point to let you know that you've ordered a lab incorrectly, it kind of sticks with you, and it will kind of create that spark for in the future where you know if you go to order that lab you'll think, well no, I shouldn't order that because, you know, in this situation, it was inappropriate. So you can make that judgment call and see if it's still inappropriate or you're actually ordering it appropriately.

Sue: I view those types of things very positively, but I think that is due to my role in administration and understanding ... Number 1, I believe very strongly in team-based care. And Number 2, I realize that everything in healthcare is a limited resource, and we don't want to waste resources by ordering things that are incorrect or that are not going to make a difference.

The pathologists admitted that this question didn’t really apply to them because they don’t often order lab tests; rather, they provide guidance to other providers.
Brad: Possibly earlier in my training when I was a resident, but generally I don't get much feedback in terms of whether the right tests are ordered or not because, for the most part, I'm guiding testing and not ordering myself.

Sam: No, ma'am, actually that's what I tell other people, that you are not ordering the right test, or you are ordering a useless test, that's what I tell other people.

This positive response to constructive criticism was identified as a theme, a participant’s desire to learn, a factor that affects perceptions of medical laboratory professional and resonates again later in this chapter. If a participant spent the time to ask for guidance and the laboratory was unable to assist them, the participant was unable to learn from the situation that seemed frustrating and left them with a negative perception of laboratory professionals as a resource.

Summary of Perceptions Prior to Working with a DCLS

Through the experiences described by the participants about their exchanges with laboratory professionals, the following is a list of participants’ perceptions of medical laboratory professionals prior to working with a DCLS:

- Busy
- Standoffish
- Frustrating
- Helpful/Unhelpful (examples of both depending on professional perspective)
  - Provider gains confidence when constructive criticism is provided by helpful laboratory personnel

These perceptions are readdressed in the next section, after the participants described their experiences working with a DCLS.
Section 2: After Working with a Doctor of Clinical Laboratory Science

Developing Rapport

The participants in this study were the first healthcare practitioners to work with the new DCLS, Dr. Brandy Gunsolus. Allport’s (1954) theory postulates that interpersonal contact is one of the most effective ways to reduce prejudice between groups. In this case, there were no preconceived prejudices towards the DCLS because the role itself was completely unknown to at least eight of the participants prior to Dr. Gunsolus starting to work at the facility. The theory also states that groups should be exposed to each other at an institutional level, within a co-operative atmosphere, treated as equals in status, and be in pursuit of common goals. I asked each of the participants how they first learned about the role of Dr. Gunsolus and what information was provided to them about her background and responsibilities. For several of the participants, their first introduction to Dr. Gunsolus seemed to be as an established educator, attending rounds and giving lectures.

Ann: So on our inpatient side, she would come, like, one afternoon a week for like an hour or so and then go over different topics. So I was a student at the same place I'm training, I'm trying to remember if I ever saw her as a student. I don't think so. But it was as an intern [that] I met her when she came to give one of her talks, and I think eventually we started to learn a little bit more about her and how unique her role is and what she does in the hospital and for us.

Ben: Oh, it was through her. She was the one who came in during my first rotation [in] was inpatient medicine, and she came in and she just pretty much explained the whole thing to us. And then after that, I just did a little bit of research on my own. But she was the one who told me directly.

John: I believe that we had gotten an email: Hey, there's a new member on the hospital team, specifically in Dr. Gunsolus's role.

Ken: I can't tell you precisely when she ... I know she introduced herself to the department, I don't recall specifically if it was, it may have been kind of in a general
public forum within the department, so to speak, I don't remember that specifically. But in terms of personal interaction, it was when I was attending on the inpatient service and she had a designated morning, once a week or so, that she would come in and...[do rounds] with the team and provide some sort of educational material, so to speak, didactic information to share with the team.

Sarah: I think it was during a lecture for residents. We were informed that she would be working with us and kind of providing education and tips for us, and then she would show up at different settings.

Sue: It was because she showed up on rounds and introduced herself and said what she was doing.

Will: I believe the first time I met her, I was rotating on our inpatient service, so it was on the inpatient setting. We had our whole inpatient team, and she had been giving a series of lectures to the inpatient team, things like hepatitis C testing or HIV testing. And it was during those initial kind of discussions that I met her.

The two pathologists were the only ones with any direct prior knowledge of the DCLS role and its incoming presence to the facility:

Brad: Well, I have to say I have some, I guess, earlier experience in that context because one of our previous [clinical laboratory science] program directors...[she], is a colleague and a friend who discussed this with me many times in the past. So it was not a surprise when that finally came to fruition....

Sam: We kind of had discussions over a few months with the folks at Rutgers who were running the program, and they approached us about having a person ... Dr. Gunsolus do her residency with us.

I asked the participants what they thought and felt when they first learned about the DCLS and what direct impact it may have on their daily clinical responsibilities. Despite the active self-introductions that Dr. Gunsolus apparently provided to the participants, there still seemed to be some lack of role clarity as to the contributions and assistance she could provide to them.

Ann: Yeah, like I said, I didn't really know that it existed and just to the extent that I've been learning now that I've been working with her.
John: To be frank with you, I had no idea what it would mean in terms of how I would change my practice or what her role would be, Dr. Gunsolus’s role would be, in my day-to-day practice.

Sue: I actually really didn't probably see the connection in that initially.

One of the participants admitted that he had interfaced with the DCLS on multiple occasions without actually knowing who she was:

Chris: So interesting enough, I did not know. I had interfaced with Brandy on multiple occasions, and she had presented a lot of utilization data, and I thought she was a pathologist. I actually did not know that she was this unique breed, and I was very impressed with her work and was quite impressed with her. And then when I found out she wasn't a pathologist, I was like, oh well, she must be a PhD. I didn't know that there was this whole special, a whole different profession and degree. And then [I] subsequently learned that and have come to really appreciate the role that she plays in our health system. But I've kind of stumbled upon it. And then there was a news story or something about her being the first in our institution or one of the first in the region, I forget exactly what the news story was, but I basically found that out after I had been working with her for quite a while.

Through the conversations with the participants it was apparent to me that she was welcomed into the hospital culture; however, their relationships with her seemed to develop passively over time and primarily after they realized what Dr. Gunsolus could contribute both on an individual level and also on a system level. Their responses confirmed a passive relationship development:

Ben: I was fairly passive about it at first, until like I said, I really got more in depth into seeing how the costs were to medicine in general...that's why I wanted to do this [respiratory pathogen panel] project with her.... it doesn't make a lot of sense what her job is, so I wanted to immerse myself and do a project.

Brad: I guess I would say, initially, I mostly came to know of her through interactions with other people who would mention her, her role. And I don't know that she reached out to me so much, but once I realized what a good resource she could be I would definitely reach out to her quite frequently because I knew that she's very efficient and can get to the root of any problem quite quickly.
Sue: As I got to know her, I developed an immense respect for her and really appreciated what an asset she is to us. I would say that did not take too long.

Will: Well, in the beginning, I didn't know what a doctor of laboratory sciences did, but after working with her the first couple of times and listening to her give our residents numerous presentations on lab-related topics, [I] realized that she was a great resource. And since that time...I've called on her multiple times in some of those roles to assist.

In fact, both pathologists admitted that despite their foreknowledge of the DCLS, they regretted not being more proactive in her training as a resident and not initially realizing the value of what she had to offer:

Brad: Well, I guess as a confession when I talked to [the clinical laboratory science program director] many years ago, this has been one of her primary interests for a long time. I have to admit that she did a lot of data gathering, but it wasn't clear to me at that point what the value would be of a DCLS person, and I've definitely come to understand that there is a very, very important niche for those personnel in the lab.

Sam: Yeah, I wasn't nearly as closely involved with her training as, in retrospect, I could have been....Knowing what I know now, I would have made it a point to interact with her on a personal level more frequently than I did.

My inclusion of two pathologists as participants provided a unique perspective about the DCLS. In reviewing educational and daily responsibilities for both of those professions, there is some overlap in knowledge related to laboratory testing, guidance, and test appropriateness. But Sam indicated that he was quite receptive to having more support for laboratory utilization, and while Brad expressed his concern that some pathologists may be apprehensive about the addition of the DCLS role, he still welcomed the expertise:

Brad: There's always a little bit of concern as a pathologist that part of your role or training is going to become obsolete, but I certainly did not. But I welcomed the opportunity to have someone with a more extensive knowledge base as a colleague and a referral source.
I inferred from the participants’ responses that the continued exposures to the DCLS were all positive experiences. The majority of them spoke of research projects that they collaborated on with Dr. Gunsolus and how they appreciated her laboratory background, insight, and knowledge. Several of the participants described their realization that Dr. Gunsolus shared similar goals in reducing inappropriate testing. She also demonstrated how appropriate test utilization would help provide the answers they were looking for.

Chris: I think she's such an integral member of the team. She's probably involved in lots of different projects that I can't even recall. But I mean, yeah, we've got ongoing projects right now that she's involved in. I think one of her big focuses is appropriate test utilization and helping us identify areas where we can reduce unnecessary testing. [That] is probably the biggest thing right now.

John: I think that she and I are kind of on the same wavelength, if you will, in terms of how we think about diagnostic testing….

Sue: …part of quality in modern healthcare is resource utilization. And so she and I have collaborated in a good number of different things in either her trying to give guidance and needing some support with physicians, which I have given her, or as we've had, for instance, different vendors come to the table trying to get us to add different types of laboratory testing on, working together, critically reviewing the data, and really thinking about the risk versus benefit, including the cost benefit of those things. So in my administrative role for someone who is really thinking about how we approach the delivery of healthcare as a system, she is an incredible asset and someone I work with regularly.

Will: I was interested in lab utilization, either overutilization or underutilization, of certain tests. And we embarked on a series of research projects. In fact, I just came back from taking a group of four residents to [inaudible] to present at an international scientific symposium on four of the projects I've worked [on] with Brandy. And we basically used the Choosing Wisely campaign and picked four tests and then did chart audits within our practice to decide how well we were doing with ordering those specific tests.

These repeated positive experiences when working with Dr. Gunsolus on multiple collaborations provided the opportunities for role clarity that ultimately led to the respect and appreciation of the DCLS role.
Ann: I didn't really know what all they did, what their responsibilities were, and what they've learned, and what they could teach us as we work together as clinicians. So I think I didn't realize how in-depth that their knowledge actually was about the lab tests, and indications, and reasoning, and just all this, especially what Brandy has, to make us be choosing wisely when we're ordering our lab tests. So I didn't know that that was even a profession, to have the depth of knowledge that she has. So it's been great because I feel like I learn so much more every small time that I'm able to interact with her. So it's definitely opened my eyes, I would say.

Brad: She helps considerably, especially when there are clinical problems that arise that involve other clinicians. She's a very good, I guess, collaborator to address problems or to, I guess, assuage the clinicians in terms of the improved laboratory testing. So I would say we have a fairly good collegial relationship, and I really respect her role, and I appreciate what she does in the laboratory.

Chris: I didn't know that there was this whole special, a whole different profession and degree. And then [I] subsequently learned that and have come to really appreciate the role that she plays in our health system.

Sue: I developed an immense respect for her and really appreciated what an asset she is to us.

The participants emphasized how her teachings and explanations made them feel more confident as healthcare providers and satisfied their desire to learn. This is a change from some of the negative perceptions that participants had about medical laboratory professionals prior to working with the DCLS. The participants described their frustrations in contacting the lab and the difficulty in connecting with someone who could answer their questions accurately and quickly. The DCLS, again, removed that barrier by serving as a laboratory liaison. The interviews revealed that many participants saw her as a one-stop-shop for their assistance. Questions no longer had to be funneled through various laboratory staff to find the best person to provide an answer.

Chris: …if I've got a question about a test, and I know it's something where I've heard her present or it's clearly within her wheelhouse, she's the first person I'm going to. So yeah. She may not be the first five people on my speed dial, but if she doesn't make the top 10, she's close to that. I rely on her fairly heavily for a lot of laboratory issues.
Will: … if I have a true question, I would just save it until I could get in touch with Brandy to answer the question… if I have in-depth questions about what the specific tests I need to order or how to interpret a test result, I go straight to Brandy. I don't even talk with anyone else in the lab now… she helps all of us in our practice, including our residents, kind of sort through the interpretation of what that means and what next step[s] should be.

Even the pathologists, who have more intimate knowledge about the inner workings of the laboratory, acknowledged that Dr. Gunsolus is now their go-to person:

Brad: Well, I guess when she first started, I always would consult with people in the laboratory and I had certain people that I would go to for specific issues and once I knew that she was kind of in the… I guess a really good resource. I would go to her much more frequently because I knew that she could navigate the laboratory system very efficiently…in the laboratory there's such a diverse number of specialties, and I would seek out support from each one individually. But once Dr. Gunsolus was here and I knew that she basically would be a one-stop-shop for answers and to help address testing problems or issues, and that really saved a lot of time for me and made things quite easy.

The participants’ desire to learn and build self-confidence is echoed in their descriptions of the topics that Dr. Gunsolus presented in her role as an educator and a collaborator. From the interviews, it was unclear whether Dr. Gunsolus selected the topics herself, whether they were selected by the facility, were chosen to combat frequent issues, or perhaps a combination of all three. Regardless, the selected topics clearly targeted practitioner needs.

Ann: …and the way that she lectures and explains this to us, it's like... what she's explaining makes us feel like more confident physicians, which is what we're all wanting to do, especially as interns. So it's amazing. And the topics that she would hit on were high-yield things, and sometimes it was things that we had no idea about, and it was mind-blowing. Or sometimes it was things that we had questions about, but she would already know the most common questions, I guess, or obstacles when ordering certain diagnostics or laboratory tests. So she's been great from the get-go…. Everyone leaves her sessions, and they're like, Oh my gosh. Why do we do what we do? What she says makes so much sense. And so it just makes us feel [like] more confident clinicians.…
Will: … in the different venues that I was on, the committees that I was chairing, I would request of her to either be a member of the committee or to present to the committee. And then, once I started hearing the information she had, that led to those research projects that we’ve completed and we plan to complete.

Another example of Dr. Gunsolus’ capabilities of targeting practitioner needs came from the perspective of an administrator with 16-20 years of clinical experience. He described how her ability to communicate and provide guidance was at a level that healthcare practitioners appreciated:

Chris: …the most professional of which has been somebody like Brandy Gunsolus. You know, that is... a laboratory scientist with... a deep understanding of what the options are and how that impacts the patient and how it impacts the lab. And a professional like that really bridges that gap in my knowledge about the laboratory test but able to interface well with me. What I have seen is that when it's at the technician level in the laboratory, what you tend to get are standard. You get black and white, yes/no answers. You get results like, that's a send-out lab just so you know, you'll get it back in 10 days. Thank you very much. Bye. Right. As opposed to, well, were you aware that we could do this? That would give you at least a screening answer that we would either confirm, that we might be able to confirm with a send-out lab or something like that.... It's a much more, kind of, it's a much less helpful response generally speaking, the more removed that person is from that interface at the clinician level.

This same sentiment was echoed by a faculty member who had 1-5 years of experience:

John: Her ability to communicate as someone that other physicians, and physicians and whatnot, would respect. An expert in the field is a very useful thing, and it's a big asset for us to have the ability to communicate with somebody who probably knows, or maybe our other staff does, but to have, kind of, a point of contact and somebody who can very clearly explain in a way that doctors speak.

Accessibility

Another theme that resonated through all the participant interviews was the convenience and accessibility of the DCLS. Although this theme was not explicitly identified by the participants, it was a factor that implicitly influenced negative perceptions of medical
laboratory professionals in participant experiences prior to working with a DCLS. Referring to the old proverb “out of sight, out of mind,” laboratory professionals are almost exclusively located in a basement, thus there is little opportunity for a visual reminder to healthcare practitioners that laboratory professionals may assist them. When I asked Sarah what her general thoughts were about laboratory professionals, her response indicated that they were more of an afterthought when needing guidance for laboratory testing:

Sarah: I thought about them only when I needed them, and I pretty much use computer references, UpToDate, to guide my medical decision making when it came to laboratory testing.

The DCLS removed this barrier by being visibly accessible and personally interacting with healthcare practitioners. Dr. Gunsolus had responsibilities on the hospital floors, served as an educator, participated in meetings regarding patient cases, assisted with research projects, consulted with healthcare practitioners, and served on committees. Each participant described how Dr. Gunsolus was very proactive in her self-introductions and indicated that they could call her anytime with any type of question. The participants were impressed by and grateful for how quickly she replied to emails and text messages. More than once, they emphasized how they felt comfortable reaching out to her as a resource or consult:

Ann: But she made herself very, very available to us, inpatient side or outpatient side. So there were a couple times I would not be on the inpatient side but would still reach out to her if I had a question about a lab or something like that….

Sarah: I feel very comfortable with her. She's very welcoming. She is extremely fast, so if you email her with something, you are not sitting around waiting for a response to try to get back to you as fast as possible.

One of the pathologists described how his relationship development with Dr. Gunsolus differed from his colleagues simply because of the physical proximity of her office:
Sam: She was a few doors down from me so... [her office was closer] to another pathologist and those two interacted more with each other... than Dr. Gunsolus interacted with me. Now, her office is much closer to me, and that is where the new resident is. So, it's partly just a physical proximity.

The participants recognized that with the DCLS serving as a laboratory liaison, being physically accessible on the hospital floors, and attending committee meetings, these exposures helped provide overall visibility and recognition for the laboratory.

Ann: I didn't really know that [the laboratory profession] existed and just to the extent that I've been learning now that I've been working with her.

Brad: I know for a fact that the laboratory has become more effective and more cost effective, and over all I think the lab in general has, across the institution has, improved its prestige.

John: I am much more cognizant now of having someone, [bringing] front and center, that laboratory diagnostics are, in and of themselves, a procedure, and they do require a level of understanding of most equipment and procedurally, how to run these specific testings in terms of diluents, etc. I feel like it has also helped me recognize the role of a lab in terms of consistency, for one. And two, I'm relying on them as a physician to give me accurate and complete data. I also recognize that without accurate and complete data for them to interpret the data and what we're working with is certainly an important side of [the] clinical bedside medicine that I did not even have an understanding of before. And I also recognize now that what I do and the procedures that I am performing, i.e. ordering labs, that I should be willing to address them and at the very least order them appropriately.

Sam: She has improved the visibility of the lab and has conserved and curtailed costs, which is not a trivial amount.

The participants welcomed Dr. Gunsolus as an equal member of the healthcare team.

She increased visibility and recognition for medical laboratory professionals with her clinical colleagues.

Ben: After working with her, I just definitely saw more of... I definitely saw a more of a need to having them as part of the overall team in general.
Chris: I'm often in meetings with her where we're looking at issues like utilization or a testing protocol and she's a valued member of the team.

Ken: So I view her as a colleague, if you will, a clinical colleague.

Sam: We work as co-equals, and I seek her advice.

Sue: And so, I would say that I have an incredible appreciation at this point for the key role a laboratory plays in healthcare and the professionals who are involved in that. It is a, tell me the folks in our laboratory, whether it's the front-line staff or the leadership there, they can make or break what we are doing. And the fact that we are so fortunate to have a very responsive group who really are motivated to give us the best care we can for our patients…I can't say enough what an incredible asset she is to us, and she is an incredible ambassador for her profession.

Will: I think I've made it clear that I feel like she's a very valuable team member, respected, and that we value her expertise, and we go to her frequently when we have questions.

Dr. Gunsolus not only increased visibility and recognition for medical laboratory professionals, she carved out a position in the hospital culture for a DCLS.

Sam: …since Dr. Gunsolus did her residency with us, she essentially continued. We saw enough value in what she was doing that we created a spot for her.

Sue pointed out that Dr. Gunsolus served as an ambassador for her discipline as a medical laboratory professional and specifically as a DCLS. Through her assertive self-introductions, active team integrations, and numerous collaborative projects, Dr. Gunsolus provided role clarity to her colleagues, hospital administrators, and clinical residents. In order to determine whether the interprofessional collaboration with a DCLS left a lasting impression on the participants, I asked them if they would make an active effort to establish a relationship with another DCLS at a different facility. The answers were nearly unanimous, indicating an affirmative effort would be made to collaborate with another DCLS:
Brad: Because the DCLS, I guess, is such a fairly novel concept, I think it would probably be different, but I would certainly if I knew that there was a person with Dr. Gunsolus's credentials at another institution. I would definitely seek them out initially and try and determine where in the laboratory hierarchy they stood and see if they really are in the same position as Brandy is here. Because she's really a main contact point in [the] laboratory.

Chris: Absolutely. My first question with, to them would be, what's our utilization look like, and what can we do to reduce unnecessary testing? Just because of the experience with Brandy on that issue.

Sarah: I would introduce myself to them. I will let them know that I'm eager to work with them. I would try to establish a baseline relationship with them just like on a personal level where you're just comfortable with that person. And then I would try to, you know, gauge what they want to help on or their areas of expertise or how they feel about going about, you know, reaching out to them for help picking tests or in laboratory studies that you want to do. 'Cause I know everybody has their own style, and some people would prefer for you to go to them in person, or some people would prefer to you to email them, and some people would prefer for you to say, “My colleagues as a whole [have] been having an issue on this. Can you have a lecture or a conference about it?” So I will try to just establish a relationship with them and try to get a feel for how they like to share their knowledge.

Sue: So I think if I were to move, make a move, it would likely be into an administrative role similar to where I am right now. So it's a little bit different than just making a clinical move. But I would definitely, along with the other leadership and people who are likely to, that you want to get to know, doing a job that really focuses on quality for a health system. I would definitely reach out to that person because I already, I have a clear understanding of what they do and the impact it has on the health system.

Will: Oh yeah, I would meet with them early in my tenure at the new organization and map out a way that we could work together collaboratively in the small unit that I am in and also in the larger organization.

Sam indicated that another DCLS is currently completing their residency training at the facility, and he is taking a different approach now that he better understands the value and potential utility of the DCLS role:

Sam: We have another candidate now, and I'm much more involved in her residency than I was with Dr. Gunsolus. And I can see that the things that we can do together that
would add to her experience and would add to the investigative studies that I sometimes do and should facilitate publications of those scientific studies.

**Summary of Perceptions After Working with a DCLS**

The following is a list of participants’ perceptions of medical laboratory professionals after collaborating with a DCLS:

- Improved role clarity for laboratory professionals and the DCLS
- Respected
- Appreciated
- Professional equal (recognized as a clinical colleague)
- Needed for laboratory stewardship (expertise for appropriate test utilization)
- Welcomed as a member of the healthcare team
- Recognized as a key component in healthcare (central component to diagnostic process)

After reviewing all of the transcripts, it was apparent to me that all participants had positive perceptions of the DCLS. When I specifically asked them whether their perceptions of general laboratory professionals had changed after working with a DCLS, the responses were not entirely conclusive. I think many of them struggled with differentiating between a DCLS and medical laboratory professionals who work exclusively in the lab. Given that earlier in the interviews most of the participants were unable to provide confident or accurate responses about educational and credentialing requirements for laboratory professionals, I was not surprised by the participants’ difficulty in answering this question. For example, Chris indicated that working with a DCLS did change his perception of the laboratory, and then he said he gained role clarity about the DCLS:
Chris: Oh absolutely. I think it, I think it changes my perception of the laboratory in general. But also, I didn't even know about this discipline, and, it, certainly the next person that I encounter that says I'm a doctorate of clinical laboratory sciences, I'm like, Oh, I know exactly what you do now.

Ann answered in a similar way, first indicating that she didn’t know the extent of how useful and knowledgeable laboratory professionals were and then immediately following with a statement about how much Dr. Gunsolus knows and can share with them (the residents). Sue indicated that she has a better appreciation for the part that laboratory diagnostics play in patient care, but she didn’t suggest that her perception of laboratory professionals changed. This was also echoed by John, who stated that his overall perception of the diagnostic process had changed, but he did not specifically answer about changes in his perception regarding laboratory professionals. Ben answered my question by stating that his biggest take-away was to make sure that lab tests should be ordered for a reason and only if they can make an impact on the management of the patient’s care. Brad, a pathologist, indicated he didn’t think his perceptions of laboratory professionals had changed, but he felt that that Dr. Gunsolus had raised the overall level of support for the lab and that the laboratory professionals respect her and see her as a great resource.

Despite the inconclusive responses to my question about how the participants felt about general laboratory professionals after working with Dr. Gunsolus, one could deduce that the general perceptions about all laboratory professionals, and about the laboratory itself, had evolved in a positive direction. This was alluded to in various participant responses. Brad stated that he knew for a fact that the laboratory had become more effective and that overall lab prestige had increased. Chris acknowledged an improved connection between laboratory professionals and clinical teams:
Chris: It's not been dramatic, but it, but there's less of a disconnect between the laboratory and the clinician. So I would say if anything, the communication and the understanding is better. Not necessarily the awareness of the training or the qualifications of those people, but more of a bridge between the two... better communication and interface between our clinical teams and our laboratory.

Sam indicated that the DCLS improved the visibility of the lab and conserved and curtailed costs. He made a pointed statement that “last year's cost avoidance was about a million dollars” and suggested that this savings was attributed to Dr. Gunsolus.

Justification for DCLS Retention

At the end of the interviews, I asked each of the participants what they saw as pros and cons to having a DCLS employed at their facility. Based on the overall positive perceptions that were conveyed about their experiences with Dr. Gunsolus, it was no surprise that they were unable to identify many cons. Ann mentioned a concern that perhaps a very seasoned practitioner set in their ways may be a source of conflict. She subsequently continued her thought by stating that was not a strong example of a con against employing a DCLS. Will mentioned that practitioners may struggle with role clarity because the DCLS is such a nascent degree; however, this study has shown that over time, a lack of role clarity is a barrier that can be overcome. Brad mentioned earlier that pathologists may express concern that some of their responsibilities may become obsolete. Conversely, evidence in this study and direct comments from both of the pathologists support that a DCLS has a more extensive knowledge base and serves as an extension and supportive colleague for a pathologist in addition to being a research collaborator. Four of the participants were unable to identify any cons. Three participants mentioned the unknown cost to employ and retain a DCLS. Nevertheless, two of those individuals immediately followed with statements indicating that the cost savings provided by a
DCLS through governing appropriate test utilization is more than enough to cover the salary of a DCLS. Sam stated that last year's cost avoidance, which he attributed to the addition of a DCLS, was about $1 million dollars.

The participants answered without hesitation when it came to listing the pros and benefits of collaborating with Dr. Gunsolus; however, I was taken aback by the unanimous positivity they expressed for retaining a DCLS. This was significant given the many perspectives that comprised this small participant pool: faculty members, hospital administrators, pathologists, attending physicians, residents, and long-standing practitioners. Many of their answers were reiterated statements from earlier in their interviews as they strove to emphasize to me just how passionately they felt about their experiences. The participants described all the roles that Dr. Gunsolus served in: educator, researcher, collaborator, laboratory liaison, and patient advocate. She helped residents gain confidence in their new capacity as healthcare practitioners and provided guidance and education on appropriate test utilization to change the mental processes of both residents and long-standing practitioners when ordering diagnostic tests. Many of the participants attributed direct cost savings to Dr. Gunsolus as they described the many process improvements she was involved in:

John: There's a lot of things that we have done and...has been indoctrinated to us by our training faculty attending, and those folks who will guide us or say this is how things are done. Her recognition of what that really means in terms of does it change our outcomes, does it change how we manage these patients? Were we ordering these tests appropriately and, if not, how to fix that? I believe that she really has helped me, me personally, and also our department to recognize that sometimes having more blood is not necessarily the right thing.

Ken: Well I'll tell you, my process has changed since our doctor of laboratory sciences has started working with us. Prior to Brandy joining our practice, I, like most of my partners, would select the top five laboratory tests, the ones I just mentioned, A1C, CMP, CBC, urinalysis, maybe throw in a TSH. Vitamin D was also very popular. And order that almost routinely on every patient. And once Brandy joined our practice and
really started reviewing laboratory ordering guidelines, have really restricted the labs that are ordered and really try to follow US Preventative Services Task Force guidelines or other national guidelines in selecting labs.

Will: I would provide evidence from the research that we presented just last week at that international scientific conference. We looked at respiratory pathogen panels and could you get by with flu plus RSV, and at our institution that’s about a $1000 difference in cost. And we estimated across the organization, if we had moved 80 to 90% of that testing from RPPs to flu plus RSV, we could have saved the organization $3.5 million in 2018 by the volume of testing that we had ordered. So I mean, it’s no question you can save money with having someone with her expertise and experience. And I think when you get hospital administration looking at the money that you could really save, I think it’s a very strong argument.

She made her colleagues more cost conscious about their laboratory test selections and helped automate reflex testing algorithms.

Ann: But overall as a whole, definitely has made me more mindful when I’m ordering labs because she also goes over things like how much X versus Y costs. So I've definitely become more conscious overall because of the interaction that we've had with her.

Will: So let’s just use a positive ANA as a screening test as an example. And again, prior to Brandy new joining our practice, I would consult a resource, figure out the tests that I should order based on a positive screening ANA, and start down that path. Once Brandy joined our practice, we actually created an ANA reflex testing algorithm so that the provider doesn’t need to do anything. They just order the initial ANA screen. If it’s positive, then the rest of the tests are automatically ordered behind the scenes. So that’s really where I think we should be heading in medicine, to have those reflex test[s] happening in the background to help us guide diagnosis and also be more cost effective.

The residents felt so strongly about the positive impacts of her teachings that they wanted to share her expertise and expose her to more colleagues. Some of the participants were directly connecting her with other colleagues to solve longstanding problems.

Ann: It’s just amazing how much that she knows and can share with us. And I just wish... because I don’t think other programs, residency programs, get to interact with her. And I just wish that more people could be exposed to her. I feel like we’re a very lucky group to get that type of knowledge. So I feel like it would honestly make the hospital save a lot of money on not ordering unnecessary tests, the more people she can
interact with. And it could make people realize that they have a quick, super knowledgeable resource in case they ever had a question or a concern for her.

Sam: In fact, I argued with our department chair to give her a faculty appointment, which hasn't happened yet. We work as co-equals, and I seek her advice. In fact, she is more knowledgeable about triaging the test, the tests, that go to reference labs than I do. I make sure that all the pathology residents that we have spent some time with her so that they learn that part of the laboratory administration. And we work collaboratively in some of the research projects. We recently published one paper, and there is another one in the works.

Sarah: I think that it's been a great addition. I think it's helped advance decision making amongst residents. I think it's grabbed an aspect that maybe sometimes attending [physicians] don't have enough time to go over or kind of brushed by because there's so much involved with patient care. I think it's very important to have someone that's dedicated specifically for that field that you can feel comfortable going to. So I think it's been a great addition, and I think any residency program or even physician or clinic staff could benefit from interacting with them.

Sue: So, one of my colleagues actually raised a concern about that, and because I knew Brandy and the work, or Dr. Gunsolus and the work, she was doing, we were able to connect him and her, and she was able to very quickly put a plan in place to get it back into an in-house lab that would not disrupt workflow or be too expensive…. I have been probably a more resource- and cost-conscious person than most for a good number of years. But I think really being able to quantify that, I think I'm better able to do as far as the waste with the things that we do since working with Dr. Gunsolus. So I think that that has made a difference. And I do think that as far as incorporating that, the teaching as far as Number 1, what is happening behind the scenes with laboratory professionals and really utilization both in quantity and in swiping the correct test, I'd say that I've incorporated that more into my teaching with our learners as well.

She increased efficiency and recognition for the laboratory, and even the longer tenured practitioners felt strongly about the positive impact and value of Dr. Gunsolus:

Brad: I would say that the pros are that it really increases the efficiency of the lab, increases the level of rapport with other clinical services, and really increases the proper laboratory utilization item. As a matter of fact, just this past Friday, she presented to our faculty senate a presentation that really, I think, brought home the real value that she brings, and she had very specific examples of things that have been issues for as long as I've been in pathology, including repeat testing for genetic tests, which she's working very hard to try and identify places where that falls through the cracks and gets repeat ordered. I think from a lab utilization standpoint, she's really made an immense difference for our institution financially and logistically, I think.
Chris: She has presented us data about routine lab test[s] and able to get, help us get, some of our utilization under better control and showing us where we’re wasting not only money but a lot of time and energy doing unnecessary lab tests. So I would say she’s had a fairly profound impact on that.

Sam: …since Dr. Gunsolus did her residency with us, she essentially continued. We saw enough value in what she was doing that we created a spot for her.

A Parallel to Pharmacy

During the interviews, two of the participants mentioned a parallel of adding much-needed laboratory expertise to the healthcare team just as it became necessary to include pharmacy expertise:

Chris: I'm pleased that we're able to have this discipline on our staff and are appreciative. As much like the expansion of pharmaceuticals has necessitated the need for more clinical pharmacists, the complexity involved in laboratory testing has, it really necessitates someone specialized in that area that can be at the elbows with a physician or APP to help guide and inform that provider because of the complexity involved on the other, on that component, of the health system. So to me there is a bit of an analogy between the two, and we're currently expanding our clinical pharmacist to assist in that just because of all the complexities around it. And I think…the same is true of laboratory testing as well where we've got to have somebody focus solely on that issue and that is as well informed and knowledgeable about that area as possible.

Sue: Dr. Gunsolus rounded with us in the unit at one point in time with some frequency, and she did a good job of saying, hey, that isn't really going to give you the answer you're looking for, or that really isn't going to help you very much, or you might want to think about adding this. So, yes, by having a direct content expert with us on the team. Occasionally our pharmacist, our Pharm.D. with a team actually, we'll have some input into that as well as far as like serum levels of different drugs and the timing of that or really what we're looking for….

While this finding does not address the research questions for this study, it is important information relevant to the DCLS and is discussed in Chapter 5.
Summary

This chapter presents the themes discovered by this study that investigated the perceptions that practitioners have about medical laboratory professionals before and after their experiences working with a DCLS. Numerous quotations from the participant interviews were included to support the identified themes.

The first themes identified as factors contributing to perceptions of laboratory professionals were (a) knowledge regarding the profession as a whole and (b) the participants’ desire to learn and build self-confidence. The three participants who had the most direct experiences and knowledge about laboratory professionals prior to working with a DCLS described their perceptions in a more positive way than the other seven participants. Those seven participants who had limited knowledge about the laboratory profession expressed frustration when they described their complicated experiences of contacting laboratory personnel for assistance. This immediately led to the second theme, a participant’s desire to learn, because even when they did connect with someone in the laboratory, the participants described their difficulties trying to get their questions answered. The interviews revealed that participants prefer to learn from their questions and/or mistakes so that they build their confidence level as a healthcare provider. If their consult with the laboratory was ineffectual, the participant was left with an overall negative perception of both the conversation and the person they spoke to.

Generally speaking, after working with Dr. Gunsolus, the participants described positive perceptions of laboratory professionals, specifically the DCLS. When I analyzed the data further, I found evidence that supported the first two themes; however, because the
perceptions were positive, I needed to determine what had changed. The DCLS was able to provide role clarity and served as a liaison for the laboratory. There were numerous occasions, as described by the participants, in which the DCLS was proactive when she introduced herself to new colleagues or residents and provided information on her background and how she could assist them. The participants admitted that it took time for them to really grasp what her role was, but they gained understanding over time. Additionally, she identified herself as a point of contact for all things laboratory related. This meant that participants no longer had to deal with the frustrations of trying to connect with the appropriate professional in the lab. Because she provided role clarity and identified herself as the primary laboratory contact, the participants described positive perceptions of medical laboratory professionals, specifically the DCLS.

The last two themes identified were (c) accessibility and (d) rapport, and these did not surface until the analysis focused on the experiences of the participants after working with a DCLS. The participants consistently and frequently described how Dr. Gunsolus made herself readily available. The DCLS made it clear to everyone that there were no stupid questions, and she would rapidly respond to phone calls, texts, or in-person queries. She provided the participants the convenience of accessibility, which served as a factor for positive perceptions of the DCLS. This also led to the last theme to emerge, rapport. The participants spoke very highly of Dr. Gunsolus. The participants conveyed how they appreciated her ability to target healthcare practitioner needs by initiating process improvements in areas in which the participants did not always anticipate the benefits. The residents described how the topics she presented during educational seminars were so relevant to their daily responsibilities that they looked forward to future lectures with Dr. Gunsolus. These repeated, positive exposures facilitated relationship development with the DCLS. This was supported in the way the
participants described how they actively pursued a relationship with her after they realized the
value of her expertise and knowledge as a laboratory liaison, thereby establishing rapport and a
positive perception of the DCLS. The participants’ noticeable transformation of their
perception of medical laboratory professionals after working with a DCLS suggests that
additional research is needed to identify other changes attributed to DCLS collaboration.
Recommendations and suggestions for future research are discussed in Chapter 5.
CHAPTER 5

DISCUSSION, IMPLICATIONS, AND RECOMMENDATIONS

The purpose of this qualitative study was to discover what perceptions healthcare practitioners have regarding medical laboratory professionals, the factors that influence those perceptions, and how those perceptions change after working with a DCLS. This chapter discusses the findings within the context of published literature and relevant theory. Implications, recommendations, and suggestions for further research are also presented.

Discussion

Healthcare practitioners are making attempts to consult with medical laboratory professionals when they have questions regarding diagnostic patient testing. However, they are often confronted with hurdles that make connection difficult. This study reiterates examples of obstacles that were identified in Taylor et al.’s (2017) investigation of reasons physicians chose not to contact the laboratory: (a) they did not know who to contact, (b) it was too difficult to get to the lab, (c) it was too difficult to contact someone who could answer the question, and (d) they did not have a relationship with lab personnel. Time is a limited commodity for healthcare practitioners. Participants’ comments suggested that when they spent their time to contact someone in the laboratory and were unable to get the answers they needed, they were left with
negative perceptions of laboratory professionals and did not view the staff as a helpful resource.

With the exception of the pathologists (n = 2), the remaining participants (n = 8) indicated they had marginal knowledge about the laboratory profession or the educational requirements necessary to work in a lab. The lack of familiarity with the profession conveys a lack of role clarity, which contributed to participants’ negative perceptions of laboratory professionals as a source of helpful information. Previous research by Collette et al. (2017) described how improved role clarity, communication, and respect facilitated collaboration between physicians and nurses. Role clarity is a core competency of the IPEC and one of the five principles of team-based care identified by the IOM (Interprofessional Education Collaborative, 2011; Mitchell et al., 2012). Both the IPEC and the IOM assert that a lack of role clarity serves as a barrier to collaborative practice.

The participants in this study had the opportunity to work with the first DCLS graduate in the nation. This new role was anticipated to fill gaps and remove barriers that prevented healthcare practitioners from obtaining timely and accurate answers to questions regarding diagnostic laboratory testing. Nearly all of the participants described how their initial, passive introduction to the new DCLS evolved into a coveted and proactive effort to establish a professional relationship with Brandy Gunsolus, DCLS, MLS (ASCP)CM. They indicated that time and repeated exposure was necessary to achieve role clarity and the understanding of what expertise the DCLS had to offer as a team member. These experiences described by the participants support Coyle et al.’s (2011) claims that relationship development requires multiple opportunities for contact and working together on shared goals. Shared goals is another one of the five principles of team-based care identified by the IOM (Mitchell et al., 2012).
Relevance to the Theoretical Framework

Allport’s (1954) ICT provided a theoretical foundation for this study, guiding the interpretation of the analyzed data. The ICT can be used as both a predictive model to forecast the likeliness that prejudices will be reduced if the formula for interpersonal contact is followed and as an explanatory model to describe the successes or failures of prejudice reduction through interpersonal contact. The four change processes proposed by the ICT (learning about the out-group, changing behavior, generating affective ties, and in-group appraisal) were evident in the data collected for this project. In this study, the DCLS was the out-group, and the participants, who were already established healthcare practitioners within the hospital culture, were the in-group. Many of the participants admitted they knew little or nothing about the Doctor of Clinical Laboratory Science degree or how a DCLS would affect their daily clinical practice. However, the data showed that, with time and repeated interactions, the participants gained role clarity and understanding of the DCLS which evolved into frequent requests to collaborate with her, supporting the ICT’s first change process: learning about the out-group (the DCLS).

Several participants described their frustrations in trying to acquire information through contacting a laboratory professional and implicitly referred to their preferences for using alternative means such as online resources, colleagues, or professional society guidelines. Over time, as participants gained role clarity and realized how knowledgeable and helpful the DCLS was, most of the participants stated they now identify the DCLS as their primary contact for lab-related questions or problems. The participants demonstrated a change in behavior as they now choose to seek out the DCLS for any lab-related questions rather than using alternative resources; this supports the ICT’s second change process.
The ICT’s third change process also occurred: the generation of affective ties between the DCLS and the participants. The participants described the multiple means by which the DCLS integrated herself into the hospital culture. Each participant had numerous interactions with Dr. Gunsolus, and many identified shared goals between themselves and the DCLS, such as appropriate test utilization, cost effectiveness, decreased turnaround times, and increased laboratory efficiency. The data indicate that these positive, repeated collaborations with the DCLS generated affective ties with the participants that spawned synergistic results for both patients and the healthcare facility. Additionally, the participants’ perceptions of laboratory professionals became more positive. These interpersonal contacts and encouraging results facilitated in-group appraisal of the DCLS, the fourth change process of the ICT. All of the participants described the DCLS in a complementary and appreciative way during their interviews.

Pettigrew and Tropp (2006) stated that while the four change processes are not essential to achieve positive outcomes, these situations designed to meet Allport’s optimal conditions achieved a significantly higher mean effect size than situations lacking one or more of the components. Additionally, institutional support was identified as an especially important condition for facilitating positive contact effects (Pettigrew & Tropp, 2006). The data for this study implies institutional support for the DCLS because administrators agreed that the AUMC would serve as the site for the required clinical rotation component of the Doctor of Clinical Laboratory Science degree. Additional institutional support was demonstrated when the AUMC immediately offered to hire the DCLS after her graduation, given the numerous positive outcomes that ensued during her one-year clinical rotation.
One study investigating the application of contact theory in IPE warned that “a solo representative of a profession is likely to feel outnumbered and marginalized, particularly if this person also feels disadvantaged by virtue of their gender and ethnicity” (Carpenter & Dickinson, 2016, p. 107). While the study was about IPE activities, it is certainly applicable here because Dr. Gunsolus was the first DCLS in the nation and at the AUMC. If Dr. Gunsolus felt disadvantaged in any way, that was not identified in any of the data as described by the participants.

Appropriate Test Utilization

Several of the participants acknowledged unnecessary test ordering practices that they attributed to hospital culture and routine practice; however, they also recognized the need to reduce inappropriate laboratory testing, which happened to be a major initiative for the DCLS. Appropriate laboratory testing served as an overarching goal shared by the participants and the DCLS which motivated the participants to communicate and collaborate with the DCLS on multiple research projects. These repeated, positive experiences promoted time and opportunities for the participants to build trust, establish reliability with and gain role clarity for the DCLS, which supports Reis and colleagues’ theoretical concept of familiarity (Reis et al., 2011). Ultimately, these experiences facilitated participants’ professional respect and appreciation of Dr. Gunsolus, which initiated an evolution towards positive perceptions of laboratory professionals as a helpful resource.
Limitations

This study captured details of participants’ perception changes of medical laboratory professionals before and after working with a DCLS; however, I feel improvement can be made in collecting more granular details of healthcare practitioners’ perceptions by interviewing additional healthcare practitioners who have not worked with a DCLS and focusing on the difficulties experienced when connecting with laboratory professionals. This study’s sampling of 10 healthcare practitioners is a small number when compared to the thousands of healthcare practitioners in the United States. Given there are only three universities currently offering the Doctor of Clinical Laboratory Science degree, it will take time before enough DCLS professionals are available to meet the potential need nationwide. Until that happens, healthcare practitioners and laboratory professionals will need to address the circumstances that serve as barriers to communication between both groups.

Implications

Participants were enthusiastic and complimentary when describing the benefits and value that Dr. Gunsolus added as a team member. As they recounted their initial thoughts and, in some cases, their hesitations about incorporating a new professional role into their daily routine, it was evident that a transition period was necessary to gain role clarity about the DCLS and to recognize the potential impact of this laboratory liaison. While it is still unclear whether all the participants understood the distinct differences between a DCLS and a general laboratory professional, it is necessary to remember that the Doctor of Clinical Laboratory Science degree was not meant to supplant the laboratory professionals responsible for
diagnostic testing. The DCLS instead serves as an extension of laboratory professionals, removing the barriers of visibility, accessibility, and professional equality by providing a doctorate-level expert of laboratory science within physical reach of healthcare practitioners.

While each institution reserves the right to establish their own requirements for DCLS employment, the AUMC requires graduation from a Doctorate in Clinical Laboratory Science program, current ASCP board certification, and completion of a one-year clinical residency (B. Gunsolus, personal communication, February 12, 2020). These employment requirements are similar to the professional admission requirements for the Doctor of Clinical Laboratory Science program at Rutgers University: baccalaureate degree in CLS or related science from a regionally accredited United States institution or equivalent, completion of a NAACLS-accredited Medical Laboratory Science program or equivalent, professional certification as a generalist MLS through the ASCP (or equivalent) with proof of continuing certification maintenance, and a minimum of three years clinical laboratory experience in the United States, preferably as a generalist MLS (Rutgers University, 2020). The requirements to become a DCLS build on those necessary to become a certified MLS (American Society for Clinical Pathology, 2020). The curriculum for a Doctor of Clinical Laboratory Science degree includes interdisciplinary theoretical courses, a clinical residency, and a clinical research project. All of these components contribute to the differentiation of the DCLS from general laboratory professionals and elevate the DCLS to the clinical doctorate level.

As the emerging DCLS role slowly integrates into the healthcare system, it will become important to prevent total communication loss between healthcare practitioners and the less visible medical laboratory professionals. Some of the participants stated how they already use the DCLS almost exclusively for laboratory-related questions, and this study only represented
10 practitioners from a large facility. This poses a potential issue in that the DCLS may become a limited resource and the expertise that other medical laboratory professionals have to offer may remain neglected. Hospital and laboratory leadership will need to combine efforts to prevent the overuse of the DCLS and the underuse of medical laboratory professionals. Since the conclusion of this research, administrators at the AUMC have hired a second DCLS in order to meet the needs for this area of expertise.

Clinical Doctorates in Healthcare

In response to an aging population living longer with the increased incidence and prevalence of cancer and other chronic diseases, there has been an increase in professionalization. Wilensky and Lebeaux (1965) described this as a “dynamic process with five stages: the emergence of an occupational group, establishment of a training and selection program, formation of a professional association, development of a code of ethics, and political activity to establish recognition and profession of professional work” (p. 408). Elliot Freidson (1970) went one step further in developing his theory of professionalization to describe how occupational groups, such as healthcare professions, secured autonomy of practice through this very process to secure exclusive ownership of their expertise (Freidson, 1970). While history has generally recognized the more dominant professions, such as lawyers and doctors, nursing and other allied health professions have made great progress in achieving their own niche of professional autonomy (Colyer, 2004).

The development of the Doctor of Clinical Laboratory Science degree aligns with the creation of and progression towards other clinical doctorates in healthcare. Examples of other healthcare professions that have clinical doctorate degrees include physical therapy (DPT),
advanced-practice nursing (DNP), audiology (Au.D.), and, of course, the familiar medicine doctorate (M.D.). It is anticipated that as healthcare continues to grow in complexity, additional healthcare professions will pursue the development of more professional doctorates. In fact, there is currently discussion of physician assistants (PAs) developing a doctorate program (Miller & Coplan, 2017). This developed after the American Academy of Physician Assistants announced in 2016 that it would advocate for autonomous PA licensing boards, direct PA reimbursement, and elimination of state laws and regulations that require a designated supervising or collaborating physician (Munk, 2017).

In 1992, the pharmacy profession announced that the Doctorate of Pharmacy degree (Pharm.D.) would serve as its only and terminal degree for practitioners in the clinical arena (McCulloch, 2014). This transition facilitated the much-needed change from pharmacists as primarily drug dispensers to being providers who monitor patient medication, manage pharmaceutical distribution and control systems, play a role in public health, provide drug information and education, administer some vaccinations, and overall promote health and well-being of patients. Healthcare practitioners rely on pharmacists to assist with complex medication therapy. Two of the participants in this study mentioned the need (and their current practice) to incorporate the expertise of a laboratory professional into a patient’s healthcare team due to the growing complexity in laboratory testing, similar to the incorporation of the Pharm.D. due to the growing complexities in medications. This suggests a parallel that, due to an expansive test menu and advanced diagnostic technology, the DCLS should assist and consult on complex test selections and result interpretations rather than merely enter results into electronic health records. Including both Pharm.D. and DCLS expertise on a patient’s
Pharmacy and laboratory science education covers some similar topics but with different perspectives. While pharmacology involves the study of drugs and their effect on the body, medical laboratory professionals learn how certain medications can affect specific test results. This information is particularly relevant in laboratory areas such as chemistry and hematology. Pharmacy and laboratory professionals can contribute different perspectives and expertise about the same medication. Group Health Cooperative in Seattle, Washington, experimented with a lab-pharmacy partnership to systematically crosscheck pharmacy and laboratory data. On the pharmacy side, the goal was to ensure patients did not develop side effects or other complications from long-term prescriptions. Laboratory personnel benefited from improved connectivity to a patient’s medication list so that laboratory tests could be interpreted appropriately (Malone, 2012). They had much success with the program that not only incorporated best practices across the board but also provided a means of standardization to ensure patient safety (Malone, 2012). Collaboration between pharmacy and laboratory professionals assisted practitioners to provide better comprehensive care for patients when it came to monitoring and adjusting medication levels. Incorporating a DCLS onto a team that already includes a Pharm.D. certainly provides an opportunity to facilitate this collaboration and perhaps hospitals should consider the potential benefits of collaboration opportunities with their current pharmacy and medical laboratory professionals to assist with medication monitoring and patient safety.

Some clarification should be made that a DCLS is not meant to replace the laboratory professional working at the bench. Similar to how pharmacy and nursing have different levels
of credentials and education based on the job function, the DCLS is considered an advanced-practice laboratory professional. The DCLS serves as a liaison for the laboratory, acting as a consultant for test selection, utilization, and interpretation, which are exactly the responsibilities of Dr. Gunsolus as described by the participants in this study. One of this study’s pathologists indicated that Dr. Gunsolus was very efficient and could get to the root of any problem quite quickly. One of the admission criteria for a DCLS program is that the applicant must already be a board-certified MLS. The knowledge and experience from working in a clinical laboratory as the MLS serves as an underpinning for the DCLS educational curriculum. Without that foundational knowledge, the DCLS would be less effective.

Recommendations

The recommendations provided are based on the findings of this study. Two sets of recommendations are discussed: (a) recommendations for DCLS programs and future DCLS graduates and (b) recommendations for newly employed DCLS and medical laboratory professionals. Because some time has passed since the beginning of this study, some of these recommendations may already be in progress.

Recommendations for DCLS Programs and Future DCLS Graduates

As I processed each transcript, I realized the participants described Dr. Gunsolus using various adjectives. I took note of the descriptions and recorded them outside of the data and coding pertinent to my research questions. The following adjectives specifically pertaining to Dr. Gunsolus were extracted from the data:

- Accessible
• Approachable
• Assertive
• Easy to talk to
• Efficient
• Knowledgeable
• Personable
• Professional
• Prompt
• Savvy
• Super down-to-earth
• Welcoming

These words all have positive connotations associated with them, and the majority contributed to the positive perceptions of medical laboratory professionals overall after participants worked with a DCLS. When I asked the participants whether they would pursue a relationship with a different DCLS, I was trying to capture data that implied whether the participants were speaking positively about the DCLS role or about Dr. Gunsolus as a person. The results suggested they were speaking positively about both the professional role and the specific traits of Dr. Gunsolus. It is my opinion that these attributes greatly contributed to the success that Dr. Gunsolus experienced in collaborating with and integrating herself into the healthcare team. While some of these characteristics could be considered measurable and could be taught to someone during their educational training (e.g., knowledgeable and savvy), the individuals responsible for screening candidates applying to a Doctor of Clinical Laboratory Science
program should look for these key qualities during the admission process. Additionally, DCLS graduates should be aware that demonstrating these attributes may increase their success of integration into their new workplace.

Recommendations for Newly Employed DCLS and Medical Laboratory Professionals

As the participants described how some of their daily experiences and processes changed after working with Dr. Gunsolus, I recognized a potential overextension for the DCLS. Almost all of the participants indicated that she was now their go-to person with questions about anything laboratory related. One participant even mentioned that he felt like he has less communication with laboratory professionals now that he has Dr. Gunsolus as a liaison. The development of the Doctor of Clinical Laboratory Science role was not meant as a replacement for the medical laboratory professionals who work in the laboratory. If the majority of healthcare practitioners were to solely rely on the DCLS for all laboratory-related questions, there is potential for the DCLS to become inundated with questions and requests that could lead to their burning out. The professionals in the laboratory can still provide assistance to healthcare practitioners. It is my recommendation that upon starting a new position, the DCLS should familiarize themself with the current laboratory professionals and determine who among them possesses the knowledge to assist healthcare practitioners in a variety of situations. Laboratory professionals should also step up to this challenge and identify themselves to the DCLS as a potential point of contact for their respective knowledge base (i.e., chemistry, blood bank, microbiology, etc.). The DCLS, serving as a liaison, could disseminate a contact list to healthcare practitioners at the facility that would identify each laboratory professional by name, contact information, and a short descriptions of their area of expertise so that healthcare
practitioners can navigate to the best person for assistance. This recommendation addresses some of the frustrations and negative perceptions described by the participants in this study while assisting with the prevention of the DCLS feeling overwhelmed and overextended.

Suggestions for Future Research

The data gathered in this study provide important information for the medical laboratory profession by identifying perceptions that healthcare practitioners have about laboratory professionals and the factors that influence those perceptions. With these findings, recommendations for future research are as follows:

1. Repeat the study by using another DCLS graduate from Rutgers University after a year of employment at a facility other than the AUMC. This suggestion may help substantiate the findings of my research and determine whether those healthcare practitioners also experience a similar change in perception about laboratory professionals.

2. Repeat the study by using a DCLS graduate from a different school (e.g., University of Texas Medical Branch or the University of Kansas Medical Center). This suggestion may help identify program strengths and weaknesses related to the efficacy and successful integration of a DCLS into a clinical healthcare facility.

3. Investigate the willingness of medical laboratory professionals to serve as a point of contact for healthcare practitioners and assist with their questions. There are many educated and/or experienced laboratory professionals who are very knowledgeable about their testing responsibilities; however, they may not be comfortable interfacing at the clinician level.

4. Investigate whether a contact list for laboratory professionals changes healthcare practitioners’ attitudes about contacting laboratory professionals for assistance. This suggestion
builds on Suggestion 3 above. If medical laboratory professionals are willing to serve as a point of contact for clinician questions, a contact list with a short description of laboratory professionals’ area of expertise will assist in providing healthcare practitioners with a more timely and direct line to someone who can appropriately answer their questions.

5. Investigate the need to restructure internal laboratory hierarchy to recognize laboratory professionals with the capability and willingness to interface with healthcare practitioners to support a DCLS in answering healthcare practitioners’ questions. This suggestion again builds on the findings of Suggestions 3 and 4 above. Depending on the results of those studies, research may be needed to determine current laboratory hierarchies in order to provide restructuring recommendations so the appropriate lab professionals are identified and recognized as direct contacts to support and prevent the overutilization of the DCLS. This restructuring may foster relationship development and improved communication between healthcare practitioners and laboratory professionals. Furthermore, because it will take time to develop enough DCLS professionals to meet the needs of the healthcare system, the restructuring of the internal laboratory hierarchy may assist in filling a gap until a DCLS becomes available.

6. Investigate the perceptions that laboratory professionals have about a DCLS. One of the participants in this study indicated that pathologists may be concerned about their professional role becoming obsolete with the addition of a DCLS. Laboratory professionals may also have uncertain perceptions or unspoken concerns about a DCLS. Another participant in this study mentioned that the laboratory professionals respected Dr. Gunsolus and saw her as a great resource. Because the DCLS is serving as a laboratory liaison, it may be beneficial to solicit the thoughts and opinions of laboratory professionals to ensure a cohesive and successful
relationship. This area of research should be considered in these early years as DCLS graduates are introduced into healthcare systems.

7. Investigate current communication issues between healthcare practitioners and laboratory professionals. This suggestion requires a detailed exploration of the process involved when contacting laboratory professionals from a healthcare practitioner’s perspective. The findings may assist in identifying root causes for poor communication, wasted time, lack of rapport, or other underlying reasons for negative perceptions that healthcare practitioners may have about contacting laboratory professionals for assistance. The results of this suggestion may provide solutions or recommendations for improvements to current communication issues that can be implemented prior to the employment of a DCLS and ultimately help prevent the overutilization of a DCLS.

8. Conduct a case study analysis of a DCLS to explore their experiences and perceptions of collaboration with healthcare professionals. This information would provide insight about an out-group ICT experience to identify any obstacles and prejudices experienced during onboarding and assist in designing solutions to mitigate these issues.

9. Investigate the cost savings attributed to the addition of a DCLS to a healthcare facility. This quantitative analysis would provide measurable and comparable financial results in pre-/post-DCLS situations.

Because some time has passed since the beginning of this study, some of these recommendations for future research may already be in progress. After the experience of this study’s data collection, it is also recommended that additional research investigating perceptions should consider an adapted interview guide for the inclusion of pathologists in the
participant pool. This modification is suggested because their knowledge of laboratory
professionals exceeds that of a typical healthcare provider, and pathologists provide more of a
consult role to healthcare practitioners instead of monitoring direct patient care.

Final Thoughts

As more DCLS professionals graduate, it is important to follow them and investigate
their roles and responsibilities as they continue to carve out their place in the healthcare system.
It is crucial that the efficacy of a DCLS in providing laboratory support to both healthcare
practitioners and current laboratory professionals be examined, measured, and reported.
Healthcare practitioners and healthcare facility administrators require awareness and education
about this new laboratory resource so that a DCLS can be further integrated into healthcare
culture, providing benefits to the healthcare system and its patients.

Dr. Gunsolus has demonstrated that her role is not only versatile but also
comprehensive. Appendix F provides a list of presentations and projects that she has completed
since her graduation in May 2018. The University of Texas Medical Branch has graduated five
additional DCLS professionals since my research began, and all are employed. Two are in
academics (with part-time consulting roles), and three are in director positions (two also have
consulting roles). They are employed in the cities of Galveston, Lubbock, and Hamilton, TX,
and Oklahoma City, OK. Rutgers will have two more graduates in May 2020, and both already
have DCLS job offers: one will be working alongside Dr. Gunsolus at the AUMC in Augusta,
GA, and the other at University Hospital in Newark, NJ.
REFERENCES


Fritsma, G. (2019, November). *Medical laboratory scientists choose wisely*. Symposium conducted at the Clinical Laboratory Managers Association of Georgia and Alabama, Birmingham, AL.


APPENDICES
APPENDIX A

IRB APPROVAL
Approval Notice
Initial Review

16-Sep-2019

TO: Leah Ames (z1664076)
School of Health Studies

RE: Protocol # HS20-0075 “Perceptions of collaboration with a doctor of clinical laboratory science”

Your Initial Review submission was reviewed and approved under Member Review procedures by Institutional Review Board #1 on 16-Sep-2019. Please note the following information about your approved research protocol:


If your project will continue beyond that date, or if you intend to make modifications to the study, you will need additional approval and should contact the Office of Research Compliance and Integrity for assistance. Continuing review of the project, conducted at least annually, will be necessary until you no longer retain any identifiers that could link the subjects to the data collected. Please remember to use your protocol number (HS20-0075) on any documents or correspondence with the IRB concerning your research protocol.

Please note that the IRB has the prerogative and authority to ask further questions, seek additional information, require further modifications, or monitor the conduct of your research and the consent process.

Unless you have been approved for a waiver of the written signature of informed consent, this notice includes a date-stamped copy of the approved consent form for your use. NIU policy requires that informed consent documents given to subjects participating in non-exempt research bear the approval stamp of the NIU IRB. This stamped document is the only consent form that may be photocopied for distribution to study participants.

It is important for you to note that as a research investigator involved with human subjects, you are responsible for ensuring that this project has current IRB approval at all times, and for retaining the signed consent forms obtained from your subjects for a minimum of three years after the study is concluded. If consent for the study is being given by proxy (guardian, etc.), it is your responsibility to document the authority of that person to consent for the subject. Also, the committee recommends that you include an acknowledgment by the subject, or the subject's representative, that he or she has received a copy of the consent form. In addition, you are required to promptly report to the IRB any injuries or other unanticipated problems or risks to subjects and others. The IRB extends best wishes for success in your research endeavors.
APPENDIX B

CONSENT FORM
Northern Illinois University
Consent to Participate in a Research Study

Title of Study: Perceptions of Collaboration with a Doctor of Clinical Laboratory Science

Primary Investigator:
Name: Leah Ames Dept.: UHHS Phone: XXX-XXX-XXXX

Key Information
- This is a voluntary research study to examine perceptions that healthcare practitioners have about medical laboratory professionals with and without a Doctor of Clinical Laboratory Science (DCLS) as a resource.
- This study involves a face-to-face/telephone/teleconference interview that will be recorded and will last approximately 45 minutes. (Each participant may choose which interview format they prefer.)
- While there are no immediate benefits to the participants, the study results can guide future DCLS hiring practices.
- The risks include potential loss of anonymity due to the small participant pool in a single facility.

Description of the Study
The purpose of the study is to examine perceptions that healthcare practitioners have about medical laboratory professionals with and without a Doctor of Clinical Laboratory Science (DCLS) as a resource. If you agree to be in this study, you will be asked to do the following things:
- Participate in a face-to-face/telephone/teleconference interview consisting of open-ended questions (approx. 45 minutes)
- Sign an Informed Consent Form
- Sign a Confidentiality Agreement

Risks and Benefits
The study has the following risks: First, due to the small sample population at a single facility, there is potential to lose anonymity as a participant. Dr. Gunsolus is assisting with initial recruitment and will therefore have the knowledge that you were asked to participate. Second, despite having all participants sign confidentiality waivers, co-workers at your facility may potentially ascertain your participation in this study. Third, participants are encouraged to speak freely with the assurance that all information is kept confidential; however, it is possible that you may feel uncomfortable discussing your interactions and perceptions of a colleague. Finally, your interview will be audio recorded, so it is possible that the professional transcriptionist responsible for transcribing the interview may recognize your voice. The information that you disclose during the interview will not be shared with anyone at any time and the final publication(s) will not disclose your name or identity in any way.
While there are no immediate benefits to the participants, the study results can guide future DCLS hiring practices. The data collected from the perspective of a practitioner who has collaborated with the new DCLS team member provides valuable insight in a previously unexplored area of healthcare research. Your thoughts and shared experiences will help identify perceptions that practitioners have about medical laboratory personnel and the DCLS.

**Confidentiality**

Only the primary researcher, Leah Ames, will know what data is collected from which participant. This is necessary to match demographic information, consent, and confidentiality agreements with the interview material.

Demographic information will be collected prior to the interview and assigned a key identifier code. This code will be a generic alpha-numeric value and assigned to the consent form, confidentiality agreement and the interview recording to be transcribed. This code will be used with all subsequent data analysis. The master list correlating the participant’s name with their key identifier code will only be accessible to the primary researcher and saved in electronic form on a password-protected computer.

All data associated with this study will be kept strictly confidential. Research records will be kept in a locked file, and all electronic information will be secured using a password-protected computer. Interview recordings will only be shared with a professional transcriptionist and the researchers responsible for analyzing the data. The recordings will be destroyed (deleted) five years after the study is completed. We will not include any information in any written or oral report that would make it possible to identify you.

**Compensation**

You will receive the following compensation for your time: Each participant will have a choice of a $15 Amazon gift card or a single $15 donation to one of three charities. Participants will be asked their preference at the bottom of this form. The Amazon gift card will be presented to the participant when the interview is concluded. If the participant chooses to donate to a charity, s/he will receive an email within 4 weeks after the interview verifying that the donation has been made on their behalf. Participants must complete the interview in full in order to be eligible for compensation. Participants have the option to decline compensation.

**Your Rights**

The decision to participate in this study is entirely up to you. You may discontinue your participation at any time. Your decision will not result in any loss of benefits to which you are otherwise entitled. You have the right to skip any question or research activity, as well as to withdraw completely from participation at any point during the process.

You have the right to ask questions about this research study and to have those questions answered before, during, or after the research. If you have any further questions about the study, at any time feel free to contact the primary researcher, Leah Ames at leah.ames@niu.edu or by telephone at XXX-XXX-XXXX. The faculty member and dissertation co-chair responsible for
overseeing this research project is Dr. Jeanne Isabel who can be reached at jisabel@niu.edu or XXX-XXX-XXXX. If you have any questions about your rights as a research participant that have not been answered by the investigators or if you have any problems or concerns that occur as a result of your participation, you may contact the Office of Research Compliance, Integrity, and Safety at (815)753-8588.

**Future Use of the Research Data**

After removing all identifying information from your data, the information could be used for future research studies or distributed to another investigator for future research studies without additional informed consent from you.

I acknowledge that my de-identified information may be used for future research studies or distributed to another investigator for future research studies without additional informed consent.

Participant’s Signature

Date

**Assigned Unique ID#**

1. Your signature below indicates that you agree to volunteer as a research participant for this study, and that you have read and understood the information provided above. You will be given a signed and dated copy of this form to keep, along with any other printed materials deemed necessary by the study investigators.

Participant’s Signature

Date

Participant’s Name (Please Print)

2. I give my consent to be audio and video recorded (as appropriate) during the interview.

Participant’s Signature

Date

**Assigned Unique ID#**
Compensation Preference (please choose one):

- $15 Amazon gift card
- $15 donation to American Cancer Society
- $15 donation to American Society for the Prevention of Cruelty to Animals
- $15 donation to The Boys and Girls Club of America
- I would like to decline compensation
APPENDIX C

CONFIDENTIALITY AGREEMENT
Northern Illinois University
Confidentiality Agreement

Title of Study: **Perceptions of Collaboration with a Doctor of Clinical Laboratory Science**

Primary Investigator:
Name: **Leah Ames**  Dept: **UHHS**  Phone: **XXX-XXX-XXXX**

You have been invited to participate in the research study of Leah Ames (XXX-XXX-XXXX), a doctoral candidate at Northern Illinois University, on the project entitled *Perceptions of Collaboration with a Doctor of Clinical Laboratory Science*. The ethical guidelines of this study require that you read and sign this form, signifying that you are willing to enter into a confidentiality agreement with respect to the interview questions and the data collected in this study.

The data collected in this study pertain to one’s thoughts, feelings, and experiences. A basic assumption for this research is that participants will present their perceptions in a way that accurately reflects their own personal beliefs; therefore, the validity of this study depends on collecting data from participants in its truest form. Discussing any part of the research with others may alter another participant’s thoughts or opinions regarding their own experiences, invalidating the data collected from them. Furthermore, discussion about the study may sabotage efforts to maintain participant anonymity since this project is confined to a single location with a relatively small participant pool. By signing below, you agree not to discuss anything regarding your participation, the interview questions, or any data collected in this study with anyone other than the principal investigators in order to protect the validity of the research.

By signing below, you are indicating that you have read and understand the above agreement and that you will follow the specified conditions.

Printed Name: ___________________________________________

Contact Telephone: _______________________________________  

Contact E-mail: _________________________________________

Signature: ______________________________________________

Date: _________________________________________________
Perceptions of Collaboration with a Doctor of Clinical Laboratory Science
Interviews with Practitioners

Dear Dr/Mr/Ms______________:

I invite you to participate in a 45-minute audio/video interview about your experiences as a healthcare provider responsible for ordering and interpreting diagnostic laboratory tests. You are one of approximately a dozen professionals currently working with a Doctor of Clinical Laboratory Science who will be invited to participate in this study.

The study has 3 primary aims:
1) To understand practitioners’ natural processes in ordering diagnostic laboratory testing and result interpretation
2) To identify perceptions that practitioners have regarding medical laboratory personnel
3) To determine if provider practices have changed over time.

Please consider participating in this study. Your insights will be very helpful to this previously unexplored area of research. If you agree, I will provide more information about the study, informed consent information, and answer any of your questions prior to the interview.

The interview will be video/audio-recorded either face-to-face on location at Augusta University Medical Center or via telephone or teleconference (AdobeConnect/WebEx/Zoom/Skype—your choice) and should last approximately 45 minutes. The audio/video recording of the interview will be reviewed by two of the project researchers to summarize responses and identify themes. Detailed notes from your taped interview will be made available to you for review, if requested.

For compensation, you will have a choice of a $15 Amazon gift card or a single $15 donation to one of three charities and you will be asked for your preference when you sign the consent form. The Amazon gift card will be presented to you when the interview is concluded. If you choose to donate to a charity, you will receive an email within 4 weeks after the interview verifying that the donation has been made on your behalf. You must complete the interview in full in order to be eligible for compensation and you also have the option to decline compensation.

Please contact the primary investigator, Leah Ames, at leah.ames@niu.edu or XXX-XXX-XXXX (cell) with any questions.

In your response, please include directions for how to best schedule an appointment with you for the interview. I hope you will consider this request and look forward to speaking with you.

Sincerely,

Leah Ames
PhD Candidate
Northern Illinois University
APPENDIX E

INTERVIEW GUIDE
Interview Guide v.4
Interview Questions Sans Demographic Information (IRB HS20-007)

Note: Demographic information to be collected separately, prior to interview.

These first questions pertain to your daily practice and experiences.
- Tell me a little bit about your current professional practice, your daily responsibilities, and your patient population.
- How many patients per week do you typically see and for what conditions?
- For those patients, approximately how often do you order laboratory testing as a part of the diagnostic process?
- As a provider, on a scale of 1 to 5, with 5 being the most important, how significant are laboratory test results in guiding your treatment for patients?

Now I’d like to address laboratory testing in the context of your professional training. (Prior to working with Dr. Gunsolus)
- Can you please describe where you initially learned about laboratory medicine and diagnostic testing?
- Can you please list some of the laboratory tests that you routinely order for your patients?
  ▪ What is your mental process in selecting which laboratory tests to order for your patients?
  ▪ How do you make this decision? Do you have flow charts or computer algorithms to assist you?
- As part of the diagnostic process, when your patient’s primary test results come back positive, suggesting that further testing is needed, how do you go about selecting more complex or diagnostic (2nd tier) laboratory tests?
- When ordering tests that are not routine, how do you determine what the appropriate tests should be? What leads you through the decision-making process?
- Has there ever been a time when you had questions about choosing a lab test for your patient or had questions about a lab test result?
  ▪ How did you go about answering your questions?
- Have you ever been informed that your order included an incorrect or inappropriate test? How about missing a needed test in your order?
- **If yes**, who brought it up? Can you describe what happened and how it was resolved?
- How did this make you feel?
- **If no**, how would this make you feel and how would you handle this type of situation?

  - What are your biggest concerns or frustrations when it comes to diagnostic laboratory testing?

**Let’s talk about when you were informed about working with a new healthcare professional, a Doctor of Clinical Laboratory Medicine.**

  - How did you learn about the DCLS and what information were you provided about their role at your facility?

  - Can you please describe what you thought and felt when you first learned about the hiring of a Doctor of Clinical Laboratory Medicine (the DCLS)?

  - What was your perception of the role of the DCLS and the potential impact on your daily clinical responsibilities, if at all?

  - What was your first collaborative interaction with the DCLS?
    - Were you assigned to this team or did you volunteer for a team that included the DCLS? Or perhaps she was assigned to a team that you were already on?

**These next questions pertain to your feelings and experiences AFTER working with Dr. Brandy Gunsolus.**

  - Please describe the relationship that you currently have with Dr. Gunsolus.

  - Talk about the process of integration that took place when she came onboard.
    - Can you describe how you felt and how your relationship was established?

  - How did working with Dr. Gunsolus affect your daily clinical responsibilities?
    - What types of projects or situations did you collaborate on?

  - Can you please describe what you thought and felt about medical laboratory professionals after working with Dr. Gunsolus?

  - Can you please describe any changes you noticed with the quality of laboratory information which affected patient care that was attributable to Dr. Gunsolus’ input?

  - How, if at all, have your daily practices changed since working with Dr. Gunsolus?
Is there anything you are doing differently?
Have any process changed?

If you were to start working at a different facility tomorrow that also employed a DCLS, how would you go about establishing a relationship with that DCLS?
How would this experience be different than when you first started working with Dr. Gunsolus?

Think back to a time before you were working with Dr. Gunsolus, the DCLS.

Did you ever contact anyone in the laboratory for assistance for any questions or concerns you had about laboratory testing?

If yes, describe the circumstance and did you find lab professionals to be a helpful resource that you would utilize again?
If no, why did you not consider contacting someone in the laboratory? What other means did you use to answer your questions or concerns?

I’d like to focus on the laboratory personnel for just a minute.

How familiar are you with the profession responsible for diagnostic testing?

Prior to working with a DCLS, what were your general thoughts about the personnel responsible for laboratory testing?

Can you please describe what type of educational requirements, training, and/or credentials you would expect someone working in the clinical medical laboratory to have?

What are your expectations of these professionals?

Have your thoughts, feelings, or perceptions about medical laboratory professionals changed at all since working with Dr. Gunsolus?
If yes, please describe.

To wrap up our conversation,

Overall, what changes, if any, have occurred for you as healthcare provider since you have been introduced to a DCLS as a resource?

What do you see as pros and cons to having a DCLS on staff or available as a resource for laboratory medicine issues?
• Is there anything that you would like to add that we have not discussed but that you feel is important?
APPENDIX F

LIST OF DCLS PRESENTATIONS, COLLABORATIONS, AND PUBLICATIONS
**Poster Presentations and Research Collaborations**


**Published, Peer-Reviewed Articles**

Singh, G., Savage, NM, Gunsolus, B., Foss, KA. *Requiem for the STAT Test: Automation and Point of Care Testing,* Laboratory Medicine, Nov. 20, 2019.
**Published, Non-Peer-Reviewed Articles**


**Presentations**

*Choosing Wisely: Best Practices Update in Laboratory Utilization*. Mar 31st, 2019, 2019 Primary Care & Family Medicine Symposium, Augusta, GA. (invited speaker)


*Choosing Wisely: Primary Care Best Practices Update in Laboratory Utilization*. Aug 7th, 2019, Grand Rounds – Department of Internal Medicine – Medical College of Georgia, Augusta, GA.

*Clinical Laboratorian Consultation: Improving Diagnosis and Reducing Cost*. July 30th, 2018, ASCLS Annual National Convention, Chicago, IL.

*Doctorate in Clinical Laboratory Science Clinical Experience: A Tale of Two Programs*. Aug 1st, 2018 – ASCLS Annual National Convention, Chicago, IL.

*Drug Interferences in Laboratory Testing*. Sept 11th, 2018, Grand Rounds – Department of Family Medicine – Medical College of Georgia, Augusta, GA.

*DCLS: One Year in Practice Review*. June 26th, ASCLS Annual National Convention, Charlotte, NC.

*Diabetic & Thyroid Testing: Appropriate Timing and Billing*. Dec. 12th, 2019, Noon Conference – Department of Family Medicine – Medical College of Georgia, Augusta, GA.
Direct-to-Consumer Genetic Testing: Scientific, Legal, & Ethical Implications. Nov 2nd, 2019, AUMC CEU Saturday, Augusta, GA.

Educating Physicians: What We Always Thought They Knew But They Didn’t. June 25th, 2019, ASCLS Annual National Convention, Charlotte, NC.

Educating Physicians: What We Always Thought They Knew But They Didn’t. Aug 10th, 2019, AUMC CEU Saturday, Augusta, GA.


Genetic Testing in Pediatrics. Feb. 11th, 2020, Faculty Senate, Children’s Hospital of Georgia, Augusta, GA.

Green Leukocyte Inclusion Crystals. Feb. 8th, 2020, AUMC CEU Saturday, Augusta, GA.

Heparin-PF4 Antibody and Argatroban: A Tale of Interdisciplinary Teamwork. Aug 10th, 2019, AUMC CEU Saturday, Augusta, GA.


Improving Laboratory Test Utilization to Reduce Diagnostic Error. Nov 15th, 2019, Medical College of Georgia Faculty Senate, Augusta, GA. (invited speaker)

Implementation of a Diagnostics Consultation Program Reduces Costs and Improves Health Outcomes: Case Studies from a Tertiary Academic Medical Center. Nov 6th, 2018, Diagnostic Error in Medicine Conference, New Orleans, LA.


Innovation to Improve Laboratory Test Utilization. Mar 15th, 2019, Florida Society for Clinical Laboratory Science Annual Meeting, Orlando, FL. (invited speaker, opening keynote)

Innovation to Improve Laboratory Test Utilization. May 2nd, 2019, Clinical Laboratory Collaborative Conference, Denver, CO. (invited speaker)

Interdisciplinary Communication. June 22nd, 2019, ASCLS Annual National Convention Leadership Academy, Charlotte, NC. (invited speaker)
Innovation to Improve Laboratory Test Utilization. Mar 9th, 2019, Alabama-Georgia Medical Laboratory Symposium, Atlanta, GA. (invited guest speaker, opening keynote)

Innovation to Improve Laboratory Test Utilization. Apr 5th, 2019, North Carolina Clinical Laboratory Consortium, Raleigh, NC. (invited speaker, opening keynote)

Innovation to Improve Laboratory Test Utilization. Apr 11th, 2019, ASCLS-NJ Spring Seminar & Expo, Sommerset, NJ. (invited speaker, closing keynote)

Innovation to Improve Laboratory Test Utilization. Apr 18th, 2019, ASCLS-IL Annual Meeting, Peoria, IL. (invited speaker, opening keynote)

Innovation to Improve Laboratory Test Utilization. Sept 24th, 2018, International Federation of Biomedical Laboratory Scientists World Congress, Florence, Italy (invited guest speaker)

Laboratory Billing, Reimbursement, & Utilization. Feb 8th, 2019, Grand Rounds – Department of Family Medicine – Medical College of Georgia, Augusta, GA.

Laboratory Billing, Reimbursement, & Utilization. Mar 29th, 2019, Grand Rounds – Department of Cardiology – Medical College of Georgia, Augusta, GA.

Laboratory Billing, Reimbursement, & Utilization. Apr 1st, 2019, Grand Rounds – Department of Pulmonology & Critical Care – Medical College of Georgia, Augusta, GA.

Laboratory Billing, Reimbursement, & Utilization. Apr 4th, 2019, Grand Rounds – Department of Neurology – Medical College of Georgia, Augusta, GA.

Laboratory Billing, Reimbursement, & Utilization. May 18th, 2019, AUMC CEU Saturday, Augusta, GA.

Laboratory Billing, Reimbursement, & Utilization. May 28th, 2019, Grand Rounds – Department of Internal Medicine – Medical College of Georgia, Augusta, GA.

Laboratory Billing, Reimbursement, & Utilization. June 21st, 2019, Grand Rounds – Department of Pediatrics – Medical College of Georgia, Augusta, GA.

Laboratory Billing, Reimbursement, & Utilization. July 26th, 2019, Grand Rounds – Infectious Disease City-Wide Group – Medical College of Georgia, Augusta, GA.

Laboratory History: From Medieval Times to Modern Technology. Mar 28th, 2019, Greenblatt Medical Library Lecture Series, Augusta, GA.

Laboratory History: From Medieval Times to Modern Technology. Apr 22nd, 2019, National Medical Laboratory Week Program – Augusta University Health Sciences, Augusta, GA.
Laboratory History: From Medieval Times to Modern Technology. May 18th, 2019, AUMC CEU Saturday, Augusta, GA.

Laboratory Science Career Options Panel. May 3rd, 2019, Clinical Laboratory Collaborative Conference, Denver, CO.

Laboratory Test Sensitivity, Specificity, & Information for Rheumatology. Nov 28th, 2018, Grand Rounds – Department of Rheumatology – Medical College of Georgia, Augusta, GA.

Medication Interferences in Laboratory Testing. Feb 9th, 2019, AUMC CEU Saturday, Augusta University Medical Center, Augusta, GA.

Medication Interference in Laboratory Testing. Apr 19th, 2019, ASCLS-IL Annual Meeting, Peoria, IL. (invited speaker)

Medication Interference in Laboratory Testing. Aug 15th, 2019, Children’s Hospital of Georgia Pediatric Morning Conference, Augusta, GA.

Medication Interference in Laboratory Testing. Aug 21st, 2019, Noon Conference – Department of Internal Medicine – Medical College of Georgia, Augusta, GA.

Medication Interferences in Laboratory Testing. Nov 14th, 2018, Grand Rounds – Department of Rheumatology – Medical College of Georgia, Augusta, GA.

Opiate Prescription Drug Monitoring. Aug 19th, 2019, Co-presented with Kristina Kruse, MD, Grand Rounds – Department of Family Medicine – Medical College of Georgia, Augusta, GA.

Sepsis Markers: The Good, The Bad, The Ugly. Feb 9th, 2019, AUMC CEU Saturday, Augusta University Medical Center, Augusta, GA.

Sepsis Markers: The Good, The Bad, The Ugly. Mar 9th, 2019, Alabama-Georgia Medical Laboratory Symposium, Atlanta, GA.


Transgender Reference Interval Study Proposal Presentation. May 9th, 2019, AU Health Interdisciplinary Research Committee, Augusta, GA.

Urine Drug Screening in Primary Care. Mar 31st, 2019, 2019 Primary Care & Family Medicine Symposium, Augusta, GA. (invited speaker)

Urine Drug Screening in Primary Care. Sept 11th, 2019, Children’s Hospital of Georgia Pediatric Morning Conference, Augusta, GA.
What’s the Deal With: Testing for Celiac/ Crohn’s/ IBD/ IBS. Nov 2nd, 2019, AUMC CEU Saturday, Augusta, GA.

#WeSaveLivesEveryday. Co-presented with Dr. Kyle Riding and Dr. Rodney Rohde, Sept 26th, 2019, ASCLS Region III Triennial Meeting, Pensacola, FL.

#WeSaveLivesEveryday. Co-presented with Dr. Kyle Riding and Dr. Rodney Rohde, Nov 6th, 2019, ASCLS Live Webinar.