EXAMINING HOW EARLY CAREER PHYSICIANS COLLABORATE IN VARYING PROBLEM SITUATIONS: FOCUSING ON PROBLEM NATURE AND COLLABORATION APPROACHES

by

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(Under the Direction of Ikseon Choi)

ABSTRACT

Effective teamwork and collaboration among healthcare professionals is considered essential to achieving positive health outcomes and executing quality patient-centered care. Collaborative competence, alongside clinical and discipline-specific knowledge and skills, is a vital component of healthcare professionals' overall competence given the majority of today's patient care is delivered collaboratively across professions, specialties, and practices. One of the most defining features of collaboration in healthcare is that members work together to identify and find solutions to problems that arise throughout the course of patient care. The purpose of this qualitative, multiple case study is to explore the different problem situations that health professionals collaborate within and to examine how they perceive and carry out collaboration in varying problem situations.

Four early career physicians (< 5 years of independent practice) were recruited to participate in a semi-structured interview, during which they described collaboration in healthcare and shared stories of collaboration in their everyday practice contexts. A total of 23 collaboration cases were collected, of which 21 were collaborations with other healthcare

professionals. Results indicate that early career physicians collaborate on problem situations that vary in degree of certainty (i.e., well-defined, ill-defined), complexity, and dynamicity, and collaboration approaches vary depending on the nature of the problem at hand. Emerged patterns suggest early career physicians tend to follow appropriate established protocols and guidelines when they collaborate on relatively well-defined problem situations, and a more integrative collaboration approach appeared to be taken to resolve ill-defined, complex, and dynamic problem situations. Importantly, it was found that early career physicians are more likely to have positive collaborative experiences when the collaboration approach and problem nature are aligned (protocol-oriented collaboration for well-defined problems, integrative collaboration for ill-defined problems). The findings of the current study recommend that educators guide students to understand the different collaborative approaches and their features and provide them with opportunities to practice collaborating on real-world situations that differ in their degree of uncertainty, dynamicity, and complexity. With proper guidance and feedback, students can learn to flexibly and strategically adapt different collaborative approaches to help them achieve their goals for each situation.

INDEX WORDS: Collaboration, Problem Nature, Ill-defined Problems, Problem Solving, Early Career Physicians, Healthcare, Case Study, Integrative Collaboration, Interprofessional Collaboration

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CHAPTER 1

INTRODUCTION

Patient care in the United States has traditionally been organized around discipline-specific specialization of care, in which healthcare professionals with similar training, expertise, and scopes of practice work semi-autonomously to "do their part" with minimal exchange of practice while treating mutual patients (Liberati et al., 2016). However, a number of factors (e.g., longer life expectancies, prevalence of patients with multiple chronic conditions) have contributed to a change in the patient care paradigm over the years as healthcare professionals find themselves facing increasingly complex clinical problems and patient needs on a regular basis (Boersma et al., 2018; Hajat & Stein, 2018; Medina et al., 2020; Wang et al., 2016). The goals of care now primarily center on improving the health and well-being of patients as a whole, and providing high-quality health care includes improving access to care, promoting preventive measures, and enhancing patients' quality of life (U.S. Department of Health and Human Services [HHS], n.d.).

To this end, effective collaboration among healthcare professionals is considered essential to achieving positive health outcomes and executing quality patient-centered care. Complex clinical problems often demand complex care interventions as well as long-term care management facilitated through interprofessional collaboration. Further, the healthcare field's tendency toward specialization of knowledge means that much of patient care currently is and will increasingly be delivered through collaborative care across disciplines, expertise, and practices. Thus, collaborative competence, alongside clinical and discipline-specific knowledge

and skills, is a vital component of healthcare professionals' overall competence when it comes to executing duties and responsibilities toward patients in their care.

This dissertation is an in-depth exploration and analysis into the phenomenon of collaboration as it is conceptualized, carried out, and experienced by healthcare professionals in real-world contexts. This chapter will provide the background, purpose, and significance of the present study.

Background of the Study

Effective teamwork and collaboration among healthcare professionals is considered essential to achieving positive health outcomes and executing quality patient-centered care (Pomare et al., 2020). According to the United States Census Bureau, the population of adults aged 65 and over is projected to reach 89 million by 2050 (Vincent & Velkoff, 2010). Current estimates show that just under 30% of adults have multiple chronic conditions (≥ 2 conditions) and require long-term, complex care planning and delivery from multiple healthcare providers (Boersma et al., 2020; Tsakitzidis et al., 2016). As such, there is an increasing need for effective collaboration to take place among providers – across professions, specialties, and practices – to ensure delivery of patient-centered care that is "safe, efficient, timely, effective, and equitable" (Interprofessional Education Collaborative [IPEC], 2011, p.11).

Evidence shows that collaborative competence, or lack thereof, can have major impact on patient outcomes. The majority of today's patient care is delivered in teams of providers and across practice settings, and breakdowns in communication and other collaborative processes have consistently been cited as contributors of medical errors through studies in hospitals and outpatient settings (Institute of Medicine, 1999; US Office of the Inspector General [OIG], 2010). Examples include lack of communication (e.g., incomplete information provided in

handoffs), failure to execute roles and duties (e.g., passive staff, incomplete participation in procedures), and acting on cognitive biases held by the staff (The Joint Commission on Accreditation of Healthcare Organizations [JCAHO], 2019, 2020).

A great number of studies have been undertaken over the years in an effort to better understand collaboration as a phenomenon. However, there is critical oversight in extant literature regarding collaboration in healthcare, in which collaboration is primarily theorized and treated as both an ideal, dichotomous state (i.e., collaboration is present/not present) and a way of working together. In doing so, existing theories and models assume collaboration to "occur" as long as it is supported and/or facilitated by the presence of specified factors (e.g., shared goals, communication, organizational supports and policies), effectively ignoring the impact that contextual factors may have on each situation (e.g., D'Amour, 2008; Sicotte et al., 2002; Wei et al., 2020). In contrast, collaboration in the real world has been described as multi-dimensional, complex, and situated in specific contexts (Barr et al., 2005; Cable, 2000). Collaboration for the purpose of delivering patient-centered care necessarily implies consideration of the dynamic and evolving problem situation at hand to effectively meet patient-specific needs.

Collaboration in Problem Situations

One of the most defining features of collaboration in healthcare is that members work together to identify and find solutions to problems that arise throughout the course of patient care (Baggs & Schmitt, 1988; Barr et al., 2005; Counsell et al., 1999; Taylor-Seehafer, 1998). One can argue, then, that the beginning of each collaborative endeavor is the discovery of a problem within a situation. A problem is defined as "a question or issue that is uncertain and so must be examined and solved" (Jonassen, 2010, p. 1), and it is produced when we discern a gap between the current state of a situation and desired ("ideal" or "goal") state (Jonassen, 2000). Problem-

solving, therefore, is the process of resolving the uncertain question or issue perceived and to close the gap between the situation as it exists now and how it should be. Problem-solving in collaboration requires multiple stakeholders to share in framing the problem situation and finding appropriate solutions to the problem (Palmer, 2021).

Collaborating through shared problem-solving and shared decision-making is believed to be especially important as problem situations increase in complexity (IPEC, 2011). This implies that in healthcare, there are a range of problem situations in which some, being more complex, require healthcare professionals to identify them as such, and they must collaborate with appropriate individuals to better understand the situation and generate more effective solutions. A potential way to approach the phenomenon of collaboration in healthcare and the mechanism behind its successes and failures is to dissect and analyze each collaborative instance into its stimulus (what prompted collaboration to occur, "the problem"), process (a sequence of events, actors involved, actions taken), and outcome. In doing so, collaboration is treated as the multi-dimensional and complex phenomenon it is described to be, and this approach may afford more insight as to how health professionals understand, approach, and carry out collaborative care in varied, real-world contexts.

Further, given the emphasis on collaboration in situations of complexity, the process of defining and assessing complexity in real-world contexts is yet another important aspect that must be explored. Despite the central role that complexity is believed to play in collaborative care, how healthcare professionals assess complexity of a problem situation and the relationship between situational complexity and their approaches to care delivery (e.g., shared decision-making) remain unclear in the literature. As such, it is worth investigating exactly when and how

healthcare professionals identify and sort problem situations according to complexity as well as their decision-making processes when resolving each situation.

The purpose of this study is to explore the different problem situations that health professionals collaborate within and to examine how they perceive and carry out collaboration in varying problem situations. While the broader research problem concerns any and all persons who have a stake in the health, wellbeing, and care of a patient, the current study will focus on exploring the problem situations within collaboration experiences of early career physicians (<5 years of independent practice) specifically.

The central research question for the present study is: What is the relationship between problem nature and collaboration approach as experienced by early career physicians during their first 5 years of independent practice? The following five sub-questions will be used to guide my inquiry and analyses:

Q1: What kinds of problem situations do early career physicians collaborate on?

Q2: How do early career physicians conceptualize collaboration in healthcare?

Q3: How do early career physicians carry out collaboration in their everyday practice?

Q4: What are the similarities and differences between how collaboration is conceptualized and practiced?

Q5: What are the emerging patterns among problem nature, collaboration approach, and collaboration experience?

Significance of the Study

Contribute to Theory and Practice

McKenney & Reeves (2020) noted people's tendency to search for solutions before fully understanding the problem they are trying to solve. This statement is representative of the

majority of research conducted in the healthcare field regarding collaboration. The literature is abundant in papers describing how collaboration *should* work in healthcare (i.e., ideal form and function) along with common challenges that hinder the collaborative process in actual practice (e.g., Fewster-Thuente & Velsor-Friedrich, 2008). These observations are generally followed by lengthy discussions on the importance of a multitude of factors such as mutual respect, role clarity, and clear communication that facilitate collaboration and often conclude with calls for "more research efforts" in finding ways to support collaboration in practice (e.g., Petri, 2010). While it is true that many of these factors play a critical role in collaboration, such papers fail to provide practical strategies or solutions to overcoming ill-structured, complex, and situational contexts that make collaboration challenging to practitioners.

First and foremost, the findings of this study will contribute to the existing body of knowledge related to collaboration in literature. This study has the potential to add to both theory and practice of the healthcare field by expanding theoretical insight into the underlying mechanism of collaboration in healthcare contexts. This includes the potential discovery of hidden factors influencing or inhibiting collaborative processes and experiences. Understanding how collaboration occurs in varied problem situations is important for designing strategies that can support health professionals to collaborate effectively (i.e., safely and efficiently address patient care needs) and improve their collaborative experiences overall.

Support Education and Training

Given the important role that collaboration plays in patient safety and outcomes, professional programs must provide a curriculum that cultivates appropriate knowledge and skills for graduates to collaborate effectively with one another, both within and across professions, as they carry out their individual duties and responsibilities. In order to meet the

field's demand for collaborative competence from graduating professionals, programs must offer students opportunities to (1) understand the nature of collaboration and identify appropriate problem contexts for its use in delivering patient-centered care, (2) experience what collaboration entails in complex, real-world contexts that they will operate within in the future, and (3) produce constructive strategies to overcome known barriers and problems that hinder the collaborative process. Structuring instruction and training in a way that is both authentic and practical requires a deep understanding of collaboration as it is currently practiced as well as the challenges experienced by those in the field.

The patterns discovered from this study will inform best practices of collaboration in varying healthcare contexts. Data gathered through this study will be compiled into a collection of cases focusing on the types of collaborative problem solving situations embedded within a variety of real-world complex problem situations. These cases will help develop trainings for collaborative competence and professional development for current practicing healthcare professionals. In addition, these cases will also inform education programs for future graduates of health professions. The problem situations gathered through the study can be used to train and prepare students with appropriate problem solving skills necessary to handle the kind of complex situations they will collaborate within after graduating.

Further, collaborative competence not only impacts the quality of outcomes and experiences among healthcare professionals but also has the potential to enhance the quality of their interactions with patients and caregivers. Patient-centered care (PCC), described as the practice of integrating the patient and their perspectives in the decision-making processes surrounding their care, recognizes patients as central stakeholders in determining their health outcomes and goals of care (Robinson et al., 2007). In essence, PCC is the practice of

collaborating with patients to plan and implement appropriate treatment options that are congruent with patient-specific needs and values.

Definitions of Key Terms

Collaboration is defined in this study as when two or more people work jointly to frame and solve problems. *Interprofessional Collaboration* refers to collaboration across professions (e.g., physicians and nurses).

Problem refers to a question or issue that is uncertain and so must be examined and solved. Problem also refers to when there is discernment of a gap between the current state of a situation and desired ("ideal" or "goal") state. *Problem situation* refers to the circumstances, conditions, and contexts that determine the formation and specifics of a problem (Dostál, 2015)

Problem solving is the process of articulating solutions to problems. Alternatively, it is "the act of transforming a situation into an updated configuration of meaning that satisfies some intention" (Palmer, 2021). *Problem framing* is defined as taking ownership of and iteratively defining what the problem is (Svihla, 2021). Problem framing includes bounding the problem (identifying what should be included and excluded as part of the problem).

Well-structured problems (also referred to as well-defined) are problems that clearly present all elements of the problem to the problem solver, and they possess correct, convergent answers (Jonassen, 2010). *Ill-structured problems* (also referred to as ill-defined) are problems that do not have a clear and obvious goal state to work toward. They possess multiple solutions, solution methods, and criteria for evaluating solutions, all of which make it difficult to determine what concepts, domains, or rules should be considered in the process of searching for an appropriate solution. These problems have one or more elements that are unknown to the problem solver.

Complexity is used to describe the interaction between internal and external factors of problems and problem solving. Complexity of a problem is a function of the breadth of knowledge required to solve the problem, the level of prior knowledge, the intricacy for problem-solutions procedures, and the relational complexity of the problem (Jonassen, 2010).

Clinical complexity refers to the care of patients with multiple coexisting medical conditions (Brown et al., 2003; Durso. 2006; Nardi et al., 2007).

Co-morbidity/Comorbidities (i.e., coexisting, co-occurring, multimorbidity) is used to describe the presence of two or more diseases or conditions that are usually long-term or chronic. Examples include heart disease, high blood pressure, and diabetes.

CHAPTER 2

LITERATURE REVIEW

The purpose of this chapter is to provide relevant conceptual, empirical, and practical literature used to inform the present study. This chapter is comprised of three sections. The first section provides a review of the current empirical, theoretical, and conceptual understandings of collaboration in healthcare literature along with how collaboration is perceived and practiced in real-world contexts. The second section examines the theories surrounding the nature of problems and establishes a new perspective into exploring collaboration in healthcare. The final section presents the conceptual framework for this study.

The Case for Collaboration

The traditional patient care model is organized around discipline-specific specialization of care, in which providers with similar training, expertise, and scopes of practice would work semi-autonomously with minimal exchange of practice (Liberati et al., 2016). However, the changing needs of the population increasingly demanded significant structural and cultural shifts be made in how patient care is delivered to effectively meet these needs. Current estimates show that just under 30% of adults are diagnosed with multiple chronic conditions (≥ 2 conditions) that require long-term, complex care planning and delivery from healthcare providers (Boersma et al., 2020; Tsakitzidis et al., 2016). This number is expected to increase over time as the population of adults aged 65 and over in the U.S. is projected to reach 89 million by 2050 (Vincent & Velkoff, 2010).

Further, the healthcare field's tendency toward specialization of knowledge means that much of patient care currently is and will increasingly be delivered through some form of collaborative care. Currently, the American Association of Medical Colleges (AAMC) lists more than 135 specialties and subspecialties within the field of medicine alone, each with practice- and disease-specific methods of prioritizing clinical problems, goals, and treatments. Coordinating care for patients with multiple chronic conditions is a complex process that requires providers to move beyond disease-centered decision-making and outcomes toward aligning care in a way that reduces treatment burden for patients while improving adherence (Tinetti et al., 2016). As such, patient care in today's contexts require healthcare professionals to collaborate efficiently and effectively across specialties, professions, and practices, and it is becoming increasingly evident that collaborative care is the key to providing quality patient-centered care.

While collaboration is being discussed as an emerging need in healthcare, demonstrating a clear cause-and-effect relationship between greater collaboration and patient outcomes has been challenging. Martin et al. (2010) examined the relationship between collaborative interventions and patient outcomes. They found that while the overall effect of interprofessional interventions was positive, a wide range of intervention methods and outcome indicators were used across studies. Yet, similar positive findings have been reported on the effectiveness of collaborative interventions in hospitals (Pomare et al., 2020), intensive care units (Donovan et al., 2018), and for the elderly (Tsakitzidis et al., 2016), suggesting that collaborating effectively within and across professions does lead to improvement of patient outcomes and quality of care (e.g., reduction in adverse events, communication on treatment options, specialized consults).

The following section discusses key findings from the literature that demonstrate the importance of promoting and supporting collaboration in healthcare.

Collaboration and Complex Care Needs

Complex care interventions[1] and management facilitated through interprofessional collaborations have been found to greatly improve patient health. As noted previously, Baggs et al. (1999) posited that collaboration among health providers is especially important for patients with complex health needs since they are more likely to benefit from shared decision-making. Carter et al (2008) found that physician-pharmacist collaborative care significantly improved blood pressure control for patients. In their study, pharmacists provided face-to-face recommendations on therapy changes and engaged in shared decision-making with physicians on ways to best implement interventions. Norton et al.'s (2020) found similar results when examining the effect of pharmacist collaboration with physicians on diabetes management. Active contributions from the pharmacist regarding medication therapy, care implementation, and patient counseling led to significant reduction in a diabetic outcome indicator associated with risk of heart attack and microvascular complications.

Findings like these demonstrate the significant impact that collaborative care can have on patient health and outcomes. Heart disease and diabetes are consistently listed in the top ten leading causes of death in the United States despite there being numerous treatment options and management guidelines readily available to the public (Murphy et al., 2021). In fact, these conditions have claimed over 800,000 lives in 2020 alone and account for around $450 billion in direct medical costs (Centers for Disease Control and Prevention [CDC], n.d.). As such, there is value in further developing the field's understanding of collaborative care as a method of improving long-term management of chronic conditions.

[1] Interventions with several active, critical and interacting components (Campbell et al., 2000)

Collaboration has also been shown to improve patient outcomes in emergent contexts. Shared decision-making between physicians and nurses have led to a reduction in mortality of patients in intensive care units (Baggs et al., 1999) and occurrence of adverse events during a hospital stay (O'Leary et al., 2011). Nurses, who spend more time at the bedside of patients, were able to provide current critical information to physicians about physiological and psychological status of patients during care planning. Nurses also serve to positively influence care decisions by incorporating patient and family concerns during the planning process, allowing for formulation of care plans that are sustainable for patients and caregivers.

In addition to clinical outcomes, effective physician-nurse collaboration has been shown to improve the overall quality of care provided to patients (Hughs & Fitzpatrick, 2010; Tang et al., 2013). Counsell et al. (2007) studied low-income seniors with multiple chronic conditions and found that receiving collaborative care management[2] not only reduced incidence of acute care needs (e.g., emergency department visits, hospitalizations), but these patients were also more likely to have documentation of having received specialized consults, provided appropriate information or treatments, and other indicators of quality of care.

Conversely, ineffective collaboration has been shown to negatively influence patient outcomes by compromising both quality of care and safety (Tang et al., 2013). This is especially true for patient care in urgent and critical care situations, in which communication issues between physicians and nurses (e.g., not speaking up, unclear communication) have led to delays in treatment and more frequent medical errors (Lingard et al., 2004; Rosenstein & O'Daniel, 2006). It was estimated that 6.3 million medical injuries occurred in the United States in 2008,

[2] Primary care physician, nurse practitioner, social worker, geriatrician, pharmacist, physical therapist, mental health social worker, and community-based services liaison collaborated on individualized care plan development, implementation, and review

and the majority of injuries occurred in patients with multiple chronic conditions (Shreve et al., 2010). Thus, finding ways to support collaborative working among health professionals is key to reducing risk of injury, improving quality of care, and lowering healthcare costs especially when addressing complex needs of patients.

Collaboration, Job Satisfaction, and Burnout

Studies have shown that there is a strong relationship between nurses' perception of collaboration and their job satisfaction. Job satisfaction is "a multidimensional construct that includes job requirements, autonomy, work relationships, and organizational conditions" (Galletta et al., 2016, p. 2). Poor physician-nurse collaborations have been associated with decreased job satisfaction, increased burnout, and increased job turnover (Galetta et al., 2016; Larrabee et al., 2003; Tang et al., 2013). These findings are reflective of changes within the nursing profession that have expanded from a traditional task-oriented, support role to one that is more clinically autonomous and engaged in collaborative decision-making and care planning (Matziou et al., 2014). For nurses in particular, a major predictor of job satisfaction was found to be psychological empowerment. A predictor of psychological empowerment was nurse-physician collaboration (Larrabee et al., 2003).

The relationship between collaboration and job satisfaction extends beyond those of physician-nurse collaborations. Ylitormanen et al. (2018) found nurse-nurse collaboration and job satisfaction to be significantly and positively related to each other. They also confirmed previous findings of studies which showed participation in decision-making and autonomy to be strong predictors of job satisfaction for nurses.

Job satisfaction, in turn, has been found to be a significant predictor of burnout among nurses (Kalliath & Morris, 2002). Burnout refers to the emotional depletion and loss of

motivation that professionals can experience in healthcare (Leiter et al., 2014), and has been a long-standing struggle experienced by health professionals as they strive to provide compassionate, competent, and ethical care in a productive, efficient manner with diminishing resources and increasing responsibilities (Kalliath & Morris, 2002). Burnout has been defined as "the index of the dislocation between what people are and what they have to do. It represents erosion in values, dignity, spirit and will – an erosion of the human soul" (Maslach & Leiter, 1997, p. 17). Much of the research on this topic has focused on designing and implementing interventions to reduce environmental contributors to burnout due to its link to patient safety outcomes and turnover costs.

Given recent context of the COVID-19 pandemic, a particularly concerning outcome of burnout lies in its relationship with the individual's physical and mental well-being (Maslach & Leiter, 2017; Toker et al., 2012). Lasalvia et al.'s (2020) study on burnout in the pandemic revealed that nurse burnout was associated with emotional exhaustion and residents with a reduced sense of professional efficacy. These findings are unsurprising given that the pandemic emergency created a sudden and significant shift in the norms of care, forcing health professionals to step into unfamiliar roles as they worked to save patient lives. Physicians and nurses faced the challenge of dealing with an unknown virus, rapidly changing information and protocols, and meeting patient care needs in new ways all the while staying safe. In the face of uncertainty, health professionals may be forced to make clinical decisions they feel uncomfortable about which can lead to stress, depression, and post-traumatic stress disorder (Koffman et al., 2020).

Therefore, these connections between psychological empowerment, job satisfaction, and burnout are particularly meaningful and worth researching further especially when considering

the stressful and challenging contexts that patient care will continue to be delivered within. In addition, these findings suggest collaborative decision-making and problem solving to have broader impact on the well-being of patients and healthcare professionals alike beyond achieving positive clinical outcomes.

Understanding Collaboration in Healthcare Contexts

What is Collaboration?

"Collaboration" in healthcare is one of many terms, along with "teamwork" and "team-oriented care," that is used to describe health professionals working together to deliver care to patients. Much of the research surrounding collaboration as a concept is hindered by the use of inconsistent, or even contrasting, definitions found throughout the literature. What makes the process of articulating the nature of collaboration especially complex are the profession-specific values, perspectives, and boundaries that influence how professionals approach problems, formulate plans, and communicate concerns with one another (American College of Clinical Pharmacy [ACCP], 2009; Hall, 2005; Tang et al., 2013). As a result, there are varying theories and definitions of collaboration, including how it is presumed to occur and what differentiates collaboration from other forms of group-oriented work (e.g., cooperation).

Table 2.1 illustrates this complexity by providing a glimpse of the many ways collaboration has been conceptualized and used in healthcare literature. All authors more or less agree that collaboration involves two or more individuals working together toward a shared goal. However, this is where the agreement ends, as authors begin diverging on whether collaboration is an active partnership between professionals, which implies relational factors underpinning the process (e.g., Rousseau et al., 2012), or simply a process of jointly solving problems together (e.g., Martin et al., 2010). A possible explanation for these divergences is that the authors may be

Table 2.1

Collaboration Conceptualized in Healthcare Literature

Authors	Definitions
Baggs & Schmitt, 1988, p. 145	"nurses and physicians cooperatively working together, sharing responsibility for solving problems, and making decisions to formulate and carry out plans for patient care."
D'Amour, 1997	"process by which interdependent professionals are structuring a collective action towards patients' care needs"
Taylor-Seehafer, 1998, p. 387	"process of working together. It implies shared planning and action over time…function[ing] as colleagues in a flat hierarchy… and decision-making that is both independent and cooperative…new problems and plans emerge from the integration of individual contributions. Collaboration involves attempts to find solutions where both parties' concerns are recognized, and important concerns are not compromised"
Counsell et al., 1999, p. 1145	"Interdisciplinary teamwork involves a greater degree of collaboration among different disciplines. Although individual team members assume discipline-specific roles, the team together identifies and analyzes problems, defines goals, and assumes joint responsibility for actions and interventions to accomplish these goals"
Way et al., 2000, p. 3	"Collaborative practice is an inter-professional process for communication and decision making that enables the separate and shared knowledge and skills of care providers to synergistically influence the client/patient care provided"
Gelling & Chatfield., 2001, p. 5	"A complex phenomenon that brings together two or more individuals, often from different professional disciplines, who will work together to achieve shared aims and objectives"
Barr et al., 2005, p.xxii	"An active an ongoing partnership, often between people from diverse backgrounds, who work together to solve problems or provide services"
San Martin-Rodriguez et al., 2005, p.133	"The process by which interdependent professionals are structuring a collective action toward patients' care needs. This collaborative process is built on a voluntary basis and necessarily implies negotiation"
Lindeke & Sieckert, 2005, p. 5	A multidimensional, "complex process that requires intentional knowledge sharing and joint responsibility for patient care"
Zwarenstein & Reeves, 2006, p. 48	"An active relationship between two or more health or social care professions who work together to solve problems or provide services"

Table 2.1 (continued).

Authors	Definitions
Hoffman et al., 2008, p. 655	"Interprofessional collaboration is a patient-centered, team-based approach to health care delivery that synergistically maximizes the strengths and skills of each contributing health professional to optimize the quality of patient care."
O'Daniel & Rosenstein, 2008, p. 2-272	"…health care professionals assuming complementary roles and cooperatively working together, sharing responsibility for problem-solving and making decisions to formulate and carry out plans for patient care. Collaboration between physicians, nurses, and other health care professionals increases team members' awareness of each others' type of knowledge and skills, leading to continued improvement in decision-making"
Despins, 2009, p. 86	"Team collaboration is an interprofessional process for communication and decision making. The shared knowledge and skills of care providers influence the care given and each provider contributes to the final integrated management plan…"
Martin et al., 2010, p. 2	"Interprofessional collaboration exists when two or more members of different healthcare professions work together jointly to solve problems or provide services"
World Health Organization, 2010, p. 13	"Collaborative practice in health care occurs when multiple health workers from different professional backgrounds work together with patients, families, carers (caregivers), and communities to deliver the highest quality of care across settings."
Bridges et al., 2011, p. 2	"...a process which includes communication and decision-making, enabling a synergistic influence of grouped knowledge and skills"
Rousseau et al., 2012, p. 2	"…an active and on-going partnership between professionals and institutions with diverse backgrounds and mandates, who work together to provide services"
Steihaug et al., 2016, p. 2	"providers from different specialties, disciplines or sectors work together...requires an effort to integrate and translate themes and schemes shared by different professional groups and the shared ownership of common goals, decision-making processes, and the integration of specialized professional knowledge and expertise."
Morley & Cashell, 2017, p. 208	"Collaboration is an integration of activities and knowledge that requires a partnership of shared authority and responsibility."

harboring conflicting paradigms that influence how they approach collaboration as a concept, such as who they consider to be a "collaborator" and the scope of their contributions in a collaborative effort.

While there is a lack of agreement in defining collaboration in healthcare, some common themes can be found throughout the literature that offer more clarity on the nature of collaboration while highlighting the purpose of collaboration in the context of patient care. The following section examines five features of collaboration as described by scholars and practitioners of the healthcare field.

Features of Collaboration

Problem solving. One of the most defining features of collaboration is that members work together to identify, analyze, and find solutions to problems (Baggs & Schmitt, 1988; Barr et al., 2005; Counsell et al., 1999; Taylor-Seehafer, 1998). The problem solving in the context of patient care can be considered two-fold. The primary problem solving at hand concerns formulating and carrying out the best course of action to meet patients' care needs (Baggs & Schmitt, 1988; O'Daniel & Rosenstein, 2008). This process naturally involves members communicating with one another and engaging in decision-making processes that influence the care given (Baggs & Schmitt, 1988; Bridges et al., 2011; Despins, 2009; O'Daniel & Rosenstein, 2008). Underlying this process is the management of clinical and situational changes that emerge throughout the course of care. Ideally, collaboration between health professionals involves a pooling of individual knowledge and skills that leads to "continued improvement in decision-making regarding patient care" (O'Daniel & Rosenstein, 2008, p. 2-272).

Synergy and Integration. Collaboration is described by several authors to involve as synergistic integration of resources toward problem solving and decision-making (Bridges et al.,

2011; D'Amour, 1997; Morley & Cashell, 2017). The use of the word "synergism" is important in understanding the purpose of collaborative care because it implies collaboration to involve purposeful and efficient integration of individual resources (e.g., knowledge, skills, competencies, activities) to *enhance* outcomes. Hoffman et al. (2008) describes collaboration as one that "synergistically maximizes strengths and skills of each contributing health professional to optimize the quality of patient care" (p. 655). This process can require individuals of different professions (i.e., interprofessional collaboration) to contribute their unique expertise and skills toward planning and carrying out treatment measures (Hoffman et al., 2008; Martin et al., 2010).

Role Clarity. Although role clarity is mentioned by only one author in Table 2.1, awareness of one's own and others' roles, contributions, and limitations is well-documented in health literature as one of the most important features of collaboration in healthcare (e.g., Interprofessional Education Collaborative [IPEC], 2011). Knowledge of others' roles was perceived to be a prerequisite for building trust (Supper et al., 2015), and a shared understanding of others' roles and responsibilities allows members to anticipate each other's actions and needs (Wahr et al., 2013). Coordinating one's care with other health professions so that "gaps, redundancies, and errors are avoided" requires clearly defined boundaries and a shared understanding of each member's expertise, capabilities, and limitations (IPEC, 2011). In essence, role clarity enables health professionals to carry out disparate but interconnected tasks in a coordinated way.

Partnership. A few authors believe that the nature of collaboration presupposes stakeholders coming together as partners to work jointly toward shared aims (e.g., Morley & Cashell, 2017). Morley & Cashell (2017) describe collaboration as "an integration of activities and knowledge that requires a partnership of shared authority and responsibility (p. 208). Sharing

ownership over problems is considered a mindset, one that allows members to view and approach problem situations in a new light that is not as rigidly confined to profession-oriented roles and tasks (Wei et al., 2020).

Interdependency. Interdependency of collaborators refers to individuals collectively acting in order to accomplish what cannot be achieved individually (San Martin-Rodriguez, 2005). D'Amour (1997) described collaboration in healthcare as a process in which interdependent professionals structure collective action toward providing patients' care needs. The interdependence is generated by the growing complexity of patient health problems and needs that providers must address in their plan and delivery of care (D'Amour et al., 2005). Baggs et al. (1999) noted the importance of increasing collaboration in situations of complexity and that complex patients are most likely to benefit from collaborative decision-making. The IPEC (2011) report shares this view, stating there is a need for collaborating through shared problem-solving and shared decision-making "especially in circumstances of uncertainty" and similarly describes the processes within these contexts as reflecting "increasing levels of interdependence among those embedded in teams" (p.24). In short, the nature of problems is believed to influence the level of interdependence of collaborating health professionals.

Table 2.2

Features of Collaboration

Features	Description
Problem Solving	• Identify, analyze, find solution to problems • Communicate, engage in decision-making processes that influence the care given
Synergy and Integration	• Synergistic integration of resources toward problem solving and decision-making
Role Clarity	• Awareness of one's own and others' roles, contributions, and limitations

	• Enables coordination of care while minimizing gaps, redundancies and errors
Partnership	• Work jointly toward shared aims • Shared ownership and responsibility over problems
Interdependency	• Collectively act to accomplish what cannot be achieved individually • Structure collective action toward providing patients' care needs

While there is no single agreed-upon definition of collaboration in the field, there appears to be a general consensus as to what elements are indicative of collaboration in the context of providing quality patient care. These elements are highly interconnected, and underlying the shared goal of providing patient-centered care is the process of identifying, analyzing, and solving problems. The types of problems that health professionals face range in terms of complexity, and there is a greater need for collaborators to engage in shared problem solving and decision-making as problem situations increase in uncertainty and complexity.

To summarize, collaboration in healthcare involves integrating one's knowledge, skills, and efforts with those of others toward identifying and solving problems throughout the course of patient care. Doing so effectively requires awareness and understanding of collaborators' roles, contributions, and boundaries so that collective action toward achieving shared goals can be structured with minimal gaps and redundancies. Collaboration as a construct implies joint ownership and responsibility over the problems encountered, and it is the process by which collective action is taken to accomplish what cannot be achieved by individual members.

Perceived Differences Across Professions

A major part of research on collaboration in healthcare concerns how collaboration is perceived and rated in practice. As such, discrepancies in perception of collaboration among health professionals is well-documented in the literature, with physician-nurse perceptions in particular being the most documented. Studies have shown that physicians tend to perceive a

greater level of collaboration and experience higher level of satisfaction with their collaborations with nurses than nurses do with physicians (Collette et al., 2017; Hamric & Blackhall, 2007; Thomas et al., 2003; Vazirani et al. 2005). Illustrating this discrepancy clearly is Thomas et al.'s (2003) study on physicians and nurses in eight ICUs, which showed that 73% of physicians reported high levels of collaboration with nurses in comparison to 33% of nurses who reported the same. Similar results were obtained in studies investigating perception of collaboration in the operating room (Makary et al., 2006), in caring for dying patients in the ICU (Hamric & Blackhall, 2007), and between nurses and residents in the ICU (Nathanson et al., 2011).

The prevailing theory is that these discrepancies result from differences in profession-specific approaches to assessing problem situations and delivering patient care (ACCP, 2009; House & Havens, 2017; Tang et al., 2013). For example, physicians typically approach patient problems prescriptively by ruling out less probable causes of clinical presentations, whereas nurses approach patient care more holistically by ruling in factors affecting patient wellbeing (e.g., socio-economic factors). As such, physicians can find nurse communications to be inefficient and unclear (e.g., nurses calling physicians without gathering all relevant information), resulting in behaviors that make nurses feel intimidated and hesitant to communicate or speak up in situations that require immediate intervention (Tang et al., 2013). Studies also show that physicians and nurses hold different views about what constitutes collaboration, which likely affects how they perceive and rate collaboration with one another. For instance, nurses often describe good collaboration as having their input respected by physicians and rate collaborations higher when they feel their professional input has influence on decision-making (Baggs et al., 1999; Chong et al., 2013; Collette et al., 2017; Makary et al., 2006). On the contrary, physicians tend to describe good collaboration as nurses anticipating

their needs and following through with their orders, and they associate collaborative behavior more often with role delineation (Collette et al., 2017; Makary et al., 2006).

Collette et al.'s (2017) study suggest that there may be more than profession-derived differences that influence one's perception of collaboration. Similar to previous studies, they found that nurses generally perceived lower collaboration with physicians than physicians did with nurses. However, authors found that nurse ratings of collaboration varied significantly based on clinical practice area. Most notably, nurse ratings of collaboration were highest in the emergency department and lowest in the operating room even though both practice areas involve working in close proximity alongside physicians. Authors discussed the possibility of interpersonal factors such as trust, communication, and mutual respect influencing these scores.

Viewing this situation in terms of problem solving offers another perspective, which is that perhaps the nature of problem situations commonly faced in the emergency department is different from those handled in the operation room. This perspective is premised on the following insights gained from the review thus far:

1. Problem complexity and uncertainty are theorized to generate interdependence (Baggs et al., 1999; D'Amour, 1997; D'Amour et al., 2005; IPEC, 2011)
2. Increased problem complexity requires shared problem solving among collaborators (Baggs et al., 1999; IPEC, 2011)
3. Nurses perceive greater collaboration when they feel their professional input influences the decision-making (Baggs et al., 1999; Chong et al., 2013; Collette et al., 2017; Makary et al., 2006)

Perhaps the nature of problem situations faced in the emergency department demand more shared decision-making and problem solving between physicians and nurses, leading to

higher ratings by nurses. In contrast, the nature of problems in the operating room may involve less shared decision-making between physicians and nurses. The lower ratings given by nurses in the operating room in comparison to those in the emergency department may (1) indicate a degree of mismatch between the level of shared decision-making expected to occur and the level that actually occurred and/or (2) a mismatch between how physicians and nurses judge problem complexity.

What is Complexity in Healthcare?

Much like collaboration, complexity is a construct that lacks clear definition and conceptualization within the healthcare field. However, experts generally recognize that complexity reflects an interaction of multiple factors that impact the care of patients (Safford et al., 2007), effectively requiring "challenging clinical decision-making and care processes that are not routine or standard" and recommendations from evidence-based medicine are "unlikely to apply in a straightforward manner" (Weiss, 2007, p. 375). In the field of healthcare, complexity is predominantly used in reference to the care of patients with multiple coexisting medical conditions (Brown et al., 2003; Durso. 2006; Nardi et al., 2007).

Clinical Complexity

Clinical complexity requires healthcare professionals to engage in decision making with patients on treatment and management of diseases while in careful consideration of interrelated factors at play, such as the increased risk of adverse interactions between drugs and diseases (Boyd et al., 2005; Tinetti et al., 2015). While clinical practice guidelines provide detailed guidance on decision making for managing single diseases, they largely ignore how to address the needs of patients with complex comorbid illnesses (Boyd et al., 2005; Nardi et al., 2007). This is because evidence-based care base their recommendations on studies with known

variables and ideal experimental conditions, often excluding confounding variables and comorbid conditions (Nardi et al., 2007). As such, striking a balance between following multiple clinical practice guidelines and adjusting recommendations for individual patients' circumstances, values, and needs can be a complex process for many healthcare providers (Boyd et al., 2005; Grant et al., 2011).

Not all cases of multiple conditions are considered to be complex, however, and two patients with the same comorbidities can have differing degrees of care and prognoses. Severity of the primary illness, stability of conditions, and the number and type of comorbidities can influence one's baseline risk and care required (Kravitz et al., 2004; Werner et al., 2007). For example, treatment of class four heart failure is prioritized over diabetes whereas treatment of poorly controlled diabetes precludes attention to that of well-compensated heart failure.

Perceived Complexity

Perceived complexity is another important dimension to consider when discussing complexity in healthcare. Studies show that primary care physicians base their identification of complex patients not only on the number of medical diagnoses involved but also on other factors such as the amount of time and resources needed for each encounter, patient adherence/non-adherence to the plan of care, and whether satisfactory clinical outcomes are achieved throughout care (Grant et al., 2006; Mount et al., 2015; Peek et al., 2009). One physician described complexity as "what I feel when I don't have an algorithm for what's in front of me" and criticized how the algorithms available to them are "for diseases, not persons" (Peek et al., 2009, p. 299). This sentiment illustrates the person-specific factors that play a significant role in determining complexity in healthcare, such as knowledge, experience, available resources, and perspective.

Problem Theory

Problems and Problem Nature

A problem is most simply defined as "a question or issue that is uncertain and so must be examined and solved" (Jonassen, 2010, p. 1). A problem is "an unknown" in a situation or a contradiction experienced, one that is recognized by the individual as a discrepancy between a goal state and the current state (Arlin, 1989; Jonassen, 2000). In addition, problems are produced only when there is a perceived need or value attributed toward finding a solution. Problems are also described as an interactive relation between an individual and their surroundings, or more specifically, a situation in the environment (Dostál, 2015). A problem situation, then, is defined as a "totality of conditions that determine the formation and specifics of the problem" (p. 2799).

A core argument within problem theory is that problems are not equal and that they vary in nature (Jonassen, 2010). Numerous labels and constructs can be found throughout literature as scholars developed and refined theories that articulate the ways in which problems vary (Funke et al., 2018). For instance, what makes a problem simple as opposed to complex? And what factors contribute to the difficulty of a problem?

One of the many criteria used to distinguish different types of problems is problem clarity (or "transparency"). Kitchener (1983) used "well-defined" and "ill-defined" to differentiate problems based on the degree of clarity or ambiguity in determining the goal state and the solution path to achieve it. Well-defined problems are described as possessing a single correct solution that is attainable by using a guaranteed problem-solving method or procedure. Ill-defined problems, on the other hand, are more ambiguous in that they can possess numerous potential solutions and solution paths depending on varying epistemic assumptions, evidence, and opinions present (Schraw et al., 1994).

Similarly, Dostál (2015) separates problems based on clarity of their elements and constraints. For "specific problematic situations," all necessary pieces of information are available, no unnecessary data is present, and the current and target states are clearly identified. In contrast, "uncertain problem situations" require the individual to first filter through the vast amounts of information available and determine for themselves what is relevant to articulating and resolving the problem situation at hand.

Problem Structuredness

Jonassen (2000) claimed that problems are not equivalent "in content, form, or process" and that they vary in "their nature, in the way they are presented or represented, and in their components and interactions among them" (p. 65-66). He described problems as existing along a continuum of structuredness, between "well-structured" and "ill-structured," and drew connections between problem nature and problem solving (Jonassen, 2010). He rejected the notion that single models or approaches can be used to solve all kinds of problems. Instead, he theorized problem solving to vary according to the type of problem at hand and argued that different sets of skills are required to solve them.

Jonassen (1997) used "well-structured" to describe problems that clearly present all elements of the problem to the problem solver and possess "correct," convergent answers. Solving well-structured problems involves applying a limited number of concepts, rules, and principles in predictive ways to well-defined, constrained parameters of a problem situation (Wood, 1983). Well-structured problems are also well-defined, as they possess clearly defined initial state, known goal state, and a limited set of operators (Jonassen, 2010). The types of problems that students are taught to solve in school and given on exams are examples of well-structured problems.

Ill-structured problems, on the other hand, appear ill-defined because they do not have a clear and obvious goal state to work toward (Jonassen, 2010). These problems also typically have one or more elements that are unknown or uncertain to the problem solver, and they usually require integration of multiple content domains to solve. They can possess multiple solutions, solution methods, and criteria for evaluating solutions (Kitchener, 1983), all of which make it difficult to determine what concepts, knowledge domains, or rules should be considered in the process of searching for an appropriate solution. The types of problems we encounter every day in the real world are generally considered ill-structured problems.

Determining structuredness of problems requires the consideration of the following parameters: intransparency, heterogeneity of interpretations, and legitimacy of competing alternatives.

Intransparency. The concept of intransparency refers to the degree of unknowns present in the problem space (Frensch & Funke, 1995; Jonassen & Hung, 2008). The more unknowns there are, the more uncertain and ill-structured a problem is said to be. The problem solver must use assumptions and guesswork to solve such problems. Dostál (2015) describes this uncertainty as being "outside the individual who finds himself in the problematic situation" (p. 2800). These problem situations with a high degree of unknowns require the individual to identify both the problem itself and the information needed to solve the problem.

Heterogeneity of Interpretations. The second parameter of structuredness is related to the number of possible interpretations or perspectives that can be used to understand and solve a problem (Jonassen & Hung, 2008). Ill-structured problems are considered more vulnerable to a wide range of interpretations depending on the stakeholders' interests, beliefs, cultures, and

standards. As such, when there are multiple parties with conflicting interests involved in the problem situation, the problem increases in ill-structuredness.

Legitimacy of Competing Alternatives. One of the ways in which a more well-structured problem differs from those more ill-structured is that the former possesses a single, correct solution path while the latter can have numerous potential solution paths and methods. Jonassen & Hung (2008) describe this parameter as the extent to which the number of potential solution paths exist within the problem space that influence the difficulty of the problem. The higher the number of potential options and solution paths, the more time and tasks are demanded of the problem solver in processing them for their validity and suitability. In addition, there is greater uncertainty in evaluating and determining which path is most suitable for resolving the problem.

Problem Complexity

Complexity is used to describe "the interaction between internal and external factors" of problems and problem solving (Jonassen, 2010, p. 9). Factors, such as the individual's experience level, degree of importance attributed to the problem, and urgency of the problem influence how the problem solver interacts with a particular problem. Parameters used to determine problem complexity include the breadth of knowledge required, difficulty level of domain knowledge, intricacy of the problem-solution process, and the degree of nonlinearity of relations among variables (Jonassen & Hung, 2008). While structuredness of problems deal with the degree of clarity (or ambiguity) surrounding framing of problem state, solution paths, and the goal, problem complexity concerns the (1) number of issues, functions, or variables represented in the problem, (2) the predictability of their interactions, and (3) consistency of behavior that

must be considered to choose a best solution path (Jonassen, 2000, 2010). The most complex of problems, therefore, are dynamic, unpredictable, and cognitively taxing to solve.

It is important to note that while ill-structured problems tend to also be more complex in nature, these two features do not necessarily go hand in hand. An example of a relatively well-structured but complex problem is the game of chess, which embodies many attributes of a well-structured problem (e.g., limited number of concepts, rules, and principles; clear goal state; context independent) as well as complexity (e.g., number of components interacting, dynamic). Examples of ill-structured but relatively simple problems are encountered in everyday life, such as deciding what do cook for dinner or what to wear to a social function.

Dynamicity

Dynamicity is thought of as a dimension or property of problem complexity (Jonassen, 2010). Dynamicity, in short, refers to the degree to which the conditions or operators surrounding the specifics of a problem (e.g., attributes, constraints, goal state) stay the same or change over time (Dostál, 2015; Jonassen & Hung, 2008). Dynamic problems feature variables and conditions that change or emerge over time in response to actions and influences. Solving these problems require an on-going consideration of the many influences acting in time, a process that can be quite complex when multiple variables are found to interact that further influence changes in the problem space.

Internal Factors Influencing Problem Solving

Internal factors of problem solving refer to specific cognitive and affective traits or dispositions of the problem solver that impact the problem-solving process (Jonassen, 2000; Jonassen, 2010). These factors can influence the individual's problem-solving capacity, how they

conceptualize and interact with problems, and even their attitudes/willingness (Dostál, 2015) toward problems.

Knowledge and Experience. Familiarity of the problem type is considered the strongest predictor of problem-solving ability. Problems that are routinely encountered appear more well-structured to problem solvers, and the more familiarity and experience is gained in identifying and solving routine problems, the less conscious attention is required in handling them. Conversely, non-routine problems appear ill-structured and require the solver to adapt prior knowledge to new, unfamiliar situations with unknown variables and operators.

In a similar manner, the more domain knowledge one holds is believed to be a strong predictor of their problem-solving ability (Greeno, 1980). However, a more accurate and significant predictor is believed to be the level of structural knowledge the problem solver holds, which refers to their depth of understanding in how interrelated concepts are organized within a given domain (Jonassen, 2010). Solving ill-structured problems require problem solvers to have well-developed and integrated conceptual frameworks that allow them to evaluate multiple perspectives, methods, and solutions (Jonassen, 2007).

Epistemic Beliefs (Intellectual Maturity). Epistemology is "an area of philosophy that is concerned with the nature and justification of human knowledge" (Hofer & Pintrich, 1997). Under the broad umbrella of epistemology is the personal belief systems individuals have about various epistemological constructs, such as knowledge and truth, and theories surrounding epistemological development involves the study of how these beliefs change over time (Jonassen, 2007). Studies have found a link between learner beliefs about the nature of knowledge and various academic measures, such as critical interpretation of knowledge, information processing, and self-monitoring of comprehension (Schommer, 1990). Their

findings suggest that learners who view knowledge as complex and dynamic (i.e., more developed epistemic beliefs) exhibit higher performance in systemic thinking and multiple perspective thinking compared to those who believed knowledge to be compartmentalized and static (Spiro et al., 1996).

As discussed previously, ill-structured problem solving often requires the individual to consider multiple perspectives, beliefs, and ideas when evaluating potential solution paths and solutions. The ways in which individuals interpret and handle complex and ill-structured problems are theorized to be influenced by their epistemic beliefs (Jonassen, 2000). In other words, solving the most complex and ill-structured problems require the ability to simultaneously respect and incorporate multiple perspectives, interpretations, and solutions while also critically evaluating and reconciling conflicting ideas through sound judgements.

Table 2.3

Problem Nature and Factors

Type	Factors	Parameters/Descriptions
External	Structuredness	• Degree of unknowns present in the problem space • Heterogeneity of interpretations • Legitimacy of competing alternatives
	Complexity	• Breadth of knowledge required • Difficulty level of domain knowledge • Intricacy of the problem-solution process • Relational complexity among concepts
	Problem Context	• Situatedness of problems • Meaning and relevance of context to solvers
	Dynamicity	• Conditions or contexts change over time
Internal	Knowledge	• Domain knowledge, structural knowledge
	Experience	• Expertise, familiarity of problem type

Reasoning skills	• Construction of problem schemas, analogical reasoning, causal reasoning, argumentation
Epistemic beliefs	• Multiple perspectives, relativistic thinking

Conceptual Framework: Collaboration and Problem Nature

Understanding the different ways problems can vary enabled researchers to sort them accordingly to produce further insight. An example of this is Wood's (2006) typology of problems based on three dimensions of "availability of data", "awareness of methods", and "precision of outcome criteria" and the skills required to solve them. Another is Jonassen's (2000, 2010) typology of 11 kinds of problems that vary primarily along a continuum from well-structured to ill-structured. Typologies like these are useful for demonstrating the wide range of problems that can be encountered in real life and the different skills and strategies required to successfully solve them. In addition, they can be further used as frameworks for developing appropriate instructional support for learners' problem-solving skills and assessing problem solving competency (Funke et al., 2018; Jonassen, 2000, 2010).

Problem theory offers a new perspective on how collaboration can be conceptualized and explored in healthcare. To review, IPEC (2011) states that patient care must be "safe, efficient, timely, effective, and equitable" (p.21), and there is theoretical and empirical support for collaboration as a crucial component to achieving this goal. The literature also shows that there are discrepancies in how healthcare professionals conceptualize, practice, and perceive collaboration in the workplace, and their experiences with collaboration appear to be linked to important measures such as job satisfaction and burnout. In addition, despite the central role that complexity is believed to play in collaborative care, few studies have explored how providers assess complexity of problem situations related to collaboration or the relationship between

degree of complexity and their approaches to care delivery (e.g., shared decision-making, shared problem solving). What problem theory offers is a method to differentiate the many problem situations encountered in practice according to their characteristic features.

The conceptual framework that will be used to guide the present study can be found in Figure 2.1, in which a relationship is posited between problem nature and collaboration approach: as problems become more ill-defined and uncertain, there is a greater need for shared problem solving and decision-making to achieve positive outcomes.

When faced with relatively well-defined problem situations, a greater benefit can be expected from an approach that prioritizes highly coordinated execution of individual roles, tasks, and responsibilities. Based on problem theory, the types of problems on this end of the spectrum are those that members likely encounter routinely, and prior experience handling similar issues enable them to resolve the situation efficiently and effectively. Well-defined problems are better handled when there is clear understanding of each member's expertise, capabilities, and limitations since this allows them to anticipate each other's actions and needs throughout the problem-solving process (IPEC, 2011; Wahr et al., 2013). Further, adhering to quality control measures and protocols promotes safety and minimizes risk when solving

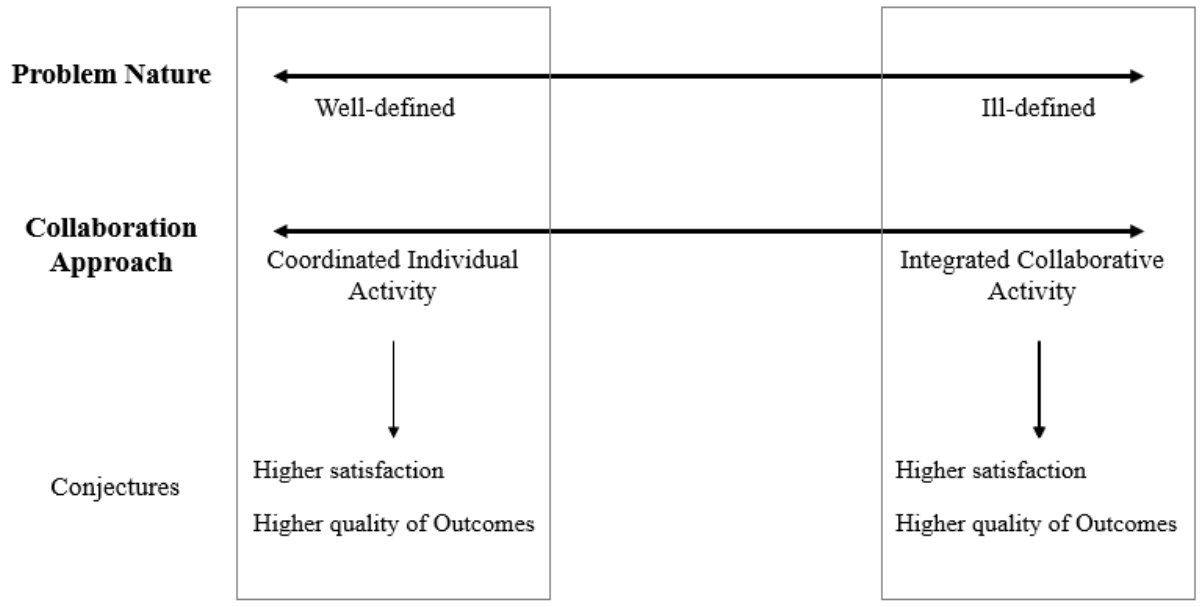

Figure 2.1

Conceptual Framework: Problem Nature and Collaboration Approach

well-structured problems since the parameters, critical elements, solution paths, and goal state are relatively well-defined. As such, taking a more integrative collaboration approach involving shared problem solving and decision making may prove to be an inefficient use of time and resources with little to no additional benefit in terms of achieving positive outcomes.

On the other hand, as problems increase in uncertainty and become more ill-defined in nature, using an integrative collaborative approach that incorporates diverse expert opinions and perspectives into the problem-solving process may lead to enhanced outcomes. These are situations in which the information needed to properly identify and articulate the problem space and contextual constraints are missing or incomplete. This makes identifying the goal(s), generating potential solution paths, and choosing an appropriate solution supported by sound rationale more challenging (Choi & Lee, 2009; Jonassen, 1997). A collaborative approach that focuses on active integration of expert knowledge and skills throughout the problem-solving

process may result in a clearer understanding of the problem(s) within context and improved decision-making overall. Adherence to executing strictly defined roles and tasks become less important. Instead, the ability to flexibly adapt and respond to situational changes and needs may be prioritized.

Table 2.4 lists the conjectured outcomes organized into quadrants using the two axes of collaboration approach and problem nature.

Table 2.4

Collaboration Approaches, Problem Structuredness, and Expected Outcomes

	Problem Structuredness	
	Well-structured Problems	Ill-structured Problems
Coordinated execution of individual activity	• High satisfaction with process and outcome • Positive outcomes (e.g., decreased mortality/harm, positive clinical outcomes)	• Incomplete problem framing • Problems may be partially addressed or left unaddressed • Negative outcomes (?)
Integrated collaborative activity	• Low satisfaction with process and outcome (e.g., waste of time, inefficient use of resources) • Positive outcomes (?)	• Meaningful experiences • High satisfaction (rewarding, worthwhile) • Higher performance • Positive outcomes

Components of the Framework

The following components will be used to explore the various problem situations physicians collaborate within and for investigating the relationship between collaboration approach and problem nature: problem nature (certainty, complexity, dynamicity), degree of integrated activity (i.e., collaboration approach, actions), outcome, and perceived collaboration experience.

Problem Nature

Real-world problems are ill-structured and complex. They are situated in context, meaningful to the individual, and open to negotiation (Jonassen, 2010). Problem situations that health professionals perceive to be collaborative in nature can be explored through their recollections of experiences. Health professionals' perception of "complexity" of problem situations can be analyzed according to various aspects of problem nature.

Collaboration Approaches

Pooling of expertise and resources toward problem solving is theorized to enhance the care of complex patient needs in situations of uncertainty. However, the amount of shared activity pursued by members may be dependent on how "ill-defined" a problem situation is perceived to be. Discrepancies in how physicians and nurses describe and rate collaboration suggest they may be using different team-oriented approaches yet identifying them across the board as "collaboration." Table 2.5 will be used in the initial identification and differentiation of the various types of collaboration expected to appear in participants' stories.

Outcome

Outcome in the present study refers to (1) clinical outcome measures as described by the participant and (2) any additional outcomes of the collaborative experience perceived to be significant by the participant.

Perceived Collaboration Experience

Health professionals perceive and rate their collaborations (e.g., satisfaction, observations of behavior) based on individual beliefs and expectations of what collaboration entails (e.g., Collette, 2017). Prior experiences with collaboration have been shown to influence attitudes and behaviors in collaborations (House & Havens, 2017; Tang et al., 2013). Probing for positive and

negative experiences with collaboration will allow for an in-depth analysis of what specific factors related to problem nature and collaboration contribute to such experiences.

Table 2.5

Collaboration Types and Descriptions

Collaboration Type	Description
Non-Collaborative	• Health professionals working independently from one another in the care of a mutual patient • Each individual performs their roles within a clearly defined scope of practice independent of one another
Coordinated execution of individual tasks	• Carry out disparate but interconnected tasks in coordination with one another • Mostly autonomous in decision-making and problem solving within one's scope of practice • Strict adherence to protocols, procedural checklists, and other forms of standardized guidelines support safety and minimize risk in most situations
Collaborative (Integrative)	• Shared problem solving (identification, analysis, solution generation) and decision-making is expected by all members • Shared problem solving and decision-making leads to enhancement of care • Frequent dynamic and fluid interactions among members focusing on problem solving • Diversity of expertise and perspectives transform and/or enhance problem framing; improve decision-making
Ad-hoc / Consultative	• Expert advice is given from one professional to another on an as needed basis when requested • Receiver of advice holds final responsibility over decisions and outcomes

Implications of the Study

The literature as it stands describes "symptoms" of a deeply complex problem. Theoretically, there are clear expectations as to what collaboration entails but it is evident that these understandings are not transferred into practice. Procedural checklists, communication protocols (e.g., SBAR), and electronic medical records have proven to reduce errors resulting

from variability of practice. However, given that problems are not equal and they vary in nature, the kind of problem situations that prove most challenging for collaborating professionals require more than a single approach to solving them. By collecting and examining health professionals' stories of collaborative experiences, I hope to obtain a detailed picture of what collaboration looks like in situated contexts, identify what made some experiences particularly challenging to them, and examine their relationship to patient outcomes.

Although this study is exploratory in nature, the data obtained will be situated in a variety of real-world complex problem situations that are meaningful to current practitioners. My hope is that the findings can inform the design of strategies that can support health professionals to collaborate effectively (i.e., safely and efficiently address patient care needs) and improve their collaborative experiences overall. Further, the problem situations gathered through the study can be used to equip students with the appropriate problem solving skills necessary to handle the kind of complex situations they will be expected to apply their domain knowledge within after graduating.

CHAPTER 3

METHODS

The purpose of this case study is to explore the different problem situations that physicians collaborate within and to examine how they perceive and carry out collaboration in varying problem situations. While the broader research problem concerns any and all persons who have a stake in the health, wellbeing, and care of a patient, the focus of this particular study is to explore the problem situations within collaboration experiences of early career physicians (<5 years of independent practice).

The central research question for the present study is: What is the relationship between problem nature and collaboration approach as experienced by early career physicians during their first 5 years of independent practice? The following five sub-questions were used to guide my inquiry and analyses:

Q1: What kinds of problem situations do early career physicians collaborate on?

Q2: How do early career physicians conceptualize collaboration in healthcare?

Q3: How do early career physicians carry out collaboration in their everyday practice?

Q4: What are the similarities and differences between how collaboration is conceptualized and practiced?

Q5: What are the emerging patterns among problem nature, collaboration approach, and collaboration experience?

Research Design

Qualitative Research: A Multiple Case Study

Qualitative research is "an approach for exploring and understanding the meaning individuals ascribe to a social or human problem" (Creswell & Creswell, 2017, p. 41). Maxwell (2013) associates qualitative research with seeing the world in terms of "people, situations, events, and the processes that connect these" (p. 29). The decision to use qualitative method of inquiry comes from the desire to understand how early career physicians make sense of each problem situation and how their interpretations of situations influence their behavior and carry out collaboration with others in delivering care. Problem solving begins with an interaction of the participants, activity, and context in constructing a problem (Jonassen, 2010). An in-depth analysis of the different problem situations early career physicians collaborate within requires not only the identification of events, people, and actions taken within each situation but also asking how the individual interacted with these elements and came to view these situations as significant, challenging, and complex. Qualitative inquiry allows the researcher to delve deeply into the participant's thoughts, emotions, reasoning, and other internal processes as they identify such moments throughout their storytelling, and this aspect is key to drawing out the data that may answer the research questions to the present study.

Five sub-questions were used to guide the overall structure and design of the study. The first half of the study (questions 1-3) was focused on identifying the various problem situations these early career physicians collaborate within, how they define and conceptualize collaboration in theory, and what collaboration actually looks like within their everyday, real-world practice contexts. The latter half (questions 4 and 5) was focused heavily on exploring the emerging

relationships, patterns, and themes from within the data gathered through the first three sub-questions.

A case study design was chosen because of its alignment with the goals of this study. Case study research is an "in-depth study of instances of a phenomenon in its natural context and from the perspective of the participants involved in the phenomenon" (Gall et al., 2003, p. 436). Case studies allow researchers to develop an understanding of a complex phenomenon as it is experienced "in its contexts and in its particular situation" by the participants and is typically undertaken in order to describe, explain, or to evaluate the phenomenon (Stake, 2006, p. 2). Stake (2006) explains that when studying a phenomenon through cases, the situation is expected to shape the activity, the experience, and the interpretation of the activity.

In a multiple case study research, the focus is to provide a characterization of the phenomenon and show how it appears in different contexts through a collection of cases that share a common trait or condition (Stake, 2006). While single case studies can provide an in-depth examination of an extreme or critical case within a specific context, a multiple case study design allows researchers to explore several cases for how the phenomenon exists in various contexts and to identify similarities and differences (Patton, 2015). A multiple case study design was deemed appropriate method since the purpose of the study is to explore problem situations related to collaboration to identify patterns or relationships between problem nature and collaboration approach.

Unit of Analysis

The purpose of conducting case study research is to focus on specific issues or problems concerning the phenomenon of interest, and so it is crucial to set boundaries of the study through research questions and by defining the case (deMarrais & Lapan, 2004). In the present study, the

phenomenon of interest that is to be explored within natural contexts was "collaboration in healthcare." A case was defined as a particular instance of collaboration (i.e., story of a collaborative experience) from the beginning to the end as told from the participant's perspective. When defining the unit of analysis in a case study, it is important to consider both where the data for the case is obtained (e.g., an individual, a program) and about what the researcher desires to say at the end of the study (deMarrais & Lapan, 2004; Patton, 2015). Considering the exploratory nature of the study and its goal of discovering patterns and relationships between problem nature and collaboration approaches, the unit of analysis was defined as a meaningful idea, concept, or thought related to specific events occurring in the context of problem solving (e.g., problem framing, reasoning, solution generation/evaluation) and collaboration (e.g., actions, behaviors, assumptions, expectations, emotions).

Research Participants

Participant Sampling

Participant sampling was based on the following criteria. Participants must be physicians who have experience practicing in either (1) ambulatory or outpatient care contexts and/or (2) emergency, critical care, or in-hospital contexts that is shift-based during their first 5 years of work as an independent practitioner of the field (i.e., post-residency and/or post-fellowship). In addition, they must not have been in the position of employer, manager, or in a strictly administrative (i.e., nonclinical) role during those 5 years.

The rationale for framing recruitment to ambulatory and in-hospital, shift-based contexts was based on Andreatta's (2010) compositional typology of health care teams[3] and the two dimensions of "role" and "personnel" detailed in the paper. The decision to limit recruitment

[3] A code was assigned to indicate whether the individuals comprising each team were consistent (stable/variable) and whether their specific role behaviors were consistent (stable/variable).

using practice contexts is based the assumption that teams characterized by stable roles and stable personnel seen more often in outpatient care contexts collaborate differently from those with variable roles and/or personnel that is more prevalent in hospital contexts. The cases collected and analyzed in the present study were expected to represent two general extremes of collaborative practice in healthcare.

Physicians were chosen specifically for two reasons. First is that the majority, if not all, of patient care is provided in teams of health professionals in which physicians hold a vital position as experts in charge of diagnosis and treatment. Much of their practice requires them to work closely with other health professionals (e.g., nurses) so that they can be informed of patient history, progress, and current status/changes in status, all of which serve to support them in their decision-making processes. Second, much of literature on collaboration in the healthcare field feature physician-nurse relationships, perceptions, and behaviors which further supports the vital position physicians hold in a given healthcare team and the patient care process.

The decision to limit the participant pool to those who are credentialed to practice independently was to ensure that the experiences and problem situations gathered are from the perspective of one who holds final responsibility over their decisions. Under this criterion, resident physicians and medical interns were not eligible to be participants. Lastly, recruitment efforts focused on early career physicians (i.e., physicians within their first five years of practice; Dyrbye et al., 2014), as opposed to those who have long-term practice experience. The rationale behind this decision is that the stories collected will reflect the cognitive processes, beliefs, and experiences of the specific period between graduation from formal education and their current place of real-world independent practice. Data gathered from this time period is predicted to provide strong implications for medical instruction and training programs moving forward.

Recruitment Procedures

Identification of the initial participant was completed by examining personal network of colleagues for those who fit the criteria of the study or can pass on recruitment information to potential participants in their network of colleagues. Then, a snowball sampling method (i.e., successive referrals through recruited participants) was used to identify and recruit further participants until a minimum of 20 cases were collected for the study. The goal was to collect equal number of cases that could represent collaboration in the two practice contexts.

Each time a potential participant was identified, a recruitment email comprised of (1) a brief introduction of the study and purpose, (2) a recruitment letter with further details on the study including the eligibility criteria, and (3) a copy of the consent form was sent. Clarification questions asked were mainly related to the eligibility criteria and whether they qualified to participate in the study. After the signed copy of the consent form was received and reviewed, a follow-up email to schedule the interview was sent.

Data Collection

Semi-Structured Interview Approach

Qualitative interviews allow researchers to gain "in-depth knowledge from participants about particular phenomena, experiences, or sets of experience (DeMarrais, 2004, p.52). Given the goal and context of this study, qualitative interviewing approach was used to collect rich descriptions of problem situations from the perspective of the participants. Interviews were semi-structured, which means a set of open-ended questions prepared ahead of time were used as an interview guide (Roulston, 2010). Semi-structured interviews provide the advantage of being consistent in overall structure and topical flow of the interview while also allowing room to adapt and probe for further description according to each participant's responses. Choosing the

semi-structured route allowed me to maintain the balance between ensuring that each participant receives the same prompts to answer sub-questions 1, 2, and 3 and affording me the chance to probe further into their thoughts, assumptions, and reasoning during critical moments within each case.

In order to elicit fuller narratives and detailed responses, DeMarrais (2004) states that it is important to ask a series of short, clear questions that ask participants to recall specific events or experiences. Careful construction of guiding questions involves thinking about how to best engage the participants in the conversations to accomplish the goals of the study. Anfara et al. (2002) stresses the importance of forming interview questions on the basis of what truly needs to be known. With these points in mind, questions were drafted to elicit responses that could be used to answer each of the sub-questions.

A central prompt for the interview was created for the participants, which was to tell a memorable story of collaborating within their everyday practice contexts, from beginning to the end of the collaboration instance. Within their accounts of specific instances of collaboration, I expected to draw rich data that would allow me to answer sub-questions 1, 3, 4, and 5. Table 3.1 shows the link between the interview questions, the data expected to be gathered, and the sub-question(s) this data could answer. The full interview guide that includes the introductory and closing script can be found in Appendix A.

A review of the collaboration literature revealed that there are discrepancies in (1) how collaboration is conceptualized by scholars and practitioners of the field and (2) how collaboration is perceived and rated by different health professions. For this study, the participants were not provided a particular definition of collaboration nor did they receive a description of collaboration features (see Table 2.2) found within the literature prior to being

prompted for a story of collaboration. By leaving “collaboration” open to their interpretation, the stories collected were expected to yield details of the kinds of beliefs, expectations, and perceptions of collaboration that the participants currently hold and how their understanding of collaboration translates into action and decision-making in practice as they collaborate with others. The stories collected were expected to capture a broad range of instances in which two or more people work together toward a shared goal and what makes them collaborative to early career physicians.

Interview Duration and Medium

Initial plans included interviews lasting between 1 ½ to 2 hours. However, the duration was revised to be between 40 minutes to 2 hours for two reasons. First, there was concern that eligible participants would find it difficult to commit 1 ½ hours for a single interview. Reducing the minimum time required to participate in the study was believed to potentially increase chances of recruitment, and the broad range of duration would allow for longer interviews if the

Table 3.1

Matrix of Interview Questions, Expected Data, and Research Questions

Interview Questions	Expected Data	Research Questions
Can you briefly tell me a little bit about the work that you do? Do you work with the same people every day? Or is it more variable (shift-based)?	• Practice context and clinical area • Who they work with, their roles • Stable roles/personnel • Variable roles/personnel	N/A
Can you tell me what it means to collaborate with others in healthcare? Probe question: What does successful collaboration look like?	• Baseline understanding and conceptualization of collaboration • How they define collaboration in healthcare (e.g., purpose, goals, who is a collaborator, functional components) • Underlying assumptions and expectations regarding collaboration	Q2

Can you tell me a story of collaborating with others, within the context of your professional practice, that was particularly memorable? And can you tell me from the beginning to the end in a way that I can imagine being there with you, like an episode of House?	• Problem situation(s), factors, traits
	• Collaborative actions, processes, interactions
	• Collaborators involved and their roles
	• Relational factors involved (e.g., trust, respect)
	• Process of understanding situations
	  ○ Cues, interpretations
	  ○ Situation assessment
	  ○ Assumptions, expectations
	• Solution process
	  ○ Approaches
	  ○ Hypotheses
	  ○ Validation and evaluation of potential paths, alternatives
	• Moment to moment/critical moments
	  ○ Challenges experienced
		Q1, Q3, Q4, Q5

	○ Emotions, thoughts ○ Assumptions, expectations ○ Reasoning behind decisions, actions ○ Motivations, goals	
How often do you encounter these types of situations? (routine / atypical)	• Routine or atypical problem situation(s)	Q1
In what way was this story/experience memorable? (e.g., positive, challenging but meaningful)	• Their emotions, feelings within and about the collaboration case	Q5
What would you do differently if you faced this again?	• Implications for educational/ instructional strategies • Clarification of personal expectations, assumptions • Outlook, beliefs about collaboration	Q5
What happened to the patient (if relevant)?	• Patient outcome due to or related to the collaboration case	Q5

participant desired. Second, 40 minutes was estimated to be the minimum time required to collect one to two detailed cases from a participant. Interviews were conducted virtually using the platform, Zoom. An external audio recording device was used for data collection. At the conclusion of each interview, the audio file was promptly uploaded to a secure dropbox and the original file deleted from the recorder.

Data Analysis

The purpose of analysis is "to bring meaning, structure, and order to data" (Anfara, 2002, p. 31). Approaches to data analysis in qualitative research can vary considerably since there is no single "right way" to analyze data (Anfara, 2002). However, no matter what approach is taken, analysis is an iterative process, involving "a constant moving back and forward" between the data set, coded extracts of data, and the analysis of data that is being produced (Braun & Clarke, 2006, p. 86).

Coding is described as "the process of organizing the data collected by bracketing chunks" and assigning a "summative, salient, essence-capturing, and/or evocative attribute" to the chunks of data (Creswell & Creswell, 2017, p. 269; Saldana, 2016, p. 4). Preliminary coding (i.e., code jottings) occurred throughout the interviews by writing brief notes of observations, reflections, questions, and "ideas for analytic consideration while the study progresses" (Saldana, 2016, p. 21).

Deductive reasoning, used in qualitative research as a theory testing process (Hyde, 2000), was employed in the initial review of the data during and after the transcription process in the form of notes in the margin of the transcripts and reflection memos at the end of each transcript. These reflection memos and notes were comprised of initial impressions, points of interest and surprise, and connections present within the data that could be related to problem

nature, collaborative processes, and the emotional experiences. During the initial round of coding, potential markers of varying degrees of problem structure, complexity, and dynamicity within each case were coded deductively in addition to coding descriptive and in vivo codes from beginning to the end of each case.

Much of the analytic process for this study was inductive in nature, meaning the raw data itself yields the codes and themes that are used to construct a theoretical explanation of an observed phenomenon (Hyde, 2000). While the deductive approach allowed for quick recognition and marking of core concepts present within the data that are of interest in the study, an inductive approach was used to closely examine data for meanings and to draw new relationships and understandings.

The process of identifying, organizing, and displaying the data into codes, patterns, and themes was done by adapting Anfara et al.'s (2002) and Harry et al.'s (2007) code mapping techniques. Figure 3.1 provides an overview of the analytic process.

Code Mapping for Question 5

What are the emerging patterns among problem nature, collaboration approach, and collaboration experience?

Third Iteration: Themes (Messages/Relationships)		
Theme 1	Theme 2	Theme 3
Second Iteration: Categories		
1A 1B	2A 2B	3A 3B
First Iteration: Initial Codes / Surface Content Analysis		
1A 1A 1B 1B	2A 2A 2B 2B	3A 3A 3B 3B
Data		

Note. Adapted from "Qualitative Analysis on Stage: Making the Research Process More Public," by V.A. Anfara Jr, K.M. Brown, & T.L, Mangione, 2002, *Educational Researc*her, 31(7). p.32 (https://doi.org/10.3102/0013189X031007028)

Figure 3.1

Code Mapping: Three Iterations of Analysis

Initial coding involved applying a mixture of descriptive and in vivo codes to the emerging cohesive thoughts within the text (Table 3.2). Initial coding was an iterative process with multiple rounds of coding, uncoding, recoding, and segmenting extracts of data as more cases were collected and new understandings emerged.

Table 3.2

Sample Interview Excerpt and Initial Coding

Sample Excerpt	Initial Coding
[1]So when I got her, her vitals and her electrolytes were all stable. [2]But throughout that Tuesday until Wednesday morning, she got progressively more confused. Her vitals or her electrolytes were like, she had low potassium, low magnesium, and [3]we kept repleting them and they just wouldn't get stabilized. She was low and [4]I later heard from – it wasn't the nursing staff, wasn't the previous physician. I didn't really get a whole lot of sign out on this patient just because of her history other than what they had known from her when she was first admitted on Friday.	[1]Perceived situational assessment [2]Condition changed, grew worse [3]Patient unstable, reasons unknown [4]"Didn't get a whole lot of sign out"; lack of history

The second iteration of analysis focused on generating categories among codes. Roulston (2010) defines category as "an abstract concept of analysis used to organize the codes that have been generated through examination of a data set" (p. 153). Harry et al. (2007) describes this process as grouping of discrete codes that reflect commonalities among codes. Similar to initial coding, categories were produced and refined over multiple rounds of reviewing the data, coded extracts, and categories for coherence.

The third iteration focused on constructing themes within and across cases from the categories generated. This level of analysis involves producing relational statements that represent the underlying messages or stories of the categories (Harry et al., 2007). At this level of analysis, categories were examined for any emerging relationships within and across the cases. Findings related to research questions 3, 4 and 5 emerged during this iteration.

The final iteration consists of theory development surrounding how early career physicians collaborate within various problem situations. Specifically, the conceptual framework and the relationships posited between problem nature and collaboration was tested and refined during this iteration of the analysis.

Thematic analysis was used as the primary method of analysis in the present study. *Thematic analysis* (TA) is a type of approach to qualitative analysis that reduces data through the application of codes (i.e., labels), categorization of data into thematic clusters, and reorganization of data into thematic representations (Roulston, 2010). The goal of a thematic analysis is to identify the themes and to use these themes to address the research. TA was chosen for this study for the flexibility it affords in approaching the data (Braun & Clarke, 2012). Nowell et al. (2017) states a major advantage of TA is that it is useful for "examining the perspectives of different research participants, highlighting the similarities and differences, and generating insights" (p.2). With this study being exploratory in nature, TA was determined appropriate for coding inductively and generating potential patterns, relationships and meaningful themes from the data gathered.

Validity and Reliability

Validity in qualitative research concerns the appropriateness of the tools, process, and data, and it is based on determining whether "the findings of the study are accurate from the

standpoint of the research, participant, or readers of an account" (Creswell & Creswell, 2017, p. 274; Leung, 2015). Qualitative researchers employ a number of different strategies and procedures to demonstrate the quality of the research process (Roulston, 2010). The following methods were used to enhance the accuracy of the findings.

Triangulation refers to the process of drawing from multiple sources and forms of data in studying the topic (Roulston, 2010). Themes that emerge across multiple sources of data provide support for validating researcher interpretations and findings. Data triangulation (multiple sources of data about a phenomenon across groups of people) was used to enhance accuracy of emerging themes. The interview data was analyzed across the four participants and across cases for commonalities and differences in conceptual understandings, themes, and perspectives. *Peer debriefing* is when a person other than the researcher reviews and asks questions about the study to enhance accuracy of each account. A second reviewer was enlisted to review the study design, data, and interpretation of findings. Lastly, a *detailed subjectivity statement* was provided to readers that outlines researcher's positions, bias, experiences, and background that shape the interpretation of findings presented in the study. This statement provides an additional layer of context for readers to use in their critical evaluation of the findings.

Qualitative reliability concerns how researchers check to determine whether the approach taken in the study is reliable (Creswell & Creswell, 2017). In short, reliability refers to the replicability of the processes and results (Leung, 2015). To support reliability of findings, detailed documentation of procedures, protocols, and steps taken is provided.

Intercoder Agreement

Cross-checking for intercoder agreement refers to the process of having two or more coders review a passage of text to determine whether another coder would code it with the same

or similar code (Creswell & Creswell, 2017). A threshold of 80% agreement was determined as the acceptable point of reliability prior to beginning the initial coding process. First round of cross-checking occurred after completion of initial coding of the first case. 106 codes were generated, after which the intercoder reviewed the same case and generated an additional 33 codes. This brought the total number of codes produced to 139 and a 76.3% agreement based on codes generated. Then, each code was reviewed alongside the coded extract to discuss and negotiate meanings. There was disagreement on two of the 139 codes, but one was able to be resolved after negotiation. The final agreement was 99% for the first case. With negotiated meanings in mind, the second case from participant 01's interview was coded accordingly. Cross-checking for this case produced an initial agreement of 96% and a final agreement of 100%.

A third round of cross-checking was undertaken using one of the cases of participant 03. There was a total of 35 codes generated with no new codes added by the intercoder. We disagreed on three codes initially, resulting in an agreement score of 92% prior to negotiation. After negotiation, we agreed to delete two codes and change the coding of one. This brought our agreement score up to 100%.

Methodological Limitations

There are two methodological limitations present within this study. First, qualitative findings are highly context and case dependent, meaning that the results obtained are generalizable to the extent of the participants recruited, their backgrounds, experiences, and worldviews. There are limitations to how much data can be obtained through interviewing, and to understand the complexities of a situation/phenomenon, direct observation is ideal for capturing events in context (Patton, 2015). Unfortunately, a decision was made to forego direct

observation and participation in daily practice contexts due to safety concerns with regard to the continuing pandemic. Second, due to limited time and resources, a decision was made to halt data collection once a predetermined number of cases has been collected (i.e., 20 cases). Though the design of current study and the results obtained offer new perspective into collaboration theory and practice, a design that embraced more participants and a larger collection of diverse cases could have yielded additional insights and patterns.

Ethical Considerations

Interviews evoke thoughts, feelings, knowledge and experience, and in the case of my proposed study and topic, interviews can be intrusive and lead to a reopening of wounds (Patton, 2015). In this study, each participant was asked to undergo an intensive reflection on their experiences collaborating with others in situations with real problems, real stakes, and real consequences. The researcher's role in the study was to elicit rich descriptions of each situation from beginning to the end. As such, the participants were probed to share their thoughts, interpretations, emotions, assumptions, and more within each critical moment of their collaboration cases. This process brought them to relive moments of satisfaction and joy as they shared why or how they found a particular case to be so meaningful and an opportunity for growth. However, many others were likely emotionally taxing and stressful to remember and narrate in detail.

The following steps were taken to protect the participants of this study. First, the informed consent and recruitment letter that were reviewed by the participants included a description of the study. The purpose of the study along with clear instructions on their right to stop the interview at any time was communicated at the beginning of the interview. The participants' right to refuse sharing or expanding on a topic or probe was always respected.

Participant confidentiality was maintained through the use of pseudonyms. Raw data (audio recordings, transcripts, consent forms) was stored securely. Any and all personally identifiable information (PII) revealed in the interview was redacted from the transcript, including institution names and cities.

Researcher Subjectivity

Subjectivity statements allow researchers to critically examine their perspectives, assumptions, and positions about key elements of the study, including theoretical perspectives, personal hypotheses, and positions in relation to the participants (Roulston, 2010). These statements can be written at the beginning of the study as a way to examine one's interests and background with respect to study design and then revisited throughout the research process.

Researcher's Subjectivity Statement

It is important that I address my subjectivity within this study as well as my past experiences and beliefs that have influenced my interest in the topic of collaboration in healthcare. My relationship with the healthcare began when I was 19 when, out of curiosity, I applied to work as a pharmacy technician at a local CVS. My experiences there taught me the positive impact I could have on a patient's life by working in the community side of healthcare. I had wonderful mentors who taught me the importance of treating each patient as if they were my own family, and in 2013, I was proud to graduate with a Pharm.D. and continue serving my local community as a pharmacist. I understood the power and influence that my professional knowledge and expertise afforded me, and my mission was to ensure each patient receives the highest quality of care from our pharmacy team.

My formal education and training instilled in me the importance of relying on protocols and evidence-based guidelines for the safety of my patients. Knowledge was discovered and

proven empirically through clinical trials, and my degree was proof that I was capable of applying that knowledge toward the care of my patients. However, memorization of treatment guidelines and my ability to identify drug interactions were useless in my work with patients whose goals, motivations, fears, and past experiences underpin every decision they make regarding their health. In addition, every doctor and nurse I spoke to had different ideas of what problems needed to be addressed, when, and how. The quality of the care I provide my patients ultimately depended on my ability to collaborate with all major stakeholders.

Having this background in healthcare means I have my own beliefs surrounding collaboration and associated challenges in healthcare. On the one hand, I recognize my potential to relate strongly to the experiences my participants will share. This will no doubt allow me to build strong rapport with them and to also understand nuances of each situation with perhaps less explanation than required by researchers without a medical background. However, it also means I must take special caution to separate my own experiences, assumptions, and feelings when interpreting and processing the data I collect from the study. I recognize that there will be answers I receive that echo my own experiences that will draw me in like a moth to a flame. The danger lies in the fact that I could assume they feel the same way I do about those experiences, which may in turn lead to inaccurate interpretations of participant answers.

As the researcher, I must be mindful of the power I have in shaping the various aspects of my study. Interview questions will have to be strictly and carefully framed to ensure there is no steering and that they are free of my assumptions of their profession, education, training, and worldview. Any sharing I do in the process of the interviewing will have to be carefully thought out to minimize introduction of my own ideas and understandings of collaboration. At the same time, my desire is to build rapport in hopes that richer details and stories will be shared

throughout the interview. Finally, the primary power differential between myself and the participants is that I will ultimately get to control the narrative by deciding what is considered significant as I interpret and analyze the data. As such, I need to constantly question what bias I am bringing into the study as I observe, interact, and analyze the interviews.

CHAPTER 4

RESULTS

The purpose of this study was to explore the different problem situations that early career physicians collaborate on and to examine how they perceive and carry out collaboration in varying problem situations. The overarching research question was: What is the relationship between problem nature and collaboration approach as experienced by early career physicians during their first 5 years of independent practice? The following five sub-questions were used to guide inquiry and analyses:

SQ1: What kinds of problem situations do early career physicians collaborate on?

SQ2: How do early career physicians conceptualize collaboration in healthcare?

SQ3: How do early career physicians carry out collaboration in their everyday practice?

SQ4: What are the similarities and differences between how collaboration is conceptualized and practiced?

SQ5: What are the emerging patterns among problem context, collaboration approach, and collaboration experience?

Each participant was asked to share a few memorable incidents of collaborating with others in their practice contexts from the very beginning to the end. These stories typically began with a brief introduction of a patient's clinical situation followed by specifics of how the participant came to be involved (e.g., taking over care). Participants were probed to share details such as their feelings, reasonings, assumptions, and more at critical moments of each story. What resulted was a collection of cases full of rich descriptions of the kinds of collaborations these

early career physicians find memorable, routine, frustrating, rewarding, and more. This chapter summarizes the results of the case analysis according to the research questions provided above.

Participant Overview

Two hospitalists (i.e., physicians working in hospitals) and two physicians working in outpatient settings were recruited for the study. All four participants are early career physicians (< 5 years independent practice) with work experience ranging from 1 month to 2 years. Table 4.1 provides a brief overview of participant profiles.

Table 4.1

Participant Profiles

Participant	Practice Context	Experience	Case No.
01	Small, rural hospital	1 month	01 - 10
02	Multi-physician outpatient primary care practice	1 year	11 - 14
03	Traveling hospitalist, acute care settings	2 years	15 - 19
04	Family medicine, outpatient health center	1 year	20 - 23

Julie Johnson (Pseudonym of Participant 01) is an internist working in a small, rural hospital in Georgia. At the time of the interview, she had completed her first month of work as an independent practitioner. Mark Anderson (Participant 02) is an internist at a multi-physician practice providing primary care in rural Georgia. He works mostly with older patients (ages 50-80 years). At the time of the interview, he had completed a little over one year of independent practice. Daniel Rodriguez (Participant 03) is an internist working as a hospitalist in acute care settings. He is currently a traveling hospitalist, meaning he temporarily fills in for other physicians at different hospitals in the area. As such, he typically does not know who he is working with or who to contact for consults during his stay at each location. At the time of the

interview, he had been working independently as a hospitalist for approximately two years. Sylvia Jones (Participant 04) works in family medicine at an outpatient health center in North Carolina. She sees a full spectrum of patients, from newborns to geriatrics, men's/women's health, and more. At the time of the interview, she had just completed her first year of independent practice.

Collaboration Case Overview

A total of 23 cases were collected, out of which 21 were cases of collaboration with other healthcare professionals. The remaining two cases (12 and 18) concerned collaboration with patients and/or family members, and they produced codes and categories that may be specific to how early career physicians problem solve, make decisions, and communicate with those in their care. As such, cases 12 and 18 were included in the analysis of sub-question 1 ("What kinds of problem situations do early career physicians collaborate on?") but were excluded in the others, since the codes generated from the two cases were distinct from others. Table 4.2 provides a sample summary of the first case with representative codes for problem nature, collaboration actions taken by members, and outcomes of the case. The full case summary table of all 23 cases collected in this study is available in Appendix B.

Table 4.2

Collaboration Case Profiles

Case 01 - "I didn't expect to be talk to like that"
Summary: The participant was in a hurry to discharge a patient who had threatened to leave AMA (against medical advice). After putting in the discharge order, she was informed by the collaborating nurse that she needed to also complete a discharge summary. When the participant replied she will do so after seeing to the other patients, the nurse replied, "Well then, [the patient's] not leaving. They will leave when you get back and get it done."

Problem Nature	Actions	Outcome	Quote
(+) Clinically simple (UTI) (-) Busy, in a rush, short on time (-) Conflicting/multiple perspectives (-) Meet administrative criteria (different goals in the situation) (-) It's my license on the line (high stakes, different stakes)	• Nurse directly refused participant's request • Nurse put me in my place (participant's perspective)	• Participant was embarrassed, stunned • Confidence shaken	• But I've got a million other pings at 8:30 in the morning when everyone is there and they're asking me a million questions • I need to get this thing that they're requesting done because otherwise the patient isn't going to leave and that's going to be on me, you know? It's again, it's my license, everything that happens is under me despite what the nurses do or don't do. It's directly tied to me, right?

Note. (+) denotes well-defined, simple, static traits and (-) denotes ill-defined, complex, dynamic traits

Research Sub-Question One:

What Kinds of Problem Situations Do Early Career Physicians Collaborate On?

One of the goals of the study was to identify the different problem situations that early career physicians collaborate on. Initial coding for all cases focused on generating descriptive and in vivo codes. Problem theory outlined in Chapter 2 was used as a frame of reference for generating a higher level of categories into which relevant codes were sorted into. Results indicate that early career physicians collaborate on problem situations with traits that can be organized into the following 4 categories: Well-defined problem traits, Ill-defined problem traits, Complexity, and Dynamicity.

Overall, the 23 collaboration cases collected in this study contained problem situations that varied in their degree of certainty (i.e., well-defined, ill-defined), complexity, and dynamicity, as determined through the cataloguing of problem nature components provided in Table 4.2 (see Appendix B, “Collaboration Case Profiles”). While the collaboration cases contained a variety of seemingly unique problem situations, they were able to be broken down into comparable traits of certainty, complexity, and dynamicity. Table 4.3 provides an overview of the problem nature traits found and their descriptions. Table 4.4 provides the coding results for this section.

Table 4.3

Problem Nature, Traits, and Descriptions

Problem Nature	Traits	Descriptions/Characteristics
Well-Defined	1. Clear Diagnosis	Clinical diagnosis helps identify current and target goal states
	2. Established Guidelines	Established guidelines increase certainty in selecting an appropriate course of action, collaborative management of a mutual patient
	3. Predictable Problems	Can anticipate how the clinical problem/condition will evolve and can treat with increased certainty
	4. Routine Problems	Handled frequently in practice; can identify and resolve more easily and with more certainty
	5. Knowledge and Experience	Familiarity and experience increases certainty and confidence in problem solving process; flexibly adapt solutions
Ill-Defined	1. Unclear, Uncertain Clinical Problem	Difficult to pinpoint source of the problem; multiple potential causes
	2. Incomplete Information	Lack of information making it difficult to frame and assess the problem situation, identify problem state, goals of care; Lack of patient history, incomplete handoff, incomplete documentation of care, waiting on lab results
	3. Information Overload	Too much information makes screening for relevancy and prioritization of problems difficult, uncertain
	4. Unknown Factors in the Situation	Degree of unknown factors, variables present
	5. Unusual, Atypical Response	Atypical; problem does not respond as expected
	6. Lack of Resources	Lack of necessary resource(s) for problem solving; limited staff, specialists

	7. Lack of Knowledge and Experience	Lack of knowledge and/or real-world experience managing a clinical condition; new or different experience with a situation
	8. Gray-Area, Borderline	Two options or solution paths are clearly identified but the situation does not meet the criteria to pursue either option
	9. Multiple Perspectives to the Situation	Multiple perspectives and interpretations of the problem are present and need to be evaluated for relevancy and legitimacy
	10. Different Stakes in the Situation	Individuals whose focus, goals, and stakes differ or conflict with those of others
Complexity	1. Clinical Complexity	Multiple comorbidities/conditions; Evaluating treatment options for an acute problem while considering other existing condition(s)
	2. Added Non-clinical Layer(s) to the Problem Situation	Contextual factors to consider; Patients' socioeconomic and educational background, needs, concerns
	3. Urgent, Time-Sensitive	Problem is time-sensitive; conditions of time-induced stress
Dynamicity		Unexpected situational changes, new problems emerging while undergoing treatment, discovering new clinical problems

Table 4.4

Problem Situations Coding Results

Problem Situation	Traits	# of Cases	# of Coded Excerpts
Well-Defined	Clear Diagnosis	8	9
	Established Guidelines	2	2
	Predictable Problems	2	4
	Routine Problems	6	8
	Knowledge and Experience	4	4
Ill-Defined	Unclear, Uncertain Clinical Problem	6	9
	Incomplete Information	5	11
	Information Overload	2	3
	Unknown Factors in the Situation	4	4
	Unusual, Atypical Situation	2	5
	Lack of Resources	5	5
	Lack of Knowledge and Experience	2	5
	Gray-Area Situations	4	5
	Multiple Perspectives to the Situation	5	7
	Different Stakes in the Situation	6	11
Complexity	Clinically Complex	7	9
	Added Non-clinical Layer(s) to the Problem Situation	5	6
	Urgent, Time-Sensitive	4	8
Dynamicity		8	21

Well-Defined Problem Traits

In problem theory, well-defined problems are described as possessing known, “best” solutions that are attainable by using guaranteed problem-solving methods or procedures (Kitchener, 1983). Most, if not all, necessary pieces of information required to solve the problem are available to the solver, no unnecessary data is present, and the current and target states are clearly identified (Dostál, 2015). Within the collaboration cases, there were certain problem

situations that participants considered to be straight-forward or typical. When probed for their reasoning behind decisions made within these particular situations, their explanations included some variation of the obviousness of the solution for that situation. Results indicate that problem situations are more well-defined when they contain one or more of the following five traits: Clear Diagnosis, Established Guideline, Predictable Problems, Routine Problems, and Knowledge and Experience.

Clear Diagnosis

Participants sometimes collaborate on problem situations involving clear and obvious current and target goal states that all parties agree on. When there is a clear clinical diagnosis available, early career physicians are able to make decisions more quickly and firmly on what the next step should be, whether it is to manage the problem independently, reach out for consults, or hand over care entirely. For instance, Participant 01 explains that in cases of cancer patients with anorexic cachexia, she orders three treatments in a predetermined order (Case 02; see Table 4.2 in Appendix B). There is clarity in what the problem is (nutritional deficiency), the goal state (deficiency corrected), and a solution path to take (e.g., nasogastric tube). Problem clarity in the form of a clear diagnosis also allows them to make decisions on how quickly they need to take action. Participant 02, who works in an outpatient setting, describes the moment he saw a lung mass in a patient's chest x-ray.

> Lung cancer, basically. So of course immediately got him an urgent referral to see a local pulmonologist for evaluation, for bronchoscopy. [Participant 02, Case 11]

Later he explains that it was because they had a firm diagnosis (lung cancer) from the start that it made coordinating care easier.

> We know the pulmonologist is going to do the biopsy and we know the oncologist is gonna start chemotherapy and immunotherapy afterwards. [Participant 02, Case 11]

Similarly, there are instances when problem severity alone can help identify the current and target goal state for a particular situation. Participant 03 describes a situation in which the patient went into cardiac arrest, was resuscitated and intubated, and "obviously needs to go into an ICU at this point." In Case 03, Participant 01 explains that her patient "definitely needed to go to the ICU" because her temperature dropped below a certain threshold.

Established Guidelines

Some clinical conditions have firmly established guidelines of care that early career physicians can use to guide their decision making. There is increased certainty and little ambiguity in framing the clinical problem and selecting an appropriate course of action to address it. Participant 04 provides the following when asked what factors contribute to healthcare professionals being more or less comfortable taking initiative in some situations as opposed to others:

> But for example for blood pressure, there is clear guidelines that we follow. If your blood pressure is higher than 140/90, that is not normal. And if it's lower than 90/60, that is also not normal; something needs to be done. If it's higher than 140/90 and you're having symptoms like chest pain, shortness of breath, headaches, you need to go to the hospital. Those are very clear guidelines that I'm hoping everyone knows in the clinic. But for wound care or leg deconditioning and swelling and poor circulation, there is no clear guidelines like that that *I* know of. [Participant 03, Case 22]

Established guidelines of care also appear to increase certainty in collaborative management of a mutual patient. In the case of lung cancer, Participant 02 states the following:

> So these kinds of cancer have a more firmly established diagnosis and guideline for care, then it's much easier to manage because all the specialists know what needs to be done. [Participant 02, Case 11]

Predictable Problems

There are some problem situations that early career physicians find predictable and easy to anticipate how it will evolve. For instance, Participant 01 finds identifying and treating cellulitis cases to be "run-of-the-mill" and very easy to figure out.

> "You can almost anticipate exactly how long you're going to be there for, who you're going to talk to, what everyone is going to say, and everyone preemptively already on the same page for those patients." [Participant 03]

Predictable problems are not necessarily limited to clinically simple ones, as indicated by Participant 03.

> we'll take a typical average patient with multiple chronic issues they just come in for say, a worsening of their COPD. They haven't stopped smoking whatever. Or they're a cocaine user and their heart failure's worse so we're treating them for congestive heart failure. These patients, they're very predictable. You know respiratory issues is their main problem. [Participant 03]

Routine Problems

Routine problems are those that are seen and handled frequently in practice. Because they are seen and handled frequently, early career physicians are able to identify and resolve these situations more easily and with more certainty. When asked for an example of a routine problem, Participant 01 stated "I can give you kind of a routine case. Easy. Anything surgery related. Diabetic patient comes in with osteomyelitis of the toe very frequently." For routine problems,

there are typical, routine methods to resolving them. Participant 01 was able to give details on how the patient care would proceed in her example including who she would call and even predicted how they would respond. Routineness of problems allows them to anticipate how the situation might change and help them prepare alternative treatments ahead of time should the original plan fail.

Knowledge and Experience

Problem theory explains that routinely encountered problems appear more well-structured to problem solvers, and the more familiarity and experience is gained in identifying and solving routine problems, the less conscious attention is required in handling them (Jonassen, 2000). In some situations that were uncertain and ill-defined, early career physicians were able to identify and pursue a solution path with relative ease and confidence due to past experiences of success in similar situations. Perhaps more importantly, knowledge and experience seem to allow these physicians to flexibly adapt solutions to fit existing constraints of a situation. For instance, Participant 01 describes a situation in which she chose to do what was minimally necessary to discharge a patient so that she could quickly move on to take care of other patients.

> I put in a discharge order, I sent all of the medications to the pharmacy, and from my understanding and from what I had done multiple times in the past, that was all I needed to do to get the patient out. The orders are in, the meds were sent, and I told the nurse. [Participant 01, Case 01]

In a critical, high-stakes situation with limited options, Participant 03 was able to quickly adapt a solution to meet patient needs.

> Problem with her is she was still unstable… She needs a pressor to run…an ICU

> medication. So I ordered this medication. She doesn't have a central line which we typically run it through, but we can run it at low doses through a peripheral line. That's fine. I've done that until we get the central line in. [Participant 03, Case 17]

In both cases, it would cost a less experienced, less knowledgeable physician more time and resources to reach the same solution paths, or they may opt to adhere to known protocols instead. Completing a full discharge summary is a significantly longer process and would have resulted in Participant 01 not being able to attend to other patients' needs as quickly. Participant 03 could have opted to transfer the patient to the ICU for care, but this would have likely cost the patient her life.

Ill-Defined Problem Traits

Participants' collaboration stories included fairly ill-defined problem situations. Ill-defined problems do not have a clear and obvious goal state to work toward, and they typically have one or more elements that are unknown to the problem solver. These problems appear ill-defined because they can possess multiple solutions, solution methods, and criteria for evaluating solutions (Kitchener, 1983), all of which make it difficult to determine what concepts or rules should be considered in the process of searching for an appropriate solution. Early career physicians appear to regularly find themselves in situations where they need to filter through vast amounts of information to identify the problem, determine the goal state, and select a solution path.

The following 10 traits contribute to the ill-definedness of a problem situation: Unclear/Uncertain Clinical Problem, Incomplete Information, Information Overload, Unknown Factors in the Situation, Unusual Atypical Response, Lack of Resources, Lack of Knowledge and

Experience, Gray Area Situations, Multiple Perspectives to the Situation, and Different Stakes in the Situation.

Unclear, Uncertain Clinical Problem

There are situations where early career physicians experience difficulty framing the problem for a number of reasons. When the root cause of the situation is unclear (e.g., multiple potential causes, nonspecific symptoms), it can be difficult to make a judgement on what is the "best" path to take to resolve it. Participant 01 calls them "confusing cases" that "warrant extra time and attention."

> …the last time she had the [pain pump] interrogated was several weeks before. Then she fell... She was hurting more. Maybe as a result of the fall, maybe the thing didn't work. [Participant 01, Case05]

> We do that but my concern at this point is, so she had bowel issues. She has bladder issues. Is there something else going on here? I don't know. [Participant 03, Case 15]

Incomplete Information

One of the many challenges early career physicians encounter in their problem-solving process is navigating situations with inadequate or incomplete information. These physicians appear to rely extensively on external sources for information, namely patients and other healthcare professionals (e.g., nurses, other physicians), to accurately assess the situation. Participants 01 and 03 mentioned incomplete handoffs and documentation in their introduction of a few of their collaboration stories.

> So, I typically start when I first get these patients is to see if the last physician left me any notes - any sign outs - essentially to see what the patients are here for, what has been

> done so far, what the plans for the future are. Unfortunately, I didn't get a lot from this previous physician for *this* set of patients. [Participant 03, Case 15]

Incomplete information can appear in many forms depending on the situation, including a lack of patient history, incomplete handoff/documentation of care, or pending lab results. Regardless, all forms of incomplete information increase uncertainty within the situation and require physicians to expend time and resources (cognitive and otherwise) to fill the gaps of what is missing. For instance, in the absence of proper documentation, physicians need to identify what relevant information is missing and try to obtain it prior to beginning their care. Participant 03 shares the following.

> It's up to the nurse to document those parameters so if they don't document it, I have to find them and ask "Hey, how? What? How much oxygen do we wean this lady off of overnight? Or how much weight of this patient lose? Or how much do they pee out overnight? How much versus how much they took in? Did they get their medications this morning? What do they refuse? Why do they refuse?" ...There was one in [City Name] which was almost 100% of the time [documentation] was inaccurate… it was a chore trying to get any accurate details or results on these patients, so I'd have to individually ask all the nurses for these parameters. [Participant 03]

Incomplete information can be especially challenging in situations that demand quick decisions be made. Participant 01 shares the following situation involving lack of patient history, inadequate sign-out, and pending labs.

> So when I got her, her vitals and her electrolytes were all stable, but throughout that Tuesday until Wednesday morning, she got progressively more confused. Her vitals or her electrolytes were like, she had low potassium, low magnesium, and we kept repleting

> them and they just wouldn't get stabilized… I didn't really get a whole lot of sign out on this patient just because of her history other than what they had known from her when she was first admitted on Friday… But we were like, why is she losing so much potassium and phos? So we had kidney studies pending. We had urine studies pending. [Participant 01, Case 03]

Information Overload

On the other hand, too much information can also be detrimental to physicians' problem-solving process. Information overload can hinder their decision making because it requires them to screen information for relevancy.

> But the problem was like, oh, and I'm trying to figure out the history 'cause we heard multiple different things, she'd seen multiple different pain doctors in Atlanta versus like locally, et cetera. [Participant 01, Case 05]

Too much information can also make problem prioritization challenging.

> It can be a little overwhelming when you have 3 or 4 requests coming at you at the same time, multiples times throughout the day. And then you have to kind of prioritize on the spot…if you're dealing with a really sick patient, but someone needs to be discharged by a certain time and then you have to kind of make those decisions quickly. [Participant 01, Case 01]

Unknown Factors in the Situation

There are times when early career physicians are aware that there are unknown factors at play in the situation but are unable to identify them. This is most commonly seen in cases where the patient condition is or becomes unstable for unknown reasons.

> Her vitals or her electrolytes were, she had low potassium, low magnesium, and we kept repleting them and they just wouldn't get stabilized… There's something else going on there. [Participant 02, Case 14]

Unusual, Atypical Response

Non-routine problems appear ill-defined and require the solver to adapt prior knowledge to new, unfamiliar situations with unknown variables and operators. One example of an atypical situation for early career physicians is when a familiar, routine clinical problem does not respond as expected to the appropriate treatment.

> The guy with the left lower leg Cellulitis who we thought was straightforward Cellulitis. But then over the course of 3 days on antibiotics, he wasn't really getting better… made us think MRSA infection. He was on antibiotics for that; he's on vanc. But regardless, he wasn't getting better over 2-3 days. [Participant 01, Case 08]

When faced with an atypical situation, these physicians must reevaluate the present situation for alternative causes and generate solutions to resolve the problem appropriately.

Lack of Resources

Lack of (or limited) resources can make a problem more difficult to solve as the path to achieve the end goal becomes less clear. With regard to collaboration, finding or having the right healthcare professional to collaborate with is important for providing timely and effective care to patients. For Participant 03, lacking necessary specialist(s) on site was a recurring problem factor that made each situation more complicated, time-consuming, and difficult to resolve.

> Now the burden is on me to transfer this patient out. We cannot do anything for this patient here. That surgeon is unwilling to perform surgery at that facility so now we have delayed care for this lady. [Participant 03, Case 19]

Lack of Knowledge and Experience

There are times when early career physicians collaborate on problem situations that are new to them and they have limited knowledge and experience solving and handling. Situations like these can be jarring to early career physicians as they try to make sense of the present situation with what they know from prior experiences, especially if they do not factor in differences in context, variables, and operators. Participant 01 shares the following regarding her negative experience collaborating with a nurse due to what was perceived as a lack of communication.

> Some nurses…will not talk to us directly about something… They'll just bypass everyone and go directly to [our supervisors] to discuss something that they're not happy with from us. Now mind you, this is something that's completely new to me. I didn't ever have this issue at any of the hospitals I trained at. If anything, it was more of a collaborative team effort thing where, if something wasn't right, they weren't afraid to talk to us about it because it was for the patient's benefit. [Participant 01, Case 03]

Early career physicians appear to trust and accept information more readily from those they consider to be more knowledgeable and experienced. Participant 04 discusses how her lack of knowledge and experience led to the following situation.

> I put myself more pressure and urgency than what the case warranted because yes, it was being pressed on by the pediatrician but also because *I* didn't know about this particular pathology case. If I had known *more* about it, even if someone is freaking out around me, I would be able to maintain calmness to think clearly and do things less hectically. [Participant 04, Case 21]

Gray-Area, Borderline

Early career physicians sometimes face what they described as "borderline" or gray-area problem situations. These are situations where two options or solution paths are clearly identified but the current situation does not fully meet the criteria for either option to be considered appropriate. In Case 03, Participant 01 shares the following about a patient whose condition was unstable but, in her opinion, did not warrant an ICU admission.

> I was already on the fence about getting her [to the ICU] if the tube thing didn't work out… Maybe could have called [the ICU physician] earlier in the morning and let him know what's going on. But at that point, altered mental status- Again, it's such a borderline thing that I don't know if they would have jumped to take her at that point. It was the low temperature that absolutely warranted an ICU admission. [Participant 01, Case 03]

These gray-area situations can also cause conflict when two people disagree on which path is the better of the two for the problem at hand. In Case 17, Participant 03 sees breaking hospital policy as the better solution path while the collaborating nurse wants to adhere to protocol during an emergency situation.

> The nurse unfortunately says, "I can't run that on the floor. She's not in the ICU. I'm not comfortable doing that." And I'm like, "This patient's blood pressure is dropping… If we do not get her on this pressor, it's going to continue to tank… you refuse to start this medication because she's not on the correct floor? Does this seem right to you?" [Participant 03, Case 17]

Multiple Perspectives to the Situation

Ill-defined problems often contain multiple perspectives and interpretations that need to be taken into account and evaluated for legitimacy and relevancy. Early career physicians appear to frequently encounter situations with different perspectives or opinions on the same problem that they need to reconcile and incorporate into their decision-making process.

> I don't 100% trust [others' input] – I take them into account and then I talk to the patient… I'll listen to what they're saying but I'll also get the patient's side and try to make a determination based on my objective findings if that's true or not. [Participant 03]

Case 14 demonstrates a situation where two oncologists provide conflicting information regarding the seriousness of a patient's condition.

> The [original] oncologist's like, "Uh, maybe not. It's not common for it to metastasize into adrenals"… This new oncologist is immediately like, "No, the patient needs to be on Prednisone. He should have been on Prednisone for the last year since he's on the medication. Probably have adrenal failure from this medication" [Participant 02, Case 14]

Different Stakes in the Situation

Codes for this particular category were originally grouped into *Multiple Perspectives to the Situation,* but they were separated into a category of their own as they specifically featured individuals whose focus, goals, and stakes differ or conflict to some degree with those of others. This is often seen in cases involving physicians of different specialties or departments collaborating on the plan of care for a mutual patient. The following excerpt demonstrates how a physician can have focuses and goals specific to their job that influence how they frame and solve problems.

> [Emergency Room doctors] don't really figure out in a lot of cases what an underlying issue might be. Their job is to stabilize a patient, treat their acute issue, and then maybe get them home. If the patient is not doing well, then they determine 'I need to have this patient admitted, have the hospitalist work it up and try to figure out what's going on and treat it'…they're in a time limit to get a patient worked up, treated, get out or discharged or admitted. [Participant 03, Case 19]

When stakeholders with conflicting focuses and interests are involved in a problem situation, the problem becomes more ill-structured and lack an obvious "best" solution. Participant 01 shares a time when she and the surgeon agreed on the procedure but disagreed on the timing of it for their patient.

> …I wanted surgery to go ahead and do something sooner rather than later…it becomes a challenge for us because we have to explain why the patient is still here… Maybe they were full in the OR. This wasn't anything urgent… But in terms of healing and discharging the patient and those kinds of numbers, those are things we look at, too. So that was the challenging part of the collaboration. Eventually being on the same page but the timing wasn't quite where we all agreed should have been ideal. [Participant 01, Case 08]

From this except, it is clear that how Participant 01 defines ideal timing is tied in part to her stake in the problem situation (i.e., timely patient discharge).

Complexity

To review, problem complexity concerns the (1) number of issues, functions, or variables represented in the problem, (2) the predictability of their interactions, and (3) consistency of behavior that must be considered to choose a best solution path (Jonassen, 2000, 2010). The most

complex of problems, therefore, are dynamic, unpredictable, and cognitively taxing to solve. In the case of early career physicians, problem complexity was identified via participants' descriptions of the baseline situation and the kinds of factors they considered in their decision making and problem solving.

Clinical Complexity

Each collaboration story generally began with a recounting of the patient clinical case, and some of them were more clinically complex than others. Clinical complexity appears to influence physicians' problem solving in two ways. First, physicians must keep in mind multiple conditions and variables as they form their initial impression and understanding of the problem situation. For example, Participant 03 shares the following about a patient case.

> He's got a history – quite an extensive history. Coronary artery disease. He's got kidney issues. He's got liver issues. He was an alcoholic. He smoked his entire life. So he's got a lot of risk factors and he's just in poor health. [Participant 03]

Second, there are situations in which the added clinical complexity produces a dilemma for the physicians in terms of deciding whether to proceed with a treatment or not. This is because the appropriate treatment for one clinical problem could potentially negatively affect the patient's other conditions. Participant 01 highlights this dilemma in a case where, in order to accurately assess the patient's wound situation, they needed to conduct a test that carries the risk of harming the patient's kidneys.

> Here is the other complicated thing…she's got bad kidney function…We need to see how bad this thing is and in order to get accurate imaging for the CTA, she's going to be hit with a really hot contrast load, but her kidneys are already suffering. [Participant 01, Case 07]

Overall, clinical complexity appears to increase difficulty of the problem-solving process for early career physicians. Participant 02 shares the following to explain what attributes made the case in question "complicated" to manage.

> His multiple comorbidities. He's a diabetic, already on insulin when he was diagnosed. He also had…an undiagnosed pretty severe coronary artery disease… When he was starting to get the work-up for the lung cancer, at the same time he also got heart stents as well… So that made his blood thinner management a little bit complicated as well. So he has diabetes, coronary artery disease. He also got anemia, as likely a GI bleed form the anticoagulation received, so he had to be stopped. So he ended up being a multidisciplinary, multiple comorbidity condition patient. [Participant 02, Case 11]

Added Nonclinical Layer(s) to the Problem Situation

Early career physicians take into consideration nonclinical factors when assessing and resolving situations. These layers add complexity to the situation, and at times, bring uncertainty to what began as a relatively well-defined problem situation. For example, Participant 01 describes a time when the patient's and bedside nurse's discomfort played a role in creating a more complex situation for her to resolve.

> …the patient…they weren't super open to wanting to get [the NG tube] and then the nurse on top of the fact that she wasn't very comfortable placing it. Kind of a one-two punch there. [Participant 01, Case 02]

In this case, the participant was able to convince the patient to receive the treatment and found a more experienced nurse to take over placing the tube. Another nonclinical layer these physicians consider is the patient's socio-economic and educational background. A clinically appropriate solution may not be appropriate after all if the patient is not able to receive it due to

financial constraints. This means physicians need to evaluate solution paths questioning whether it is best course of action for treating the clinical issue and while also considering if the solution is accessible to the patient. Participant 04 shares the following situation about trying to find a viable solution to treat the patient's condition:

> …it's a little bit hard because the patient has no insurance. So I put in referral to see vascular surgery, but apparently the financial aid program he signed up for, they do not take vascular surgery… [Participant 04, Case 22]

Awareness of contextual factors can also add to the complexity of a problem situation. Participant 03 stresses context when introducing a particular collaboration case and in justifying his decision making on a problem later.

> This was the height of the delta variant pandemic. So, delta was the worst in terms of what I saw. ICU was *packed* and we were pushing patients to— We were opening up rooms in other floors of these patients to treat them as ICU patients. People are dying left and right. Codes were a very common occurrence every day - cardiac arrest. [Participant 03, Case 17]

Urgency, Time-Sensitive

A major aspect of real-world problem solving is time as a limited resource. Urgency is one of the determinants of how an individual interacts with a problem (Jonassen, 2010). Lack of time is a constraint early career physicians must contend with as they process information and make clinical decisions. Time-sensitive situations tend to be high pressure, high stakes situations, in which their decisions impact the lives and well-being of the patients in their care.

> …these patients need surgery relatively quickly and then they need to get therapy quickly to try to get them back to as close to baseline as possible. The longer you delay, the further you get away from proper functioning. [Participant 03, Case 19]

Dynamicity

Early career physicians collaborate on dynamic problems that feature variables and conditions changing or emerging over time in response to actions and influences. What may begin as a relatively simple and well-defined problem can evolve over time into a much more complex and ill-defined problem situation. Unexpected situational changes and emerging problems appear in critical moments, and they can heighten urgency and demand action from the physicians. Participant 03 describes the following case where a patient is admitted for abdominal pain.

> The CT scan shows she's got a lot of stool burden in her colon, so she's constipated. [Participant 03, Case 15]

While at first the patient seemed to be doing well after receiving treatment, she vomited clots and blood the next day.

> So I'm thinking, 'Uh-oh, did we maybe cause like a perforation or some kind of lesion from the NG tube that we initially put on?' So I immediately call a GI specialist. [Participant 03, Case 15]

As the participant is looking into this new development, he discovers the following:

> The CT scan shows that constipation is resolved but her bladder is now distended. It's enlarged, and it's dilated back to the kidneys and there looks like there's some fluid leaking around the kidneys so there's a tear there that is concerning. [Participant 03, Case 15]

At this point in the case, he needs to incorporate all known factors and variables into his understanding of the situation as he manages ongoing treatment of her constipation and bladder distention while also investigating the cause of her vomiting. Additionally, he begins questioning what unknowns there are in the situation that he needs to account for.

Research Sub-Question Two:

How Do Early Career Physicians Conceptualize Collaboration in Healthcare?

Chapter 2 included a discussion on how collaboration is defined and conceptualized a myriad of ways by researchers and practitioners of the healthcare field. Collaboration is broadly understood to involve two or more people working together toward a shared goal. However, the finer details of what this process looks like or entails appear to be in dispute. What this revealed was that in order to provide a meaningful analysis of collaboration and problem nature, we must first understand how the participants themselves (i.e., early career physicians) define and conceptualize collaboration. Prior to collecting collaboration cases from participants, they were first asked to share what it means to collaborate with others in healthcare. Their answers provided the following three themes for how early career physicians conceptualize collaboration: Collaboration is Seeking and Receiving Help, Collaboration is Shared Understanding and Shared Decision Making, and Collaboration is Providing Care Together. Table 4.5 provides a summary of the results for this section.

Collaboration is Seeking and Receiving Help

Seeking Help to Solve Difficult Problems

Early career physicians describe collaboration as reaching out to others to seek their help, advice or thoughts on specific problems. These are problems that they are experiencing difficulty solving on their own and so they reach out to others whose input may enhance their

Table 4.5

Collaboration Conceptualized from Early Career Physicians' Perspectives

Themes	Description	Participants
Collaboration is Seeking and Receiving Help	• Reaching out for help, advice, thoughts, expert input on specific problems • Receiving help, expert input, support from collaborators • Receiving updates on patient matters, help stay informed on patient situations	1, 2
Collaboration is Shared Understanding and Shared Decision-making	• Communicating to achieve shared understanding of patient situation • Exchanging ideas on how to optimize care • Jointly create or revise plans of care	1, 2
Collaboration is Providing Care Together	• Working together to provide care that goes beyond what they can provide on their own • Successfully treating and managing conditions requires consideration of multiple variables and systemic solutions	1, 3, 4

understanding of the problem situation. Participants 01 and 02 provide the following about collaborating with others in moments of confusion or uncertainty.

> I will collaborate with my colleagues if I'm like, "Huh? Well, it's been a while since I saw this. I manage it this way, the patient's not quite getting better. Do you have any input, or do you have any advice for me?" Likewise, they'll ask me questions, too. Like, "Hey we tried this, and this, and this and it's not really working. Am I missing something? Can you take a look at them?" That, to me, is probably the most direct form of collaboration. [Participant 01]

> With other primary care physicians… We run our cases of patients' history by each other, see if we're not missing anything, especially when concerned about, you know, we're not exactly sure what's going on with the diagnosis or patient's conditions. Kind of run ideas or cases by each other and make sure we're doing all the right things. [Participant 02]

These situations can sometimes require seeking and receiving expert input on how to best manage certain conditions for his patients.

> In a lot of cases, seeking out help to specialists to see how a certain condition should be managed or certain work-up for patients…Seeking their opinion on how to work up certain patients with which you are having trouble kind of pinning down patient's condition and diagnosis. And also, management of the patients if the patient has more rare conditions. [Participant 02]

Receiving Updates and Being Informed

For Participant 01, receiving updates on patient matters (e.g., patient status, situational changes) is an important part of collaboration. These updates help her stay informed on the patient's situation and allow her to make timely changes to patient plan of care when necessary.

> When [nursing staff] reach out to you about something that looks weird – blood pressures that are low, high blood sugars, etc. – just the act of reaching and communicating… making a decision based on new information together is collaboration to me. [Participant 01]

Collaborators also weigh in on situations (i.e., provide consult) and provide additional information that she can consider in her planning and decision making.

> And then if anything changed or if case management reached out to family…they will weigh in with that and say, "ok, I talked to this patient family member….they would be really good inpatient rehab patients. So, consider this in your discharge plan." [Participant 01]

Collaboration is Shared Understanding and Shared Decision Making

Collaboration involves communicating with others to achieve a shared understanding of the patient situation. This is distinct from *Receiving Updates and Being Informed* in that this process appears to be a two-way exchange of information and ideas. This involves exchanging ideas with others on how to optimize patient care, which Participant 02 considers especially important for managing patients with more complicated conditions.

> Collaboration…means to exchange idea as to how to basically optimize patients' care… a vast majority of collaboration is basically how to diagnose difficult cases or…what's the best way to manage these kinds of patients. [Participant 02]

Shared understanding allows collaborators to collectively create or revise a plan of care that is most appropriate given specifics of the current situation. Participant 01 shares an example of what she refers to as a direct form of collaboration.

> They'll get a bunch of folks together in front of one patient's room, discuss the patient's history, involve the family as well, and talk through barriers, talk through changing aspects of their management, reach a conclusion and a plan that everyone agrees to and then move forward with that.

Collaboration is Providing Care Together

Early career physicians describe collaboration as working together with others to provide a type of care to patients that goes beyond what they can provide on their own. In other words, they recognize the unique contributions each member makes that result in holistic patient care.

> So, to collaborate with others – nurses, physicians, physical therapists – essentially, we come together, we treat a patient for *all* their needs. *I* might treat a patient for their specific illness, disease, whatever. Therapist will help try to strengthen them up, figure out what they're going to need post-discharge. A pharmacist will help me figure out if the dosing of a medication is correct, if the medication is correct in the first place. Essentially, it's a…multimodal method for treating one patient and I couldn't do my job if I didn't have the rest of them. [Participant 03]

> So we're very blessed in that our clinical we have so many different aspects or people who are working very different aspects of medicine, not just providing medical care. So, collaboration to me means being able to work together to be able to give a more…broad service to our patient. [Participant 04]

Their belief is that clinical problems are not context-independent and so, successfully treating and managing their conditions requires consideration of multiple variables and systemic solutions.

> For example, my patient would have diabetes but then they can't get their strips or medicine because they don't have the money to afford it, but also they're homeless and how are they going to be able to eat the foods that they need? That's when the care management or the social work team or even behavioral health team come in, help provide those other resources so that I as a provider can be able to take care of their medical needs because I can just prescribe the medicine, but if they can't even take it because they can't buy it, there's no way that any of us will be successful. [Participant 04]

Research Sub-Question Three:

How Do Early Career Physicians Carry Out Collaboration in Practice?

The previous section covered how early career physicians conceptualize collaboration. This section presents how early career physicians carry out collaboration in terms of their behaviors, actions, and the expectations they hold as they collaborate with others in real-world practice contexts. The data used to answer this sub-question were drawn from the collaboration cases collected, specifically from their recollection of what happened in each case, what actions they took, and the assumptions, expectations and reasonings throughout their collaboration experience. Analysis revealed that there are a few baseline behaviors that are present in all collaborations. However, there are slight, nuanced differences between how early career physicians collaborate with other physicians and how they collaborate with nurses. As such, results for this sub-question are organized under the following three categories: General Collaborative Behaviors and Actions, Collaboration with Other Physicians, and Collaborating with Nurses.

Table 4.6

Descriptions of Collaboration in Practice

Categories / Subcategories	Description
General Collaborative Behaviors and Actions 1. Seek Help from Collaborators 2. Identify Goals and Make Decisions Together	• Reach out for help, advice, thoughts, expert input on problems • Take others' input into consideration as they discuss and agree on a plan of care for the patient • Identify constraints, articulate goals together
Collaborating with Other Physicians 1. Reach Out to Physicians to Solve Problems 2. Collaborating Physicians Share Updates, Their Plans 3. Early Career Physicians' Expectations of Other Physicians	• Communicate to achieve a better understanding of the patient condition; shared understanding for effective care planning and execution • Share and receive updates on decisions, changes to care • Expectations on what "good" physicians do (roles, communication)
Collaborating with Nurses 1. Nurses are Sources of Information 2. Expectations of Nurses	• Nurse input enhances understanding and assessment of situations, timely response to changes in patient conditions • Nurses raise concerns, awareness of potential problems • Expect nurses to clearly and directly communicate their requests, concerns • There are nurse-specific tasks and responsibilities

General Collaborative Behaviors and Actions

Seek Help from Collaborators

Early career physicians reach out to collaborators when they need help or advice on a problem. Collaboration cases generally begin with a recounting of their management of the patient's condition until they determine external involvement is needed to properly resolve a particular problem situation. This pattern can be seen in cases for all four participants across a variety of collaborations and collaborators.

> …what we can manage independently, we do. And then when we have issues like what I ran into…and after talking to [the collaborator], we have some options. [Participant 01, Case 05, Collaboration with a pharmacist]

> But he developed this really severe diarrhea, so I had to get in contact with his…oncologist treating him…try to find out the causes of the severe diarrhea [Participant 02, Case 11, Collaboration with an oncologist]

> So I call a urologist at that point and they're like "Yeah, just put a foley catheter…." [Participant 03, Case 15, Collaboration with a urologist]

> I sought help from behavioral health saying, "Can you please help me manage her expectations?" [Participant 04, Case 23, Collaboration with behavioral health professional]

Of note, early career physicians appear to be inclined to reach out to healthcare professionals they know well in certain situations. When Participant 02 was unsatisfied with his collaborator's responses to his concerns, he decided to text an oncologist he works with closely

to get their thoughts instead. In another example, Participant 03 reached out to an ICU nurse he knew well to help resolve a situation after his collaborating nurse refused.

Identify Goals and Make Decisions Together

Early career physicians collaborate with others by taking their expert input into consideration as they discuss and agree on a plan of care for the patient. This process can involve identifying constraints of the situation, articulating their goals, and constructing an appropriate plan that meets the patient's needs.

> In the event that the pain pump is still functioning and she's just in severe pain from something else, we don't want to give her anything long-acting. We want to stick with short-term medications. We don't want to give her too much. We just want to get her enough to see her pain medicine doctor… [Participant 01, Case 05, Collaboration with a pharmacist]

Collaborating with Other Physicians

Reach Out to Physicians to Solve Problems

Early career physicians communicate with collaborating physicians to achieve a better understanding of the patient condition and to create a shared understanding of the situation for effective care planning and execution. Early career physicians independently manage their patients' conditions or the present problem situation until they reach a threshold where the decision to reach out to another physician is made. This appears to be mediated by an acute awareness of the limitations of their knowledge and experience, perceived boundaries of their expertise and others', and how these pieces relate to the problem situation at hand.

For problems that are perceived to be clearly outside of one's expertise, early career physicians transfer the problem over to the appropriate specialist(s).

> For GI, because I'm suspecting a GI bleed from a massive bleed, they're a specialist that can do an endoscopic evaluation that I'm not trained for so I called them to do that. [Participant 03, Case 15]

In some cases, early career physicians reach out to seek answers to a puzzling problem.

> The urologist, I called them because of the bladder widening…I knew to put a foley in her. That was the easy part. My question was, this supposed rupture of her kidneys, her renal calices specifically, I didn't know what to do about that. So I was trying to figure out what's the answer here. How do we treat *that*? So that's why I call the urologist for that. [Participant 03, Case 15]

Early career physicians also reach out to collaborating physicians to enhance their understanding of the situation.

> Because I can pull up the side effects of the chemotherapy and the immunotherapies, but the oncologists work with these therapies everyday so they would have a better idea of what's a typical side effect profile's like and they can tell us, tell *me* a little bit better on whether they think this is due to their treatment they prescribed or not… Kind of communicating to get a better idea of what's going on. [Participant 02, Case 11]

Finally, early career physicians reach out to other physicians to achieve or maintain shared understanding of their patient's situation.

> Definitely in terms of treating someone with some kind of cancer growing, I'll definitely make sure I run all the changes or things I'm thinking by the oncologist, make sure it doesn't interfere with their plan or get their opinion on how to best approach these kinds of cases. [Participant 02, Case 11]

Ultimately, early career physicians communicate with collaborating physicians to make better decisions in all aspects related to providing patient care. Participant 02 explains that gathering the collaborator's thoughts and rationale behind decisions is important for his own clinical judgement and communication with patients. The following excerpt is from Case 13, in which a patient asks him for a referral to a new neurologist because she feels she is not being treated properly by the first.

> Usually that's where the communication with the specialist would be important. If it's something certainly serious or more complicated, I would call them up and see what they're thinking, what their rationale is for their clinical decision, and I'll try to explain that to the patient. [Participant 02, Case 13]

Collaborating Physicians Share Updates, Their Plans

Early career physicians receive communication from other physicians that update them on important decisions made or changes to care for a mutual patient. The key focus appears to be receiving timely and appropriate communication from the other physicians that allow them to effectively provide patient's care.

> Usually a good specialist office, if they're well-run, will automatically fax me a copy of the office notes. And so, when I see the patient next, I'll keep an eye on what their plan is. And they usually have a good explanation… I would just read their specialist note, see what they did, what their recommendation is, and check in with the patient next time. [Participant 02, Case 14]

Communication can be related to recent changes or new developments in a patient's condition that they need to be aware of.

> We have another patient… his heart rate goes up in the 120s, 130s sometimes at night. So the overnight physician will sometimes start him on some amiodarone to try to get it down without affecting his blood pressure too much. Notified us of that. [Participant 01, Case 04]

Early Career Physicians' Expectations of Other Physicians

Participants 02 and 03 describe what a "good" physician does or is like after sharing a negative experience collaborating with a physician. In Participant 02's case, his expectations were related to communication and behavior in collaboration.

> Usually if something serious is going on that could be managed non-emergently, then a good specialist will be responsive to my concern because not every day I'm calling specialists and tell them what's going on.

For Participant 03, his expectations are related to roles and responsibilities when providing patient care.

> …at other places, oncologists are pretty good about getting palliative care on board early, which you should do. You've diagnosed with cancer, you should get a palliative physician, palliative care team on board early to kind of help manage this patient's emotions, expectations, education about this process.

Collaboration with Nurses

Nurses are Sources of Information

Nurses play a critical role in supporting the decision making of early career physicians by supplying them with key patient-related information. Analysis revealed that nurses are valuable sources of information that allow physicians to (1) enhance their understanding and assessment of situations and (2) respond to changes in patient conditions in a timely manner.

Information for Assessing Situations. Nurse input on the patient's background, context, and other details can help enhance physicians' understanding of a problem situation. Participant 03 explains that nurses get to know the patients well, and the information nurses provide are taken into consideration as he assesses his patients.

> …I'm totally going by the patient and what they're saying "I feel like crap. This is horrible." But then the nurses might come out and say "Yeah, we know this guy. He's been here hundreds of times. He always seeks pain medications"… that helps a lot because they know the patient and I don't. So I'll sometimes take that into account a lot actually, and it helps out. [Participant 03]

He goes on to share that nurse input can also provide better insight on confusing situations and helps him articulate his goals for the patient.

> … 'Why has this patient been here for 10 days? They're just COPD exacerbation.' And the previous hospitalist is documenting that [the patient is] doing really bad, they're feeling horrible or they're in 10 out of 10 pain. But then the nurses come out and say, "Hey, this person is a frequent flyer. We know this person. They're just a drug seeker" or "They're noncompliant" or whatever. I was like 'Oh, that helps a lot.' So, it kind of helped me figure out what I'm *actually* working towards if I have some of that information.

Information for Problem Solving. Nurse communication helps early career physicians to quickly respond to new or developing problems and make appropriate changes to their care plans.

> …as soon as [patient's blood pressure] dipped…[the nurses] were all on us, communicating with me…They'll find you and let me know… make sure that this

> information was communicated so that we can know about it and stop medications, give him some fluids, give him more blood, etc. [Participant 01, Case 04]

In some cases, nurse communication of their concerns can raise awareness of a potential problem that may have been overlooked and/or require further investigation.

> …then the nurse, after she saw them, told me she was very concerned because his head circumference was very large for his age… [Participant 04, Case 21]
>
> [The nurse] also were mentioning about how they were concerned about the leg circulations… [Participant 04, Case 22]

Nurses also alert physicians when the prescribed treatment does not work as expected and the plans may need to be changed.

> …what you don't really anticipate all the time is how bad their pain is. So I get calls all the time about, 'Hey, this isn't working'… they're on this or that… 'Ok, give me a second.' I'll put that in for them. [Participant 01]

Early Career Physicians' Expectations of Nurses

Early career physicians appear to hold expectations of nurses based on their perception of nurses' roles and responsibilities in the overall scheme of patient care. These expectations can be divided into expectations of how nurses should communicate and expectations around what a nurse's job is.

Nurse Communications. There are times when early career physicians expect nurses to clearly explain the exact nature of their requests and how they would like the physicians to fulfill them. For example, Participant 01 reflects on a negative experience that may have been prevented had the nurse communicated her request differently.

> I think a little bit of the barrier there was that she had said it needed to be submitted for the patient to go up. And if she had said, "Oh, just open up the draft and I can see it. That's all we need." It would have been a completely different thing. [Participant 01, Case 01]

There is also an expectation surrounding communication style of nurses when making requests.

> …some of them have tact… they'll get what they want from you, but they'll do it nicely in a way that you don't feel like you're being blackmailed for it [Participant 01, Case 01]

Perhaps most importantly, early career physicians expect nurses to communicate directly with them on problems or concerns that they may have related to patient care.

> If we request something, if there's a problem, they should communicate that to us directly…not just not do it and then not say anything. [Participant 01, Case 01]

What Nurses Do. Early career physicians have a set of beliefs around what tasks and responsibilities are to be handled by nurses in the line of care. Some tasks are expected to be handled by nurses simply because early career physicians lack the knowledge or training to do them. These tasks are considered to be firmly within the domain of nurse practice. In Case 17, Participant 03 explains that while he can provide the medication dose and rate of infusion, he does not know how to run the IV pump so he cannot administer it.

Some tasks are expected to be handled by nurses, not because physicians cannot do them, but because they believe these tasks are a part of what nurses do.

> …I've put NG tubes in, and I've taken them out. It's not expected of me 'cause it's a time consuming thing that we anticipate surgeons or nurses will do for us as a part of the things that they do, just like administering medications. [Participant 01, Case 03]

> That's what the nurses help us do. They check on the patients periodically. They do neurological checks. They do vital sign checks. [Participant 01, Case 03]

Their expectations of nurses may, in part, be influenced by their prior experiences in training (e.g., internship, residency).

> Where I trained – both locations – NG tubes and enteral feeding and confused patients can be handled on the floor by floor nurses. If they can't, they will tell you right away…the communication and the attempt, they would do it. It was expected, in fact. [Participant 01, Case 03]

Research Sub-Question Four:

What are the Similarities and Differences Between

How Collaboration is Conceptualized and Practiced?

The purpose of this sub-question is to analyze how collaboration in theory transfers into everyday practice for early career physicians. Specifically, the goal is to examine what aspects of their conceptualization of collaboration is carried out in practice contexts and to see if there are any notable contradictions or gaps between how they describe collaboration and how they practice it in real life.

To review, early career physicians conceptualize collaboration as (1) seeking and receiving help, (2) communicating for shared understanding and decision making, and (3) providing care together. Findings indicate that the broader themes of their answers to research sub-question two are in fact in agreement with results for sub-question three. However, differences emerged in the form of finer details of when, how, and with whom they collaborate that vary depending on the nature of the problem situation at hand. The clearest distinctions were found and organized into the following two major themes: Relatively Well-defined Problem

Situations: Follow Protocols and Routine Procedures and More Ill-defined, Complex, Dynamic Situations: Integrated Problem Solving. Table 4.7 provides an overview of the results for this section.

Table 4.7

Collaboration Based on Problem Nature

Themes	Description
Relatively Well-defined Problem Situations: Follow Protocols and Routine Procedures	• Follow established protocols, guidelines • Tacit understanding of how tasks and responsibilities are distributed • Notify appropriate parties according to protocol • Support each other to effectively perform individual roles
More Ill-defined, Complex, and Dynamic Problem Situations: Integrated Problem Solving	• More active seeking and integration of expertise into problem solving and decision making • Patient-specific information and critical status updates sought from nurses

Relatively Well-defined Problem Situations: Follow Protocols and Routine Procedures

Well-defined problems often have established guidelines and protocols that early career physicians can follow to resolve them appropriately and successfully. These problems tend to also be familiar and routine to the collaborating parties, and in many cases, there is tacit understanding of how tasks and responsibilities are to be distributed among members according to their expertise and roles.

> The nurses know to begin start chest compressions and all that…By the time I get there, she's not responsive. Another physician's running the code. I take over; she's my patient. [Participant 03, when a code blue was called on his patient]

Overall, early career physicians do not engage in efforts to achieve and negotiate shared understanding with collaborators beyond making sure the patient is being adequately cared for

according to protocol. Communication involves notifying appropriate parties of the problem and ensuring everyone stays updated on the status of the care progress. Similarly, they do not engage in shared decision making for well-defined problems outside of confirming routine procedures and treatments.

"Help" received in these situations appears to be any action that supports others to effectively perform their roles. Collaborating physicians contribute their expert knowledge and skills to the problem by providing necessary consults, performing procedures, and managing conditions according to their specialties.

> We call surgery. They look at it. And they say, "OK, we need to take the patient to the OR" or "We don't need to take the patient to the OR." And then we manage based on that point. They'll go and they'll amputate or they'll do an I&D and then they'll follow along with the patient afterwards. We manage the antibiotics, the pain… They'll kind of do the ultimate signing off. And then we're the ones to do the discharges for the patient. [Participant 01]

On the other hand, nurses help by ensuring all required procedural care is provided to patients at expected times and contexts. This often involves reaching out to physicians to remind them of orders that are missing or to update them when a patient meets a set of predetermined criteria for further treatment.

> Or diet orders. One of the common ones. [The nurses are] ready to fire these questions whenever a patient comes back from a stress test or procedure and they're hungry. [Participant 01]

More Ill-Defined, Complex, and Dynamic Problem Situations: Integrated Problem Solving

For early career physicians, collaboration on ill-defined problem situations involves more active seeking and incorporation of expert advice into their decision making. At baseline, these problems exhibit traits that are more cognitively taxing and difficult to solve (e.g., incomplete information, multiple interacting parts changing over time), and the goal of communication is to negotiate a shared understanding with collaborators and in some cases, engage in shared decision making and care planning.

Seek Collaborators' Expertise

For problems that prominently feature a lack of information, knowledge, or experience, early career physicians reach out to appropriate professionals in hopes of closing the perceived gap. They reach out to other physicians and pharmacists when they need specific expert input that can enhance their understanding of the problem situation and resolve it effectively.

> I tried doing a combination of like oral tramadol, IV morphine every so often after I gave her like a one-time dose of Dilaudid to try to get her over that hump and it still wasn't really working. So I talked to pharmacy, who helped me. [Participant 01, Case 05]

Patient-specific information and critical status updates, on the other hand, are mostly sought from nurses since they spend more time at the bedside of patients and have access to such information.

> It's up to the nurse to document those parameters so if they don't document it, I have to find them and ask… [Participant 03]

Receiving Communication Just-in-Time

For situations that are highly uncertain, unclear, and unpredictable, early career physicians rely heavily on receiving communication from collaborators that can help them stay

updated on situational changes and make appropriate care decisions in time. Just-in-time communication is especially important when managing patients whose condition is unstable for unknown reasons.

> …We don't know exactly what spurred this. He has a lot going on with him… you don't know if he's going into septic shock or not… as soon as [patient's blood pressure] dipped…[the nurses] were all on us, communicating with me…They'll find you and let me know… make sure that this information was communicated so that we can know about it and stop medications, give him some fluids, give him more blood, etc. [Participant 01, Case 04]

Research Sub-Question Five:

What Are the Emerging Patterns Among

Problem nature, Collaboration Approach, and Collaboration Experience?

The findings of research sub-question four covered the patterns found between problem context and collaboration in practice. In short, early career physicians communicate and collaborate differently as problem situations become more ill-defined, complex, and dynamic traits. The purpose of research sub-question five is to see what patterns emerge when collaboration experience is added to the analysis. The collaboration cases were labeled according to the following three categories: Positive, Negative, and Neutral/Mixed. Overall, early career physicians have positive collaboration experiences when their underlying expectations (Table 4.5, Collaboration Conceptualized and Table 4.6, Collaboration in Practice) on a given problem situation match what occurs in reality (Table 4.7, Collaboration Based on Problem Nature), and their experiences become more negative when expectation and reality are not aligned.

In Figure 4.1, each collaboration case was plotted according to the degree of definedness, complexity, dynamicity of the central problem situation (x-axis) and the collaboration behaviors and actions identified (y-axis). The problem traits of each case were first marked with (+) or (-) based on whether the traits correspond to well-defined, simple, and static nature or ill-defined, complex, and dynamic nature (see Table 4.2, Appendix B). The traits were then tallied according to (+) and (-) to determine each case's general placement along the x-axis. Cases 06 and 09 (2+ and 2+/1- traits respectively) were relatively well-defined compared to the rest of the cases and placed on the axis using the overall tallied score of +2 and +1.

Some cases were determined to be slightly more ill-defined when compared with others of similarly tallied scores if the traits pointed to greater ambiguity or urgency overall. For instance, Case 10 possessed two problem traits, "Non-urgent problem (+)" and "Information Overload (-)", and was placed in the center of the x-axis. Case 02 had four problem traits (Cancer patient, nutrition deficient (+), well-defined clinical problem and goal (+), unexpected situation (-), patient did not want the treatment/procedure (-)) which summed to produce the same neutral score. But instead of being placed at the center along with Case 10, Case 02 was plotted further to the right because the traits combined to produce a more urgent, uncertain situation overall compared to Case 10. Each case was similarly reviewed, plotted, compared with others possessing similar scores, and positioning adjusted on the graph based on degree of urgency and stake. The type of collaborative actions undertaken (e.g., discussing potential treatments before deciding on a plan together) combined with the frequency of such actions within each case were used to plot the cases' positions along the y-axis.

The four shapes (circle, triangle, square, diamond) correspond to the participants (01 – 04 respectively), and the colors indicate the type of experience associated with the case. Of the 21 collaboration cases, 10 were identified as positive experiences (marked

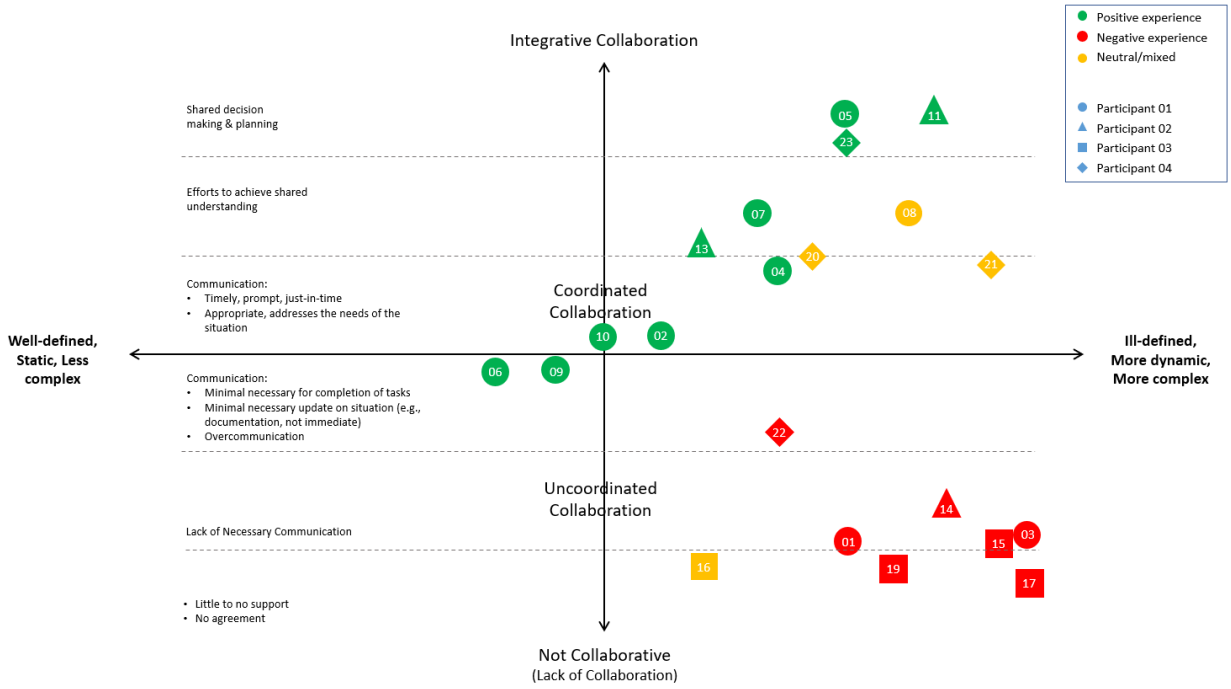

Figure 4.1

Problem Nature, Collaboration Approach, and Experience

green), 7 as negative experiences (red), and 4 as neutral or mixed experiences (yellow). Overall, the following patterns were discovered in the analysis for this section:

1. Highly integrative collaborations (i.e., efforts toward achieving shared understanding, shared decision making) on problem situations that are highly ill-defined, dynamic, and complex in nature were associated with positive experiences
2. Collaborations that lacked these qualities (e.g., lack of necessary communication, lack of support/agreement among collaborators) on highly ill-defined, dynamic, complex problem situations were associated with negative experiences.

3. Collaborations that focused more on coordinated execution of roles and responsibilities (e.g., timely, appropriate communication and support) on less ill-defined, dynamic, and complex problem situations were associated with positive experiences.
4. Collaborations involving minimal necessary communication, updates, and documentation required for completion of tasks on relatively well-defined problem situations were associated with positive experiences.

Positive Collaboration Experiences

There were 10 collaboration cases that participants described as positive, successful, or good. Of these, three cases involved nurses, five involved physicians, and four involve professionals categorized as "other," which include pharmacists, case managers, and administrators.

Positive Collaboration with Nurses

Cases 02, 04, and 05 are positive collaboration experiences involving nurses. In each of these cases, the participant's expectations of nurses with respect to the problem situation are aligned with what occurred in real life. The collaboration with nurses in Case 05 was on a routine, familiar problem situation (i.e., patient experiencing pain after stress test) that was resolved via independent action from the nurses (i.e., administered morphine prior to stress test).

The problem situation in Case 02 was also relatively well-defined, as both the clinical problem and its potential solution paths were clearly identified and familiar to Participant 01. The ill-defined component was introduced when the nurse communicated her inability to execute an order due to her lack of experience with the procedure. The nurse's direct and prompt communication allowed Participant 01 to make alternative plans to resolve this new situation, and she was still able to meet her goal of correcting the patient's nutritional deficiency. The

collaboration with nurses in Case 04 featured a problem situation that was very complex, unclear, uncertain, and unpredictable. Participant 01 was able to effectively care for the patient thanks to nurses providing just-in-time communication of key information as the patient's condition changed over time.

Positive Collaboration with Physicians

Cases 04, 06, 07, 11, and 13 are positive collaboration experiences involving other physicians. The problem situation in Case 06 was relatively well-defined, as it involved collaborating on a routine, frequently seen clinical problem. Collaborating physicians distributed care duties according to expertise, and patient was successfully discharged after receiving appropriate care. Of the five cases in this group, Case 11 had the most ill-defined, complex, and dynamic problem situation, and the collaboration involved more communication that focused on maintaining a shared understanding of the evolving patient situation and jointly making decisions to optimize their care.

Positive Collaboration with Other Healthcare Professionals

Cases 05, 09, 10, and 23 are positive collaboration experiences involving professions other than nurses or physicians. Case 09 had the most well-defined problem situation of the group (e.g., medically stable, non-urgent), and collaboration was limited to receiving routine status updates from the case manager. On the other hand, Cases 05 and 23 both featured a problem situation that could not be resolved independently for various reasons. Regardless, both were deemed positive experiences by the participants. Communication between collaborators focused on shared decision making, and participants reported that they received help and support from their collaborators.

Negative Collaboration Experiences

There were 7 collaboration cases that participants described as negative or frustrating experiences. Four cases involved collaboration with nurses, and three cases were collaboration with physicians.

Negative Collaboration with Nurses

Cases 01, 03, 17, and 22 are negative collaboration experiences involving nurses. In each of these cases, the participants' expectations of nurses did not match what actually occurred in reality. In Case 03, Participant 01 collaborated with a nurse on a problem situation that was highly ill-defined, complex, and dynamic. The situation was unclear due to a lack of information (e.g., labs pending, lack of patient history), and the patient was unstable for unknown reasons. The participant expected direct communication on problems related to orders given and timely updates on the patient status, neither of which were fulfilled by the collaborating nurse.

Case 17, while also highly ill-defined and complex, featured a different set of problem traits. The problem situation in question needed to be urgently resolved as the patient's life was at stake in the moment, but the obvious solution path was out of reach, meaning an alternative solution was necessary. Multiple perspectives and different stakes were also present in this gray-area situation. The expectation was for the nurse to agree with the participant's plan and to carry out his treatment order that would resolve the problem situation. As with Case 03, these expectations were not met by the collaborating nurse.

Notably, Case 22 was described by the participant as a "routine but difficult collaboration," with the primary complaint being overcommunication from the collaborating nurse that was disruptive to the participant's work. The problem situation can be considered fairly well-defined as it concerns a non-urgent, routine problem, but it is also ill-defined in that the clinical problem lacks a standard protocol for treatment. The participant's expectation for the

nurse in this case was for them to manage the patient's wound independently, but the nurse reached out too frequently and inappropriately (i.e., unwarranted).

Negative Collaboration with Physicians

Cases 14, 15, and 19 are negative collaboration experiences involving other physicians. All three cases are highly ill-defined, complex, and dynamic, with Case 19 being less so than the other two cases. Cases 14 and 15 were collaborations on problem situations that were uncertain, unclear, and with a patient that was unstable for unknown reasons. Participants reached out to collaborating physicians in an effort to obtain more information and support that would enhance their understanding of the problems situation. In both cases, the participants did not receive the help that was requested, and they needed to seek help from alternative sources as a result.

Neutral/Mixed Collaboration Experiences

Cases 8, 16, 20, and 21 are collaboration cases that did not have a particularly positive or negative experience tied to them. Case 08 involved a situation that was atypical and uncertain, with collaborating physicians disagreeing on the timing of the treatment (i.e., multiple perspectives, different stakes). The participant described this part of the collaboration as "challenging" but did not apply any other qualifier to the case that suggested it to be a negative experience overall. Case 16 also did not have a distinct positive or negative emotion attached to the collaboration experience. Case 20 and 21 were classified as "mixed" experiences because they had both positive and negative emotions associated with them. Case 20 was described as stressful but successful, and Case 21 was stressful but provided a great learning experience for the participant.

CHAPTER 5

DISCUSSION

The purpose of this study was to explore the different problem situations early career physicians collaborate within and to examine how they perceive and carry out collaboration in varying problem situations. The central research question for the present study was: What is the relationship between problem context and collaboration approach as experienced by early career physicians during their first 5 years of independent practice? This chapter is organized according to the five research sub-questions used to guide study design and analysis. We first begin with a brief summary of results followed by a discussion of findings and implications for medical education and training. This chapter will conclude with study limitations and future research directions.

Summary of Findings

Problem Situations Early Career Physicians Collaborate On (Question 1)

Overall, the 23 collaboration cases collected in this study contained problem situations that varied in their degree of definedness, complexity, and dynamicity, as determined through the cataloguing of problem nature components provided in Table 4.2. Findings indicate that early career physicians collaborate on problem situations with traits that can be organized into the following 4 categories: Well-defined problem traits, Ill-defined problem traits, Complexity, and Dynamicity.

The 5 traits related to well-defined problems are Clear Diagnosis, Established Guideline, Predictable Problems, Routine Problems, and Knowledge and Experience. The 10 traits related

to ill-definedness of a situation are Unclear/Uncertain Clinical Problem, Incomplete Information, Information Overload, Unknown Factors in the Situation, Unusual/Atypical Response, Lack of Resources, Lack of Knowledge and Experience, Gray-Area/Borderline, Multiple Perspectives to the Situation, Different Stakes in the Situation. The complexity traits found are Clinical Complexity, Added Non-Clinical Layer(s) to the Situation, and Urgent/Time-sensitive. Dynamicity concerned new emerging problems and situational changes over time.

Collaboration Conceptualized and Carried Out in Practice (Questions 2 and 3)

Early career physicians conceptualize collaboration in healthcare according to the following three themes: Collaboration is Seeking and Receiving Help, Collaboration is Shared Understanding and Shared Decision Making, and Collaboration is Providing Care Together (Table 4.5). The first theme covers the act of reaching out to collaborators and receiving their advice, thoughts, and/or expert input for problem solving, especially in cases of uncertainty, confusion, and when managing complex clinical conditions. In addition, receiving updates on patient matters and being informed of critical pieces of information for planning and decision making is an important part of collaboration. Shared Understanding and Shared Decision Making involves communicating with collaborators, exchanging ideas to optimize care, and collectively creating and revising plans of care to fit the current needs of patients. Finally, early career physicians conceptualize collaboration as jointly providing a type of care to patients that goes beyond what they can provide on their own. Successfully treating and managing patient conditions requires consideration of multiple variables and systemic solutions.

In terms of how early career physicians carry out collaboration in their everyday practice (Table 4.6), results indicate that there are a few baseline behaviors and actions that are common to all collaborations. General Collaborative Behaviors and Actions include (1) seeking

collaborator help and input on problems and (2) identifying constraints, articulating goals, and making decisions together. There were slight, nuanced differences found between how early career physicians collaborate with other physicians and how they collaborate with nurses. Early career physicians collaborate with other physicians by reaching out to them for help when solving problems and sharing updates and plans for mutual patients with one another. Nurse collaborations, on the other hand, primarily involve receiving nurse input that enables (1) enhanced understanding and assessment of problem situations and (2) timely response to patient condition changes. Early career physicians have physician- and nurse-specific expectations in terms of their behaviors (e.g., physicians/specialists should be responsive to my concerns) and responsibilities (e.g., nurses run IV pumps and place NG tubes) when collaborating together.

Differences Between How Collaboration is Conceptualized and Practiced: Based on Problem Nature (Question 4)

Findings indicate that the broader themes of how early career physicians conceptualize collaboration in theory and carry it out in real-world practice are aligned. However, some differences emerged in the finer details of when, how, and with whom they collaborate that vary depending on the nature of the problem situation at hand. The clearest distinctions were found and organized into the following two major themes: Relatively Well-defined Problem Situations: Follow Protocols and Routine Procedures and More Ill-defined, Complex, Dynamic Situations: Integrated Problem Solving (Table 4.7).

Emerging Patterns Among Problem Nature, Collaboration Approach, and Collaboration Experience (Question 5)

Results indicate that early career physicians have positive collaboration experiences when their underlying expectations (Table 4.5, Collaboration Conceptualized and Table 4.6,

Collaboration in Practice) on a given problem situation match what occurs in reality (Table 4.7, Collaboration Based on Problem Nature), and their experiences become more negative when expectation and reality are not aligned. Of the 21 collaboration cases, 10 were identified as positive experiences (marked green in Figure 5.2), 7 as negative experiences (red), and 4 as neutral or mixed experiences (yellow). The following key patterns among problem nature, collaboration approach, and collaboration experience were discovered:

1. Highly integrative collaborations (i.e., efforts toward achieving shared understanding, shared decision making) on problem situations that are highly ill-defined, dynamic, and complex in nature were associated with positive experiences.
2. Collaborations that lacked these qualities (e.g., lack of necessary communication, lack of support/agreement among collaborators) on highly ill-defined, dynamic, complex problem situations were associated with negative experiences.
3. Collaborations that focused more on coordinated execution of roles and responsibilities (e.g., timely, appropriate communication and support) on less ill-defined, dynamic, and complex problem situations were associated with positive experiences.
4. Collaborations involving minimal necessary communication, updates, and documentation required for completion of tasks on relatively well-defined problem situations were associated with positive experiences.

Discussion

Integrating problem theory into the study of collaboration as a construct provided a novel way to conceptualize collaboration as an interaction between the problem solver, the collaborators, and the nature of the problem situation at hand. The assumption was that real-world problems vary in nature and so the process of collaborating to resolve those problems must

vary as well. The following section will provide interpretations of the major findings and discuss implications for collaboration education and training.

Uncertainty, Complexity, and Dynamicity in Real-World Problem Situations

Findings indicate that at the core of real-world patient care is identifying and managing a wide variety of problems, many of which require some form of collaboration to resolve effectively. To understand how these problems vary, Jonassen's (2010) method of differentiating problems was adapted and used to organize the problem traits found within the cases according to structuredness, complexity, and dynamicity.

Uncertainty in Problem Situations

The cases collected in this study strongly suggest that the majority of real-world collaborations in healthcare involve highly ill-defined problem situations. Of the 21 cases, only two are collaborations involving relatively well-defined problem situations while the remaining 19 cases were collaborations on ill-defined situations. Problems with high degree of unknowns (e.g., incomplete information, unclear clinical problem, unknown factors, lack of knowledge/experience) make identifying key variables and their relationships difficult, and according to the literature, the process of solving such problems is based on assumptions or guesswork to a certain extent (Jonassen & Hung, 2008). Findings indicate that when faced with uncertain problem situations, early career physicians reach out to collaborators for their advice and expert input. One way to interpret this is that early career physicians collaborate to reduce the degree of uncertainty in a problem situation so that they may better articulate the problem space and identify appropriate goals of treatment.

> In the event that the pain pump is still functioning and [the patient] is just in severe pain from something else, we don't want to give her anything long-acting. We want to stick

> with short-term medications. We don't want to give her too much. We just want to get her enough to see her pain medicine doctor… I don't know what's safe doing all these combinations over all these hours. [Participant 01, Case 05]

Complex and Ill-defined Problem Situations

Oftentimes, the path to managing or treating one condition had potential to affect the status of other coexisting conditions and required participants to actively process all relevant interacting components when evaluating potential solutions (e.g., Cases 07, 11, 19). This can be a cognitively taxing and difficult process that is further complicated by the addition of nonclinical layers to the situation, such as the patient's socioeconomic circumstances and wishes. In problem theory, complexity concerns the (1) number of issues, functions, or variables represented in the problem, (2) the predictability of their interactions, and (3) consistency of behavior that must be considered to choose a best solution path (Jonassen, 2000, 2010). Within the context of healthcare, complexity is similarly recognized as a reflection of the interaction of multiple factors that impact the care of patients (Safford et al., 2007). When faced with clinical and/or nonclinical complexity in situations, participants problem solved by: (1) inventorying the multiple conditions and variables as they form their initial assessment of the situation, (2) assessing the potential risks and benefits of different treatment options, and (3) weighing the pros and cons of possible solution paths based on the multiple interrelated factors at play.

> So unfortunately the main treatment for immunotherapy colitis is really high-dose steroids and the patient's already diabetic, a long time diabetic on insulin…So I was texting with his oncologist…basically come up with the plan to get him off the prednisone…try to respect the patient's wishes but also coordinate with the oncologist to kind of minimize the harm to the patient. [Participant 02, Case 11]

Problems like these are not only complex but also ill-defined as there are likely multiple interpretations and perspectives of what "acceptable" outcome looks like between collaborators and stakeholders in the situation. The target goal is less obvious, and it is difficult to determine what factors should be considered when justifying a "best" solution path (Kitchener, 1983). The challenge of collaborating on such problems lies in articulating new goals and generating a "best" fit solution for the situation that may not be as clear-cut or agreeable to all collaborators involved. And because clinically complex patients are more likely to require the care and attention of multiple specialists and providers, the process of negotiating goals, needs, and perspectives may be particularly challenging in collaborations involving a high degree of complexity. Fortunately for Case 11, the participant and the oncologist were able to jointly create a treatment plan for the patient that satisfied all parties, and he described it as a "good case" where he was able to collaborate from a primary's perspective to coordinate his patients' care with multiple collaborators. In sharp contrast is Case 19, where uncommunicated and unresolved differences in goals and priorities may have been the cause of conflict between collaborators and delayed critical care to a patient.

Dynamicity in Problem Situations

Early career physicians collaborate on dynamic problems that feature variables and conditions changing or emerging over time in response to actions and influences (Dostál, 2015; Jonassen & Hung, 2008). The cases demonstrated how a relatively simple and well-defined problem can evolve over time into a much more complex and ill-defined problem situation (e.g., Cases 08, 11, 15). Unexpected situational changes and emerging problems appeared in critical moments, and they can heighten urgency and demand action from the physicians (e.g., Cases 03, 04, 17). This is clearly illustrated in Case 15, where the problem was initially clearly identified

as unresolved constipation, but the situation became much more unclear and ill-defined as new discoveries were made.

> The CT scan shows that constipation is resolved but her bladder is now distended. It's enlarged, and it's dilated back to the kidneys and there looks like there's some fluid leaking around the kidneys so there's a tear there that is concerning. [Participant 03, Case 15]

Findings indicate that early career physicians handle dynamic problems through constant reassessment of potential factors and appropriate treatment measures as situational developments occur. As such, they have certain expectations related to collaboration that are specific to dynamic problem situations. As problems become more dynamic in nature, early career physicians expect and rely on more communication between collaborators so that they can maintain a heightened awareness of the situation as it evolves, closely monitoring and making changes to the care plan when necessary.

> …as soon as [patient's blood pressure] dipped…[the nurses] were all on us, communicating with me…They'll find you and let me know… make sure that this information was communicated so that we can know about it and stop medications, give him some fluids, give him more blood, etc. [Participant 01, Case 04]

Nurses in particular play a critical role in ensuring that physicians stay informed of patients' status and alert physicians of significant changes that require their immediate attention. Early career physicians appear to rely heavily on nurses to help them make the right clinical decisions for the patient at the right time (e.g., Cases 03, 04), and the timing of decision making is much more crucial when problems are dynamic and unpredictable in nature. Similarly, early career physicians collaborate with specialists by prioritizing prompt communication of new

decisions and care changes to ensure that their individual contributions can be synergistically integrated (e.g., Cases 08, 11, 14).

A Spectrum of Collaboration in Healthcare

These results suggest that just as problem situations vary by possessing different combinations of problem traits, collaboration to resolve such problems may vary in nature as well. The cases collected in the study share the commonality of centering on an instance of collaboration, meaning regardless of how these experiences are described by the participants (e.g., positive, frustrating), they are stories of when collaboration was required and how it unfolded. This data was then used to construct a refined conceptualization of collaboration shown in Table 5.1, which shows a range of collaboration and their characteristic features specifically in situations where collaboration is perceived to be necessary. The continuum ranges from Not Collaborative (i.e., lack of collaboration) to Integrative Collaboration. Along the continuum are two additional markers: Uncoordinated Collaboration and Coordinated Collaboration.

Not Collaborative marks one end of the spectrum, which is a lack of necessary collaboration among members. These are situations in which there is little to no support from collaborators even when requested. There may also be a distinct lack of interest by one or more members toward reaching an agreement on a plan or structuring collective effort toward providing care for a mutual patient. There is active, intentional refusal to acknowledge or address other members' concerns and needs.

Next are collaborations characterized by a lack of necessary communication between collaborators. In *Uncoordinated Collaborations,* a collaborator who holds key information does not deliver it to the appropriate party at the right time or at all. Uncoordinated collaborations may

Table 5.1

Collaboration Spectrum and Characteristic Features

Collaboration Type	Characteristic Features	Example Case and Description
Integrative Collaboration	Shared decision making & planning	Case 05: The pharmacist shared their reasoning behind their decision making. They jointly created a treatment plan that meets their needs.
	Efforts to achieve shared understanding	Case 07: Other MDs shared their reasoning behind decisions, thoughts, concerns
Coordinated Collaboration	Communication: • Timely, prompt, just-in-time • Appropriate, addresses the needs of the situation	Case 04: The participant received timely communication and updates from the overnight physician, nurses, and nurse practitioners about the patient's condition
	Communication: • Minimal necessary for completion of tasks • Minimal necessary update on situation (e.g., documentation, not immediate) • Overcommunication	Case 09: Case managers update the participant daily on the status of patient placement
Uncoordinated Collaboration	Lack of Necessary Communication	Case 03: Collaborating nurse did not inform the participant about their decision to not execute the order (i.e., place NG tube). Nurse skipped communication with the participant and called in another MD.
Not Collaborative (Lack of Collaboration)	• Little to no support • No agreement	Case 17: Collaborating nurse refused participant's order to run an ICU-only (lifesaving) medication for a patient because it was against hospital protocol.

lead to gaps or redundancies of care when some members remain unaware of important updates related to the patient's status and treatment plans.

A step above this are collaborations where there is communication but only those that fulfill the minimal requirements necessary for completion of tasks among members. This can include brief updates on non-urgent situations that do not require immediate or direct communication between collaborators. Overcommunication is also a part of this area of the collaboration spectrum.

Coordinated Collaboration is distinct in that it is characterized by timely communication among collaborators that is appropriate for the situation at hand. These collaborations feature just-in-time support from members that enable effective appraisal and management of an evolving situation together. Further along the continuum are collaborations where communication and collaborative efforts are focused toward achieving and maintaining a shared understanding. These efforts can include reaching out to collaborators to obtain their perspective of a situation or sharing one's reasoning behind decisions with others. The timing of communication is not as important as ensuring that collaborators are on the same page.

Finally, the most integrative of collaborations involve members actively engaging in shared decision making and care planning. These are collaborations where members communicate and work together with a shared goal of negotiating and creating a plan of care for the patient that is a product of their integration of knowledge and expertise.

This study confirms that collaboration exists in different forms by providing examples of collaborations in which early career physicians vary in when and how they communicate, share perspectives, and make decisions with collaborating physicians and other healthcare professionals. The participants' reasoning behind actions and decisions, motivations,

assumptions, and expectations within each collaboration case were used to refine the original conceptualization in Chapter 2 (Figure 2.1) by offering characteristics that could be used to distinguish one collaboration from another. For instance, the most integrative collaborations appear to be distinct from others in that the process of problem solving and decision making is shared among members. There are more dynamic and fluid interactions among members that prioritizes optimizing care decisions through the integration of their expertise and perspectives into the problem solving process. In contrast, coordinated collaborations focus more on timely execution of tasks and communication required to provide care effectively and efficiently according to protocol.

Notably, collaborations perceived to be less than ideal were incorporated into the spectrum as well. These are instances where collaboration is initiated (e.g., reach out for consultation) but collaborators are perceived to be unresponsive, unhelpful, or uncooperative (e.g., Cases 14, 17, 19; see Appendix B). It was initially unclear how these particular collaborations would fit in the overall spectrum or whether it was even appropriate to add them to the same continuum. Findings indicated, however, that these collaborations contained some of the most extreme ill-defined problems, poor outcomes, and negative experiences. Examining them in conjunction with the others could lead to emergence of additional patterns, relationships, and understandings.

The collaboration cases demonstrated that early career physicians use varying degrees of communication and joint activities when collaborating with others in practice. Communication itself varied in timing, frequency, form/method, and purpose across and within cases. For instance, there were some collaborations where communication was perceived inappropriate because it was late (Case 3), lacking in quality and content (Case 14), or more frequent than was

desired (Case 22). On the other hand, there were cases where the participants were pleased by how their collaborators reached out at the right time (e.g., Case 4), took time to explain their reasoning behind decisions (e.g., Case 11), or articulated goals and plans for the patient (Case 5).

Given these findings, collaboration in healthcare can altogether seem arbitrary in when, how, with whom, and in what contexts it exists in real-world practice. The literature has shown that scholars and practitioners alike have approached this dilemma by largely ignoring it, instead choosing to take the simpler route of decontextualizing this complex phenomenon as "a joint problem-solving activity" that involves "communication", "shared authority", and "common goals." What resulted are generalized models of collaboration that may be theoretically sound but virtually inapplicable to real-world contexts. However, integrating problem theory into the study of collaboration in real-world practice allows us to construct meaningful explanations of what collaboration is, how it is carried out, when, with whom, and for what purpose.

Collaboration in Practice Based on Problem Nature

Results indicate that when collaborating on relatively well-defined problem situations (e.g., clear diagnosis, routine, predictable), early career physicians tend to follow appropriate protocols and guidelines that are in place, and there is a general tacit understanding among collaborating parties of how tasks and responsibilities are distributed according to expertise and roles (Cases 06, 09).

> We call surgery. They look at it. And they say, "OK, we need to take the patient to the OR" or "We don't need to take the patient to the OR." And then we manage based on that point. They'll go and they'll amputate or they'll do an I&D and then they'll follow along with the patient afterwards. We manage the antibiotics, the pain… They'll kind of do the

ultimate signing off. And then we're the ones to do the discharges for the patient. [Participant 01, Case 06]

On the other hand, a greater degree of joint, integrated problem solving occurs when collaborating to resolve more ill-defined, complex, and dynamic situations. This includes active seeking and integrating of collaborators' expertise into problem solving and decision making, and a greater reliance on nurses for their timely input on patient-specific information and critical updates. This pattern is further supported by cases containing ill-defined, complex, and dynamic problem situations that *lack* these integrative collaboration features. In these cases, participants' complaints include feeling out of the loop due to lack of communication/updates (Case 03), unresponsiveness and lack of suggestions from the oncologist (Case 14), and specialists' refusal to provide consult (Case 15).

These findings suggest that early career physicians have collaboration behaviors and expectations that are specific to the nature of the problem situation being resolved. They are more likely to initiate collaboration with the goal of enhancing their understanding of the problem situation, and their underlying expectation is that their collaborators are responsive to their concerns and provide detailed expert input on the problem that can support their independent decision making. As problems become more ill-defined in nature, early career physicians increasingly rely on and engage in direct communication with collaborators for joint problem solving, such as evaluating potential treatments and constructing care plans. When the problem also exhibits dynamicity, timely communication and support between collaborators becomes critical for maintaining awareness of the situation as it evolves.

Emerging Patterns Among Problem Nature, Collaboration Approach, and Collaboration Experience

Effective Collaboration for Different Problem Situations

The results revealed that for problems that were highly ill-defined, dynamic, and complex in nature, a more integrative collaboration approach was used to successfully create and execute solutions. According to problem theory, the information needed to properly identify and articulate the problem space and contextual constraints are missing or incomplete in ill-defined problems. This makes identifying the goal(s), generating potential solution paths, and choosing an appropriate solution supported by sound rationale more challenging (Choi & Lee, 2009; Jonassen, 1997). A collaborative approach that focuses on active integration of expert knowledge, perspectives, and skills throughout the problem-solving process likely enables early career physicians to obtain a clearer understanding of the problems within context and improve decision-making overall.

On the other hand, problems that are more well-defined appear to be more efficiently managed when a less integrative approach is used to resolve them. Some of the well-defined traits identified for early career physicians include problems with a clear diagnosis, problems with established guidelines, and problems that are routine or familiar. When a well-defined problem containing any combination of these traits is also static in nature, it makes sense to use a collaborative approach that focuses on following through with individual tasks and responsibilities and adhering to known quality control measures and protocols that promote safety. In these situations, collaboration that minimizes unnecessary communication (i.e., overcommunication) and streamlines care processes without compromising quality and safety is important since time is a limited resource for early career physicians. It is important to note,

however, that as well-defined problems increase in dynamicity, collaborations need to shift to prioritize prompt identification and delivery of critical information to one another for timely decision making and action.

Participants offered patient outcomes for 14 of the 21 collaboration cases collected in the study (Table 5.2). Nine cases had positive patient outcomes and the remaining 6 had negative patient outcomes.

Table 5.2

Collaboration Case Outcomes

Outcome Type	Case	Patient Outcome
Positive	02	Patient received necessary nutrition
	04	Received timely, appropriate care as their condition changed
	05	Received appropriate medication therapy and care
	06	Discharged after receiving necessary procedure
	10	Fix missing orders for patients
	11	Respected patient wishes, minimized harm
	13	Patient referred out as requested
	16	Patient was notified of their prognosis, was appreciative
	20	Received appropriate treatment
Negative	03	Patient was transferred to the ICU
	08	Longer hospital stay (perceived)
	14	Important treatment component missed, delayed treatment
	15	Delay in appropriate care
	17	Delay in care
	19	Delay in care

Interpretation of the overall pattern of these cases (Figure 5.1) is that effective collaboration, as indicated by patient outcomes, entails:

1. More integrative collaboration approach for resolving highly ill-defined, dynamic, and complex in nature

2. A focused, coordinated execution of roles and responsibilities that includes timely, appropriate communication and support on less ill-defined, dynamic, and complex problem situations
3. Adherence to established protocols/guidelines that minimizes unnecessary communication for efficiently and systematically resolving well-defined problem situations

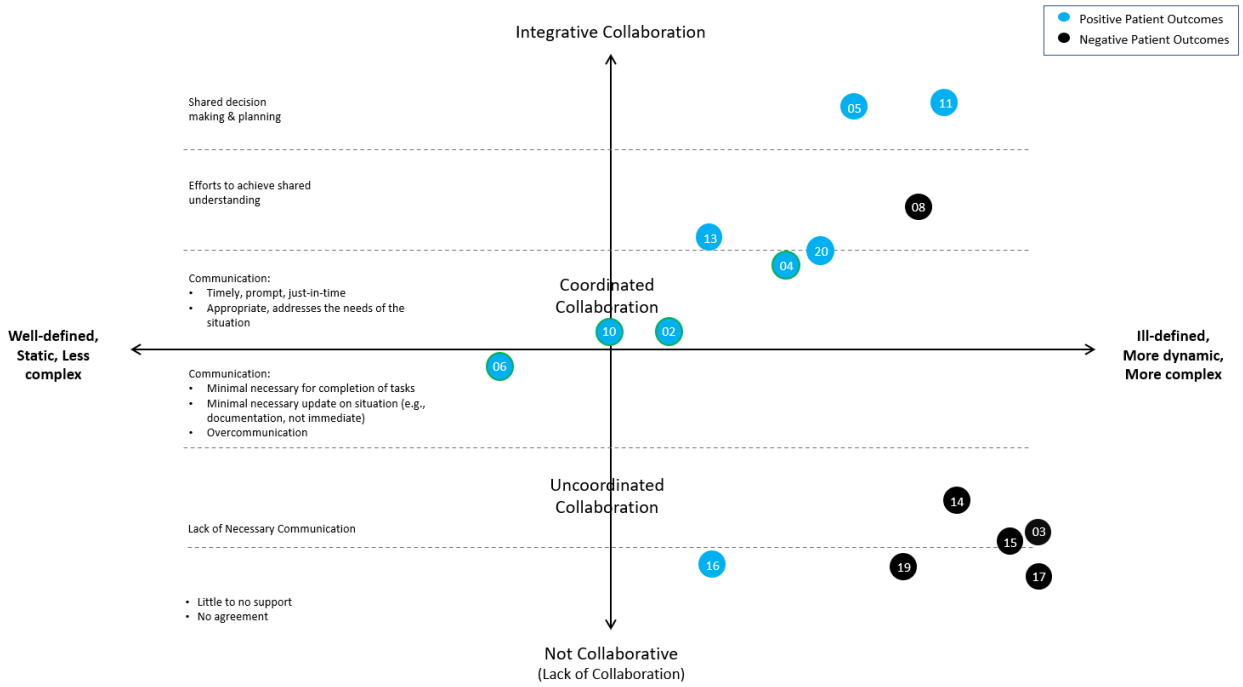

Figure 5.1

Collaboration Case Outcomes

Relationship Among Problem Nature, Collaboration Approach, and Collaboration Experience

The second pattern to emerge shows a consistent relationship between problem nature, collaboration approach, and collaborative experience as shown in Figure 5.2. Each case collected in the study was plotted according to the collaborative processes undertaken by members and the

problem traits identified. The cases were then marked as positive, mixed, and negative based on the participants' description of their experiences.

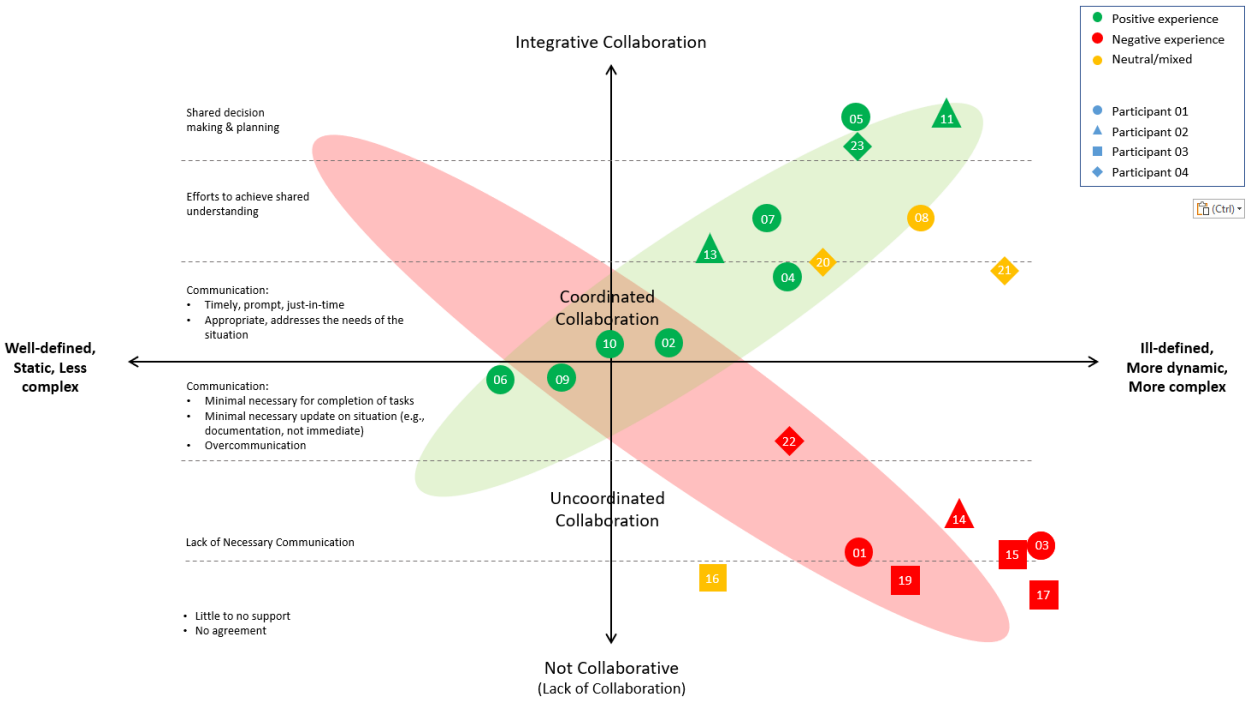

Figure 5.2

Emerging Patterns: Problem Nature, Collaboration Approach, and Experience

Such emerged patterns imply that early career physicians are more likely to have positive collaborative experiences when the collaboration approach and problem nature are aligned as described previously. Cases that involved ill-defined, dynamic, and complex problem situations were able to be successfully resolved through a more integrative collaboration approach and perceived overall as positive experiences. Conversely, cases that involved similarly ill-defined problems that lacked appropriate communication or support from collaborators were perceived as negative experiences. Two of the positive collaboration cases involved problems that were more well-defined and static in nature, and they were managed efficiently through

communication of necessary information. Unfortunately, none of the cases collected in this study involved an integrative approach to resolve well-defined problems. It would be interesting to confirm through future studies whether such collaborations would be perceived negatively by early career physicians.

Findings and Implications

Scholars and practitioners of the healthcare field consider problem solving to be a defining feature of collaboration, a process that involves communicating with one another and engaging in decision-making that influences the care given to patients. In this study, problem theory offered a new perspective into understanding the phenomenon of collaboration in healthcare, through which there was analysis of the types of problems that practitioners collaborate on, how these problems vary, and the decision-making processes that underlie effective collaboration. The assumption driving the decision to view collaboration through the lens of problem solving was that it would yield new theoretical understanding of collaboration and practical implications for ways to promote effective collaboration for current and future healthcare professionals.

IPEC (2011) stated that patient care must be "safe, efficient, timely, effective, and equitable" (p. 21), and there was theoretical and empirical support within the literature for collaboration being a crucial component of achieving this goal. Despite the important role collaboration appears to play in ensuring quality care planning and delivery, some aspects of collaboration theory and practice were left largely unaddressed or explored in research until the present study.

First, collaboration is believed to be especially important as situations increase in complexity (Baggs et al., 1999), with complexity described as an interaction of multiple factors

that impact the care of patients (Safford et al., 2007). In addition, the IPEC (2011) claimed there is a need to collaborate through shared problem-solving and shared decision-making "especially in circumstances of uncertainty" (p.24). Prior to this study, it was unclear exactly how practitioners assess complexity or uncertainty of problem situations as they collaborate with other healthcare professionals and what the intersection of problem nature and collaboration approach looks like. Problem theory was used in this study to not only strategically extract, identify, and sort problem traits that correspond to uncertainty, complexity, and dynamicity in real-world problem situations but also demonstrate the range of problems and their component traits resolved everyday through collaboration in practice. Further, the case study design of the study was used to compare and contrast the 23 collaboration instances collected to determine what types of situations early career physicians appear to take a more integrative collaboration approach as opposed to others (e.g., coordinated, "as needed" communication).

Patterns drawn from collaboration and problem-solving data within the study support the assertion that collaboration through shared decision-making is important in situations of uncertainty and complexity. As discussed in the previous section, findings indicate integrative collaboration approaches to resolve highly ill-defined problem situations were associated with positive experiences and timely delivery of appropriate care to patients. Conversely, collaborations on similarly ill-defined problems that lack integrative problem solving among collaborators were associated with negative experiences from early career physicians' perspectives and negative outcomes (e.g., delayed care).

The theoretical implication of these findings is that collaboration in the real world is problem-specific and context-dependent. Prior studies have noted discrepancies in how healthcare professionals conceptualize and perceive collaboration in practice, but they did not

investigate the details of the contexts in which these differences exist. These discrepancies were often simply attributed to the profession-specific values, perspectives, and boundaries that influence how professionals approach problems and communicate concerns with one another. However, a more nuanced perspective to consider is that collaboration to resolve problems involves processes that vary depending on the nature of the problem that is to be resolved. The profession-specific roles, responsibilities, and perspectives merely further complicate how collaboration is understood, practiced, and perceived as it occurs in different problem situations.

Attempts to produce a singular definition of collaboration in healthcare may have been hindered because problem context was not included in the process. Some authors view collaboration to be integrative in nature involving joint decision making and care planning among members (e.g., Counsell et al., 1999) while others view collaboration to be assuming complementary roles and cooperative work (e.g., O'Daniel & Rosenstein, 2008). Findings of this study suggest that collaboration, at least from the perspective of early career physicians, can take many forms comprised of specific ways of communication, decision-making, and execution of roles required to achieve care goals within a broad range of situations. If the problem situation is highly ill-defined, collaboration should involve more communication that focuses on sharing expertise, maintaining a shared understanding, negotiation of needs and goals among collaborators, and joint decision making that results in enhanced care to patients. Not all situations require this level of integrative collaboration, however, and likely benefit instead from more coordinated, seamless execution of complementary roles and responsibilities.

Perhaps an initial starting point for defining collaboration in healthcare may be the following: Collaboration is the processes by which two or more people strategically communicate and resolve varying problem situations together in order to achieve the shared goal

of delivering quality care to patients in a timely manner. Effective collaboration, then, requires proficiency in problem assessment, strategic communication, and collaborative processes that are specific to solving the type of problem situation in question.

Implications for Health Professions Education

The central goal of interprofessional collaboration training and education is to guide current and future health professionals to develop the knowledge and skills necessary to collaborate effectively as independent practitioners in real-world contexts. The results of this study offer valuable insights on what elements should be considered when designing instructional activities to promote effective collaborative competence.

The findings of the current study recommend that educators guide students to understand various collaborative approaches and their features and strategically adapt appropriate collaborative approach needed to successfully handle real-world problem situations. Misaligned approach for a given problem can lead to inefficient use of time and resources, adding stress and urgency that impede their problem-solving process. In worst case scenarios, some collaborations can be uncoordinated and lacking in ways that ultimately result in negative outcomes all around (e.g., delayed care, prolonged hospital stay, loss of trust). On the other hand, there is a distinct pattern of relationship between problem nature and collaboration approach discovered in this study that may guide the development of pedagogical strategies for promoting effective collaboration for medical students.

Findings also suggest that students should have opportunities to practice collaborating on real-world situations that differ in their degree of uncertainty, dynamicity, and complexity. With proper guidance and feedback, they can learn to flexibly and purposefully adapt the different collaborative approaches to help them frame and achieve their goals for each situation. The

problem situations should be authentic, multi-layered, and designed to compel students to employ similar cognitive and collaborative processes used by physicians to achieve positive outcomes in the real world. For example, information and resources should not be presented entirely at the start of the activity nor should they be available to all members from the start. Based on the data captured in this study, students should instead be guided to practice processes such as filtering and evaluating known information for relevancy to the situation, identifying the unknowns of the situation, and actively seeking resources to increase problem clarity for better problem framing. The traits found in this study can be used to guide the construction of varying problem situations.

The ability to discern which collaborative approach is more appropriate to resolve a problem situation may be a critical component of collaborative competence. As such, instructional design efforts should focus on creating and reinforcing pathways between problem nature and collaborative approach. Collaboration on relatively well-defined problems should focus on ensuring appropriate guidelines and protocols are followed by members and that all necessary tasks are accounted for. Dynamic problems require identifying and delivering critical information to one another as the situation evolves. Ill-defined problems benefit from active sharing of knowledge, ideas, and perspectives among members to negotiate a "best-fit" plan for the patient. With proper guidance and scaffolding, students can learn to make informed decisions and collaborate strategically to resolve each problem situation using the different approaches discussed in this study.

Future Research Direction

The present study is the first in a new line of research into collaboration theory and practice, and as such, it was important to design it in a way that ensures capture of data that is not

limited to any specific frame or theory. The goal was to extract meaningful data from the source (i.e., real-world practitioners' experiences and perspectives) that can be used to propose a new theoretical perspective on collaboration in healthcare. This was also the rationale behind the decision to not provide existing definition(s) of collaboration from the literature to the participants. By leaving "collaboration" open to their interpretation, the stories collected were expected to yield details of the kinds of beliefs, expectations, and perceptions of collaboration that the participants currently hold and how these views translate into decision-making and action as they collaborate with others. As a result, this study captured a broad range of instances in which two or more people work together toward a shared goal. Cross-case analysis was conducted to draw conclusions as to what makes some successful, others more challenging, and what aspects make each instance "collaborative" to early career physicians.

It is important to recognize that a wide range of collaboration and problem types were collected and analyzed for this study. However, interpretations of results are based on a limited number of cases and problem situations relative to the spectrum of diverse problem situations and collaborations that most definitely exist across the many practice types and institutions in the real world. Therefore, patterns discovered in this study should be confirmed on a larger scale with more participants, collaboration cases, and practice contexts in future studies.

Early Career Physicians' Perspectives on Collaboration

This study focused on the experiences and perspectives of early career physicians (ECPs) rather than those with many years of experience practicing and collaborating with other healthcare professionals in the field. This decision was made on the assumption that the collaboration stories collected would reflect the cognitive processes, beliefs, and experiences of the transition between formal education/training and their current place of real-world

independent practice. Data gathered from those within this career phase, especially those related to challenges and difficulties, were expected to provide meaningful and practical implications for medical education and training programs. Incorporating multiple stakeholders' perspectives, situational assessments, reasoning processes, and interactions with one another throughout each collaboration instance is needed in this line of collaboration research moving forward. In addition to collecting interview data, future studies should consider field observations focusing on the social and interactional collaborative processes to generate additional insight on how healthcare professionals collaborate in varying contexts and situations (Emerson et al., 2011).

Additional Lines of Future Research

Problem Nature, Collaboration Approach, Patient Outcomes. Future studies should further examine the relationship between problem nature, collaboration approach, and patient outcomes. There were some cases where patients were transferred over to another's care (e.g., shift change, transfer to another department or facility) and there was no way to obtain patient outcome data. Rather than solely relying on participant recollection, collecting additional forms of data to supplement interview data is recommended. A list of key outcomes (e.g., mortality, delayed care) should also be prepared prior to data collection for cross-case analysis.

Problem Traits. It is also important to note that the exact nature of the problem traits themselves and how they interact to influence collaboration need further investigation. It is possible that each trait has an inherent value or weight associated, and a situation is more difficult to resolve in collaboration with others when some of these traits are present as opposed to others. For instance, Incomplete Information and Different Stakes in the Situation both make a situation more ill-defined in nature, but the latter has potential to make the collaboration more difficult since there are conflicting opinions and goals that need to be negotiated to resolve the

situation. For the purposes of this study, the traits were tallied equally and used to place each case on the quadrants. Future studies may consider investigating the significance of each trait and their influence on the participants' collaboration experience and outcomes. This includes looking into whether certain combinations of traits make collaborations more challenging and lead to negative outcomes.

Participant Differences as Variables. It is currently unknown whether factors such as age, gender, education, cultural background, and more played a role in the results obtained in the present study. Future research should consider examining participant individual differences as potential intermediate variables in how healthcare professionals assess problem situations, communicate with others, and make decisions throughout collaboration. In a similar vein, how individual participants determine "good" or "effective" collaboration (e.g., their values, priorities, criteria for judging collaboration) may be another aspect worth pursuing in this line of research.

Epistemic Beliefs and Collaboration. The ways in which individuals interpret and handle complex and ill-structured problems are theorized to be influenced by their epistemic beliefs (Jonassen, 2000). In the current study, all four participants specialized in internal medicine but each possessed their own unique ways of practicing medicine and collaborating with others. Specifically, there appear to be differences in how they process and evaluate information including those obtained from collaborators. For instance, Participants 01 and 03 both work as hospitalists and shared similar stories of collaborating with physicians and nurses, but Participant 03 was noticeably less willing to take others' words and decisions at face value and critically evaluated his own assumptions and reasoning for validity. From an epistemological perspective, one may argue that Participant 03 possesses a paradigm that accommodates critical

interpretation of knowledge and multiple perspective thinking (Hofer et al., 1997; Jonassen, 2010). Examining the relationship between healthcare professionals' epistemic beliefs, problem nature, and collaboration approaches could be another potential direction of research that further our theoretical understanding of collaboration in healthcare.

Prior Experience with Collaborators. It is worth noting that early career physicians may trust and hold in higher regard health care professionals with whom they have experienced positive collaborations in the past. Participants 02 and 03 shared instances when they felt more comfortable or inclined to reach out to those they are familiar with specifically to receive advice, second opinions, and support. Case analysis showed that this behavior typically occurs when facing an urgent problem situation (Cases 14 and 17) and when uncertainty can be reduced through input from a trusted source (Case 14). This suggests that prior experiences with collaborators has an influence on early career physicians' expectations and their problem solving via collaboration. Examining the effects of prior experiences of collaborations (e.g., positive, negative, involving specific professions) on healthcare professionals' current attitudes, behaviors, orientation, expectations, or other factors related to collaborations may be another direction of research in the future.

Does Practice Context or Team Composition Matter?

The participants of this study were intentionally recruited from inpatient and outpatient contexts so that the data collected can be analyzed for any differences in how collaboration is conceptualized and carried out between the two contexts. This was based on the assumption that there could be differences in variability of who early career physicians collaborate with in hospital contexts as opposed to outpatient settings for a number of reasons (e.g., traveling physicians/nurses, variable shifts) and that this could result in different interpersonal and

collaborative dynamics. Surprisingly, physicians across both contexts responded that they work with a mixture of familiar and unfamiliar coworkers and collaborators, and the cases themselves feature collaborators and collaborative approaches that depends more on the problem situation itself rather than the practice context. All four participants provided cases that involved collaborating with those they had worked with many times prior and others who they were not as familiar with, and there were no discernable differences in outcome or experience based on this factor alone.

Conclusion

The purpose of this study was to explore the different problem situations early career physicians collaborate on and to examine how they perceive and carry out collaboration in varying problem situations. The results showed that early career physicians collaborate on problem situations that vary in their degree of certainty, complexity, and dynamicity, and there are varying collaboration approaches taken depending on the nature of the problem situation at hand. Early career physicians collaborated on relatively well-defined problem situations by following appropriate established protocols and guidelines. In contrast, a more integrative collaboration approach was taken to resolve ill-defined, complex, and dynamic problem situations. In addition, there appear to be a consistent relationship between problem nature, collaboration approach, and collaborative experience, in which early career physicians are more likely to have positive collaborative experiences when the collaboration approach and problem nature are aligned.

A key contribution of this study is the collection of cases demonstrating various collaborative problem solving situations embedded in real-world practice contexts. These cases detail what factors early career physicians take into account when faced with different problem

situations, the various processes involved in making care decisions through collaboration with others, and the outcomes of each collaboration. Further, additional details such as early career physicians' assumptions, expectations, behaviors, reasonings, and difficulties experienced within critical moments of the collaborations will hopefully provide additional insight for collaboration education and training for current and future healthcare professionals.

One of the goals of this study was to discover what types of relationships or patterns emerge between problem nature and collaboration approach with hopes that findings may provide insight into collaboration training and education for current and future practitioners. Though the study was exploratory and limited in scope, these findings serve as a first step in a new direction of collaboration research that examines the relationships between problem nature, collaboration approach, and collaboration experience.

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Appendix A

Interview Protocol & Questions

Introductory Script

Thank you for agreeing to be a participant for this interview today. My name is Eunice Kim, and I am doctoral student in the Learning, Design, and Technology program at the University of Georgia. I am conducting a study exploring healthcare professionals' perspectives and experiences with collaboration as it relates to their everyday clinical practice contexts. Specifically, I'm interested in exploring how collaboration is perceived and carried out by physicians within various problem situations.

The topic for this interview is focused on your experiences working with other healthcare professionals in real-world contexts. Before we begin, I would like to remind you that any information you share today will be kept confidential as explained in the consent form. The interview will be audio-recorded, and an identifier code will be assigned in the place of your name. The interview will take between 40 minutes to 2 hours. If you feel uncomfortable and would like to pass on any of the question, please let me know. Do you have any questions for me before we get started?

What is Collaboration?

1. Can you briefly tell me a little bit about the work that you do?
    a. Do you work with the same people every day? Or is it more variable (shift-based)?
2. Can you tell me what it means to collaborate with others in healthcare?
    a. Potential probe question: What does successful collaboration look like?

Collaboration Experiences & Problem Contexts

3. Can you tell me a story of collaborating with others, within the context of your professional practice, that was particularly memorable? And can you tell me from the beginning to the end in a way that I can imagine being there with you, like an episode of House?
    a. To elicit more stories or if participant has trouble recalling a specific one, substitute “memorable” with the following: “typical”, “routine”, “common type of problem”, “recently encountered” “atypical”, “unusual”, “challenging”, “negative”, “positive”
4. How often do you encounter these types of situations? (routine / atypical)
5. In what way was this story/experience memorable? (e.g., positive, challenging but meaningful)
6. What would you do differently if you faced this again?
7. What happened to the patient (if relevant)?

Closing Script

Thank you for your time and I appreciate you sharing these stories with me today. I have one last question for you: would you be willing to do a follow-up zoom call with me to answer any clarification questions I may have about these stories you shared today?

Appendix B

Collaboration Case Profiles

Table 4.2

Collaboration Case Profiles

Case 01 - "I didn't expect to be talk to like that"
Summary: The participant was in a hurry to discharge a patient who had threatened to leave AMA (against medical advice). After putting in the discharge order, she was informed by the collaborating nurse that she needed to also complete a discharge summary. When the participant replied she will do so after seeing to the other patients, the nurse replied, "Well then, [the patient's] not leaving. They will leave when you get back and get it done."

Problem Nature	Actions	Outcome	Quote
(+) Clinically simple (UTI, can go home) (-) Busy, in a rush, short on time (-) Conflicting/multiple perspectives (-) Meet administrative criteria (different goals in the situation) (-) It's my license on the line (high stakes, different stakes)	• Nurse directly refused participant's request • Nurse put me in my place (participant's perspective)	• Participant was embarrassed, stunned • Confidence shaken	• But I've got a million other pings at 8:30 in the morning when everyone is there and they're asking me a million questions • I need to get this thing that they're requesting done because otherwise the patient isn't going to leave and that's going to be on me, you know? It's again, it's my license, everything that happens is under me despite what the nurses do or don't

			do. It's directly tied to me, right?

Case 02 – Nurse communicates her lack of experience with a procedure
Summary: Nurse promptly let the participant know that she feels uncomfortable placing an NG tube for a cancer patient (likely due to lack of experience). The participant was able to find another nurse with more experience to place it.

Problem Nature	Actions	Outcome	Quote
(+) Cancer patient, nutrition deficient (clear diagnosis) (+) Well-defined clinical problem/goal (need nutrition) (-) Nurse cannot perform task (unexpected situation) (-) Patient did not want the treatment, procedure	• Nurse lets MD know she's uncomfortable (lack of experience) • MD discussed, agreed on a plan with the patient	• Patient received nutrition	"But the nurse was uncomfortable with it 'cause I guess she had not done very many of them or something. So she's like, 'Hey, I'm not really comfortable with this. Can we talk about it?'"

Case 03 – Lack of communication from the nurse
Summary: The participant ordered an NG tube be placed for a patient. The nurse did not follow through with the order because she did not believe it was warranted, and the nurse did not communicate with the participant about this decision. The participant assumed all was well until when she was urgently called over because the patient's situation had worsened. Patient was transferred to the ICU.

Problem Nature	Actions	Outcome	Quote
(-) Lack of information (patient history) (-) Inadequate or incomplete sign-out, handoff (-) Unclear, uncertain clinical problem(s) (-) Unstable, reasons unknown (-) Unknown factors present (-) Waiting on lab results, evidence	• Participant told nurse to put in NG tube • Participant didn't receive any updates, news about the patient • Nurse did not inform the participant about her decision to not place the tube • Nurse skipped communication with the participant and called in another MD	• Feel upset about being out of the loop, not in control (on a high stakes situation) • Loss of trust • Patient was transferred to the ICU	• "I was already on the fence about getting her there [ICU] if the tube thing didn't work out." • "I was upset about that because naturally I would have wanted to be the one in the know. You walk in and you're out of the loop. This is your patient; you're managing them. All of these

(-) Borderline, gray-area problem situation (-) Patient condition, situation worsened (dynamicity) (-) Legal consequences, implications (concern, different stakes) (-) "Everything reflects back on you" (different stakes) (-) Multiple perspectives to the situation			decisions, everything again reflects back on you and if something is not communicated right, then it feels like you're not actually the one driving the management."

Case 04 - Highly coordinated, communicative team

Summary: The participant received timely communication and updates from the overnight physician, nurses, and nurse practitioners about a mutual patient's status.

Problem Nature	Actions	Outcome	Quote
(+) Cancer, anemic (clear diagnosis) (-) Clinically complex (-) Unclear, uncertain clinical problem(s) (-) Patient condition changed (dynamicity)	• Other MD updated her on the patient's situation overnight • Nurses were quick to get in touch when the patient's condition worsened • Nurses communicated information, allowed participant to adjust treatment in time as needed	• Patient received timely, appropriate care as their condition changed • Positive collaboration experience	• "So everyone's watching his blood pressure really carefully and as soon as it dipped – had two reads where he was very hypotensive – they were all on us, communicating with me"

Case 05 - Learned something new from this collaboration experience

Summary: The participant reached out to a pharmacist for assistance in creating a treatment plan for a patient. The pharmacist was helpful and shared their reasoning behind their decision making. They jointly created a treatment plan that meets their needs.

Problem Nature	Actions	Outcome	Quote
(-) Lack of information (patient history) (-) Unclear, uncertain clinical problem(s)	• Reached out to pharmacy for help/advice • Jointly identified their goals for the patient	• Learned something new about pain management	• *"They're* the experts in this…I don't want to give [the patient] too much. I don't know exactly what's

(-) Constraints limiting investigation of clinical problem (-) Difficult, complicated patient case	• Discussed, agreed on a plan of care (shared decision making) • Recognized others' expertise	• Patient received appropriate medication therapy and care	safe doing all these combinations over all these hours. That was about the extent of what I was comfortable with and familiar with. But they were very great in explaining to me all the other options and what their thoughts were behind the decision they made to offer her oral Dilaudid, which I've never prescribed and we don't typically need to."

Case 06 - Collaborated with surgery on a routine case
Summary: A diabetic patient was admitted for toe amputation. MD and surgery collaborated to provide medical management and surgery.

Problem Nature	Actions	Outcome	Quote
(+) Routine case, frequently seen (+) Clear diagnosis	• Routine, typical interactions in collaborating • Distribute care duties according to expertise, roles	• Patient discharged after receiving necessary procedure	• "As far as the standard procedure: when they come in, who we call, they're happy to assist to do the surgery or not if the patient doesn't need it. And then we collaborate together on medical management afterwards surgical management, then we get them discharged."

Case 07 - Collaborated with surgery on an atypical case

Summary: A patient was admitted with a severe foot wound. The participant, a surgeon, and a vascular surgeon collaborated to form a plan of action after weighing the risks and benefits associated with a necessary procedure.

Problem Nature	Actions	Outcome	Quote
(+) Serious problem, clear and obvious (maggots in wound) (-) Clinically complex (-) Added clinical layer(s) to consider in decision (Complexity) (-) Different stakes in the situation	• Other MDs shared their reasoning behind decisions, thoughts (shared understanding) • Surgery waited for vascular surgeon to weigh in on the situation • Discuss, agree on a plan with the patient (shared decision making) • Distribute care duties according to expertise, roles	• Patient is working with surgery to schedule the procedure	• "Surgery said 'We're not going to anything just yet. We want to make sure the stent is working or if there's anything that can be done about the stent that was placed to increase blood flow to help that wound heal.'" • "We need to see how bad this thing is and in order to get accurate imaging for the CTA, she's going to be hit with a really hot contrast load, but her kidneys are already suffering…"

Case 08 - MD to MD collaboration – Not on the same page

Summary: What initially appeared to be straightforward cellulitis changed to become a potentially serious infection. Surgery performed the necessary procedure when imaging confirmed need, but the participant feels that this situation could have been prevented had surgery acted sooner.

Problem Nature	Actions	Outcome	Quote
(+) Clinically simple (-) Patient condition, situation worsened (Dynamicity) (-) Problem wasn't responding to treatment (Atypical) (-) Multiple potential causes of problem situation	• Participant reached out to surgery for consult • Recognized others' expertise • Other MD shared their reasoning behind decisions, thoughts (Shared understanding)	• Patient was losing his patience • Longer hospital stay • Challenging collaboration experience	• "It's a little challenging because for me, I wanted surgery to go ahead and do something sooner rather than later. And then it becomes a challenge for us because we have to explain why the patient is still here and

(-) Multiple perspectives to the situation (-) Different stakes in the situation (-) Disagree on timing of action			eventually they're going to look at the numbers…" • "I felt like he could have benefited from an I&D sooner. But if surgery says "No, we'll wait and see" you kind of go by what they say."

Case 09 - Collaborating with case managers on finding a facility for a patient
Summary: The participant is collaborating with a case manager for a patient who needs placement at a skilled nursing facility post-surgery.

Problem Nature	Actions	Outcome	Quote
(+) Clinically simple (+) Non-urgent problem or situation (-) Limited options, no clear solution available	• Distributed care duties according to expertise, roles • Case managers update the participant daily on status of patient placement	• Patient is still waiting on placement	• "…collaboration with case management throughout this whole process was them reaching out to places, updating me daily – sometimes twice a day, in the morning and the evening."

Case 10 - Daily interdisciplinary meetings
Summary: The participant has daily meetings with 20 other healthcare professionals and staff members, during which they share updates on the status of their patients, make requests to one another, and recommend next steps based on the information that is shared.

Problem Nature	Actions	Outcome	Quote
(+) Non-urgent problem or situation (-) Task, information overload	• Receive requests, updates, recommendations from collaborators • Take action based on others' recommendations, input	• Sometimes stressful collaboration (if administrator is present) • Fix missing orders	• "After I tell them my part of the story and what I think, physical therapy, pharmacy, case management weighs in and says, "Well, based on what you told us and what we know and what we see and what we saw the patient can and can't do, we

			recommend that XY and Z." And I'll write down my little note and I'll leave after I put in all my orders for that to help move things along."

Case 11 - Collaborating with specialists on difficult, complex cases
Summary: The participant collaborated with specialists to care for a newly diagnosed cancer patient. Though the cancer diagnosis was clearly defined and care guidelines readily available, the patient had multiple comorbidities, an undiagnosed coronary artery blockage, and unexpected side effects from his chemo/immunotherapy that demanded extra care and management from him and his collaborators.

Problem Nature	Actions	Outcome	Quote
(+) Well-defined clinical problem (+) Established guideline for care available (-) Clinically complex (-) Added clinical layer(s) to the problem situation to consider (complexity) (-) Urgent, time-sensitive problem situation (-) Informed of an emerging problem (dynamicity) (-) Discovered a new problem (dynamicity) (-) Different stakes in the situation	• Distributed care duties according to expertise, roles • Recognized others' expertise • Reached out for help/advice from oncologist • Called oncologist to get a better idea of the situation, what they're thinking (Shared understanding) • Shared thoughts, plans with the oncologist (Shared understanding) • Discussed, agreed on a plan of care for the patient (Shared decision making)	• Positive collaboration experience • Jointly created a care plan that respected patient wishes while minimizing harm	• "So these kinds of cancer have a more firmly established diagnosis and guideline for care, then it's much easier to manage because all the specialists know what needs to be done." • "I'll definitely make sure I run all the changes or things I'm thinking by the oncologist, make sure it doesn't interfere with their plan or get their opinion on how to best approach these kinds of cases."

Case 12 - Collaborating with a patient to treat their depression
Summary: The participant worked with a patient to find a suitable psychiatrist who could take over management of her symptoms.

Problem Nature	Actions	Outcome	Quote

(+) Clinically simple (-) Problem not responding to appropriate treatment (Atypical) (-) Different stakes in the situation	• Discuss, agree on a plant with the patient • Recognize others' expertise	• Patient is being treated by a psychiatrist and receiving counseling	• "I can read up on all the clinical guidelines in terms of adding antipsychotics for resistant depression, but I don't think I've prescribed it frequently enough to know to comfortably titrate it or monitor side effects and that kind of thing for these more specialty-oriented medications."

Case 13 - Coordinating care when the patient and specialist are at odds

Summary: The participant referred a patient out to a different specialist to get a second opinion on her condition. While he understood the reasoning of the first specialist, he also wanted to respect the patient's wishes to seek a second opinion.

Problem Nature	Actions	Outcome	Quote
(+) Clinically simple (-) Unclear, uncertain clinical problem(s) (-) Different stakes in the situation	• Other MD shared their reasoning behind decisions, thoughts (Shared understanding)	• Patient was referred out to a second specialist as requested	• Usually people trust their cardiologists. They say, "You need a stent." The patient usually don't have a problem with that. But something a little bit more nebulous or up in the air…Even though we may not have this full specialist training, you kind of have to make a clinical judgment."

Case 14 - Situation with unresponsive, unhelpful collaborators

Summary: The participant reached out to the oncologist multiple times about the care of a mutual patient. The oncologist was not responsive to his concerns and didn't offer ideas, plans, or suggestions. The participant decided to refer the patient to another oncologist who treated the patient and his symptoms appropriately.

Problem Nature	Actions	Outcome	Quote

(+) Clear diagnosis (prostate cancer) (-) Unstable, reasons unknown (-) Discovered a new problem (dynamicity) (-) Potentially urgent problem (unclear, not enough information) (-) Different perspectives on the situation (-) Potential missing treatment/therapy (unclear, lack of knowledge/experience)	• Reached out to the oncologist for help/answers • First oncologist was not responsive to questions, lacking answers	• Important treatment component was missed (initial collaboration) • Patient felt better, condition stabilized (after second collaboration)	• "… the old oncologist is not doing anything he's supposed to, not responsive to any feedback, attempts at collaboration. So, I did end up having to refer him to this new oncologist and was able to get him back on prednisone." • "Usually if something serious is going on that could be managed non-emergently, then a good specialist will be responsive to my concern because not every day I'm calling specialists and tell them what's going on. So *usually* when specialists get a call from PCP, they're slightly more attentive."

Case 15 - Frustrating situation involving unwilling, unhelpful specialists

Summary: At a small, rural hospital, the participant took over the care of a patient whose condition suddenly changed to what could potentially be a surgical emergency. He reached out to neurosurgeons at hospitals nearby for consult but unfortunately did not receive support or help from them. In the end, he consulted general neurology and was able to receive some answers.

Problem Nature	Actions	Outcome	Quote

(-) Inadequate or incomplete sign-out, handoff (-) Lack of information (patient history) (-) Problem wasn't responding to appropriate treatment (Atypical) (-) Patient condition, situation worsens (dynamicity) (-) Discovered a new problem (dynamicity) (-) Unknown factors present (-) Unclear, uncertain clinical problem(s) (-) Borderline, gray-area problem situation (-) Different perspectives on the same situation (-) Different stakes (-) Resource unavailable, constraints limiting investigation of problem	• Talked to others to gather information • Reached out for help/advice to specialists • First specialist was responsive to concerns, took action • Nightshift MD refused to take over care • Neurosurgeons were unwilling to provide consult on the problem (at other hospitals)	• Delay in appropriate care to patient • Frustrating situation/ experience	• "I just said…can you just talk to me and like you concur with this other neurosurgeon that there's something here that needs a procedure? If so, even if you can't admit them, that would help me figure out what the next steps are… But because they had no open beds, he wasn't even willing to consult with me, which is very frustrating"

Case 16 - I did what others neglected to do

Summary: The participant took over the care of a patient who was recently diagnosed with stage 4 cancer after months of being treated as a pain seeker. After realizing the previous hospitalist and the specialists neglected to inform the patient about her prognosis, he took on the burden of communicating with the patient and family members.

Problem Nature	Actions	Outcome	Quote

(-) Taking over the care of a patient (lack of information) (-) Concern for legal consequences, implications (different stakes)	• Communicate with patient/patient family about their health • Took on others' responsibilities, burden of care • Navigating variable practice norms	• Patient was notified of their prognosis	• "What the other specialists neglected to do was sit down with her, explain everything, explain the prognosis. Nobody would talk to her about prognosis. I was the first one that said 'You have maybe a few months to live'" • "I don't think it's right to leave a patient in the dark. I mean the oncologist was on this whole time and they hadn't said anything… So, I was like, it's not right. it's not ethical to leave them in the dark about this. So I talked."

Case 17 - Nurse wouldn't break protocol

Summary: A patient went into cardiac arrest and remained unstable after resuscitation. Knowing the ICU is full with critical COVID patients, the participant instructed the nurse to run an ICU medication to keep the patient stable until she could be transferred. The nurse replied that she's uncomfortable running the medication on the floor and refused his order. After a verbal confrontation with the nurse, he asked an ICU nurse that he knows well to come over and run the medication.

Problem Nature	Actions	Outcome	Quote

(+) Emergency, typical situation (+) Clinically simple (+) Serious problem, clear and obvious (-) Patient condition, situation worsened (dynamicity) (-) Added nonclinical layer(s) to the problem situation (-) Ideal solution out of reach (-) Different perspectives to the same problem situation; Participant's ethical values (-) Gray area situation (-) Participant's license on the line (different stakes) (-) Urgent, Time-sensitive	• Routine, typical interactions • The participant lets the nurse know what they need to do next • Nurse lets the participant know she is uncomfortable with his plan • Nurse directly refused to follow plan • Reached out to another collaborator	• Frustrating collaboration experience • Delay in care to the patient • Patient stabilized, transferred to ICU	• "This nurse unfortunately says "I can't run that on the floor. She's not in the ICU. I'm not comfortable doing that." And I'm like "This patient's blood pressure is dropping still, like she's going. If we do not get her on this pressor, it's going to continue to tank… We're just gonna make it worse from not doing anything simply because you refuse to start this medication because she's not on the correct floor?"

Case 18 - Frustrating experience with a patient's family

Summary: A family member refuses to accept the participant explanation about the patient's condition and asks him to look further into the situation. After finding nothing new, the participant talks to the patient's cardiologist and transfers care over to another hospital.

Problem Nature	Actions	Outcome	Quote
(-) Clinically complex (-) Unstable, reasons unknown (-) Multiple potential causes of problem situation	• Communicated with patient's family • Shared thoughts on the problem situation, what actions taken (shared understanding) • Discuss, agreed on a plan of care for the patient (shared decision making)	• Frustrating collaboration with patient's family	• "But me being new, I work it up and even working it up more I find no extra answers, but they are absolutely adamantly refusing to accept that that's the truth and I don't know what to do at this point."

Case 19 - The ER doc lied to meet his own goal

Summary: The ER doctor lied to get a high-risk patient admitted while fully aware the hospital did not have the resources to properly care for this patient. The participant and the affected surgeon go to confront the ER doctor about his unprofessional, unethical actions. Patient was transferred to another facility that could provide appropriate care.

Problem Nature	Actions	Outcome	Quote
(-) Administrative policies and demands (different goals) (-) Unknown factors in the situation (-) Gray area/Borderline (-) Clinically complex (-) Urgent, time sensitive problem situation	• ER doctor lied to meet his metrics (professionalism, ethics) • Surgeon confronts participant and ER doctor directly for answers • Reached out to a specialist at another hospital to transfer care	• Delay in care to the patient • Negatively affected by the ER doctor's decision (shift in burden of care) • Patient was transferred to an appropriate facility • Learned to question everything	• "Now the burden is on me to transfer this patient out. We cannot do anything for this patient here. That surgeon is unwilling to perform surgery at that facility so now we have delayed care for this lady." • "I question everything now. I am much more questioning about what others say… medicine isn't perfect. People can be distrustful. Like they can lie to you in your face. There's differing experiences."

Case 20 - Stressful, but successful collaboration

Summary: The participant is informed by a church member that someone they know has COVID and that their symptoms are getting worse. She reached out to her colleagues to see if anyone could see them at the clinic that day since it was her day off. She relayed necessary information to the front staff and the provider who agreed to see the patient.

Problem Nature	Actions	Outcome	Quote
(-) Added nonclinical layer(s) to the problem situation (-) Last minute, disruptive changes (-) New information added	• Reached out for help • Talked to others to gather information • Routine, typical interactions in collaborating	• Patient received treatment • Felt exhausted and apologetic to the team • Felt stressed	• "It is stressful because last minute changes can be disruptive to the flow of things…" • "Honestly, I would say it's just like any everyday just

(-) Staff shortage (resource limitation)	• Try to be flexible, work with others' situations		looks a little different. What I would call it is "Unexpected surprise."… We're used to something always happening. We just don't know what it's going to be."

Case 21 - I learned that even veteran specialists can be wrong

Summary: A nurse and a pediatrician told the participant that they are concerned about one of her patients. The participant, thinking she had missed something important, reached out to different specialists for consult on the patient case. A pediatric neurologist assured her that the patient is fine and that there is no need for concern.

Problem Nature	Actions	Outcome	Quote
(+) Clinically simple (-) Constraints limiting investigation of problem (-) Informed of an emerging problem (dynamicity) (-) New situation, never encountered before (-) Busy, in a rush, short on time (-) Urgent, time sensitive problem situation (-) Unclear who to reach out to for the problem (-) Lack of knowledge on the clinical problem	• Communicate with patient/family about their health • Discuss, agree on a plan with the family (shared understanding) • Reached out to neurologist for advice/help • Recognized others' expertise • Pediatrician did not offer help/support	• Learned something new • Felt stressed, terrible thinking she missed something important • Felt frustrated, treated like she doesn't know what she's doing • Confidence shaken by others	• "But then our pediatrician, who is the head of our pediatric department in the clinic, approached me and was telling me that they noticed the measurements of the child and were very concerned." • "…they told me that I should be reaching out to the pediatric neurologist. So even when I started my pursuit, I was incorrect."

Case 22 - Routine but difficult collaboration with a wound care nurse

Summary: The wound care nurse frequently asks the participant to come in and check on their patient at the end of each visit, which the participant finds disruptive to her own schedule of seeing patients. She explains that she trusts him to manage the wound on his own so she finds this situation frustrating, especially when she is asked to provide solutions to problems she believes outside of her control.

Problem Nature	Actions	Outcome	Quote

(+) Routine problem (-) Added nonclinical layer(s) to the problem situation (-) Added clinical layer(s) to the problem situation (-) Last minute changes (-) Lack of clear guidelines/standard protocol	• Nurse noticed potential problem, let MD know about a concern they have • Nurse wanted MD to check over their work • Nurse did not readily accept MD's suggestions • MD trusted/expected nurse to handle the problem independently	• Felt frustrated when nurse doesn't like MD's answers but won't offer their own	• …it's becoming a little bit disruptive for me because I'm trusting that the wound care team can handle the wound. • But for wound care or the leg deconditioning and swelling and poor circulation, there's no clear guidelines like that that *I* know of.
Case 23 - Successful collaboration in an atypical, stressful situation **Summary:** When the MD found herself unable to manage a difficult patient on her own, she reached out to multiple collaborators for help. She received advice and support, and an administrator ultimately stepped in to dismiss the patient.			
Problem Nature	**Actions**	**Outcome**	**Quote**
(-) Taking over the care of a patient (uncertain) (-) Conflicting information (-) Atypical, difficult patient (paranoia, violent behavior, response to treatment) (-) Constraints limiting investigation of clinical problem	• Reached out for help/advice • Discussed, agreed on plan of care (shared decision making) • Collaborators were responsive to concerns, took action	• Felt supported by collaborators • Safely "fired" the patient	• "Well, multiple people were involved, but some would help create a plan for myself… Some people actually tried calling her directly, and they would spend like an hour and a half on the phone with her."

Note. (+) denotes well-defined, simple, static traits and (-) denotes ill-defined, complex, dynamic traits

Appendix C

Consent Form

Researcher's Statement
I am asking you to take part in a research study. Before you decide to participate in this study, it is important that you understand why the research is being done and what it will involve. This form is designed to give you the information about the study so you can decide whether to be in the study or not. Please take the time to read the following information carefully. Please ask me if there is anything that is not clear or if you need more information. When all your questions have been answered, you can decide if you want to be in the study or not. This process is called "informed consent." A copy of this form will be given to you.

Principal Investigator: Ikseon Choi, Ph.D.
Learning, Design, and Technology Program
Department of Career and Information Studies, College of Education
Contact Information: ichoi@uga.edu

Purpose of the Study
The purpose of this study is to explore the different problem situations that healthcare professionals collaborate within and to examine how they perceive and carry out collaboration in varying problem situations.

Study Procedures
If you agree to participate:
- You will be asked to participate in an interview via a video call.
- Interview questions will ask about your perception of collaboration within the healthcare field and your experiences working with other health professionals in real-world contexts. The interview will take place remotely via Zoom at a time that is convenient for you. The interview session is expected to take around 40 minutes to 2 hours, depending on your availability. You may be asked for a follow-up interview.
- The interview will be audio recorded and transcribed for analytic purposes.

Risks and discomforts
- We do not anticipate any risks to you from participating in the interview.

Benefits
There are no direct benefits to you by participating in this interview. However, the data collected from the participants in the research activities has the potential to benefit our society. The data collected from you in the interview will be used to improve health professions education through exploring how collaboration is perceived by health professionals and identifying experiences that enhance collaboration and its related processes.

Audio Recording

By agreeing to take part in the interview, you are consenting for me to review your audio recording and transcribe it to use as data for this study. The interview will be conducted using Zoom, and a separate audio recorder will be used to record the interview. Your signature below indicates that you have read or had read to you this entire consent form and have had all your questions answered.

Audio Recording and Transcription
Please provide initials below if you agree to have this interview recorded and transcribed for the purposes described above or not.

_____ I give my consent to have this interview audio recorded and transcribed (initial)

Privacy/Confidentiality
The interview audio recordings will be transcribed after the data collection is finished. The recordings and its transcriptions that will be used as data for research will be stored in Microsoft Word and Excel. Dropbox.com with password-protected access will be used to store and access this data. Audio recordings will be removed from the database and destroyed within 90 days of the completion of the transcriptions. Since Internet communications are insecure, there is a limit to the confidentiality that can be guaranteed due to the technology. To protect your identity and to maintain confidentiality during research, personal identifiers in the data will be replaced with randomly assigned research numbers before being stored in DropBox. Approved researchers will access this data according to the IRB guideline.
The project's research records may be reviewed by departments at the University of Georgia responsible for regulatory and research oversight. Researchers will not release identifiable results of the study to anyone other than individuals working on the project without your written consent unless required by law. De-identified information obtained from this research may be used for future studies (or shared with other researchers) without obtaining your additional consent.

Taking part is voluntary
Your involvement in the interview is voluntary and you may choose not to participate in the interview or to stop at any time without penalty or loss of benefits to which you are otherwise entitled.

If you have questions
The main researcher conducting this study is Eunice S. Kim, a doctoral student, and Dr. Ikseon Choi, Professor, in the Department of Career and Information Studies at the University of Georgia. Please ask any questions you have now. If you have questions later, you may contact Eunice S. Kim at sj.eunicekim@uga.edu or at 404-384-4692, or Dr. Choi at ichoi@uga.edu. If you have any questions or concerns regarding your rights as a research participant in this study, you may contact the Institutional Review Board (IRB) Chairperson at 706.542.3199 or irb@uga.edu.