

Exploring the Concept of Confidence in Surgical Residency Training

by

Mackenzie Catherine Lees

A thesis submitted in partial fulfillment of the requirements for the degree of

Master of Science

in

Surgical Education

Department of Surgery
University of Alberta

© Mackenzie Catherine Lees, 2018

Abstract

Most existing work on confidence is based on surveys and questionnaire data, and approaches the topic from the perspective of a 'confidence crisis'. Few studies have considered the phenomenon of confidence during surgical training in depth. The objectives of this study are to explore what confidence means within surgical education and to explore factors that might affect it.

Qualitative research methods were used to explore the experiences of confidence during surgical residency training. Seven residents from the University of Alberta volunteered to participate in individual semi-structured interviews. Each participant received a post-interview research brief that included a summary of his/her interview responses. Interview transcripts were coded and analyzed using inductive strategies to determine common categories, topics, and recurring themes.

Five major themes arose to describe residents' understanding of confidence. First, participants described confidence as an internal, subjective feeling of being able to accomplish a task/set of tasks expected of oneself. Second, residents described confidence as a feeling of faith and belief in one's self. Third, confidence was described as being context- and task-specific and thus varied throughout residency. Fourth, residents associated confidence with overcoming challenges. Finally, participants stated that confidence constantly fluctuated based on both internal and external factors. Internal factors had a lesser influence on confidence and included personal experiences, self-perception, personal expectations, and individual skill development. External factors played a more significant role and included patient issues, feedback, relationships with staff surgeons, and working within a supportive environment.

Confidence is associated with perception, competence, and the progression of skills and knowledge; therefore this is a highly important concept during surgical training. A resident's confidence level is continuously challenged during their training and subject to both high and low points. Understanding this complex concept is important, as it directly impacts how residents progress and improve throughout residency and ultimately become confident, independent surgeons. Further research needs to be done on factors that affect the development of confidence during surgical training, and on the interplay between surgical confidence and competence. The results from this study have the power to implement changes in practice while also opening up new possibilities for future research studies.

Preface

This thesis is an original work by Mackenzie Catherine Lees. The research project, of which this thesis is a part, received research ethics approval from the University of Alberta Health Research Ethics Board, “Developing confidence during surgical residency training”, ID Pro00066174, February 7, 2017.

Acknowledgments

Above all else, I would like to thank my family for always being supportive. Thank you Jeff for putting up with me during this unique stage in my surgical career - your advice, encouragement, and patience are appreciated more than you know. Thank you Uncle Archie for taking the time to read over my thesis and provide edits. A special thank you to my mom and dad for providing me with everything I have ever needed and for being amazing role models. Everything I have accomplished was made possible by you. A special shout out to my Dad for listening to me vent about surgery stuff, providing career advice, and for being the ultimate surgical role model.

This work would not have been possible without the University of Alberta General Surgery residents who participated, and I am so thankful that you gave up some of your limited free time to chat with me!

Guiding me through my research project were my supervisors, Dr. Bin Zheng, Dr. Lia Daniels, and Dr. Jonathan White. Thank you for all the expert advice and support.

Table of Contents

ABSTRACT	II
PREFACE	IV
ACKNOWLEDGMENTS	V
LIST OF TABLES	VIII
LIST OF FIGURES.....	IX
GLOSSARY OF TERMS.....	X
CHAPTER ONE: BACKGROUND INFORMATION AND LITERATURE REVIEW	1
My personal thoughts on confidence during surgical training.....	1
Discussing confidence in general.....	2
Why is confidence important?	4
Related Concepts.....	6
What does confidence mean within surgical training?.....	8
Resident preparedness and the ‘confidence crisis’	10
Factors affecting operative confidence.....	11
What are the gaps within our knowledge?	12
How will this study aim to fill those gaps?	12
CHAPTER TWO: METHODOLOGY BACKGROUND INFORMATION.....	14
What is qualitative research?	14
What is meant by ‘interpretive inquiry’?.....	15
What is hermeneutics and why is it important?	16
Why do we interview?	18
What is the role of the researcher?	20
How do we evaluate our data?.....	21
CHAPTER THREE: RESEARCH METHODS.....	22
Research site and participants.....	23
Ethics	23
Data collection.....	23
Data Analysis	25
Delimitations.....	27
CHAPTER FOUR: RESULTS	29
Residency word association.....	29
How can we describe confidence?	30
Competence versus confidence	31
Experiencing confidence during general surgery residency training	34
The development of confidence during surgical residency training	35
Identifying factors that affect the development of confidence.....	37

Framework of Surgical Confidence	41
Testing The Results	43
CHAPTER FIVE: DISCUSSION	48
What have we learned about confidence during surgical residency training?	48
How do the results compare?	49
Practical Implications	53
Limitations	53
Future directions	54
Summary.....	54
REFERENCES.....	56
APPENDIX A: CONFIDENCE RELATIONAL MAP (BLANK).....	62
APPENDIX B: EXAMPLE OF COMPLETED CONFIDENCE RELATIONAL MAP	63
APPENDIX C: INTERVIEW PROTOCOL	64
APPENDIX D: MEMBER CHECK/RESEARCH BRIEF TEMPLATE.....	66
APPENDIX E: EXAMPLE OF COMPLETED MEMBER CHECK	68

List of Tables

Table 1: Elements Associated with the Development of Confidence	4
Table 2: Comparing Confidence and Competence	33
Table 3: The Relationship Between Confidence and Experience	36
Table 4: Factors Affecting Confidence Before the Task	45
Table 5: Factors Affecting Confidence During the Task	46
Table 6: Factors Affecting Confidence After the Task	47

List of Figures

Figure 1: Residency Word Associations	29
Figure 2: Theoretical Trajectory of Confidence Over Time	35
Figure 3: Framework of Surgical Confidence	43

Glossary of Terms

Medical student: a student currently enrolled in medical school

Resident: graduate of medical school pursuing training in a specialized field of medicine

'On-call' or 'call': when a doctor is on duty overnight or during the weekend; usually requires physically staying in the hospital

Postgraduate year (PGY): number of years of medical training that occur after medical school. For example, PGY-3 means 3rd year of training after completion of medical school, or 3rd year resident.

Staff physician ("Staff"): a physician who has completed all of their training and is practicing medicine independently

CHAPTER ONE: Background Information and Literature Review

Chapter 1 provides the context and background for this study. My personal thoughts on confidence will be presented first, followed by a discussion on the broad meaning of confidence, and finally a review of the literature specific to the concept of confidence within surgical and medical education. The chapter will conclude by outlining the purpose of this study and the research objectives.

My personal thoughts on confidence during surgical training

As a current surgical resident, the concept of surgical confidence is both personally and professionally relevant to me. Since beginning my surgical training I have struggled with confidence more often than not. The first year of residency is a staggering transition from being a medical student, and the magnitude of this transition is not fully grasped until residency has already begun. There is a sharp learning curve during this year as you adjust to new responsibilities, lifestyle changes and a whole new range of knowledge and skills that need to be mastered. With each successive year of surgical training there are more responsibilities to be met, more knowledge to acquire, and more surgical techniques to master.

Reflecting on the concept of confidence, I think it represents a personal, subjective feeling about one's self, but how I feel does not always correspond to the opinions of others. I have encountered situations where I don't feel comfortable or confident doing a task (e.g. putting in a chest tube or doing an appendectomy) but afterwards received feedback from the staff surgeon stating I performed well. The opposite situation has also happened. With that in mind, I also think that confidence is intimately linked with competence, although not in a direct or linear fashion.

When I think about my own experiences with confidence, the first thing that comes to mind is how much it fluctuates. My confidence can change at the drop of a hat depending on how well a surgery goes or how I perform over the course of an entire surgical rotation. I can feel very self-assured one day, but then receive one piece of bad feedback or answer a question incorrectly and my confidence is taken away. This

varies based on many factors, some big and some little. Whether this is unique to my personality or shared by others, I'm not certain.

Secondly, my confidence is not uniform; I am confident with some surgical tasks and clinical situations but not others. I am not confident with everything that comes my way, especially since clinical and surgical situations vary considerably. These situations are unpredictable and difficult cases can sometimes leave me wondering if my skills are actually where I think they are or perhaps I've just been lucky so far. After these experiences, I often look at my more senior colleagues and wonder, "how did they get to be so good and how do they seem so confident with everything? Are they doing something special or am I doing something wrong?"

My observations of other residents and staff surgeons, coupled with my personal reflections and wondering how I would ever become so knowledgeable or technically skilled, led to the idea of studying confidence during residency. After discussions with colleagues and staff mentors, and reviewing the literature, it became apparent this phenomenon was a shared interest that would benefit from further investigation. Going into this study, I wanted to find out what other residents thought about confidence, what their experiences with confidence had been like, and what affected their confidence levels.

Discussing confidence in general

Performing a simple database search on the keyword 'confidence' results in 245,737 articles (results from Academic Search Complete database search November 2016). After further narrowing down the topic by English language and exclusion of confidence intervals, over 70,000 articles remain. Although a seemingly simple concept, briefly reviewing the literature hints at the more complicated, broad, and variable use of the term across several different domains. Merriam-Webster dictionary defines confidence as "a feeling or belief that you can do something well or succeed at something" [1] [1]. It further defines self-confidence as "confidence in oneself and in one's powers and abilities" [2] [2]. These definitions are very similar and often used interchangeably within the literature. For my purpose and for simplicity, I will maintain these terms as synonymous. Other definitions include the words faith, trust, reliance,

self-assurance and certainty to explain what confidence means. According to Bandura, “confidence is a non-specific term that refers to the strength of belief but does not necessarily specify what the certainty is about”[as cited in, 3]. Oney et al add to this by defining confidence as “the belief that an event or behaviour will reoccur as expected due to evidence or based on past experiences” and that confidence can be extended to people, objects, and systems [4]. When searching the literature, the variability in the definition of confidence can be confusing and overwhelming. This variability has been noted by other researchers, one of whom suggests that it “might be due to researchers’ need to define self-confidence in ways that fit their research objectives and are compatible with their disciplines” [4].

Several key elements have been associated with the concept of confidence. These elements can positively or negatively influence an individual’s confidence. One author describes the positive attributes as emotional intelligence/emotional competence, resilience, confidence, attitude and cognitive ability, trust, and intuition, with the negative characteristics including narcissism, depression, doubt, uncertainty, and negativity [5]. In a similar paper, White proposes three additional general attributes: belief in positive achievements, persistence, and self-awareness [6]. In both articles, the authors discuss the antecedents, or precursors, which help to develop confidence (see Table 1). Knowledge is the first of these and perhaps one of the most important, as “no amount of confidence can produce success when requisite skills and knowledge are absent” [7]. Knowledge can be acquired through formal or informal education[5], or even through vicarious reinforcement, as suggested by Bandura [8]. Previous experience is perhaps the second most important, and among the most commonly discussed elements of confidence. Several studies have stressed the importance of past performances on the development of confidence and a cyclical relationship is often noted [9-12]. Success is related to this, as the more success an individual has, the more confidence is reinforced [13, 14]. Having an adequate support system is paramount to confidence. Support can be provided through internal sources such as positive self-talk [15, 16] or external sources such as mentors, colleagues, family, or friends [17-19]. Interestingly, these antecedents can be related to factors affecting operative confidence. Studying the defining characteristics and influencing factors brings a better understanding to an

otherwise complicated and somewhat abstract concept.

Table 1: Elements Associated with the Development of Confidence

Knowledge	External stimuli
Perceived readiness	Emotions
Experience/past performance	Adaptation
Personal goals	Self-esteem/certainty
Success	Trust
Instructor influence	Support (Self/other)

Note: Adapted from Perry (2011) and White (2009) [5, 6]

Why is confidence important?

At the core of several definitions is the notion that confidence is a feeling, whereas others believe it belongs somewhere between cognitive ability and personality[20]. Regardless of this, most camps agree that confidence is fluid[4, 5, 21]. We can be confident in one subject but not another, and we can be confident at one moment but with the passage of time and new attentions, that confidence can change. Perry describes confidence as a dynamic cycle where “confidence informs self-efficacy, which influences learning, which further influences confidence, learning and affective domains...whether positively or negatively” [5]. Clanton reiterates this notion suggesting that heightened confidence leads to increased enthusiasm and increased likelihood to perform new skills, which leads to a positive cycle of motivation and learning[13]. In a novel approach, Stajkovic describes confidence as a higher-order construct encompassing hope, self-efficacy, optimism, and resilience[22]. He further suggests that confidence positively influences performance, attitudes, and subjective well-being and that employees who are more confident are better able to cope with the difficult and dynamic changes in the workplace[22]. Confidence thus has links to both performance and learning.

Numerous studies have explored the link between confidence and performance across several domains, such as education, medicine, business, and sports performance [13, 20-25]. This link between confidence and performance has multiple facets, including motivation, resilience, concentration, and goal-setting. Confident individuals show more resilience and tend to be more task-oriented. For example, when

faced with obstacles, Bandura and Wood showed that confident individuals remain task-oriented by focusing on solutions to the obstacles, whereas less confident individuals were more likely to become self-diagnostic and focus on their perceived inadequacies [as cited in, 21]. Marshall adds to this, suggesting that individuals who lack confidence might have difficulties maintaining concentration when they encounter difficulties with the task at hand, which may subsequently impair their performance [26].

Confidence plays a large role in education and learning. One of the influencing reasons is the positive effect it has on school performance through links to motivation and students' expectations [20]. Individuals with higher levels of confidence have greater motivation for learning [20, 24]. A strong sense of confidence has been associated with the setting of challenging goals and the expenditure of maximal effort and persistence to achieve those goals [21, 25]. Bandura notes that the satisfaction gained from successfully accomplishing goals helps to foster intrinsic interest [25]. Individuals with feelings of self-doubt become more easily discouraged by failures and obstacles compared to those who are more assured of their capabilities, and subsequently increase their efforts to succeed when they notice their performances are falling short [25].

The importance of confidence has been established but what are the implications for individuals who are overconfident or seriously lacking confidence? Individuals who lack confidence and repeatedly underestimate their performances are at risk of losing their motivation for learning [24]. Similarly, students who repeatedly overestimate their performance may be at a disadvantage because they may start to believe that they already know it all and thus put less effort into learning. In surgery, both overconfidence and the lack of confidence are concerning. Self-directed learning and self-assessment is a large part of learning in medicine and "junior surgeons who incorrectly estimate their ability may compromise the effectiveness of their training and this may impact patient safety" [27].

In summary, confidence is important for many reasons. Higher levels of confidence motivate us to learn at school and work hard at our jobs. It allows us to be resilient when faced with difficult tasks or when obstacles are placed in our way. Lower levels of confidence can be associated with feelings of self-doubt, lack of motivation and

lower performance levels.

Related Concepts

Several related terms come up when searching the literature for confidence. Self-efficacy, competency, and self-esteem are just a few. Although these terms are similar and often used as synonyms, they are conceptually different and their misuse can cause considerable confusion. These three related concepts are briefly explored below.

Self-efficacy

Self-efficacy theory is very common in the literature and was originally made popular through Albert Bandura's work on Social Cognitive Theory [14, 28]. Bandura defines self-efficacy as "people's beliefs about their capabilities to produce designated levels of performance" [25]. He believes that self-efficacy provides the basis for human motivation, well being, and personal accomplishments. According to Bandura, self-efficacy develops from and is enhanced by four primary factors: successful performances, vicarious experience, verbal persuasion and emotional arousal [25]. When an individual masters a new skill and is successful, it generally creates a feeling of efficacy. Vicarious experience pertains to the education of an individual while watching others perform in certain situations, for example learning how to suture a wound by watching an expert do it. While learning new tasks and performing them, positive verbal persuasion received from others (colleagues, staff, mentors, etc.) boosts that feeling of efficacy and helps to promote development of new skills. Lastly, Bandura explains emotional arousal as the emotional and physical reactions that become associated with and influence learning [as cited in, 5].

However, having the appropriate skills or self-beliefs alone is not sufficient as "competent functioning requires both skills and self-beliefs of efficacy to use them effectively"[29] . When an individual has a higher level of self-efficacy, the more vigorous and persistent their efforts to accomplish a task become [25]. In comparing confidence and self-efficacy, Bandura argues that confidence often has no theoretical basis and reflects only the strength of certainty about a performance or perception [as

cited in, 28]. Self-efficacy, on the other hand, represents both “affirmation of capability and strength of that belief”[as cited in, 28] . Gist and Mitchell agree that self-efficacy is about perceived abilities, while confidence “comprises abilities and certainty based on knowledge” [as cited in, 4]. To represent this, Oney et al suggest the example of a medical doctor who has the abilities and competencies to perform surgery, but may not be confident about the procedure or its outcome [4]. Gallagher adds that self-efficacy beliefs are the key psychological traits that allow an individual to be resilient in the face of obstacles and difficult situations [14].

Based on what we know of self-efficacy theory, some debate that it is a better measure compared to confidence. Elfenbein argues that self-efficacy is a better construct because it is situation-specific and measurable, whereas confidence is individually understood and interpreted[3]. Furthermore, because of a lack of a shared theoretical framework for confidence, Elfenbein argues that self-efficacy is a more precise framework for studying this phenomenon[3]. In another paper, the authors suggest that self-efficacy is a better target for intervention and change as it has more influence on outcomes, whereas confidence may be more useful as an outcome indicator[28].

Competency

Simply put, competency means having a required skill[30][30]. When researching the topic, many articles dealt with competency within the domains of education and medicine. Competency is specifically related to tasks and thus the majority of research is task and/or domain-specific. Although, the term competency is frequently misused and often thought to be synonymous with the term confidence, they are indeed separate concepts. Bandura argues that confidence is related to the strength of a belief but it does not imply a level of perceived competence[as cited in, 4] . Multiple studies within medical education have investigated the relationship between competency and confidence, with some studies showing an inverse relationship [31], a positive relationship[13], or no correlation at all[32, 33]. During a study of clinical skills assessment with junior trainees, Barnsley et al were unable to demonstrate any positive relationship between competence and self-reported ratings of confidence [33]. Yet

another study found a significant inverse relationship between the confidence and competence of practitioners completing a simple surgical task [31]. On the other hand, Clanton et al found a strong relationship between confidence and competence while testing the development of surgical skills within a group of medical students [13]. Critiques of these type of studies mention the inaccuracy of self-assessments[34] and improperly defining the terms or using them interchangeably [9, 35].

Self-esteem

Self-esteem is defined as the positive or negative attitude toward one's self [as cited in, 4]. It is a "personal judgement of worthiness that is expressed in the attitudes the individual holds towards himself" [36]. Self-esteem can be interpreted in a variety of ways. For example, a person can have a high self-esteem and thus feel superior to others, but may still feel inadequate in terms of their own personal standards/goals/expectations [37]. Furthermore, 'high' self-esteem might be interpreted as an individual thinking they are 'very good' but to another individual it might mean they are just 'good enough' [37]. In this regard, self-esteem is very much an individualized, private construct that is invisible to others. Confidence, on the other hand, can be observed through an individual's behaviours and verbal statements and thus is more of a public construct[4]. Additionally, self-esteem is not related to past experiences or performances, unlike confidence [4]. Similar to confidence, self-esteem is related to goals and success. Coopersmith states, "the person with high self-esteem apparently moves more directly and realistically towards his personal goals" [36] and such people are "more independent in conformity-inducing situations [and] manifest greater confidence that they will succeed" [36] Related terms include self-acceptance, self-respect, and self-satisfaction.

What does confidence mean within surgical training?

Many studies have examined confidence within medical students and fewer within residents, but a thorough description of the concept is still lacking. Although some studies provide a definition of confidence to the reader, the resident or medical student participants are often left to interpret the concept of confidence on their own[3, 9, 35].

Most of what we know about confidence comes from questionnaires/surveys where confidence is generally measured using Likert scales, requiring trainees to choose a rating from 1 to 5 on a scale of “confident” to “non-confident”, without really describing what each rating means. In addition to the lack of a rich and thorough description, confidence is often used interchangeably with the term ‘competence’, which simply means that someone is capable of performing a function or has the necessary skill/knowledge [30][30]. This can be confusing, as some authors feel that confidence can be used as a surrogate marker for operative competence[38, 39], while others feel that competence and confidence do not necessarily correlate[35, 40].

Several other studies have emphasized the variance in the definition of confidence, competence, and the sometimes synonymous nature of the terms. Roland *et al* interviewed several junior doctors through various focus groups, where he specifically asked them to define confidence and competence[35]. Although the participants understood the general difference between the terms and the importance associated with them, they still had difficulty defining and distinguishing between the two. Furthermore, the junior doctors recognized that confidence and competence were intertwined and “both were crucial to being a proficient professional with the requisite skills and personal attributes to contribute to the effective care of patients” [35]. Similarly, Stewart *et al* interviewed junior doctors to explore the value of the terms competence and confidence as measures of the junior doctors’ perceptions of ability[9]. The participants had difficulty defining both terms individually and often interchanged the two. Stewart notes that “asking a [junior doctor] whether they are confident to perform a task will not identify their beliefs about their competence. Neither will asking them whether they are ‘competent’ give information on what they would be willing to perform” [9]. Elfenbein refers to these issues in her review article on the ‘confidence crisis’ and states that “surgeons have a sense that confidence is very important to possess, but we have little formal language to discuss it”[3].

While confidence and competence are often linked and substituted for one another, they are separate entities. Surgical competence has traditionally been thought of as the procedural skills associated with performing a surgical procedure, encompassing a mixture of both technical and cognitive factors. It includes the ability to

perform the entirety of a surgical procedure, but also encompasses factors such as judgment, communication and decision-making skills, as well as professionalism [41]. The concept of competence during surgical residency training has become extremely popular through the introduction of Competency Based Medical Education (CBME), an education program that emphasizes learning through the development of competence not simply by the time spent in training[42]. Surgical confidence, although no standardized definition exists, might then be described as the feeling of self-assurance arising from the appreciation of one's own surgical abilities.

In simplistic terms, surgical competence can be thought of as the objective, external view of one's abilities while confidence could be the person's own subjective, internal view of those same abilities. Both are important, as "confidence without competence manifests as hubris, while competence without confidence results in indecision and doubt" [3].

Resident preparedness and the 'confidence crisis'

North American survey results from the past 15 years suggest that more than 20% of residents expressed concern about their surgical skills and practicing independently by the end of surgical training [38, 39, 43-45]. Additionally, forty-three percent of surgical program directors surveyed by Mattar et al in 2013 felt that incoming fellows (i.e. recently graduated residents) were unable to perform even 30 minutes of a major procedure by themselves [46]. In 2008, Bucholz et al surveyed 4136 American general surgery residents to characterize the factors associated with operative confidence and how they related to further subspecialty training[43]. Their results showed that more than 2/3 of general surgery residents felt confident with their operative skills but more than 20% of PGY-5 residents expressed concerns about their ability to practice independently after graduation [43]. Yeo and colleagues found comparable results a year later when 28% of surveyed residents reported concerns about their ability to perform procedures independently [45]. Another similar study from 2014 interviewed 232 graduating general surgery residents in the US and found only half of the residents felt confident in their ability to practice independently after training [38]. These studies all suggest there is a problem relating to the confidence and

preparedness of residents to operate independently, a so-called ‘confidence crisis’[3]. In contrast, studies performed by Foley, Friedell, and Klingensmith all reported that residents are indeed confident and prepared to operate independently [47-49]. Who is right? In her 2016 article, Elfenbein completed a systematic review of the available data on resident confidence and concluded that “the confidence crisis is a potentially dangerous narrative based on low-quality evidence” and that further research within the social sciences is needed in order to truly understand why some residents express concerns about being prepared for independent practice[3].

Factors affecting operative confidence

Several studies have examined the factors responsible for the variance in trainee confidence. Binenbaum et al looked at the elements of residency that contributed to building confidence by surveying medical and surgical residents[11]. Medical decision making and having good backup support with which to work through decisions were ranked among the highest contributors to the development of physician confidence [11]. Patient cases, professional interactions, and general learning of medical or surgical knowledge were also ranked highly. Interestingly, vacation time and personal time spent with family and friends were ranked within the top 15% of items that contributed to the development of physician confidence[11]. Based on the survey results of Bucholz’s study, male gender, being a senior resident, being married, and the type of residency program (community hospital, decreased number of residents in the program, and no fellows) were all independently associated with higher levels of confidence [43]. The importance of mentorship was also mentioned in Bucholz’s study, as residents who were comfortable asking mentors for help reported increased levels of confidence [43]. In 2014, Friedell et al surveyed 297 chief general surgery residents and found that increased procedural numbers significantly corresponded with increased procedural confidence [48]. Several studies found associations between male gender and increased confidence levels [38, 39, 43, 48]. In summary, the literature strongly suggests that the development of surgical confidence is multifactorial and affected by both trainee-specific and program-specific factors.

What are the gaps within our knowledge?

Much recent work in medical education has focused on the topic of competence, and much effort has been expended on designing frameworks and tools to objectively assess the abilities of surgical graduates. My experience in surgical education has led me to wonder whether this focus on competence might overlook another key aspect of surgical training: the concept of confidence. Confidence is clearly a complicated topic lacking a homogeneous theoretical framework or thorough description. Literature from the social sciences provides the reader with a generic idea of what confidence represents and how it might affect our actions. There is no uniform description of confidence within surgical or medical training, which therefore makes it difficult to meaningfully interpret the response to questions regarding confidence, particularly studies using quantitative methodology and Likert scales. Much of the literature suggests there is a confidence crisis among general surgery residents, with many residents feeling unprepared for independent practice after graduation – again, this is difficult to interpret without a uniform description of confidence.

One of the larger gaps in knowledge is what confidence actually means within surgical education: how can we describe it and recognize it? If competence is an “external” perspective of a surgeon’s skills, surgical confidence could represent a surgeon’s “internal”, subjective view of their own abilities. The concept of confidence and its importance in medicine and surgery is already recognized but a rich and thorough description is still lacking.

To the best of our knowledge no studies have used in-depth discussions or qualitative research methods with surgical residents to explore issues surrounding the concept of confidence. Although this issue has been looked at previously, there is still much to be learned.

How will this study aim to fill those gaps?

My study intends to advance the understanding of confidence within surgical residency training. The two main goals of this study are to explore what the term ‘confidence’ means within surgical education and to further explore the factors affecting it. Secondary goals include investigating how residents have experienced confidence

throughout their training and how they develop confidence. Putting these goals together, how does a surgical resident know they're confident to pick up a scalpel and cut, and what can influence that? These goals will be achieved through a qualitative research study including three parts: (1) pre-interview activity (fill-in-the-blank diagram), (2) in-depth, semi-structured interview, and (3) post-interview research brief. Qualitative methodology was chosen because I wanted to explore the underlying opinions, reasons, and motivations of residents regarding the concept of confidence. I hoped to further understand and explain a complex concept, not just to measure it or attempt to fix it. The methodology literature review will be discussed in Chapter Two, and the specific research methods will be further detailed in Chapter Three.

CHAPTER TWO: Methodology Background Information

Chapter 2 provides the background information for the study methodology. A brief overview of qualitative research, interpretive inquiry, and hermeneutics is provided. The rationale for interview, pre-interview activities, and open-ended questions will also be discussed. Finally, a review on how to evaluate qualitative data is outlined.

What is qualitative research?

Definition

Qualitative research is an umbrella term used to cover several forms of inquiry that help us to understand and explain the meaning of a social phenomenon. Case study, field study, ethnography, naturalistic inquiry and interpretive research are some of the other terms that are often used interchangeably[50]. Regardless of the variable terminology, the key idea behind all qualitative research is the view that individuals construct reality by interacting with their social worlds. Qualitative researchers are interested in understanding the meaning people have constructed[50] and their lived experiences.

Quantitative versus qualitative research

The majority of people are arguably more familiar with quantitative data, which serves to take apart a phenomenon in order to examine each variable and uses numeric data. Qualitative data is the opposite: it seeks to understand how all the parts fit together to form a whole using nonnumeric data in the form of words[51]. Quantitative research is usually associated with the philosophical system of positivism and is therefore considered a 'hard' science. In contrast, qualitative research is most often associated with phenomenology and symbolic interaction and thus considered more of a 'soft' science[52].

Characteristics of qualitative research

There are several key characteristics of qualitative research. First is the idea that this type of research is conducted through the emic perspective or the insider's viewpoint. This means that understanding the social phenomenon of interest is from the

participant's perspective and not the researcher's viewpoint[50]. This is an important aspect when trying to understand the lived experience(s) of another person. Secondly, the researcher is the instrument for both data collection and analysis, which is a stark difference when compared to quantitative research. The researcher must travel to the people, site, or institution to collect the data in its natural setting, thus the researcher participates in a certain amount of fieldwork during a qualitative study. Lastly, qualitative research primarily uses inductive research strategies. Hypotheses and theories are created based on the data rather than testing the truths of pre-existing theories [50]. By combining the above elements, qualitative research creates richly descriptive findings.

What is meant by 'interpretive inquiry'?

Defining interpretive inquiry

Interpretive inquiry is a type of qualitative research and like other methods of qualitative research, the focus is to understand the meaning and purpose that people give to their own actions and interactions with others [53]. In comparison to basic or general qualitative research, where researchers simply summarize what participants say, interpretive inquiry goes a step further with a more in-depth interpretation of the data. The goal of interpretive inquirers is to elucidate the interpretations that the participants have already given to their own actions and the actions of others [53]. One concept central to interpretive inquiry is the idea that there is no special research methodology to obtain the answers we are looking for. Ellis reminds us "from interpretive inquiry we learn to think more fruitfully than we could before in our efforts to gain wisdom or find helpful approaches to difficult problems. The aim of interpretive inquiry is not to write the end of an existing story but to write a more hopeful beginning for new stories." [54] The lack of a structured research strategy makes interpretive inquiry daunting for some. This type of research requires an attitude of humility, openness, and the understanding that "one makes the path by walking it" [55].

Key ideas of interpretive inquiry

There are a few key ideas to keep in mind when starting an interpretive inquiry. Most research studies begin with a question, and interpretive inquiry refers to this as the “entry question”. This first step of the process requires the correct attitude, one of “openness, humility and genuine engagement”[55]. With this attitude, the researcher acknowledges and accepts the fact that they don’t know everything about the question, the strategy or the answers, but that they care about making things better and advancing their own knowledge. The entry question is practical, simple, open and reflects genuine engagement with the situation or topic of interest. These questions typically take the form of ‘why’ and ‘how’.

When we think about the process of interpretive inquiry, it is helpful to visualize the process as a series of loops or circles that form a spiral. Each loop represents a separate inquiry activity with the goal of getting closer to understanding the question at hand [55]. A single loop or circle represents a small part and the complete spiral represents the whole, thereby incorporating the theory of hermeneutics. The entry question begins the first loop, and each subsequent loop is approached with a new question. It is crucial to enter this first loop in the right way, as it can frame the remainder of the inquiry and is often the major turning point within an interpretive inquiry. The information gleaned from one circle can change or provide direction for the question used for the subsequent loop, which brings us to the theory of hermeneutics and the circularity of understanding [55].

What is hermeneutics and why is it important?

Definition of hermeneutics

Hermeneutics is the theory of interpretation and the art of understanding [51]. This theory is embodied by three central themes, which have been carried on since the early Nineteenth century when Friedrich Schleiermacher, the founder of hermeneutics, first discussed them [56]. The first theme discusses the creative character of interpretation. Schleiermacher described the interpretation and understanding of text as a very creative process, not just a mechanical or scientific function [56]. The data produced from qualitative research is an “expression of creative spirit” [56] and to fully identify and

understand the meaning behind the participant's expression, the data must be interpreted in a holistic manner, rather than dividing it into disparate elements or pre-existing categories [55, 57]. Ellis also reminds us that "it is not enough for a researcher to simply report quotations of what participants have said about the research topic and to presume that they have passed on the participant's meaning unaltered. There is no meaning until it is constructed by the one hearing or perceiving" [57].

This introduces us to the second theme of hermeneutics: the back and forth movement between expression and meaning. It helps to look at expression as a larger 'whole' and the meanings behind that expression as 'parts'. This second theme focuses on the "interplay of part and whole in the process of interpretation" [56]. Julia Ellis describes this theme nicely by explaining that "to understand a part, one must understand the whole, and to understand the whole, one must understand the individual parts" [55]. This back and forth movement between the part and the whole has become known as 'the hermeneutic circle'.

The final theme of hermeneutics relates the importance of language in human understanding. The language used by an individual can divulge a great deal about them. It is rooted in community, tradition, and history and the words, phrases, and general use of language during dialogue is key. Consequently, as our language changes, so do our interpretations [57].

The Hermeneutic circle

The hermeneutic circle is built upon the back and forth movement between the part and the whole and consists of both a forward arc and a backward arc. The forward arc is the researcher's attempt to make initial sense of the research participant, text or data. This is accomplished by using an individual's preconceptions or prejudices, which include purposes, interests and values [55]. The backward arc involves re-evaluating the initial data interpretation to find confirmation, contradictions, and/or inconsistencies, i.e. to uncover something new. The forward arc of the hermeneutic circle is thus identified as the projective phase and the backward arc as the evaluative phase. The hermeneutic circle can be incorporated into research methodology by first thinking of a research project as a series of loops (or circles) that forms a spiral, as described earlier. Each loop or circle within the spiral represents an activity that resembles data collection,

interpretation and evaluation, i.e. the hermeneutic circle [55].

Key ideas of hermeneutics

In addition to the concepts described above, there are a few other key ideas of hermeneutics. The first is the idea of forestructure, which represents an individual's existing "preconceptions, pre-understandings, prejudices" [55] as well as their values and interests. The use of forestructure and prejudice is employed during the forward arc or the projection phase of the hermeneutic circle and is unavoidable. The term 'horizon' is another word to describe our preexisting prejudices. Our prejudices change how we interpret a situation, meaning or text, and what we can see at any given time is limited by our vantage point – also known as our horizon [54]. When undertaking qualitative research, it is not enough to simply abandon one's own horizon in order to understand the vantage point of the participant. Instead, a 'fusion of horizons' must take place. This occurs by dialectical engagement and the medium of language, again bringing up the importance of language on understanding.

Why do we interview?

How do interviews work?

The purpose of qualitative research is to understand the meanings people have constructed [50] and their lived experiences. Interviews can be one way of understanding such things and they can be conducted in a multitude of ways. For qualitative research in particular, interviews are usually semi-structured and informal. The agenda is set by the researcher but allows room for spontaneous topics to be discussed as well. For a beginning researcher it is advisable to prepare questions for the semi-structured interview ahead of time to help guide the process. These questions will not necessarily all be covered, but act as a "number of possible prompts that may help the participant recall salient ideas and experiences" [57]. Researchers must be careful of and pay attention to the language used by participants in an interview. The participant's language provides meaning specific to their experiences and as our language changes, so does our interpretation – one of the central themes of

hermeneutics [57]. The ideal interview creates a setting that allows the participant to recall an important experience while also being able to then analyze and reflect on that experience. This can be challenging and usually dealt with through the use of multiple interviews with a participant over the duration of an experience. However, if multiple interviews are not possible then the use of a pre-interview activity (PIA) can help.

Pre-interview activities and graphic elicitation techniques

A pre-interview activity consists of an activity/question(s) relating to the participant and the research topic in mind. The purpose of a pre-interview activity is to facilitate a participant's recollection and reflection and often involve diagrams, drawings and pictures. Complex feelings and perspectives are often difficult to describe in text and PIAs can help participants express or depict feelings and perspectives about the topic at hand. When these activities are given in advance of the actual interview, they also allow more time for the participant to analyze and reflect. Additionally, PIAs serve as an effective icebreaker, or 'getting to know you' activity so the interview becomes an informal dialogue instead of a seemingly judgmental interrogation[57]. Using a diagram or a picture as the pre-interview activity stimulates the participant to think 'outside the box' and beyond verbal responses, therefore avoiding 'ready-made' answers and encouraging a more holistic narration of self[58]

Open-ended questions

Another key concept of the semi-structured interview is the use of open-ended questions. This portion of the interview serves to uncover what is important to the participant: their values, motivations, preoccupations, fears, hopes, and so on. This helps the researcher get to know the participant better and therefore helps them understand the participant's experiences – these are the parts that allow us to understand the whole. The open-ended questions used in this portion of the interview largely serve as prompts for stories or points of view that might come easily to mind [57]. These questions usually start off with simple getting-to-know-you questions followed by questions more directed to the research topic of interest. The use of open-

ended questions allows for an increased breadth of answers and more opportunities for discussion. These questions should not pry and should be neutral to avoid leading the participant towards negative or positive answers. The researcher should aim for questions that create space for the participant to detail their own experiences, regardless of whether they are positive, negative, or otherwise. Open-ended questions allow the participant to discuss the things that come to mind first, which allows the researcher to see their goals, preoccupations, and what is important to them. The researcher uses pre-interview activities and open-ended interview questions to try and understand the participant's lived experiences: what is it like to have that experience, and what does it mean to the participant to have that experience? Using this interview method, the researcher learns more about the parts that make up the whole and obtains phenomenological access to the participant's lived experiences.

What is the role of the researcher?

In qualitative research the investigator is the primary tool for data collection and analysis. There are several key qualities that embody a good qualitative researcher. First off, they must be able to tolerate and have the patience for a large amount of ambiguity. There are no set guidelines or rigid structural framework for this type of research and this can be frustrating for some. Merriam states that sensitivity, or being highly intuitive, is the second necessary trait [50]. The researcher must be sensitive to the people, the setting, the context and the information being gathered, as this will help identify personal biases and the potential influences they might have. Given the personal nature of qualitative research, being a good communicator is also a crucial trait. Guba and Lincoln state that "the extent to which inquirers are able to communicate warmth and empathy often marks them as good or not-so-good data collectors" [as cited in, 50]. Along with communication, listening is an important trait. Being able to "[hear] what is not explicitly stated but only implied, as well as noting the silences, whether in interviews, observations, or documents, is an important component of being a good listener" [50]. Good communication skills also require good written skills, as qualitative research results in a large amount of written work, whether from field notes, interview transcripts or personal memos.

How do we evaluate our data?

Within qualitative research, data interpretation and analysis vary depending on a researcher's existing prejudices, values, and preconceptions. As such, multiple interpretations or realities might exist for the same data set. Therefore, the same criteria that are used to judge quantitative data do not transfer well to qualitative data and the notion of validity doesn't apply to an interpretive account or to qualitative research in general. In contrast to quantitative research, there is no hypothesis, guessing, or speculation with qualitative studies. In order to evaluate the data one should instead ask "whether the concern which motivated the inquiry has been advanced" [55], i.e. whether an answer has been uncovered. In order to help determine whether an answer has been revealed, there are six questions one should also ask regarding their data [55]:

1. Is it plausible and convincing?
2. Does it fit with other material that we know?
3. Does it have the power to change practice?
4. Has the researcher's understanding been transformed?
5. Has a solution been uncovered?
6. Have new possibilities been opened up for the researcher/
participants/structure of the context?

There are disagreements regarding the best criteria used to evaluate qualitative data, depending on who you ask and the type of qualitative research being evaluated. Whereas quantitative data uses terms like validity and reliability, qualitative research tends to focus more on evaluative criteria that are more relevant to their body of work and more representative of the product itself. Guba and Lincoln used the blanket term 'trustworthiness', which further included credibility, transferability, dependability, and conformability [59, 60]. These criteria were meant as rough equivalents for terms used in quantitative research: internal/external validity, reliability, and objectivity.

Persuasiveness, insightfulness, and practical utility are three additional criteria often used in qualitative research. Persuasiveness is defined as "whether a reader,

adopting the same viewpoint as articulated by the researcher, can also see what the researcher saw, whether or not he agrees with it” [as cited in, 61]. Insightfulness refers to the ability of the qualitative data to increase our understanding[61]. And lastly, practical utility reflects whether the data is useful and can enhance our overall understanding, promote communication, and/or resolve conflicts [61].

More recent researchers advocate returning to the terminology used in social sciences, including rigor, reliability, validity and generalizability, in order to achieve consistency, objectivity, and comprehension[62]. Regardless of the criteria used, in qualitative research neither the ability to predict or include certain phenomenon into general rules or laws is needed to classify an explanation as ‘useful’ or ‘good’ and “sanctioning explanations exclusively in terms of predictive ability is deemed inappropriate”[61].

CHAPTER THREE: Research Methods

Chapter 3 provides detailed information on the exact research methods used in this study. The research participants are described first, followed by ethics approval, data collection and analysis. Lastly, data evaluation and study delimitations are discussed.

Research site and participants

This study was carried out at the University of Alberta Hospital located within Edmonton, Alberta. Residents from the University of Alberta General Surgery residency program were invited to participate. Purposeful sampling was employed, and individuals were invited to participate from each postgraduate year (PGY) 2, 3 and 4 for a total of 7 participants (three PGY-2, three PGY-3, and one PGY-4). Residents who had completed or were currently enrolled in research years were excluded. The original goal was to conduct 9 interviews (3 each from PGY-2, PGY-3, and PGY-4), and was decided upon prior to data collection. This was determined by looking at the total number of residents within the general surgery program, the number of residents within each level of training, and the time taken to interview, transcribe, and analyze a single field test interview, as well as the time constraints of a Masters Degree program. Participation in this study was completely voluntary and due to exclusion criteria, there were a limited number of residents to recruit, particularly within the PGY-4 cohort.

Ethics

Ethical approval for this study was granted by the Health Research Ethics Board of the University of Alberta (Pro00066174). Confidentiality was maintained through the use of pseudonyms and the modification or exclusion of any identifying information.

Data collection

After obtaining signed participant consent forms, data for this study was collected through the completion of a pre-interview activity (PIA), a semi-structured interview, and a post-interview research brief/member check. The PIA was emailed to the participant

approximately one week prior to the scheduled interview and consisted of a 'fill-in-the-blank' diagram called a confidence relational map. Relational maps are frequently used in psychological/sociological studies and various types exist[58, 63]. For the purposes of this study, a concentric circle model worked best and this was adapted to reflect factors affecting confidence (see Appendix A and B). Participants were instructed to reflect on the factors they associate with the concept of confidence (positive, negative, neutral) and then arrange them in order of importance within the concentric circles, with the most important factors being closest to the center, and the less significant factors being further away. Of note, the participant's confidence relational map was explained by the participant and further discussed during a portion of the semi-structured interview.

The interview protocol was developed during a qualitative research methodology course taken by the author (ML) in Fall 2016 and further refined in the months prior to obtaining ethics approval (see Appendix C). Interview questions were specifically designed to be open-ended and carefully worded in order to avoid leading questions, coming across as prying or interrogative, or suggesting negative/positive connotations. These questions served as a guide and to orient me, but also left room for the conversation to take its own course. I field-tested the interview protocol in a pilot interview with a general surgery resident who was not eligible to partake in the study. This was very useful as it enabled me to experience what an interview would be like, critique my own habits as an interviewer (e.g. trying to remain neutral with my own responses), and to change any portion of the protocol if needed. Keeping in mind the principles of hermeneutics, I entered each interview with an open mind, humility and a genuine interest in advancing my knowledge regarding the concept of confidence.

I conducted one semi-structured and informal interview with each volunteer participant. These were scheduled at a time convenient to the participant and generally lasted between 1-2 hrs. Each interview was audio-recorded and transcribed verbatim by myself soon after the interview. I chose to personally transcribe each interview rather than using a transcription service for two major reasons. First off, I had assured each participant of their complete anonymity and anything they said had absolutely no bearing on their education or residency program whatsoever. I didn't want my

participants to worry about what they said to me or which stories they shared, as they often mentioned other residents and staff surgeons by name. Secondly, although it was a long and tedious task, listening to and transcribing the interviews allowed me to experience the interview for a second time and really get to know my data. While transcribing, I was able to pick out common themes, experiences, and elements, thereby allowing for simultaneous data collection and analysis. Additionally, when discussing my later analysis, results, and data as a whole, I was very familiar with the data and could remember who said what and in what context.

After transcription, a summary of the interview, including representative quotes, was provided to the participant (see Appendix D and E). This research brief acted as a member check and allowed the participant to reflect on whether the collected data was representative of their thoughts/ideas during the interview and to add or clarify any comments they made. Only one resident responded with a clarifying comment regarding their thoughts on competence versus confidence. The member checks were important as they enabled me to check whether I really understood what the participant was saying and thus were a method for documenting the trustworthiness of my results.

After only 3 interviews, similarities between participant answers became apparent, which brings up the concept of data saturation. Also known as theoretical saturation, this concept is loosely defined as the point during data collection and analysis where no new information or themes are observed in the data[64, 65]. Some studies suggest that saturation is achieved in as few as six interviews for similar participants[64], while others advise upwards of 20[as cited in 64]. Other studies suggest describing the data in terms of producing rich (detailed; good quality) and thick (ample quantity) results instead of focusing on the sample size[65]. The sentiment of saturation is that the researcher is confident that no radically new information that would change the results of the study would be achieved through further data collection, and it is this sentiment rather than a specific number of interviews that I focused on during my study and analysis.

Data Analysis

The goal of my analysis was to investigate what confidence is, and what affects it.

As a novice qualitative researcher, keeping these research questions in mind helped to focus my analysis. Analysis was performed in an inductive and paradigmatic fashion, and included both the participants' discussion of their confidence relational map as well as their actual interview responses. Data analysis was completed in groupings based on postgraduate year, i.e. all the PGY-2 interviews were analyzed at the same time. Each transcript was read over three times and a different coloured pen was used for each cycle of coding. I used both descriptive coding and in-vivo coding to identify the codes that 'popped out' and recurring phrases/words. A code was defined as a "summative, salient, essence-capturing, and/or evocative attribute for a portion of language-based data"[66] and mostly consisted of short sentences or phrases. Codes were organized into an excel spreadsheet according to each research question and then grouped into categories based on topic. Representative quotes were compiled for each category. For the factors affecting confidence, the categories were further subdivided into internal versus external. From the categories, themes were developed. The analysis portion of my study was ongoing and I repeatedly revisited my results and the transcripts to evaluate whether 'the whole' represented 'the parts' and vice versa, thus reflecting the fluidity of the interpretive process and the hermeneutic circle (see Chapter 2, page 17).

A second coder (JW) went through all transcripts and examined the data in a similar fashion. The second coder is a surgeon who also has experience with qualitative research and medical/surgical education, thus provided valuable insight during the data analysis process. We met several times to review the results and subsequently develop a conceptual framework using themes from each research goal. Additional meetings were held with the remainder of the committee (BZ, LD) to discuss the findings.

Evaluating The Findings

As mentioned previously, the same criteria used to evaluate quantitative data do not transfer well to qualitative data. Keeping in mind the evaluative criteria discussed previously (see page 21), the findings of this study show evidence of trustworthiness. It was carried out in a systematic and rigorous fashion with plausible results. My data

collection and analysis led to both intricately detailed and thick results that are coherent and well documented with representative examples. This study transformed my original understanding of a multifaceted concept and the information obtained from the results has the power to influence changes within surgical residency training programs. Furthermore, my results have high levels of credibility, consistency, and can be viewed as transferable to similar residents/programs/situations.

Delimitations

Exclusion of PGY-1 and PGY-5 residents

The first year of surgical residency is quite different from subsequent years of training. This year is spent primarily on off-service rotations, including non-surgical rotations, with the main goal of learning how to manage patients on the ward. Very little time is spent operating, regardless of whether the resident is on his or her own home service or another surgical service. I felt that it would be difficult to compare the development of confidence within PGY-1 residents as compared to more senior levels, given the lack of operating time, which is a large portion of the development of confidence within a surgical resident.

PGY-5 general surgery residents are considered 'chief' residents and given a very different role compared to other PGY 1-4 residents. At this level in training, it is expected that you know the surgical basics and instead focus more on becoming an independent surgeon, teaching more junior residents, being a team-leader, and perfecting clinical decision-making skills. This 'chief' year is also a unique experience at our institution, as the last 3 blocks of the academic year are spent in preparation for the Royal College Exams, and during this time clinical activities are limited. I felt that it would be difficult to compare the confidence of PGY-5 residents to those of the more junior levels as this resident cohort is generally expected to have sufficient confidence as a surgeon, and their final year can be seen more as "fine-tuning". As a group (myself, BZ, LD, JW), we were more interested in the confidence growth seen in PGY-2 through PGY-4.

Exclusion of residents who are completing/have completed dedicated research years

Taking time off for research is optional and varies from 1-3 years while residents work towards a Master's degree or Doctoral degree (PhD). Recent research has suggested a decline in confidence regarding both clinical knowledge and technical skills associated with dedicated research years[67, 68]. This is a unique factor affecting confidence and highly variable, therefore the committee (myself, BZ, LD, JW) felt it would be better to exclude residents who had taken time off for dedicated research years (through the Clinician Investigator Program or otherwise).

Inclusion of only general surgery residents

General Surgery is my home program and therefore including only General Surgery residents was the most applicable to my underlying interests and subsequent research questions. Each surgical residency varies in terms of structure, formal education, teaching, supports, level of seniority, resident responsibilities, etc. I felt that the data would be more cohesive and applicable if it dealt with a single surgical specialty that I am directly knowledgeable about. Furthermore, I already had established rapport with the majority of residents within my program, which would make the interviews easier for both the participant and myself.

How can we describe confidence?

At the end of each interview, participants were explicitly asked to define confidence via close-ended questions (see interview protocol, Appendix A). Using these results, as well as those discovered through traditional coding and analysis of the interview transcripts, I was able to compile a rich and thorough description for the concept of confidence within the context of surgical education. Five themes were identified that when combined, really embody the nature of the concept as expressed by participants:

1. Confidence is subjective
2. Confidence is faith in yourself
3. Confidence is constantly fluctuating
4. Confidence is task-based
5. Confidence is associated with overcoming challenges

Residents described confidence as a subjective and fluid feeling, representing their opinions about themselves. Residents also felt that confidence was a feeling of faith and belief in one's self:

*“Confidence is trusting your own judgment and decision-making skills
...and being able to make decisions without second-guessing or
questioning yourself.”*

Trusting one's self was intimately related to amount of experience and feelings of familiarity and comfort associated with clinical tasks and/or situations:

*“When you're presented with a situation or a task, your response to
that is one of comfort and calmness.”*

Residents describe confidence as continually fluctuating, based on both intrinsic and extrinsic influences. Confidence is therefore not a static concept:

*“Confidence is a fluctuant thing, it's not something that you have and it's
there forever.”*

When discussing confidence, residents generally discussed it in regard to performing a task. For example, performing an appendectomy, placing a chest tube in

the emergency room, or seeing a patient in clinic. Confidence is thus a ‘task-based concept’ pertaining to a specific task or sets of tasks that are expected of a surgeon. Completing common operations, performing procedures, making clinical decisions, treating sick patients while on-call overnight, and making plans for outpatients in clinic are a few examples of such tasks.

Lastly, having confidence means having the ability to meet and overcome challenges:

"Every time I have faced a challenge and overcome it, it has been good for my confidence."

Again, challenges could involve an operation, dealing with an acutely ill patient, performing a minor procedure, or being asked questions during an academic half-day. Novel situations presented some of the biggest challenges. One resident explained:

"And I think where I'm not confident personally, is where I haven't seen stuff or done stuff so I don't think I would be competent at it."

Overall, residents described confidence as knowing how to handle a situation, knowing the right answer, and being able to step up to the plate and overcome whatever challenge comes their way.

Of note, the concept of confidence was clearly linked with the notion of perception, both of the resident themselves and by others. Confidence affects demeanour and how you appear to others, thus it is felt inwardly but expressed outwardly. For example, after incorrectly answering a staff surgeon's question at an academic half day, one resident explained the situation as being "...so momentarily devastating to [his] confidence" that he went home to immediately read more about the topic "so [he] wouldn't look like an idiot again". This notion of "not looking like an idiot" was reiterated by most participants.

Competence versus confidence

When asked to describe the association between confidence and competence, all participants seemed to understand the similarities and differences between the two

concepts. Residents were aware that confidence is clearly distinct from competence. Additionally, they could explain why the concepts were important to one another. The main distinction between the two concepts, as described by participating residents, was whether the concept stemmed from internal or external factors. Residents felt that confidence represented internal beliefs, whereas competence represented external opinions (see Table 2).

Table 2: Comparing Confidence and Competence

Concept	Illustrative Quotes
Confidence	<p><i>“Belief in my own ability to do something”</i></p> <p><i>“Confidence is trusting your own judgement and decision-making skills ...and being able to make decisions without second-guessing or questioning yourself.”</i></p> <p><i>“Confidence is your state of being – you feel like you can do something.”</i></p> <p><i>“Self-perceived sense of skill and ability”</i></p> <p><i>“Faith in myself and my ability to handle any situation in front of me”</i></p> <p><i>“My belief in my own ability”</i></p> <p><i>“Someone who is comfortable in his or her own knowledge base and ability to perform”</i></p>
Confidence	<p><i>“I think competence would be the objective measure of one's skill and ability.”</i></p> <p><i>“Competence would be my ability as deemed by other people”</i></p> <p><i>“Competence is the ability to do something. If you're competent at something, that's other people saying that yah, you can do something, but it's not your own state of feeling you can do it.”</i></p> <p><i>“Objective measure of one's skill and ability”</i></p> <p><i>“Competence is what others think of your abilities”</i></p>
Competence vs. Confidence	<p><i>“Confidence is feeling like I can handle it, while competence is whether I actually can handle it.”</i></p> <p><i>“You can be confident in situations where you may not necessarily be competent.”</i></p> <p><i>“I think competence gives confidence, but not necessarily the other way around.”</i></p> <p><i>“They're different, but they definitely relate to one another. I think you can be competent and not confident, and confident without being competent.”</i></p>

Experiencing confidence during general surgery residency training

As one would expect, residents described an overall upward trend of confidence while advancing through their residency and generally feeling more confident over time. However, this trend is not stable and quite susceptible to “mini-setbacks” with resultant ups and downs (see Figure 2). Residents used several analogies to describe the progression of confidence, comparing it to a mountain range, roller coaster, and even a staircase. One resident explained:

“Overall it's improved, but it frequently gets leashed back when you realize all the things you can't do. So if you were to draw it in a line graph, it would look like a mountain range going up, with multiple ups and downs, but the overall trend is upwards.”

Residents felt their confidence fluctuated often and was mostly dependent on external factors, such as how well they performed an operation, the difficulty of consults while on call, how the day went overall, and so on:

“It definitely fluctuates, and pretty much based on how things go that day...it's definitely a little bit of a roller coaster.”

The transition from junior to senior resident also changed how residents experienced confidence. As post-graduate level advances, there is an increase in both the quantity and quality of roles and responsibilities for residents to navigate through:

“...just being further along in residency helps, [I'm] obviously way more confident now compared to first year.”

Additionally, residents are faced with increasing expectations from staff surgeons and more senior colleagues. The new roles, responsibilities, and expectations may be unfamiliar territory, thus creating a dip in a resident's confidence:

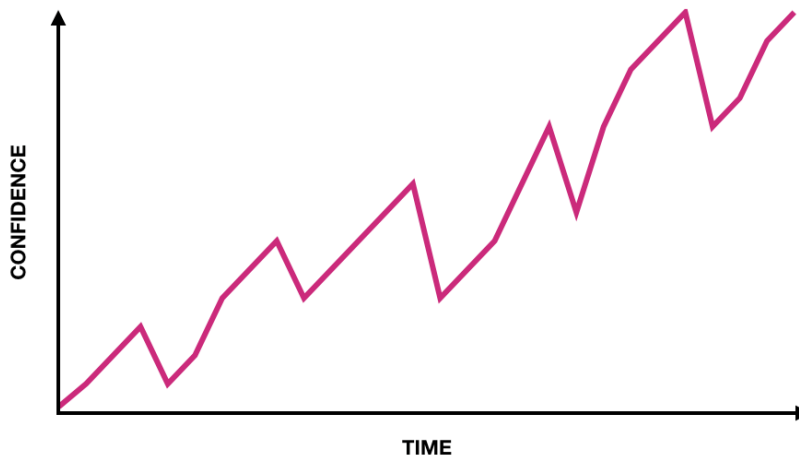
“Right now, I'm at the lull in between feeling confident again with the new challenge that I'm facing.”

These dips in confidence can be difficult for residents to overcome. Getting stuck in the ‘confidence gutter’ and trying to resume a previous level of confidence or higher is

an ongoing battle throughout residency. Being able to encounter difficult situations and self-doubts throughout residency requires maintaining a baseline level of confidence, which is reliant on seemingly small factors that play a large role and really help residents progress throughout their training:

“That would be one of the challenges of residency, when you get to those dips in confidence, when it’s in the gutters for whatever reason, is finding your way back to your previous level or higher. If you look at residency as a spectrum, it’s kind of like a staircase – you go up a few steps but then fall back a few steps but in the end, what keeps you going towards the top is maintaining some level of confidence.”

Figure 2: Theoretical Trajectory of Confidence Over Time



The development of confidence during surgical residency training

Developing confidence requires the building blocks of experience, practice and repetition. Although confidence is not experience itself, it comes with experience. Increased experience with clinical situations or operations leads to increased familiarity. This feeling of familiarity then leads to increased comfort and subsequently elevated confidence levels (see Table 3). This in turn enables residents to better handle unknown circumstances and apply existing skills to new situations, confidence is thus transferable between tasks:

“Knowing general surgical principles that you can apply to other procedures, so that makes you more confident that if you were pressed to do something new, you would be able to kind of make your way through it.”

Residents start to realize ‘oh, I’ve done this before, I know how to handle this’ and novel situations become less intimidating. The frequency of repetition also plays a role, particularly when discussing technical skills (e.g. emergency room thoracotomy or appendectomy). Skills that are used repeatedly in close succession build more confidence than skills used infrequently over a longer course of time:

“...then kind of tied with that is seeing the same case over and over close together. So like if you're doing a breast rotation and you're doing like 7 mastectomies in a row, that's way more confidence-building then if you see one mastectomy 7 times in a month. It solidifies it in your mind, you've done it over and over, you know what to expect, you know the steps.”

Table 3: The Relationship Between Confidence and Experience

Concept	Illustrative Quotes
Experience is required to build confidence	<i>“For me confidence is all about experience. I've done it before so I can picture myself doing it again.”</i>
	<i>“The more experience you get, the more confident you'll get.”</i>
	<i>“Experience is probably my biggest thing. Just seeing and doing as much as you can.”</i>
	<i>“And I think where I'm not confident personally, is where I haven't seen stuff or done stuff so I don't think I would be competent at it.”</i>
	<i>“So the more experience you have with someone, especially doing the same operation, the more comfortable you feel doing it.”</i>
	<i>“My confidence in gallbladders is good, because I've done a lot. But for cases I haven't seen or done before, then not so much.”</i>
<i>“Just seeing and doing stuff. Over and over and over.”</i>	

Identifying factors that affect the development of confidence

Participants described several factors that affected the development of their confidence. These were identified through analysis of confidence relational maps and interview transcripts (see Appendices). There are both internal and external factors that can affect a resident's confidence during their surgical training. Internal factors reflect a participant's personal traits, abilities, feelings, etc. External factors represent situational factors or outside forces that play a role in the development of confidence.

Internal factors affecting confidence

Within each category of internal factors, several sub-categories were identified (see Table 4). Personal experiences, self-perception, personal expectations, and individual skill development were all classified as internal factors. Resident perception of self is an important intrinsic factor. Residents repeatedly expressed concerns about what others thought of them, what they thought of themselves, and how this impacted their residency and confidence. When reflecting on their training, the notion of "not looking like an idiot" was brought up by several residents and reflected how they dealt with making mistakes or errors. Answering a staff surgeon's question incorrectly, not knowing the right answer at academic half-day, missing a diagnosis, etc., were all commonly described situations that made residents feel 'like an idiot' and less confident. Lack of knowledge, clinical errors, and perceived difficulties with technical skills lowered resident confidence and made them feel like they would be looked badly upon. Importantly, this fear of looking like an idiot made some residents hesitant to ask questions:

"...like you get asked 'why would you flush that drain?' and then you think, 'well I don't understand why I wouldn't have flushed that drain' but now I'm too scared to ask that question...that takes a step back from your confidence. When you're kind of treated like you're an idiot for not knowing, but then you're scared to ask because you don't want to look like more of an idiot."

Personal expectations also played a role, primarily in relation to the PGY-level of the resident. Residents expressed concerns about whether they were performing at the level they should be (i.e. am I doing what a PGY-X should be doing?) and this often led to peer comparisons:

“...comparison has an affect on your confidence because if you think that you’re at the same level as your colleagues then you’re not as stressed out about being bad, but if you think you’re worse than them, you’re going to be super stressed out when you’re operating with staff, because you don’t want to be known as the ‘bad one’”.

Stress, mental health, fatigue, and self-esteem/inherent self-confidence also play a role, although more indirect, as one resident explains:

“So I don’t think by strict definition it would make you feel more or less confident, it just affects your performance.”

Surprisingly, residents did not think elements of their personal life, e.g. marital status or having children, played a significant or direct role in their confidence at work:

“I feel like it makes you feel more whole as a person, which makes you feel better at work, but I don’t think it directly affects my confidence.”

Experience is crucial to the development of confidence. Lack of experience leads to less confidence and being less comfortable completing a particular task or participating in a certain situation. More experience, whether it’s with the same task/situation or a related one, results in more confidence and more comfort. One participant felt that personal experiences were initially more helpful than book knowledge:

“I think when you see something that you’ve seen before, it’s kind of an obvious thing...and you really do draw on personal experiences a lot. Because that, I think, tends to lead ahead of your book knowledge.”

Seeing their skills and abilities develop and improve throughout training greatly increased resident confidence. Recognizing their improvement when comparing their skills as a senior compared to a junior, completing their first independent appendectomy, or performing much better on the mock oral exams compared to previous proved to residents that they were learning, getting better, and truly becoming a surgeon:

“If you don’t think you’ve gotten better at x, y, and z when you look at the beginning of the year compared to the end, then no matter what your eval says, or what your inherent sense of self-confidence is, or how many [cases] you’ve done...if you don’t think you’ve done it any better or you think you’re just as bad then you’re not going to feel any more confident.”

Overcoming challenges and successfully completing tasks that are above a certain level are also significant confidence boosters for residents. These moments reassure residents that they are indeed learning and progressing well.

External factors affecting confidence

Patient factors, feedback, relationships with staff surgeons, and working within a supportive environment, were all identified as external factors (see Table 5). Patient factors included patient outcomes (i.e. whether they experienced a complication or not), patient acuity (i.e. unstable patient), and difficulty of a patient’s case/operation. In some situations, residents felt that patient complications or failures reflected their abilities, thus causing them to feel less confident if things went poorly.

When things go well with a patient’s operation/admission/etc., residents felt more confident in their abilities and judgements. Similarly, residents expressed less confidence when dealing with unstable patients or participating in difficult operations.

Receiving useful feedback plays a vital role in the development of confidence. This was reiterated multiple times by all participants. Staff surgeons, senior colleagues, or peers can provide feedback. It can be informal or formal, but should be direct, useful, and occur on a regular basis (i.e. timely). Positive feedback contributes the most to

confidence levels by providing positive reinforcement/affirmation and encouragement. Negative feedback can be useful if given in a constructive manner. As one resident pointed out,

“...a lot of staff are very good at pointing out what you’re doing wrong, and they’re bad at saying what you’re doing wrong and how to fix it.”

Furthermore, residents felt that *“telling me that I’m doing something wrong isn’t helpful, but telling me why I’m doing it wrong and how I can do it right makes a big difference.”*

A resident’s rapport with the staff surgeon also has meaningful effects on confidence levels. Most residents described a ‘good’ staff relationship as one in which they felt comfortable with the staff and not scared or intimidated by them. Feeling comfortable working with a staff surgeon made it easier for residents to ask questions, make clinical decisions and just ‘go for it’ without feeling dumb or belittled:

“If you’re terrified of your staff, then your self-confidence is lower than it probably normally is, right from the get-go. If you make any errors or consequences in that staff’s presence, it’s going to be amplified and affect your self-confidence even more so.”

Knowing that the staff surgeon trusts you also increases resident confidence levels. Being given responsibility (e.g. allowed to start the case) or being independent and operating without the staff proved to residents that the staff trusts them and has confidence in their abilities, therefore making residents feel more confident themselves. Residents also appreciated when staff surgeons let them struggle and try to problem-solve in order to overcome a challenge:

“... if you’re doing a chole, as soon as you put your instruments in they say, ‘oh – looks like a tough one, why don’t you let me poke around’ versus the staff that lets you struggle, and trusts that you won’t make horrific errors and lets you battle through it, that really builds your confidence.”

Lastly, working within a supportive environment can help increase confidence. Feeling supported comes from all colleagues, not just the staff surgeon. This includes

nursing staff, peers, senior residents, chiefs, physicians from other specialties, etc. Regardless of the setting, feeling supported and encouraged helped increase confidence levels. Having senior back-up also helped increase confidence – knowing there is always someone around to ask questions provides reassurance, support, and encouragement:

“...having someone more experienced than yourself telling you that is exactly what they would do - that really helps move you along the ladder and you feel more confident and efficient and more competent. That is a huge one – just having someone say ‘yup, you’re okay there’ – reassurance.”

Framework of Surgical Confidence

Combining what was learned about the factors affecting resident confidence levels and how confidence was described, I developed a framework for surgical confidence. As stated previously, residents frequently related confidence to the performance of a task. Confidence can therefore be defined as applied to tasks and sets of tasks that are expected of a surgeon (e.g. doing a common operation or procedure, seeing sick patients while on call, making clinical decisions, etc). There are 3 stages to completing a task: before, during, and after. Internal and external factors can affect confidence at each stage of task completion, with certain factors having more impact at one stage versus others (see figure 3).

Before a surgical task, certain internal factors play a role in developing resident confidence and contribute to a positive mindset. These include previous experience, personal expectations, inherent self-esteem and underlying levels of stress. External factors that are important before the task include patient factors (case difficulty, “sick” patient, emergent operation) and working within a supportive and encouraging environment.

During the task, confidence boosters and prior experience are significant internal factors. For example, residents described talking out loud while operating as a personal way to make themselves feel more confident in a difficult situation:

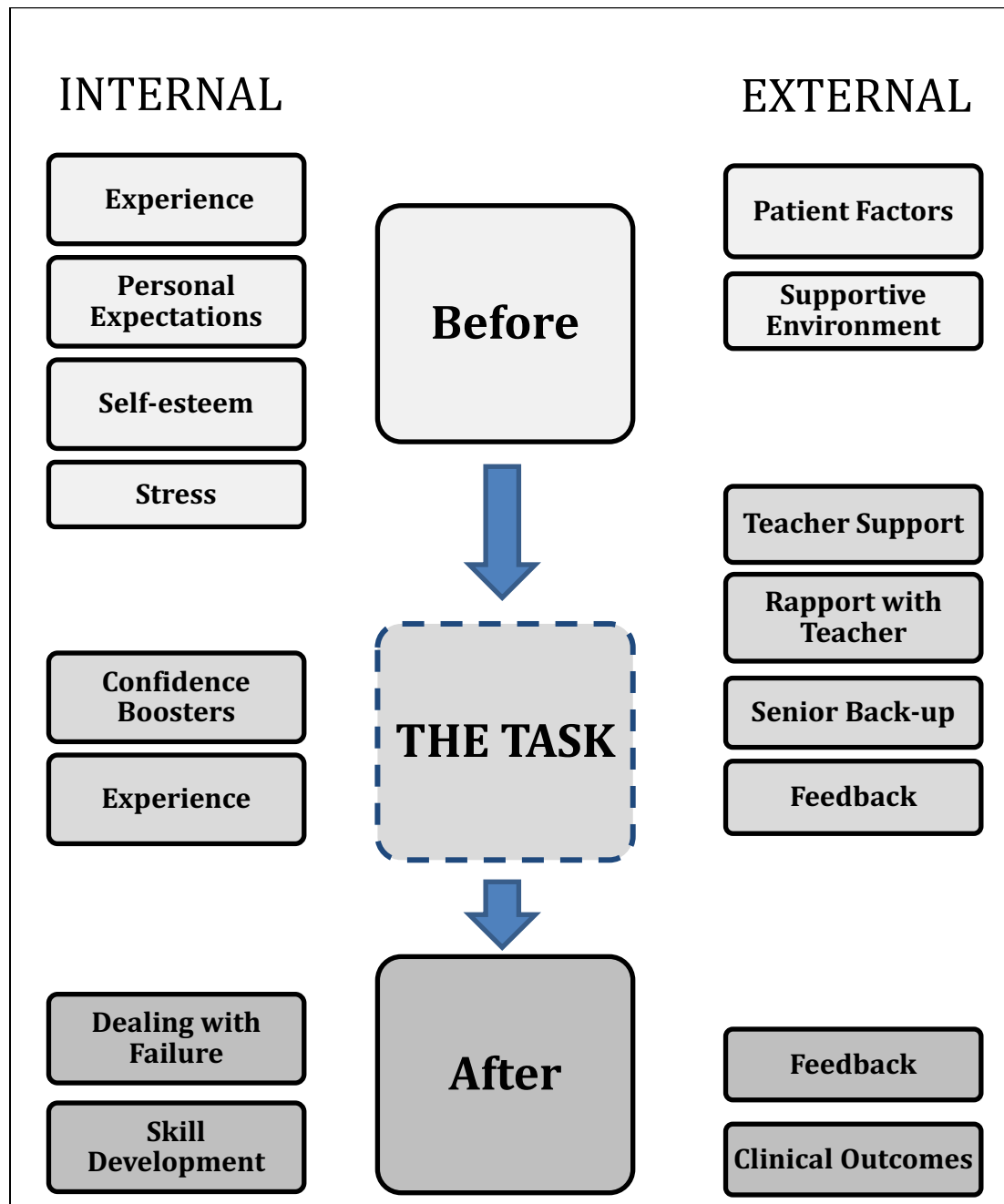
“I find talking through it or explaining myself makes me more confident in what I did and the decisions that I made...if I’m struggling with an operation, then I think ‘I’m not pushing hard with the L-hook because I’m not sure what’s behind this structure’...so then the staff knows that you’re being cautious and thinking, instead of just fumbling.”

Personal experience also plays a role during the task as residents think of previous similar cases in order to help them during novel situations. External factors that help with confidence during the task include teacher support, overall relationship with the teacher, and having senior back-up (being able to ask for help). Residents also felt that it was helpful to have direct and immediate feedback, whether negative or positive, while actively doing a task, particularly if the task requires technical skill.

After the task, residents are better able to appreciate any errors or mistakes that might have been made, their own personal improvement, and their ability to see whether they have overcome a challenge (dealing with failure and skill development). Feedback after task completion is also important for developing confidence. External factors made a more significant impact during and after the task. Working within a supportive environment and relationship with the staff surgeon seemed to have the biggest effect on resident confidence while performing the task, whereas feedback regarding completion of the task appeared most important afterwards.

When I applied this framework to the hypothetical situations of a high-confidence resident and low-confidence resident, the framework resonated with the findings. Tables 4 – 6 provide further examples of internal and external factors divided into task stages, with representative quotes from participants.

Figure 3: Framework of Surgical Confidence – Factors affecting confidence before, during, and after a surgical task.



Testing The Results

Using the study findings, one can picture the scenarios or circumstances that create a confident resident versus the scenarios that contribute to an uncertain resident. These scenarios can occur at any point throughout surgical training. A confident

resident has seen and done as many operations, consults, and cases as possible and thus has considerable experience. Typically, this resident is a senior resident closer towards the end of their residency. They have a solid knowledge base and feel comfortable asking and answering questions without fear of judgment or ridicule from other residents, staff, or colleagues, especially if they answer a question incorrectly. Many operations would be elective cases done on stable patients, and in operating rooms without time constraints so feelings of being rushed or flustered could be avoided. The resident would be trusted by staff to start the case on their own and continue as appropriate for their postgraduate level of training. When encountering challenges, this resident would be allowed to struggle, within reason, to learn how to problem solve on their own. Throughout all of this, the resident would feel supported and encouraged by their educators and unafraid to ask questions. Mistakes or errors would be viewed as learning opportunities, and not occasions where they are belittled or made to feel like an idiot. Lastly, this resident would receive constructive, direct, and specific feedback on a regular basis.

The inverse experiences lead to an unsure and tentative resident. This type of resident has little experience, operative and otherwise, which could be due to decreased case volume and/or junior level of training. They might feel that their knowledge base is lacking and they can't seem to ever answer 'pimping' questions correctly, for which they think they are "the stupid one". They are often rushed in the operating room, clinic, or while doing consults and subsequently get flustered. When they make mistakes, they are notified they are wrong, but not taught *why* they were wrong or how to improve/correct upon their mistake. They might get belittled and beaten down for not knowing the answer, and thus are afraid to ask questions. While operating, they don't receive much autonomy, they aren't allowed to start a case or complete portions of the surgery appropriate for their postgraduate level of training, which further contributes to feelings of low confidence and incompetence.

Table 4: Factors Affecting Confidence Before the Task

INTERNAL	Experience <ul style="list-style-type: none"> • Familiarity, comfort • Prior and related • Momentum of experiences 	<p><i>“Mostly I just think experience. The more experience you get, the more confident you’ll get.”</i></p> <p><i>“Just seeing and doing stuff. Over and over and over.”</i></p>
	Personal expectations and Perception of Self <ul style="list-style-type: none"> • Level of training (PGY-level) • Peer comparison • Comparison of personal expectations with expectations of others 	<p><i>“Other people’s perception of you is one thing, but also personal perception matters. At the end of the day you probably think you’re stupid, but then if a staff tells you they think your knowledge base is where it should be then that’s awesome. In your own mind, you always think you’re way worse.”</i></p> <p><i>“Self-perceived comparison – has an affect on your confidence because if you think that you’re at the same level as your colleagues then you’re not as stressed out about being bad, but if you think you’re worse than them, you’re going to be super stressed out when you’re operating with staff, because you don’t want to be known as the ‘bad one’.”</i></p>
	Self-esteem, inherent self-confidence	<p><i>“Someone who has no self-confidence whatsoever, you can’t do anything to change that sometimes. For someone with a lot of self-confidence, you can’t knock them down either.”</i></p>
	Stress/Fatigue/Mental health	<p><i>“If you’re tired, you feel like crap and you’re slower, so you think that you might not be doing things as well and that can affect your confidence.”</i></p> <p><i>“I think most of us realize this job is going to be stressful so we can just deal with it, and put it in the back. But everyone has a breaking point so that has to be remembered.”</i></p>
EXTERNAL	Patient factors <ul style="list-style-type: none"> • Case difficulty • Unstable patient 	<p><i>“There are some consults and it’s stressful and you have to just make the decisions that make sure the person lives and then you can figure out all the other stuff tomorrow when everything is calm. Those circumstances help build your confidence too because you saved a life.”</i></p>
	Controlled environment	<p><i>“It’s definitely the more controlled environments where you have the chance to shine and build confidence. It allows you to show them what you can do.”</i></p>

Table 5: Factors Affecting Confidence During the Task

INTERNAL	<p>Confidence boosters</p> <ul style="list-style-type: none"> • Memories of positive feedback • Talking it through, verbalizing thoughts (self-talk) 	<p><i>“...it helps to think about the times where someone has complimented you or given good feedback, as a type of self-savage manoeuvre...”</i></p> <p><i>“...you think about what you would do or what should be done, and then when the staff actually does it, you’re confident it was the right move. So just thinking about what to do, even if you’re not participating can help you to learn.”</i></p>
	<p>Experience</p> <ul style="list-style-type: none"> • Familiarity, comfort • Prior and related • Momentum of experiences • Transferability 	<p><i>“For me, confidence is all about experience. I’ve done it before, so I can picture myself doing it again.”</i></p> <p><i>“Knowing general surgical principles that you can apply to other procedures, so that makes you more confident that if you were pressed to do something new, you would be able to kind of make your way through it.”</i></p>
EXTERNAL	<p>Supportive Environment</p> <ul style="list-style-type: none"> • Feeling supported and encouraged • Having expert backup • Not being rushed 	<p><i>“The support you’re provided by others, especially the staff...If they provided you with that support to do it, without even having to ask, then that would help. And the unsupportive ones don’t help anything.”</i></p> <p><i>“Having someone more experienced than yourself telling you that is exactly what they would do...you feel more confident and efficient and more competent. That is a huge one – just having someone say ‘yup, you’re okay there’ – reassurance.”</i></p> <p><i>“When staff are really in a rush to get through their day so they don’t even give you a shot...but when you’re trying to learn a skill and you’re being rushed...that makes you feel like you’re inadequate and don’t know what you’re doing, even though you do know what you’re doing, you just can’t safely do it at that pace. Personally I struggle with that, when it’s how fast can you get through things versus doing it safely and well.”</i></p>
	<p>Rapport with teacher (staff surgeon)</p>	<p><i>“...when I feel comfortable around them I am able to perform to the best of my ability, and even when they’re quizzing me and I get things wrong, it’s not a reflection of me, like, how good of a resident am I, it’s just a learning opportunity.”</i></p>
	<p>Being trusted by the teacher (staff surgeon)</p> <ul style="list-style-type: none"> • Being given responsibility (i.e. allowed to start a case) • Operative autonomy • Being allowed to struggle (problem-solving) 	<p><i>“I was the senior, without a chief, so for a couple cases I would scrub with the off-service R1 and we would just do the case [while the staff watched]. So that was great, I mean it was just an appy, but still. That was confidence boosting.”</i></p> <p><i>“The best teachers are the ones that recognize you’re struggling, they tell you to take a step back, gather yourself, think about what can be done differently and how to get through this – they might even make suggestions on things to try, which is entirely different than them just taking over and doing it themselves...having those couple minutes to try and figure out a difficult situation is how you really progress as a surgeon. Not everyone is willing to give you those few minutes.”</i></p>

Table 6: Factors Affecting Confidence After The Task

INTERNAL	<p>Dealing with failure</p> <ul style="list-style-type: none"> • The effects of errors/mistakes on personal perception of skill/ability • Not knowing the right answer 	<p><i>“Like you get asked ‘why would you flush that drain?’ and then you think, ‘well I don’t understand why I wouldn’t have flushed that drain’ but now I’m too scared to ask that question.”</i></p> <p><i>“So momentarily devastating to my confidence, and then I went home and read about it, and walked through it so I wouldn’t look like an idiot again.”</i></p> <p><i>“I get nervous about going to the OR because it’s not like, ‘am I good at operating’ but more so if they’re going to ask me a question that I don’t know the answer to and I’m going to look stupid.”</i></p>
	<p>Seeing improvement of skill</p> <ul style="list-style-type: none"> • Development • Progression • Overcoming challenges • Realizing that I CAN do this 	<p><i>“The other thing...that also builds your confidence, is that you progress very slowly throughout your residency, but you don’t always see that you are better than you were...but then you work with a fresh R1 and they are so inexperienced, and you think ‘wow, that was me, and now I’m here, so I guess I have learned some stuff’.”</i></p> <p><i>“When I get a case that’s beyond my level and I do well on it, whatever it is...that was above my level, we don’t see volvulus every day and I’m not experienced with that, but that was a win for me and builds my confidence.”</i></p> <p><i>“I think the biggest thing is situations where I have been challenged and I have risen to that occasion, have been the biggest thing that helps give me that confidence...Every time I have faced a challenge and overcome it, it has been good for my confidence.”</i></p>
EXTERNAL	<p>Feedback</p> <ul style="list-style-type: none"> • Direct, useful, regular • Constructive criticism • Informal/formal • Staff surgeon/senior colleague • Feedback from peers 	<p><i>“Times that contribute to increased confidence would be after good rotations where you felt like you learned a lot, contributed a lot, were valued and then validated with positive feedback and evals. This helps give a permanent boost to your confidence.”</i></p> <p><i>“... feedback to me would be ongoing, either constructive criticism...just good or bad...they give you good feedback or tell you ‘good job’, that definitely boosts my confidence...For example, every day on GI my preceptor would sit me down and we would talk about what I did good, what I did bad, and what I needed to improve on. It was nice, because every day I got ongoing feedback about what my preceptor thought about me.”</i></p> <p><i>“Operative feedback, because we don’t really get it a lot, and it’s hard to gauge where you are because you never operate with people in the same year as yourself. So all you see is like Chief residents operate, and then you think ‘well, I can’t do that’. So having somebody actually tell you ‘that’s good for your level’ or ‘this is how you should do this’ is actually super useful but doesn’t usually happen.”</i></p> <p><i>“Sometimes just hearing from other people you work with, if you see them outside of the hospital, that you’re doing well or they’ve had good things, then that makes a big difference.”</i></p>
	<p>Patient Factors</p> <ul style="list-style-type: none"> • Clinical Outcomes 	<p><i>“But I just find that when you have a case where the patient does well, they’re happy, and go home and everything is good, then that really builds confidence a lot.”</i></p>

CHAPTER FIVE: DISCUSSION

Chapter 5 provides a discussion on the study methodologies and findings. A brief summary of the findings will be presented first, followed by a comparison of the results to those found in the literature, potential implications for practice, study limitations, and suggestions for future directions.

Based on available evidence, there are three major gaps in knowledge regarding the concept of confidence within surgical education:

1. A rich and thorough description of confidence is lacking
2. There is little detail specifically regarding the factors affecting confidence
3. There is a potential 'confidence crisis' among general surgery residents.

To the best of my knowledge, this study is the first to qualitatively explore confidence within general surgery residents. The main results of this study are twofold: what is confidence, and what factors affect confidence.

What have we learned about confidence during surgical residency training?

Confidence is a multidimensional concept that varies throughout surgical residency training. It is subjective, internal, and represents a feeling of belief or faith in one's self. Surgical confidence is also a task-based concept, meaning residents discussed confidence as being able to adequately perform a surgical task. Residents described their experiences with confidence as being quite variable, with multiple high and low points throughout their training, but with an overall increasing trend. These high and low points in confidence can be affected by a range of several factors, both internal and external. Internal factors included categories such as personal perception and expectations, previous experiences (i.e. operative), and seeing personal skill development. External factors reflected outside forces that affected confidence, such as feedback from teachers, patient factors, rapport with staff surgeons, and being able to work within a supportive environment.

How do the results compare?

Describing Confidence

Within the surgical and medical literature, a rich and thorough description of confidence is lacking. The results from this study confirm that confidence is a multidimensional concept broadly understood and with considerable importance during surgical training. The participants in this study appreciated the meaning and value of confidence, but it remained challenging to determine a collective definition of what it means within surgical education, as confidence meant slightly different things to different people. Similarly, residents understood the concept of competence and how it related to confidence, but also encountered difficulties describing it precisely. These findings resonate with other medical studies emphasizing the variable definition of confidence[9, 35]. However, compared to the junior doctors interviewed in those studies, my participants were clearly able to distinguish between confidence and competence. Based on the results, surgical confidence can be described as a subjective, internal feeling that one can accomplish a surgical task.

The study findings also resonate with those studies examining confidence from other domains, including nursing, sports performance, law, and psychology. Several of these authors have also described confidence as a feeling that varies considerably based on a range of factors[4-6] and is context-dependent[5, 28]. Stankov et al found that confidence ratings were related to item difficulty when surveying students about mathematics, i.e. students were less confident on difficult items [23]. Davis et al also noted comparable variations: “the patterns of increase in confidence were different for different roles” [69]. Several of my participants discussed how their level of confidence changed according to the situation or task at hand and whether they had experienced it before. This present study confirmed that confidence is variable during residency and sensitive to both internal and external elements, including situational, personal, and task-related factors as well as past experiences.

Given the variability among existing definitions and the lack of standard methods of measurement, some experts argue that perhaps confidence is not the best construct to explore an individual’s belief in their own abilities[3, 28, 70]. Self-efficacy is

comparable to confidence and several studies have already suggested using self-efficacy instead of confidence, as extensive research has been published on its definition and methods of measurement[3, 8, 25, 70] and thus it already has a solid theoretical construct. Furthermore, Bandura's original concept of self-efficacy already takes into account social factors, with self-efficacy being derived from performance accomplishments (i.e. competence), vicarious experiences, verbal persuasion (e.g. positive feedback), and emotional arousal (e.g. anxiety, fear)[5, 25]. This combination of factors makes self-efficacy a potentially more attractive construct for use in surgical education and the results of this study do relate directly to self-efficacy. More studies are beginning to look at self-efficacy specifically in surgical trainees. For example, Salles et al surveyed 179 residents from several surgical specialities and found that self-efficacy was positively associated with both resident well-being and personal accomplishments[70]. Although this research enhances the existing data on the description and use of confidence within surgical education, additional studies are still needed to further explore the definition and measurement of confidence, and to determine the best construct for investigating resident confidence levels during training.

The Importance of Confidence

At the end of each interview, residents were asked why they thought confidence was important during their surgical training and their replies reflected previously established links between confidence and performance levels[21, 23], with a particular emphasis on resilience. Echoing findings from Bandura and similar researchers, residents felt that being more confident helped them overcome challenges and develop their skills[25, 26]. Furthermore, residents felt that being more confident made them seem more competent to others and thus were provided more opportunities and better surgical experiences. The interplay between confidence and competence (performance) was just briefly touched upon during my research, and additional studies are needed to further investigate this relationship among surgical trainees.

Factors Affecting Surgical Confidence

The literature strongly suggests that the development of surgical confidence is multifactorial and shaped by both trainee-specific and program-specific factors, findings reiterated in our study. The factors identified in this study were divided into internal and external elements. Interestingly, external social factors were repeatedly brought up during the interviews and discussed with considerable intensity, suggesting their increased importance to residents when compared to internal factors.

My findings are consistent with several other related studies. Bucholz et al also found that PGY-level, mentor's perception, and being comfortable asking for help affected confidence[43]. Binenbaum et al found that being able to make decisions independently and having good back-up support largely contributed to the development of resident confidence[11], findings also seen in my study. Surgical case volume and operative autonomy are often cited in the literature and mentioned anecdotally as key elements for developing confidence (and competence) among surgical trainees[11, 32, 38, 39, 71]. The resident participants in my study focused on the importance of surgical experience and repetition of those experiences for the development of their confidence, not necessarily 'case volume' on it's own. These findings particularly resonate with an article from a nursing journal that outlines antecedents of confidence as part of a concept analysis[5]. In this article, Perry lists several antecedents that overlap with my findings, including knowledge, past experiences, personal goals, instructor influence, external stimuli (e.g. setting, situation), self-esteem, and several others[5]. Perry believes that promoting these factors and culturing them in the clinical setting is important for development of confidence with benefits seen for students, staff, and patients[5].

Residents in this study reported that spending time with family and friends contributed to their overall happiness, but did not feel that their personal lives (i.e. marriage, family) played a direct role in their surgical confidence. This is in comparison to Binenbaum's study, in which residents ranked personal time (including vacation time and time spent out of hospital with family and friends) as having a significant contribution to developing confidence[11]. Similarly, Bucholz et al found that married residents with children felt more confident compared to their counterparts[43]. In

several studies, male gender was associated with increased confidence[38, 39, 43, 48]. During my study, only one participant brought up the notion of gender differences, although this was not specific to surgery nor a recurring theme throughout that participant's interview.

Factors that negatively affect confidence incite feelings of inferior intelligence, inadequacy, and frustration, and they seem to play a bigger role than positive ones, as resident participants chose to particularly focus on these elements during their interviews. Individually, each of the negative experiences may not seem damaging, but when combined and repeated often enough, they create the perfect storm. Furthermore, once these negative experiences cause declines in confidence levels and a resident is in the 'confidence gutter', it becomes that much harder for a resident to return to their previous level of confidence – two steps back for every one step forward.

Being able to manage difficult situations and self-doubts throughout residency requires maintaining a baseline level of confidence. This is reliant on seemingly small factors that play a large role and really help residents progress throughout residency and build their confidence through the development of skills and knowledge. While I cannot not confirm nor deny the existence of a 'confidence crisis', this study has significantly advanced my understanding of what confidence is and the factors that affect its development throughout surgical residency training. Additionally, this study reflects the collective experiences of a group of Canadian general surgery residents using qualitative methods, the first of its kind. While academic and anecdotal evidence has previously reported the importance of surgical case volume and operative autonomy as being important for confidence, my results clearly show that external social factors also play a substantial role. Additionally, the resident participants highlighted the fluctuating and variable nature of confidence levels. These levels can change over the course of one operation, one overnight call shift, an entire day of work, or after several months on a particular rotation. Confidence is thus hard to measure at one finite point of time and even though residents experience low points, one should remember there are high points in confidence as well. Before confirming or denying the existence of a confidence crisis among surgical residents, further investigation is needed regarding what confidence means among surgical trainees and how it can be accurately

measured.

Practical Implications

The findings of my study can increase educator awareness of factors that could be negatively affecting resident confidence levels. Program directors and residency training programs can use the knowledge gleaned from this study to provide better educational experiences for residents, with the goal of maximizing resident confidence. By increasing the factors positively associated with confidence and decreasing or changing factors with negative associations, educators can improve resident learning experiences and accelerate their progress towards becoming a confident and independent surgeon. For example, knowing that constructive feedback has a large positive impact on resident confidence, program directors and staff surgeons could implement changes to improve the quality and frequency of feedback that residents receive throughout their training.

Limitations

This study is limited by the number of interviews conducted with each participant. Participants were interviewed at one time point during their residency. Ideally, this would be a longitudinal study with residents being interviewed several times throughout the length of their residency training. It is possible that participant responses during their single interview were biased by recent experiences and consequently influenced by their level of confidence and subsequent interview responses at that exact moment. The interview participants were also residents from a single surgical program at a single institution, a limitation easily addressed by repeating this study within another surgical specialty and/or university.

An additional limitation is the potential for researcher bias and several efforts were made to reduce this. Interview questions were designed to be open-ended and specifically worded to be non-leading. During the interview, feedback was provided using verbal and non-verbal cues that remained as neutral as possible. Lastly, I tried to be cognizant and reflective of the ways I could influence the data, thereby allowing me to avoid them.

Future directions

This inquiry is only the beginning, and there are several ways to expand this study and provide direction for future research. First and foremost, it would be worthwhile repeating this study with residents from other General Surgery programs and surgical specialties across Canada to see if the findings are transferable and whether they are specific to our program or not. The information gleaned from my study could also be used as background information or a pilot inquiry for larger scale studies with longitudinal follow-up. These studies would have the opportunity to improve upon methodology, for example, refining the interview questions and number of interviews used in this study.

Using the results regarding the factors affecting confidence, future studies should focus on practical ways to use this knowledge and subsequently measuring the effect of the changes on resident confidence levels. One example would be to design a study to implement specific techniques on improving the quality of feedback, teaching techniques for staff surgeons, or improving PGY-appropriate operative experiences and then measuring the changes in confidence levels attributed to those changes.

Lastly, more research is needed regarding the interplay between confidence and competence within surgical education. It would be also be interesting to qualitatively explore the effects of over- and under-confidence on surgical trainee performance.

Summary

Confidence is associated with perception, competence, and the progression of skills and knowledge and is therefore a highly important concept during surgical training. A resident's confidence level is continuously challenged during their training and subject to both high and low points. Understanding the concept of confidence during surgical residency training is an important research subject, as it directly impacts how residents make clinical decisions and complete procedures safely. Consequently, resident confidence directly pertains to patient well-being and the provision of safe patient care. The results from this study have the potential to introduce changes in practice while also

opening up new possibilities for future research studies.

This study leads to three conclusions:

1. Confidence is a multifaceted and complex concept. Further work regarding its description and measurement needs to be undertaken.
2. Surgical residents require more than case volume and experience to succeed in residency.
3. We cannot confirm or deny whether there is a problem with surgical resident confidence as resident confidence levels continuously fluctuate throughout training

References

1. *Confidence*, in Merriam-Webster.
2. *Self-confidence*, in Merriam-Webster.
3. Elfenbein, D.M., *Confidence Crisis Among General Surgery Residents: A Systematic Review and Qualitative Discourse Analysis*. JAMA Surg, 2016. **151**(12): p. 1166-75.
4. Oney, E. and G. Oksuzoglu-Guven, *Confidence: a critical review of the literature and an alternative perspective for general and specific self-confidence*. Psychol Rep, 2015. **116**(1): p. 149-63.
5. Perry, P., *Concept analysis: confidence/self-confidence*. Nursing Forum, 2011. **46**(4): p. 218-230.
6. White, K.A., *Self-confidence: a concept analysis*. Nursing Forum, 2009. **44**(2): p. 103-114.
7. Schunk, D.H. and F. Pajares, *Competence Perceptions and Academic Functioning*, in *Handbok of Competence and Motivation*, A.J.D. Elliot, C.S., Editor. 2005, Guilford Press: New York. p. 94.
8. Bandura, A., *Self-efficacy: toward a unifying theory of behavioral change*. Psychological Review, 1977. **84**(2): p. 191-215.
9. Stewart, J., et al., *Clarifying the concepts of confidence and competence to produce appropriate self-evaluation measurement scales*. Med Educ, 2000. **34**: p. 903-09.
10. Ytterberg, S.R., et al., *Clinical confidence and skills of medical students: use of an OSCE to enhance confidence in clinical skills*. Academic Medicine, 1998. **73**(10): p. S103-105.
11. Binenbaum, G., D.W. Musick, and H.M. Ross, *The development of physician confidence during surgical and medical internship*. Am J Surg, 2007. **193**(1): p. 79-85.
12. Peyre, S.E., et al., *A surgical skills elective can improve student confidence prior to internship*. J Surg Res, 2006. **133**(1): p. 11-5.
13. Clanton, J., et al., *The relationship between confidence and competence in the development of surgical skills*. J Surg Educ, 2014. **71**(3): p. 405-12.

14. Gallagher, M.W., *Self-Efficacy*, in *Encyclopedia of Human Behaviour*, V.S. Ramachandran, Editor. 2012, Academic Press - Elsevier, Inc.: London. p. 314-320.
15. Gesell, I., *Am I talking to me? The power of internal dialogue to help or hinder our success*. Journal for Quality & Participation, 2007. **30**(2): p. 20-21.
16. Hardy, J., *Speaking clearly: A critical review of the self-talk literature*. Psychology of Sport and Exercise, 2006. **7**(1): p. 81-97.
17. Haffer, A.G.R., B.J., *Discovering confidence in clinical reasoning and critical thinking development in baccalaureate nursing students*. Journal of Nursing Education, 1998. **37**(2): p. 61-70.
18. Benner, P., C. Tanner, and C. Chesla, *From beginner to expert: gaining a differentiated clinical world in critical care nursing*. Adv Nurs Sci, 1992. **14**(3): p. 13-28.
19. Oermann, M.H. and A. Moffitt-Wolf, *New graduates' perceptions of clinical practice*. Journal of Continuing Education in Nursing, 1997. **28**(1): p. 20-25.
20. Stankov, L., S. Morony, and Y.P. Lee, *Confidence: the best non-cognitive predictor of academic achievement?* Educational Psychology, 2014. **34**(1): p. 9-28.
21. Hays, K., et al., *The role of confidence in world-class sport performance*. J Sports Sci, 2009. **27**(11): p. 1185-99.
22. Stajkovic, A.D., *Development of a core confidence-higher order construct*. J Appl Psychol, 2006. **91**(6): p. 1208-24.
23. Stankov, L., et al., *Confidence: A better predictor of academic achievement than self-efficacy, self-concept and anxiety?* Learning and Individual Differences, 2012. **22**(6): p. 747-758.
24. Boekaerts, M. and J.S. Rozendaal, *Using multiple calibration indices in order to capture the complex picture of what affects students' accuracy of feeling of confidence*. Learning and Instruction, 2010. **20**(5): p. 372-382.
25. Bandura, A., *Self-Efficacy*, in *Encyclopedia of Human Behaviour*, V.S. Ramachandran, Editor. 1994, Academic Press: New York. p. 71-81.

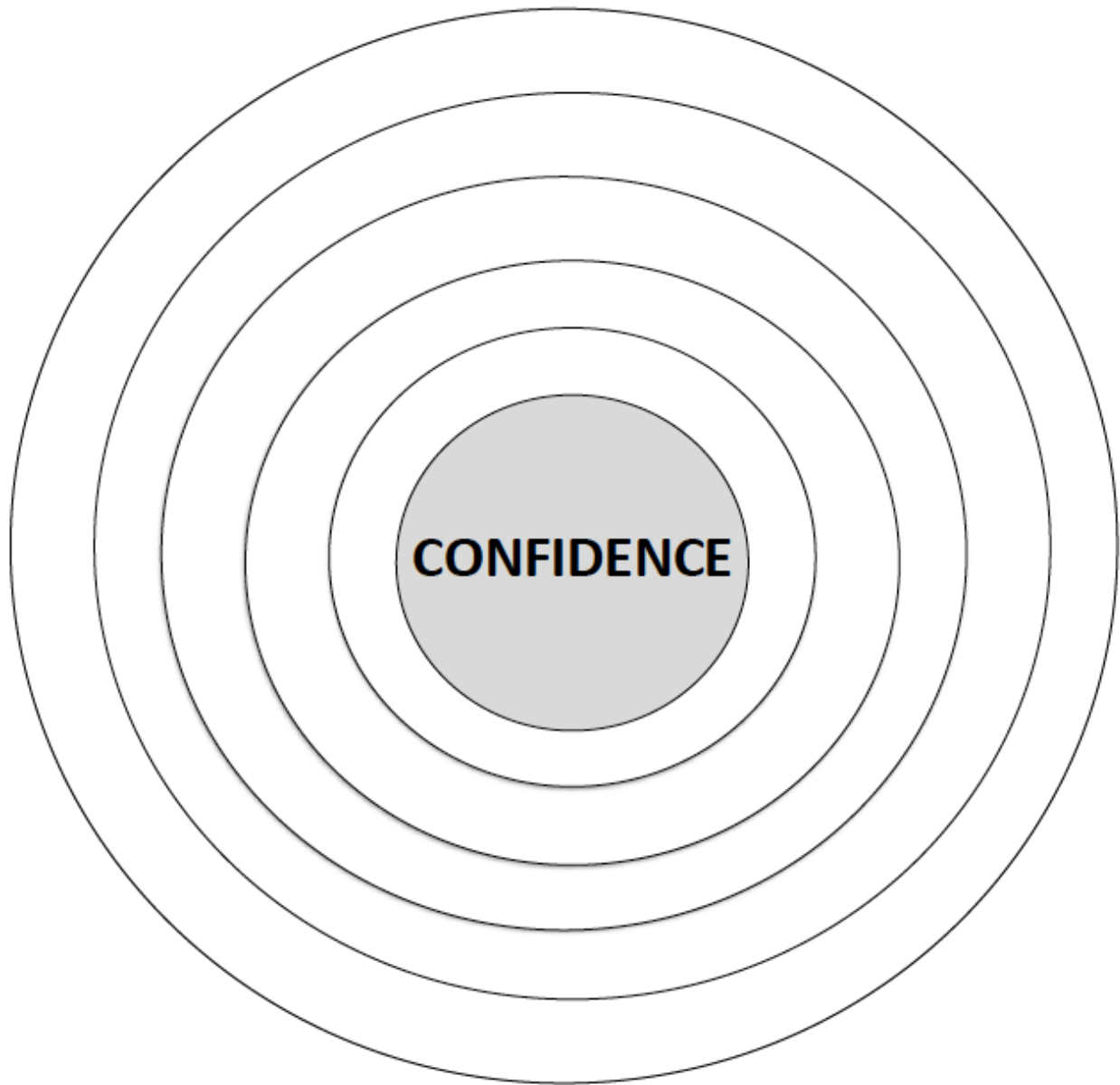
26. Marshall, M.A. and J.D. Brown, *Expectations and Realizations: The Role of Expectancies in Achievement Settings*. Motivation and Emotion, 2004. **28**(4): p. 347-361.
27. de Blacam, C., et al., *Are residents accurate in their assessments of their own surgical skills?* Am J Surg, 2012. **204**(5): p. 724-31.
28. Cramer, R.J., T.M.S. Neal, and S.L. Brodsky, *Self-efficacy and confidence: Theoretical distinctions and implications for trial consultation*. Consulting Psychology Journal: Practice and Research, 2009. **61**(4): p. 319-334.
29. Bandura, A., *Social foundations of thought and action: A social cognitive theory*. 1986, Englewood Cliffs, NJ: Prentice-Hall.
30. *Competence*, in *Dictionary.com*.
31. Leopold, S.S., et al., *Impact of educational intervention on confidence and competence in the performance of a simple surgical task*. J Bone Joint Surg Am, 2005. **87-A**(5): p. 1031-37.
32. Morgan, P.J. and D. Cleave-Hogg, *Comparison between medical students' experience, confidence and competence*. Med Educ, 2002. **36**: p. 534-39.
33. Barnsley, L., et al., *Clinical skills in junior medical officers: a comparison of self-reported confidence and observed competence*. Med Educ, 2004. **38**(4): p. 358-67.
34. Davis, D.A., et al., *Accuracy of physician self-assessment compared with observed measures of competence*. JAMA, 2006. **296**(9): p. 1094-1102.
35. Roland, D., et al., *A qualitative study of self-evaluation of junior doctor performance: is perceived 'safeness' a more useful metric than confidence and competence?* BMJ Open, 2015. **5**(11): p. e008521.
36. Coopersmith, S., *The Antecedents of Self-esteem*. 1967, W. H. Freeman and Company: San Francisco.
37. Rosenberg, M., *Society and the Adolescent Self-Image*. 1989, Wesleyan University Press: Middletown, Connecticut.
38. Fonseca, A.L., et al., *Operative confidence of graduating surgery residents: a training challenge in a changing environment*. Am J Surg, 2014. **207**(5): p. 797-805.

39. Fonseca, A.L., et al., *Graduating general surgery resident operative confidence: perspective from a national survey*. J Surg Res, 2014. **190**(2): p. 419-28.
40. Snyder, R.A., K.P. Terhune, and D.B. Williams, *Are today's surgical residency graduates less competent or just more cautious?* JAMA Surg, 2014. **149**(5): p. 411-2.
41. Grober, E.D., Jewett, M.A.S., *The concept and trajectory of "operative competence" in surgical training*. Can J Surg, 2005. **49**(4): p. 238-40.
42. Syed, S. *Competency Based Medical Education (CBME): What is it?* CanadiEM 2016 February 21, 2018 [cited 2018; Available from: <https://canadiem.org/competency-based-medical-education/-comments>].
43. Bucholz, E.M., et al., *Our trainees' confidence: results from a national survey of 4136 US general surgery residents*. Arch Surg, 2011. **146**(8): p. 907-14.
44. Coleman, J.J., et al., *Early subspecialization and perceived competence in surgical training: are residents ready?* J Am Coll Surg, 2013. **216**(4): p. 764-71; discussion 771-3.
45. Yeo, H., et al., *Attitudes, training experiences, and professional expectations of US general surgery residents*. JAMA-J AM MED ASSOC, 2009. **302**(12): p. 1301-08.
46. Mattar, S.G., et al., *General surgery residency inadequately prepares trainees for fellowship: results of a survey of fellowship program directors*. Ann Surg, 2013. **258**(3): p. 440-9.
47. Foley, P.J., et al., *The State of General Surgery Training: A Different Perspective*. Journal of Surgical Education, 2008. **65**(6): p. 494-498.
48. Friedell, M.L., et al., *Perceptions of graduating general surgery chief residents: are they confident in their training?* J Am Coll Surg, 2014. **218**(4): p. 695-703.
49. Klingensmith, M.E., et al., *Factors influencing the decision of surgery residency graduates to pursue general surgery practice versus fellowship*. Ann Surg, 2015. **262**(3): p. 449-55; discussion 454-5.
50. Merriam, S.B., *Chapter one - what is qualitative research*, in *Qualitative Research and Case Study Applications in Education*. 1998, Jossey-Bass Publishers: San Francisco. p. 3 - 25.

51. Schwandt, T.A., *The SAGE Dictionary of Qualitative Inquiry*. Third ed. 2007, Thousand Oaks: Sage.
52. Guba, E.G. and Y.S. Lincoln, *Competing paradigms in qualitative research*, in *Handbook of Qualitative Research*, N.K. Denzin and Y.S. Lincoln, Editors. 1994, Sage: Thousand Oaks. p. 105 - 117.
53. Smith, J.K., *Interpretive Inquiry*, in *The SAGE Encyclopedia of Qualitative Research Methods*, L.M. Given, Editor. 2008, Sage Publications Ltd: Thousand Oaks.
54. Ellis, J., *Chapter one - Introduction: the teacher as interpretive inquirer*, in *Teaching from Understanding: Teacher as Interpretive Inquirer*, J. Ellis, Editor. 1998, Garland Publishing, Inc.: New York. p. 5-13.
55. Ellis, J., *Chapter two - interpretive inquiry as a formal research process*, in *Teaching from Understanding - Teacher as Interpretive Inquirer*, J. Ellis, Editor. 1998, Garland Publishing, Inc.: New York.
56. Smith, D.G., *Hermeneutic inquiry: The hermeneutic imagination and the pedagogic text*, in *Forms of Curriculum Inquiry*, E.C. Short, Editor. 1991, SUNY Press: Albany. p. 187-209.
57. Ellis, J., *Researching children's experience hermeneutically and hoslitically*. The Alberta Journal of Educational Research, 2006. **52**(3): p. 111-126.
58. Bagnoli, A., *Beyond the standard interview: the use of graphic elicitation and arts-based methods*. Qualitative Research, 2009. **9**(5): p. 555-60.
59. Guba, E.G. and Y.S. Lincoln, *Naturalistic Inquiry*. 1985, Newbury Park, CA: Sage Publications.
60. Cohen, D. and B. Crabtree. *Evaluative Criteria*. Qualitative Research Guidelines Project. 2006 [cited 2018 February 20]; Available from: <http://www.qualres.org/index.html>.
61. Patterson, M.E. and D.R. Williams, *Collecting and Analyzing Qualitative Data: Hermeneutic Principles, Methods, and Case Examples*. 2002, Sagamore Publishing: Champaign, IL. p. 11-36.
62. Morse, J.M., *Critical Analysis of Strategies for Determining Rigor in Qualitative Inquiry*. Qual Health Res, 2015. **25**(9): p. 1212-22.

63. Copeland, A.J. and D.E. Agosto, *Diagrams and relational maps: the use of graphic elicitation techniques with interviewing for data collection, analysis and display*. International Journal of Qualitative Methods, 2012. **11**(5): p. 513-33.
64. Guest, G., A. Bunce, and L. Johnson, *How Many Interviews Are Enough?* Field Methods, 2016. **18**(1): p. 59-82.
65. Fusch, P.I. and L.R. Ness, *Are we there yet? Data saturation in qualitative research*. The Qualitative Report, 2015. **20**(9): p. 1408-16.
66. Saldana, J., *The Coding Manual for Qualitative Researchers*. 3rd ed. 2016, Los Angeles: SAGE Publications Ltd.
67. Grova, M.M., et al., *Dedicated Research Time During Surgery Residency Leads to a Significant Decline In Self-Assessed Clinical Aptitude and Surgical Skills*. J Surg Educ, 2017. **74**(6): p. 980-985.
68. D'Angelo, A.L., et al., *Residents' perception of skill decay during dedicated research time*. J Surg Res, 2015. **199**(1): p. 23-31.
69. Davis, D.J., A.M. Skaarup, and C. Ringsted, *A pilot survey of junior doctors' confidence in tasks related to broad aspects of competence*. Medical Teacher, 2005. **27**(6): p. 548-552.
70. Salles, A., et al., *Self-Efficacy and Well-Being among Surgical Residents*. Journal of the American College of Surgeons, 2017. **225**(4): p. e44.
71. Fillmore, W.J., et al., *Chief resident case experience and autonomy are associated with resident confidence and future practice plans*. J Oral Maxillofac Surg, 2013. **71**(2): p. 448-61.

Appendix A: Confidence relational map (blank)

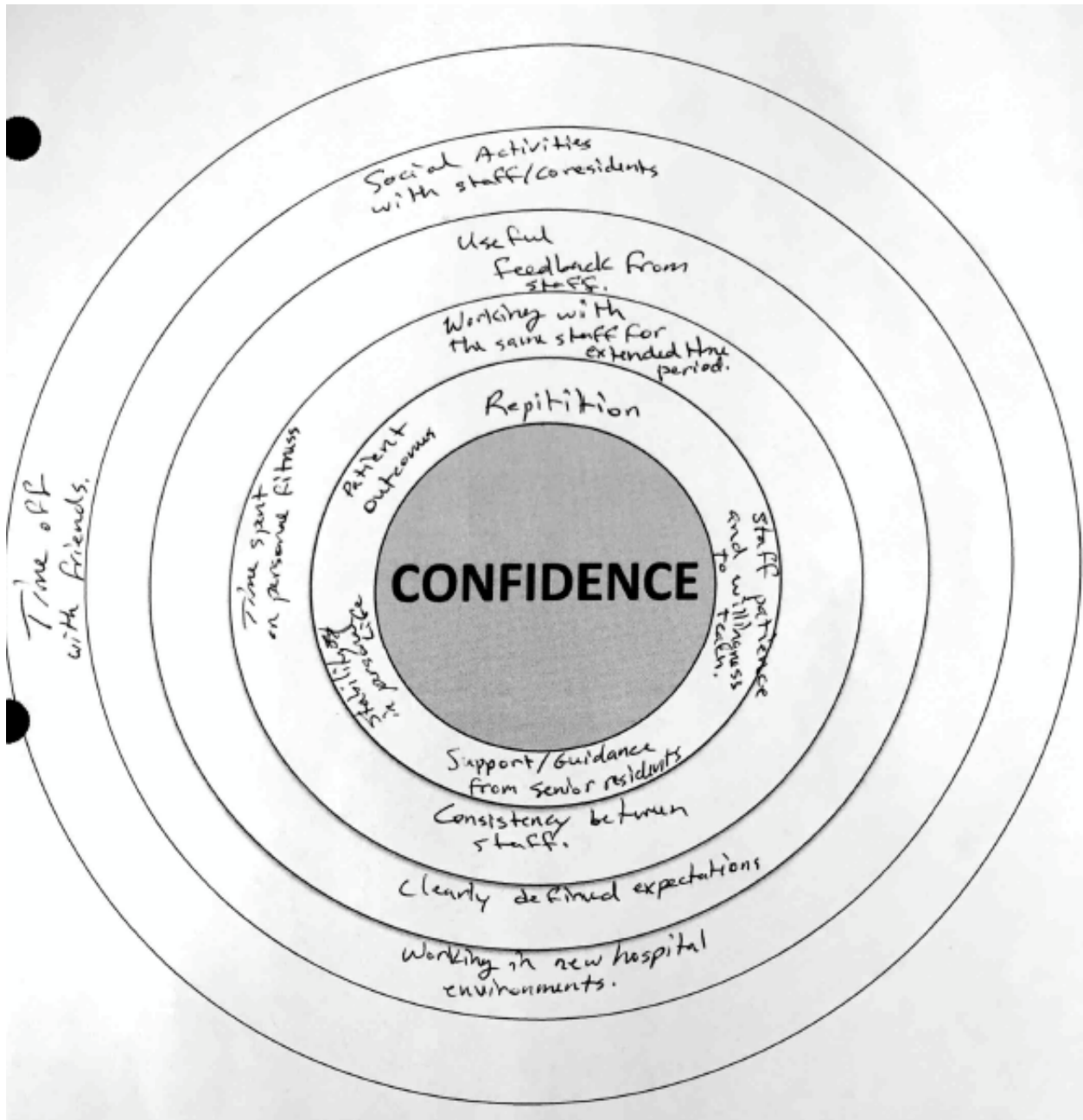


INSTRUCTIONS:

Confidence is the center of these circles. This represents your confidence during your surgical residency training. Think of the factors that affect your confidence (neutral, positive or negative). These factors can be anything you can think of (social, academic, emotional, technical, values, etc).

Arrange these factors in order of importance within the concentric circles. Factors placed CLOSEST to the center imply the most importance, i.e. the further from the center, the less importance of that factor on your confidence.

Appendix B: Example of completed confidence relational map



Appendix C: Interview Protocol

INTERVIEW PROTOCOL AND SCRIPT

Introductory preamble: *The purpose of this study is to examine the concept of ‘confidence’ during surgical residency training. More specifically, we want to discover how confidence develops throughout residency – how exactly does a resident gain the confidence to take up the scalpel and cut?*

Being a surgical resident myself, I am aware of the difficulties associated with a surgical residency and I personally have had ups and downs with my own confidence throughout the years. For this purpose of this interview, I am interested in your personal experiences with confidence and what your opinions are regarding confidence.

Start recording: *Review the information on the consent form and outline what is required from the participant. **Participant gives consent by signing the consent form.***

1. First activity: “icebreaker”

Make a list of 20 important words that come to mind for you when you think about your general surgical residency. Divide the list into two groups, in any way that makes sense to you.

2. Getting to know you questions

a.	If you could pick one thing that you wouldn't have to worry about anymore, what would it be?
b.	If you had one week off a month (or 2 days per week), what are some of the things you like to do with your extra time?
c.	What are some of the things you like about being your age? What are some of things that you don't like so well?
d.	Is there anyone (real or fictional) that you admire and would like to be like?

3. Questions about surgical residency

a.	Before you began your surgical residency training, what did you think would be the more interesting parts of the experience?
b.	Have you changed some of your ideas about the interesting aspects of surgical residency or which aspects are more interesting?
c.	What did you think would be the more difficult aspects of your surgical residency? Did you have any surprises with regards to what is or is not more difficult?
d.	If you could make any changes to the surgical residency training program, what are some of the things you would change so that it could be a better experience for someone like you?

4. Explanation and discussion about the participant's confidence relational map

5. Questions about developing operative confidence during surgical residency training

a.	During your residency, what kinds of circumstances make it easier for you to feel confident?
b.	Would you say there are particular kinds of surgical experiences that make it more difficult for you to feel confident?
c.	In a surgical situation in which it is difficult to feel confident, what are some good things to do that help boost your confidence?
d.	How would you say your confidence in doing surgery during has changed over time during your surgical training?
e.	What are some of the hospital experiences that have helped boost your confidence the most? (i.e. clinic, OR, emergency room)
f.	What are some elements outside of the hospital that help boost your confidence?
g.	Can you say more about the kinds of experiences or events that contributed to any of your changes in confidence?
h.	If you could go back in time to the beginning of residency, what, if any, words of advice would you give yourself?
i.	<i>Probing question...can you give me an example if one comes to mind easily?</i>

6. Close-ended questions about confidence

Confidence is a difficult concept to define. Most people understand its general meaning and its importance, but have difficulty putting it into words. Additionally, confidence can be defined differently depending on the person, place, time, and setting. Surgical literature rarely defines the term but frequently mentions it when discussing matters of resident learning.

a.	What does the term confidence mean to you? How would you define it?
b.	Why do you think confidence is important during residency?
c.	What do you think is the most important factor for developing confidence during residency?

7. Closing remarks:

This concludes our interview. Is there anything you wanted to add or further discuss? Is there anything that I might have forgotten to ask or discuss? Do you have any questions for myself?

Thank you very much for participating, it is much appreciated! As a token of our appreciation, we would like to give you this coffee gift card.

Appendix D: Member check/research brief template

RESEARCH BRIEF

On _____, 2017 you participated in a semi-structured interview with myself (M. Lees). The focus of our conversation was to glean more information regarding the development of confidence during surgical residency training. The following is a brief summary of the things we discussed.

Please review the details below and reply to this summary with the following pieces of information:

1. Does this summary reflect your memory of our interview?
2. Do you have anything additional to add about the development of confidence during surgical training or any additional responses to the questions listed?

Thanks,
Mackenzie

SUMMARY OF INTERVIEW

1. **Getting to know you questions**
 - a. **One thing you wouldn't have to worry about anymore:**
 - b. **What would you like to do with your free time:**
 - c. **Likes/dislikes of your age:**
 - d. **Person you admire:**
2. **Questions about surgical residency**
 - a. **Interesting things about residency:**
 - b. **Difficult aspects of residency:**
 - c. **Changes to the residency program:**
3. **Questions about developing confidence during surgical residency training**
 - a. **Circumstances that make it easier to feel confident:**
 - b. **Circumstances that make it difficult to feel confident:**
 - c. **How to boost your own confidence:**
 - d. **Change in confidence over time:**
 - e. **Experiences that help boost confidence the most:**
 - f. **Advice to yourself:**

4. How would you define confidence and competence?
 - a.
5. Why do you think confidence is so important during residency?
 - a.
6. Single most important factor for developing confidence?
 - a.
7. **Your confidence map** (identifying factors that have a smaller versus larger impact on the development of your confidence)



APPENDIX E: Example of completed member check

RESEARCH BRIEF

On February 16, 2017 you participated in a semi-structured interview with myself (M. Lees). The focus of our conversation was to glean more information regarding the development of confidence during surgical residency training. The following is a brief summary of the things we discussed.

Please review the details below and reply to this summary with the following pieces of information:

1. Does this summary reflect your memory of our interview?
2. Do you have anything additional to add about the development of confidence during surgical training or any additional responses to the questions listed?

Thanks,
Mackenzie

SUMMARY OF INTERVIEW

1. Getting to know you questions

- a. **One thing you wouldn't have to worry about anymore:** research
- b. **What would you like to do with your free time:** visit home, more time to the adjuncts of residency (reading/studying), team sports, the personal things
- c. **Likes/dislikes of your age:** able to tolerate lack of sleep, younger end of cohort, maybe people are a bit nicer. Dislike = not being able to connect with your staff as easily, judgments from patients about how young you look
- d. **Person you admire:** mixture of characteristics combined from various senior residents

2. Questions about surgical residency

- a. **Interesting things about residency:** initially just the operating (touching things!), knowing the abilities of surgeons and what we can do. Now the medicine itself has become more interesting, and how that interplays with surgery – having that deeper understanding about what's really going on with anatomy and physiology, etc
- b. **Difficult aspects of residency:** time management, social life, stress of meeting expectations, deciding how to please whichever staff you're working with (particularly overnight while on call)
- c. **Changes to the residency program:** better balancing of rotation schedules over our 5yrs, planning rotations according to long-term goals; stronger mentorship program; decreased paperwork (i.e. ward work)

3. Questions about developing confidence during surgical residency training

- a. **Circumstances that make it easier to feel confident:** supportive operating environment, nice staff person, *“Generally speaking, just your current state, in terms of recent evals (good or bad)...I think that's intimately tied to how well you feel about that current period that you're at. In the big picture sense, good feedback helps you feel more confident and vice versa.”*
- b. **Circumstances that make it difficult to feel confident:** mistakes, bad feedback, bad relation with staff

- c. **How to boost your own confidence:** thinking about the times where I have done something well or received good feedback; talking through the problem, explaining why I chose to do something (operating or management plans), asking for help
- d. **Change in confidence over time:** *“Overall it’s improved but it frequently gets leashed back when you realize all the things you can’t do. So if you were to draw it in a line graph, it would look like a mountain range going up, with multiple ups and down, but the overall trend is upwards”*
- e. **Experiences that help boost confidence the most:** managing sick patients, clinic (indirectly), good feedback. *“No matter what you do, as long as you’re doing the right thing in that situation, then that makes you feel better and more confident.”*
- f. **Advice to yourself:** Better time management, regular reading schedule

4. How would you define confidence?

- a. *“It’s a self-perceived sense of skill and ability. It has to do with the person.”*

5. Why do you think confidence is so important during residency?

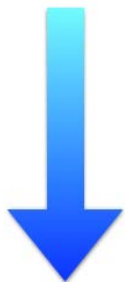
- a. Affects other people’s perception of you, affects your progression, impacts your performance, affects your peers, junior learners, patients. Leads people into not trusting you. *“If you’re more confident, you’ll be perceived as more competent and they’ll let you do more.”*

6. Single most important factor for developing confidence?

- a. *“I think the most important factor would be whether or not you see yourself improving....So again, all of those things in that inner circle of the relational map would be the most important things for developing confidence: repetition, practice, inherent self-confidence, explicit/direct didactic teaching and errors/mistakes... so those are important. But even more so, if you don’t think that you’ve improved, regardless of what others say, then your confidence is stagnant too.”*

7. Your confidence map (identifying factors that have a smaller versus larger impact on the development of your confidence)

Smaller impact



Larger impact

Interest level, Morale of training program, mentorship
Sleep level, expertise of teacher, skill level of assistant
Self-perceived comparison to colleagues, overall mental health, stress level, level of training, understanding of anatomy/physiology
Understanding/urgency/frequency of procedure, attitudes of allied health member
Evaluations, regular feedback, relationship with operating staff, difficulty of procedure