Online Competency-Based Resident Assessment for the Discipline of Anesthesiology: A Needs Assessment

Christina Tremblay

Lakehead University

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Dr. Christina van Barneveld

Thesis Supervisor

Dr. Rachel Ellaway

Committee Member

Abstract

In Canada, the Royal College of Physicians and Surgeons of Canada (RCPSC) are implementing a model of competency-based medical education (CBME) for all specialty-training programs called Competence by Design (CBD). Anesthesiology is an RCPSC discipline that is represented at all medical schools in Canada and is among the first specialties to adopt CBD. The RCPSC model of CBD includes frequent observations and assessment of resident performance; competence committees review this data in order to make decisions on resident progress. Electronic portfolios are an important enabler in moving to CBD given the volume of assessment data, the complexity of data generated, and the need for comprehensive reporting of resident competence.

The purpose of my study was to describe the perceived data needs and challenges of anesthesiology programs when implementing CBD. In stage 1 of my study, stakeholders were interviewed regarding their needs and challenges in handling CBD assessment data. Stakeholders in stage 1 included 13 experts from the RCPSC CBD working group charged with defining the competencies for anesthesiology at the national level. The findings from this stage were used to help structure questions for stage 2 of my study, which included three focus groups. The resident focus group comprised of 4 residents, the faculty focus group comprised of 3 faculty members, and CBD focus group comprised of 5 CBD experts. Participants were recruited from across Canada.

The data from stage 1 suggested that, although contextual variables such as local culture and availability of resources were important, there were similarities in the needs and challenges of anesthesia programs when implementing CBD. These similarities fell into 4 main converging themes: balance between localization and a common model for assessment tools and practices, information access and ownership, performance monitoring, and the need for training. In stage 2 these themes were discussed more thoroughly by all focus groups. Each focus group highlighted

items of particular importance, which I have called diverging themes. These included scheduling concerns from the faculty focus group, information access post-training by the CBD focus group, and four risks by the resident focus group. These four risks were the bias of faculty when promoting residents, reductionism resulting in a loss of valuable feedback, lack of time and space impacting patient care, and potential legal ramifications. The perceived needs and challenges of using an electronic portfolio in both stages were intertwined with general needs and challenges of CBD implementation. Results of the study are discussed in relation to theory and past research. Recommendations are provided. I conclude the thesis with key questions derived from my findings that should be posed to all stakeholders when adopting an electronic portfolio for the purposes of CBD. Further research is recommended to evaluate current electronic portfolio systems and their ability to successfully support CBD.

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Chapter 1: Introduction

Canadian medical education is moving to competency-based medical education (CBME), which involves a change in the way resident competence is assessed (Frank et al., 2010). The Royal College of Physicians and Surgeons of Canada (RCPSC) is implementing CBME, branded as Competence by Design (CBD), in each of the 84 disciplines over several years. I chose anesthesiology as the focus for my study because it was one of the first to launch CBD and every medical school in Canada has an anesthesiology residency program. In 2017, the RCPSC launched their new teaching, learning, and assessment strategy for anesthesiology residency education as part of their CBD initiative.

CBD calls for multiple formative observations to demonstrate achievement of competence. The increased number of formative assessments requires program leadership and residents to have a mechanism to illustrate progression of competence in real-time. This marked importance of assessment processes and assessment data introduces the need for a robust multi-faceted assessment system, which has been modeled as a kind of electronic portfolio (Driessen & Scheele, 2013; Holmboe, Sherbino, Long, Swing, & Frank, 2010; Jefferies, Simmons, Ng, & Skidmore, 2011; Metheny et al., 2005). A portfolio is defined by the RCPSC as "a flexible, multi-faceted means of collecting evidence of the achievement of competence over time" (Bandiera, Sherbino, & Frank, 2006, p. 32). Another definition of a portfolio is "a collection of evidence maintained and presented for a specific purpose" (Carraccio & Englander, 2004, p. 382). An electronic portfolio offers the potential ability to provide real-time progression data that transparently enables success. This real-time progression data could allow the learner to direct their own learning path which enables them to identify their weaknesses and advocate for their learning needs in alignment with CBME

(Carraccio & Englander, 2004; Donato & George, 2012). Some of the barriers identified regarding the use of portfolios are the time it takes for learners to maintain, the mentor's familiarity with portfolios, and the uncertainty of how to use a portfolio (Carraccio & Englander, 2004; Donato & George, 2012). Although the use of electronic portfolios predates CBD, the focus of my research is on the use of electronic portfolio systems to support residency programs in the move to CBD. I explored this by examining stakeholder needs and challenges as they related to the implementation of an electronic portfolio in CBD for the discipline of anesthesiology.

Situating the Researcher

I acknowledge that, as a participant in the adoption of CBD in anesthesiology at the Northern Ontario School of Medicine, I may be unable to be fully objective in this study. Therefore, in the interests of full disclosure I present the following reflexive statement. My role within medical education at the NOSM began in 2011 when I took up a position with the Sudbury anesthesiology faculty as Program Coordinator. My duties were to support them locally and assist with the development of a new Royal College anesthesiology program at the NOSM. We were aware of the upcoming move to CBME and took this under consideration when planning this new educational program.

The design for the NOSM anesthesiology program focused on establishing a culture within the clinical setting by teaching faculty about assessment for learning, increasing assessment completion by monitoring faculty compliance, and clearly defining program expectations of resident performance. All three of these new program principles align with CBME and were lacking in the previous joint NOSM/Ottawa anesthesiology residency program. We developed and implemented an online learning management system as a way of providing residents a single

location for all curriculum and program related documents. This system is used as a mechanism to illustrate expectations on resident performance within the NOSM anesthesiology program.

In 2013, I transitioned to my current role of Assistant Curriculum Instructional Designer at the NOSM where I have continued to work very closely with the anesthesiology program as well as with other specialty programs. Given the July 1, 2017, CBD launch date for anesthesiology across Canada, I worked to ensure the NOSM anesthesiology program was ready to successfully implement CBD at that time. This work focused on choosing an effective electronic portfolio, converting the daily paper assessment forms to electronic, and training faculty on how to use the new competency framework and how to use the new electronic portfolio.

I continue to support the use of electronic portfolios, which could enable a smoother transition to CBD for residents, faculty members, and administrators. In my experience, portfolios are an essential component to successful implementation of CBD and are an accreditation requirement (RCPSC, 2017). I have also observed local frustrations when we discuss electronic portfolios because what residents, administrators, and faculty leadership need, does not match what is being delivered within current NOSM postgraduate programs. For instance, the residents use two disparate electronic systems with half of their assessment data in one electronic system and half in the other. Each electronic system has different reporting capabilities making it more difficult for residents to track achievement of outcomes and plan learning trajectories.

I use Lincoln and Guba's (1985) trustworthiness criteria to reflect on the methods I used to minimize research bias: credibility, transferability, dependability, and confirmability. Each criterion has multiple ways of being incorporated into qualitative research. I have employed them throughout my study to reduce chance of bias. In terms of credibility, my prolonged engagement in the field helps my insight into the context to minimize the distortions, and I used triangulation of stage 1

interview results using focus groups. For transferability, I used purposeful sampling of participants to ensure I was speaking with individuals knowledgeable on the topic providing depth to my findings. For dependability I used the code-recode strategy (Braun & Clarke, 2006) with my results, which helped me gain a deeper understanding of patterns in the data. For confirmability I used reflexive journaling throughout the entire research process to monitor the influence of my own background, perceptions and interests (Anney, 2014).

Problem Formulation & Research Question

My study assumes that implementing a robust electronic portfolio for anesthesiology CBD that can illustrate real-time resident progression, provides adequate triangulation of resident data, and reports on resident progression is likely to be challenging. There are multiple factors that might influence the success of an electronic portfolio system including alignment with program needs, flexibility and adaptability, alignment and communication with other products such as institutional learning management systems, ongoing training, and setting a clear purpose (Donato & George, 2012). Additional factors are likely to include the needs and expectations of the RCPSC and medical education community to provide reports on learner progress, acceptability and validity of competency assessments as well as the electronic portfolio's applicability to a broad range of specialties.

Based on discussions with CBME leads, program directors, and program administrators from schools across Canada, at the time of my study there was no one system available that was able to deliver these items. This deficit made it challenging to envision an effective adoption of a CBD model. I therefore conducted a needs assessment study on current electronic portfolios and associated processes in use in anesthesiology, to discover what challenges and benefits

anesthesiology faculty saw regarding online assessment, what the future model of online assessment would look like, and tried identifying the gaps between current practices and future practices. My research question was as follows: *Within the context of Competence by Design (CBD), what are the perceived needs and challenges for Canadian postgraduate anesthesiology program stakeholders in moving to an electronic portfolio?*

Chapter 2: Literature Review

This chapter provides a platform for understanding the important concepts of my research question by discussing the current literature and existing gaps in knowledge. I explore the following main concepts: CBME and CBD, electronic portfolios, anesthesiology programs, and needs assessment research.

CBME and CBD

Hauer (2014) differentiated between traditional models of residency training and those that support entrustment decisions. Traditional models of residency education generally included little training to supervisors on teaching, and trainees being assigned tasks based on year of training or staffing needs rather than individualization. Trainees often felt uncomfortable seeking help, which rewarded clinicians who discouraged questioning or uncertainty. Traditionally, faculty and residents worked together for only a brief duration of time culminating in one general end of rotation assessment of resident performance. These assessments were often vague and of little value (Hauer, 2014). The traditional model for teaching is doctor-centred, assessment is mainly summative and based on testing theoretical knowledge, and the learner is viewed autonomously rather than as part of a team (Klass, 2007).

In the early 1990s the RCPSC took a first step to moving to CBME by developing a competency framework coined the Canadian Medical Education Directives for Specialists (CanMEDS) and implemented this framework across all Canadian medical schools in 1996 (McMillan, 2014). The most recent iteration of this framework is CanMEDS 2015 (RCPSC, 2017). The CanMEDS 2015 framework is represented in reports using the image of a flower, where the center of the flower represents the central role of a physician as Medical Expert, and the petals of

the flower represent other roles of a physician: Communicator, Collaborator, Leader, Health advocate, Scholar, and Professional (RCPSC, 2017). CanMEDS is a widely accepted competency framework in health professional education, with variations adopted around the world (Iobst et al., 2010; Mulder, 2010). Although the CanMEDS competency framework has been used to inform outcomes in the Canadian version of CBME, this is just one of the five educational principles of CBME (ten Cate, 2012). Each of these educational principles has been employed within the CBD framework.

(1) Outcomes-based. Focusing on outcomes in medical education is a challenge because of the lack of reliable standards for physician knowledge and competencies which require definition (Taber, Frank, Harris, Glasgow, Iobst, & Talbot, 2010). In Canada, outcomes for achieving competence are defined at the national level (RCPSC, 2017). To decide the competence of a resident, faculty observers are asked to make entrustment decisions on a regular basis. Within the clinical context this is described as "the reliance of a supervisor or medical team on a trainee to execute a given professional task correctly and on his or her willingness to ask for help as needed." (ten Cate et al., 2016, p. 191). There is a certain amount of risk that must be accepted when making entrustment decisions on residents in the clinical setting (ten Cate et al., 2016). The outcomes-based model combines graded responsibility with an effective supervision model to reduce risk to the patient (ten Cate et al., 2016).

Making decisions based on entrustment is a culture shift for all of Post Graduate Medical Education (PGME) across Canada (RCPSC, 2017). Hauer et al., (2014) outlined the differences between current cultures in training as compared to one based on structured or summative entrustment decisions. Entrustment decisions common in current clinical settings are "ad hoc

entrustment decisions by clinical supervisors about trainees which are usually based on a mix of estimated trustworthiness of the trainee, estimated risk of the situation, urgency of the job to be done, and suitability of this task at this moment for this learner" (ten Cate et al., 2016, p. 193). The second type of entrustment decision described was "summative entrustment decisions, grounded in sufficient evaluation and made by educational program directors or clinical competency committees" (ten Cate et al., 2016, p. 193). The shift to outcomes-based training with summative entrustment decisions requires more training of faculty observers, tailoring learning and assessment to resident needs, trusting residents to seek supervision when needed, encouraging self-reflection, facilitation of longitudinal contact between faculty observers and residents, developmentally sequencing competencies and milestones to move toward unsupervised practice, and informing entrustment decisions using multiple sources of evidence (documented observations). According to Hauer et al. (2014), these behaviours are not fostered in the traditional environment. Once the outcomes framework is created, further faculty development to understand and apply the outcomes will be a challenge, as is echoed throughout other literature (Beard, 2011; Frank & Danoff, 2007; Holmboe et al., 2010; Malik et al., 2012; Whitehead, 2012). These changes also have implications for program evaluation and accreditation requirements locally and nationally (Taber et al., 2010), which will also require faculty development and support to ensure buy-in and success (Frank & Danoff, 2007). Given these many changes, the RCPSC has indicated it will be flexible in overseeing the move to CBD, recognizing that changes of this magnitude in the past (e.g.,CanMEDS competency framework) took ten years to adopt and implement across Canada (Frank & Danoff, 2007; RCPSC, 2017).

(2) Integrating knowledge, skills, and attitudes. When adopting a CBME model there needs to be consideration of how to base curricula and assessment on individual competencies without neglecting the importance of the overall picture of competence (Taber et al., 2010). Maudsley et al. (2014) described competence as "not equal to a list of learning objectives or reductionist tasks; rather, competence is a broad objective that necessitates an integration of knowledge, skills and behaviours in practice" (p. 103). Promoting reductionism when developing and implementing assessment tools is a major concern identified in the literature (Carraccio et al., 2008; Hodges, 2013; Talbot, 2004; ten Cate & Scheele, 2007; van der Vleuten & Schuwirth, 2005; Whitehead, 2012; Zibrowski et al., 2009). Carraccio and Englander (2013) described this problem:

> Education broke them down into smaller and smaller fragments of behaviours that could be directly observed, and assessed them using a checklist. In trying to make something simple that is inherently complex, our tools allowed us to judge whether learners could perform simple tasks but not whether they were capable of integrating those tasks to care for patients…We can mitigate this threat to validity by embracing the complexity of the competencies; that is, looking for ways to assess the "whole," which in care delivery is greater than the sum of its parts. (p. 1069)

Although it is important to avoid reductionism, contextualizing and clarifying expectations of learners is also one of the main predicted benefits of moving toward CBME (Carraccio & Englander, 2013; Klass, 2007; Torbeck & Wrightson, 2005). Programs must balance describing the competencies in their discipline with the larger picture of overall competence (Taber et al., 2010).

Talbot (2004) identified a second concern regarding the demonstration of skills in one setting not necessarily demonstrating competence in general. If moved to a different context, the resident may no longer be able to perform that skill with the same level of competence and that

simply measuring the skill in one context is not enough (Talbot, 2004). Competency assessment is therefore one of the main challenges and reasons that implementation of CBME has failed in the past (Bhatti & Cummings, 2007; Carraccio & Englander, 2013; Carraccio, Wolfsthal, Englander, Ferentz, & Martin, 2002; Jefferies et al., 2011; Klass, 2007; Lurie, Mooney, & Lyness, 2009; Schuwirth & van der Vleuten, 2011; Swing, 2007; Talbot, 2004; ten Cate & Scheele, 2007; Torbeck & Wrightson, 2005).

Competency assessment is also a major factor in guiding the learning and behaviours of residents and faculty (Schuwirth & van der Vleuten, 2011). This is increasingly relevant when moving towards CBME:

> Competency-based medical education (CBME), by definition necessitates a robust and multi-faceted assessment system...For trainees, CBME requires enhanced attention to formative assessment to ensure they receive frequent and high-quality feedback to guide their development and the acquisition of the necessary competencies. (Holmboe et al., 2010, p. 676)

There is a consensus in the literature regarding the need to use a variety of assessment tools and assessors to adequately assess competence (Baartman, Bastiaens, Kirschner, & van der Vleuten, 2007; Carraccio & Englander, 2004; Driessen & Scheele, 2013; Gaytan, 2005; Govaerts, van der Vleuten, Schuwirth, & Muijtjens, 2007; Holmboe et al., 2010; Metheny et al., 2005; Schuwirth & van der Vleuten, 2006; van der Vleuten, Schuwirth, Driessen, Govaerts, & Heeneman, 2014), frequent workplace-based assessment with multiple raters and timely mechanisms for feedback is key to the implementation of CBME within postgraduate programs, and it is a key component in establishing the validity of a program's assessment measures of a resident's

attainment of competence (Iobst et al., 2010; Swing, 2010). Pereira and Dean (2009) suggested that multiple assessment methods are needed to take into account the complex interplay of knowledge, skills, aptitudes, and values necessary to achieve competence.

(3) Time-independent. With CBME, it is possible for learners to progress at different rates through the program (Taber et al., 2010). However, in a time-free model the logistics of balancing training experiences and delivering good health services can be a challenge (Taber et al., 2010). To have resident scheduling be completely time-free would require "tremendous administrative resources, along with the allocation of financial and material resources … for example, if a trainee moves from a given training module earlier than expected, a gap in patient care provision could result unless another trainee is immediately available to step into his or her place" (Nousiainen, Caverzagie, Ferguson, & Frank, 2017, p. 595). The RCPSC has adapted this educational principle of CBME by using time as a resource rather than trying to achieve time-independent specialty programs (RCPSC, 2017, ten Cate, 2012).

(4) Individualized. "In adopting a CBME model, medical educators must consider how to base curricula and assessment on individual competences while not neglecting the less tangible aspects of overall, integrated competence" (Taber et al., 2010, p. 689). The challenges of individualized learning in relation to policy and procedure follow from "greater faculty involvement of observation and assessment as well as in the supervision of individualized learning pathways. The implication may be a need for additional faculty, or for individual clinical teachers to spend more time teaching, thus taking clinical practice time away from an already underserviced enterprise" (Taber et al., 2010, p. 689). This may result in increased workload for the program

directors and faculty, and a shortfall in the remuneration for the amount of work asked of them (Malik, 2012). There are a number of questions outlined by Taber (2010) with respect to this: "How can the need for additional involvement from faculty be organized? What is the potential impact on patient care? What are the implications for remuneration? Will additional personnel be required?" (p. 689). This is increasingly complicated because resource needs are the responsibility of multiple stakeholders such as "government, academic centres, hospitals, and other health care organizations" (Taber et al., 2010, p. 689).

(5) Workplace learning. Residency education already used clinical workplaces as the setting for learning with clinical rotations and in-training assessment reports. CBME calls for increased monitoring of this workplace learning, which has led to new formative and summative assessment tools and processes as they relate to the overall picture of competence through a program of assessment (Taber et al., 2010). When choosing tools it is important to take into account the purpose of the assessment (i.e., formative or summative), practicality, reliability, and validity (Sherbino, Bandiera, & Frank, 2008).

Concerns around reliability and validity of these new assessment tools are echoed throughout the literature with respect to assessment (Driessen & Scheele, 2013; Metheny et al., 2005; Sherbino, Bandiera, & Frank, 2008; van der Vleuten et al., 2014; van der Vleuten & Schuwirth, 2005). Development of good assessment tools is important but what seems to be more pressing is ensuring inter-rater reliability, which cannot be inherently a quality of the tool itself (van der Vleuten & Schuwirth, 2005). This is why there is a need for a robust multi-faceted system of assessment with multiple well-trained assessors (Driessen & Scheele, 2013; Holmboe et al., 2010; Metheny et al., 2005; Sherbino et al., 2008; van der Vleuten et al., 2014). Increasing the frequency

and heterogeneity of assessment tools will increase the reliability and validity of the overall summative interpretations and judgements (Driessen & Scheele, 2013).

A program of assessment should provide a master plan of assessment across a residency program rather than focusing on individual assessments, so that:

> Individual assessments, purposefully chosen in such a way that the whole is more than the sum of its parts. Not every individual assessment, therefore, needs to be perfect. The dependability and credibility of the overall decision relies on the combination of the emanating information and the rigour of the supporting organizational processes. (van der Vleuten et al., 2014, p.1)

Reviewing all resident assessment data collectively rather than each individualized assessment as stand-alone entities is an attempt at moving away from anatomizing competency into a checklist of items for achievement (i.e., reductionism), and aligning assessment with the educational goals and strategies employed in a residency program (Bhatti & Cummings, 2007; Chan & Sherbino, 2015; Holmboe et al., 2010; Metheny et al., 2005; Sherbino et al., 2008; van der Vleuten et al., 2014). Although there has been a recent shift in methods of assessment to include qualitative data captured through multi-source feedback, self-assessment, peer assessment, and portfolios (van der Vleuten & Schuwirth, 2005), it can be challenging to aggregate them to allow for interpretation of these assessments (Driessen & Scheele, 2013).

These 5 educational principles (outcomes-based; integrating knowledge, skills and abilities; time-independent; individualized; and workplace learning) all apply to the CBD framework with the exception of time independency. Taber et al. (2010) explained that variation in completion times needs further exploration before this might be looked at as a viable option. They indicated

that the shortening or lengthening of training time should take into account issues such as differences in residents, residents' essential role in service delivery, and the time required for residents to mature and integrate competencies within their practice (Taber et al., 2010, p. 690).

Stages of Training. There are four stages of training during the span of residency within the CBD framework. These stages are labelled 'transition to discipline', 'foundations of discipline', 'core of discipline', and 'transition to practice'. Each stage varies in length depending on the discipline and local context but recommended durations of time for each stage are set out by the CBD working group for each specialty. The 'transition to discipline' stage focuses on introducing residents to their specialty, providing them with orientation to CBD, and assessing their current skills and knowledge (RCPSC, 2017). The 'foundations of discipline' stage focuses on residents providing care for patients who are mostly healthy and developing their skills to help them care for more complex patients (RCPSC, 2017). The 'core of discipline' stage focuses on residents managing care for both uncomplicated and complicated patients across their lifespan. It broadens the range of procedures residents will encounter within different patient care settings, and extends abilities in residents taking care of critically ill patients (RCPSC, 2017). The 'transition to practice' stage focuses on refining and polishing residents' skills, preparing for independent practice, and ensuring they can provide comprehensive care for all their patients (RCPSC, 2017). The stages function as markers of resident progression. Each stage has its own milestones, Entrustable Professional Activities (EPAs), and training requirements.

Milestones. Milestones are defined by the RCPSC as "an observable marker of an individual's ability along a developmental continuum" (RCPSC, 2017). In the CBD framework,

milestones are based on the CanMEDS competencies for that discipline. They are intended to add transparency for all stakeholders because they help form a shared understanding of performance expectations when completing assessments on resident progress (Carraccio & Englander, 2013). Milestones are a specialty-specific list of behaviours that faculty observe to make entrustment decisions on resident competence (RCPSC, 2017). Recall the problem of reductionism discussed earlier, making the milestones alone, too labour intensive and anatomized when assessing each individually (Carraccio et al., 2008; Talbot, 2004; ten Cate & Scheele, 2007; van der Vleuten & Schuwirth, 2005). Faculty entrustment decisions on EPA performance are proposed as the solution to the reductionism problem because it aggregates the milestones (CanMEDS framework) into the essential competencies within the discipline (Boyce, Spratt, Davies, & McEvoy, 2011; Frank et al., 2010; Giudice & Carraccio, 2011; Jones, Rosenberg, Gilhooly, & Carraccio, 2011; Mulder, 2010; ten Cate, 2005; ten Cate & Scheele, 2007; ten Cate, Snell, & Carraccio, 2010).

Entrustable Professional Activities (EPAs). EPAs were first introduced as a way to conceptualize the overall competence of a learner while not reducing competence to a checklist of items (Hauer et al., 2013; ten Cate, 2005). EPAs are linked to clinical practice in such a way that they are a task of that discipline and should be familiar to residents, faculty, and the public (Jones et al., 2011). The RCPSC (2017) has defined an EPA as "a key task of a discipline that can be entrusted to an individual who possesses the appropriate level of competencies." That is to say that once a faculty member feels that a key task can be entrusted to the resident, the resident has demonstrated competence for that task (RCPSC, 2017).

Each EPA requires multiple observations by different faculty members before the resident is deemed competent to practice the task independently (RCPSC, 2017). By mapping the milestones

as tangible entities within the larger umbrella of an EPA, the concept of measuring competence should become contextualized to medicine, achievable, and residents should have a much clearer conceptualization of their progress within their program (ten Cate, 2010). ten Cate (2005) identified attributes for an EPA:

1. Part of essential professional work in a given context;
2. Must require adequate knowledge, skill and attitude, generally acquired through training;
3. Must lead to recognized output of professional labour;
4. Should usually be confined to qualified personnel;
5. Should be independently executable;
6. Should be executable within a time frame;
7. Should be observable and measurable in their process and their outcome, leading to a conclusion ('well done' or 'not well done'); and
8. Should reflect one or more of the competencies to be acquired. (p.1177)

These attributes illustrate the complexity of EPAs and highlight their applicability to medicine. The EPA is intended to make the core competencies meaningful and allows residents and faculty the opportunity to reflect together on significant elements of professional context as represented by the competencies (Jones et al., 2011). The importance of having the CanMEDS or any competency framework contextualized to clinical practice in the form of workplace based assessments (WBAs) is stated in much of the literature and might be seen as one of the most important attributes of the EPA framework as alluded to by the aforementioned list of attributes (Boyce et al., 2011; Frank et al., 2010; Holmboe et al., 2010; Powell, Carraccio, & Aschenbrener, 2011; Schuwirth & van der Vleuten, 2006; ten Cate, 2005; ten Cate et al., 2010).

The shift to CBD involves a shift in thinking toward patient-centred care, authentic and formative assessment, and focused on performance improvements (Klass, 2007). CBD focuses on the assessment of resident performance in context (Bhatti & Cummings, 2007; Carraccio et al., 2008; Carraccio & Englander, 2013; Klass, 2007; ten Cate, Snell, & Carraccio, 2010). In CBD, EPAs and milestones are translated into daily assessment tools intended to help faculty implement and operationalize CBD in alignment with defined outcomes (RCPSC, 2017). This is not to say that all program requirements will be encompassed within a specialty program's EPAs but it is intended that the vast majority will and that those that do not fit within an EPA will be defined as a stand-alone entity for residents to achieve separately (e.g., completing an Advanced Cardiac Life Support course). The policy that describes these stand-alone requirements as well as the required and recommended clinical exposures, is titled training experiences.

Training experiences. In the traditional context of PGME, specialty training requirements dictated the required duration, content and sequence of training in the form of a rotation-based roadmap for each specialty. A resident successfully completing their specialty training requirements is expected be able to demonstrate all of the CanMEDS competencies outlined by their discipline (RCPSC, 2017). For example, traditional anesthesiology programs required a minimum of 30 months in anesthesiology, 3 months in the intensive care unit (ICU), one month of thoracic anesthesia, etc. equivalent to the full five years of training. With the move to CBD, these requirements have become less prescriptive, allowing more freedom for each program to plan clinical exposure and duration locally.

The new discipline-specific training experiences policy for each specialty now includes required, recommended, and other training experiences (RCPSC, 2017). The major change is that

the new policy no longer dictates the duration of time in a specific specialty area of training. This replaced the specialty training requirements and was developed by the RCPSC CBD working group as they transitioned to CBD (RCPSC, 2017). For example, the anesthesiology training experiences policy now indicates that the clinical exposure that must occur during the 'Transition to Discipline' stage of training includes exposure to peri-anesthetic areas, preoperative anesthesia, the operating room, and post-anesthesia care. The policy also requires that the residents receive orientation to anesthesiology and CBD (RCPSC, 2017).

These training experiences are linked to each of the stages of training and also encompass items like orientation, and certifications, which would not fit EPAs. This is to allow programs to plan more flexibly in accordance with resident progress, giving residents more time in disciplines where they struggle and less in those for which they excel. This new model intends to allow programs additional flexibility but hinges upon successful implementation of EPAs with frequent low-stakes observational workplace-based assessments (WBAs).

Workplace-based assessment (WBA). WBAs include any type of assessment occurring within the clinical setting (Driessen & Scheele, 2013). This includes multi-source feedback, and encounter cards. The RCPSC defined encounter cards as a "method of direct assessment that helps the assessor to capture observations of clinical competence from brief encounters with learners" (Bandiera, Sherbino, & Frank, 2006, p.39). It is of note that throughout the literature, encounter cards have been given many names such as 'mini clinical exams' (mini CEX), 'micro clinical exams' (micro CEX), 'daily evaluation cards', and 'daily observation cards' (DOCS). For this study, the term 'workplace-based assessment' (WBA) will be used to cover different kinds of daily observational resident assessment.

Multi-source feedback is defined as an assessment that gathers data from multiple observers regarding particular resident behaviours or professional constructs (e.g., professionalism and communication skills) of the resident. In educational settings, observers may include physicians (e.g., resident peers, supervising physicians), allied health professionals (e.g., nurses, pharmacists and psychologists), medical students, patients, and family members. A self-assessment is frequently included (Bandiera, Sherbino, & Frank, 2006).

Driessen and Scheele (2013) made three recommendations for the optimization of these tools including: alignment with assessors' expertise and trainees' developing ability in the workplace, the use of holistic rating scales, and focusing only on those competencies relevant to the actual activity in question. Carraccio (2013) expanded on this, stating that:

> The first is that our preconceived notion of what learners are capable of doing may result in a significant gap between expectations and performance...The second...is that the biggest problem in evaluating competencies is not the lack of adequate assessment instruments but, rather, the inconsistent use and interpretation of those available by unskilled faculty. (p. 1069)

Chan and Sherbino (2015) described the development of WBA tools and their implementation within their program of assessment. These WBAs focused on authentic emergency medicine tasks rather than generic competencies by using a checklist of items for the faculty to observe and a holistic rating scale to denote their level of entrustment. It was noted that this tool helped guide faculty in developing a shared mental model of program expectations and generating more specific actionable feedback. Furthermore, they illustrated that since the adoption of these WBA forms, the in-training assessment reports (ITARs) had significantly more agreement than earlier forms (Chan & Sherbino, 2015). Faculty assessors based their judgement on a compilation of observations or

workplace-based assessments over a period of time (usually in a 4 week ‘clinical block’). Each assessment is based on the CanMEDS competency framework according to accreditation standards (RCPSC, 2017).

Barriers remain even if faculty accept WBAs as a better approach. Driessen and Scheele (2013) observed that WBA programs are often overly complex and subjective, placing too large a burden on busy trainees and supervisors, and not stimulating trainees to strive for excellence. Carraccio and Englander (2013) described ways to address the challenges of CBME implementation:

> … the challenges to assessment in CBME are real, but we can address them by (1) improving reliability through frequent sampling, (2) reducing cost and increasing acceptability by building assessment into our daily work and studying the issues in implementation, (3) providing validity by bringing those assessments to the authentic clinical environment and aligning what we measure with what we do, and (4) adding impact by making assessment a "team sport" and for learners and their evaluators. (p. 1069-70)

In other words, frequent direct observations of resident behaviours using validated tools could address these issues (Carraccio & Englander, 2013). Programs then can use these assessment data to make decisions of resident progress. The bodies charged with making these important decisions within CBD are called competence committees.

Competence committee. CBD mandates that programs set up a competence committee to provide guidance for training activities to help residents progress in their current stage, to review all evidence, and to make evidence informed progress decisions using all available clinical and academic resident performance data (RCPSC, 2017). Competence committee reviews must occur at

least twice annually and/or at times of promotion from one stage to the next (RCPSC, 2017). Nearing the end of training, the competence committee makes summative entrustment decisions regarding certification and privileging residents for future unsupervised practice (ten Cate et al., 2016). Local decisions regarding the competence committee include membership composition, and a process for data aggregation, review and decision-making (RCPSC, 2017).

Other Frameworks

CBD is not the only approach to CBME (Boucher, Frank, Van Melle, Oandasan, & Touchie, 2017). Although implementations and designs vary between models, there is a common concept of producing physicians with the competencies to continue learning and adapting throughout practice to meet societal needs (Boucher et al., 2017). According to Boucher et al. (2017) CBME should be "flexible, socially accountable, measurable and evidence-based" (p. 2). Other CBME frameworks include The College of Family Physicians of Canada's (CFPC) Triple C curriculum (CFPC, 2018), the United States' Outcomes Project (Swing, 2007), the United Kingdom's Promoting Excellence for undergraduate medical trainees (GMC, 2015), and Australia and New Zealand's, Fellowship Competencies (RANZCP, 2018).

Although each of these CBME frameworks take a different approach, they still require a way to allow learner real-time accounts of how they are progressing within the program. For example the United States' Outcomes Project uses the terminology of Milestones instead of EPAs for their competencies which are linked to their six domains of care (Swing, 2007). The General Medical Council (GMC) in the United Kingdom started with undergraduate training rather than residency programs using themes rather than Milestones or EPAs (GMC, 2015). The Royal Australian & New Zealand College of Psychiatrists (RANZCP) has started to roll out CBME for

only one discipline rather than moving all programs nationally (RANZCP, 2018). The RANZCP framework is similar to CBD with the exception of indicating the number of months required in each of the disciplines to achieve competence (RANZCP, 2018). Whether they are called key features, EPAs, or something else, WBAs remain a key component for each of these frameworks and will need to be supported by an electronic portfolio to help manage the data they generate.

Electronic Portfolio

The CBD requirement of multiple WBA tools with multiple faculty observers generates large amounts of data that must be analyzed in a cohesive way in order to verify competency (Baartman et al., 2007; Benjamin, Robbins, & Kung, 2006; Gaytan, 2005; Pereira & Dean, 2013). One way of managing large amounts of data is to use an electronic portfolio to automatically aggregate multiple sources of WBA and portray resident data in a manageable way allowing for meaningful performance feedback to residents (Benjamin et al., 2006). Electronic portfolio systems for assessment are often designed to automate the process of collecting standard written assessments, which provides efficient means of accomplishing various administrative tasks consistently and simultaneously (Benjamin et al., 2006).

Using electronic portfolios in a CBD framework. As part of CBD, the RCPSC aims to provide each resident and fellow with a personalized RCPSC Resident ePortfolio to support lifelong learning and assessment (RCPSC, 2017). Each school is free to decide whether they wish to adopt the RCPSC Resident ePortfolio, continue using their current system if it can meet the requirements of CBD, or choose an entirely new system that can meet their requirements.

An electronic portfolio provides the opportunity for identifying areas that need to be addressed such as quality of faculty feedback, curriculum, feedback for trainees, faculty and administration, and teaching environment (Benjamin, et al., 2006; Carraccio & Englander, 2004; Donato & George, 2012; Driessen & Scheele, 2013; Edwards & Petra, 2013; van der Vleuten et al., 2014). Cambridge (2008) defined six primary functions of electronic portfolios: "(1) educational planning; (2) documenting knowledge, skills, and abilities; (3) tracking development (e.g., procedure logs); (4) finding a job; (5) evaluation within a course; and (6) performance monitoring in the workplace" (p. 1230). These primary functions of the electronic portfolio would help support implementation of the aforementioned educational principles of CBME (outcomes-based; integrating knowledge, skills and abilities; time-independent; individualized; and workplace learning; ten Cate, 2012).

Research literature on electronic portfolios. There are numerous electronic portfolio initiatives described in the literature including the: e-STEP program developed in the UK for surgical programs; Cleveland Clinic Learner College of Medicine portfolio developed in the US for Undergraduate students; ResEval developed at NYU for Internal Medicine residents; and PASS developed at Queens for Family Medicine residents (Dannefer, Bierer, & Gladding, 2012; Larvin, 2009; McEwen, Griffiths, & Schultz, 2015; Triola, Feldman, Pearlman, & Kalet, 2004). What all of these electronic portfolio systems have in common is that they endeavour to capture, measure, and present/report on competency-based data of learners in a timely and comprehensive manner. Keeping a simple logbook of skills, which reduces the profession to a mechanic checking off of technical tasks as they are completed, is not sufficient. A competent professional is more than the sum of their operational competencies (ten Cate & Scheele, 2007). These competencies are

captured through various assessment types including but not limited to: self, peer, faculty, and other allied health professionals' evaluation of residents; yearly in-service examination results; written examinations; oral presentations; resident research projects; clinical logging; daily evaluation cards; and reflection exercises (McEwen et al., 2015; Roark et al., 2006). Electronic portfolios are being used to mediate many of the new processes and additional assessment demands of CBME (McEwen et al., 2015; Triola et al., 2004; Wu, Dietz, Bordley, & Borgstrom, 2009). Pugh (2009) stated:

> …today's residents see an ever increasing range of diseases and conditions, and the surgical profession is faced with a continuous increase in new technologies and procedures, making an ill-defined time-based system no longer applicable to our educational needs...The most important aspect in using a web-based curriculum is to view it as an educational resource and tool meant to enhance teaching and learning. It is not a substitute for thoughtful educational program, nor is it a substitute for excellent teaching and mentoring. (p. 179)

An electronic portfolio should be a tool for teaching and learning, not a substitute for thoughtful education. Technology has altered the flow of information and the expectations surrounding our ability to navigate and develop knowledge (Wallace, Clark, & White, 2012). The use of a well-designed electronic portfolio should "vastly improve the organization, aggregation, and cataloguing of the multitude of residency performance artefacts and allow for portability of resident's portfolio as is required for CBME" (Rao et al., 2012, p. 457). Not only is portability important but the design of the system is fundamental in determining its success (Masters & Ellaway, 2008). Some of the processes that can be enabled by an electronic portfolio include the physician advisor helping to guide resident learning, resident ability to review real-time progress, and data aggregation for the

competence committee while ensuring protection of confidentiality (Dannefer et al., 2012; McEwen et al., 2015; Roach, Roggin, Selkov, Posner, & Silverstein, 2009; Triola et al., 2004).

Recommendations for the successful implementation of an electronic portfolio include: (1) defining a clear purpose; (2) incorporating functions already performed by learner; (3) orienting residents and mentors to clear expectations; (4) gaining buy-in from learners and mentors; (5) assuring adequate training time; (6) beginning with a limited number of portfolio assignments; (7) keeping content flexible to maintain authenticity; (8) ongoing faculty development; (9) using experienced clinician educators in portfolio review; and (10) creating a system for continuous improvement for the portfolio process (Donato & George, 2012).

It took five years for internal medicine programs in the United States to move over to an electronic portfolio with faculty development opportunities, champions, improving assessments, building a mentorship program, and posting some reflective exemplars (Donato & George, 2012). Some of the barriers in moving to an electronic portfolio include additional training requirements, cost, custom development needs, and ongoing maintenance of the system (Donato & George, 2012).

Roach et al. (2009) described the contextual requirements of electronic portfolios as being ‘practical’, ‘reliable’, and ‘valid’. The term ‘practical’ is described as feasible (affordable and acceptable), comprehensive (range of competencies it addresses), and relevant (viewed as important and worthwhile). The term ‘reliable’ is described as producing precise, consistent, and reproducible assessments with agreement between raters regarding any given individual’s performance. The term ‘valid’ is described as measuring the qualities it claims to measure with meaningful results for the population and the setting in which they are generated (Roach et al., 2009). To meet these contextual requirements, it is important to consistently evaluate the competency framework, the

assessment tools, and the electronic portfolio in place at each local institution. Each contextual requirement is important to building and maintaining an electronic portfolio within training.

Electronic portfolio challenges. Throughout the literature, there are a number of challenges listed to incorporating web-based systems into the clinical environment which include: (1) decrease in educational benefit with repetition (i.e., surface-learning); (2) barriers in deployment (i.e., low resolution, small screen, need internet connection, and compatibility with different platforms); (3) maintaining professional standards (i.e., privacy and security), volume license policies, resource limitation (e.g., expensive simulators); (4) lack of trained faculty; (5) ethical challenges (e.g., balancing educational interests with commercial needs); (6) organizational inertia, blurring of professional and personal boundaries; (7) not knowing which applications to trust; (8) unwillingness to change; (9) variable computer literacy levels; and (10) technophobia (Amin et al., 2011; Basu, Parvizi, & Chin, 2013; Chu, Erlendson, Sun, Alva, & Clemenson, 2012; Cook & Ellaway, 2015; Wallace et al., 2012). The most recurrent concerns in the literature surround issues of faculty development, adequate resources, and the difficulty of change (culture, management, and introduction of new innovation). Each electronic portfolio vendor has different faculty development opportunities and materials to help leadership, faculty, administrators, and residents. That said, the main onus is on the PGME office and local programs to ensure residents and faculty are trained on usage of the electronic portfolio.

In terms of change, Amin et al. (2011) lists three essential aspects of change associated with the use of technology: transmediation (moving existing information, practices, and tools to new media while retaining their essential qualities), innovation (forms and processes that could not exist without technology e.g., technology-enhanced simulation), and prosthesis (extends beyond human limits, allowing us to do things faster, more accurately, and in more places simultaneously than

would be possible without technology). Wallace et al. (2012) stated: "the rapid adoption of new technology (soon to be ubiquitous in clinical environments) has already transformed many aspects of our culture, commerce, and communication, and has the potential to change the way we teach, learn and practice medicine in the future" (p. 1). The new training algorithm must not only adopt and take advantage of new technologies but must be positioned to continuously address future advances in hospital and patient care diagnostic treatment modalities (Pugh et al., 2009). It is therefore imperative to involve the programs early on when making sweeping changes to their training systems as driven by educationalists and governments (Pereira & Dean, 2013). Otherwise it seems that these systems end up with an increasingly overwhelming bureaucratic burden of WBAs and domains of evidence that residents, faculty, and program leadership do not value as necessary components for success (Pereira & Dean, 2013).

Anesthesiology programs

Anesthesiology is defined as "a medical specialty responsible for the care of patients before, during and after surgical operations, labour and delivery, and certain interventional procedures" (RCPSC, 2017, p. 1). They are expected to be able to support and sometimes lead resuscitations, critical care medicine, palliative care, and pain medicine (RCPSC, 2017).

In Canada, to become an Anesthesiologist, a resident currently spends 5 years in a PGME program once they have completed undergraduate medical training (RCPSC, 2017). During their PGME program, the resident is immersed in clinical training in various clinical settings including but not limited to the emergency room, intensive care unit, operating room, pre-anesthesia clinic, post-anesthesia care unit, obstetrical care unit, pediatric care unit, and more (RCPSC, 2017). In these clinical settings, the resident learns skills related to being an anesthesiologist, as well as, a

well-rounded clinician by exposing them to many different patient cases with varying complexity. Although most of the training occurs at the bedside, all programs also have a component of academic teaching (RCPSC, 2017).

Programs generally take residents out of the clinical setting for academic teaching approximately one half-day per week where residents are taught the base knowledge for success in their discipline. This academic teaching includes but is not limited to simulation, problem-based learning cases, didactic teaching, and case-based learning. Each program will be unique in its scheduling, organization, and delivery of their academic curriculum to meet the anesthesiology competencies.

On July 1, 2017 anesthesiology was one of the first two programs to launch CBD (RCPSC, 2017). Although exciting to go first it also means they have faced additional implementation challenges along the way. The Fédération des Médecins Résidents du Québec (FMRQ, 2018) made recommendations based on themes of preparation prior to residency, training and pedagogical model during residency, and assessment during residency (milestones, EPAs, and competence committees). These included knowledge dissemination to residents and faculty, programs holding faculty accountable to completing assessments, prior and ongoing mandatory training for all faculty acting as resident clinical supervisor, ongoing reassessment of EPA appropriateness and practicality, face-to-face feedback despite the electronic portfolio, clinical scheduling allowing for success in achieving EPAs, and objective, transparent, comprehensive, and flexible competence committee decisions (FMRQ , 2018). These recommendations pertained to both of the programs that launched CBD in 2017. The practicality of achieving so many EPAs was particularly highlighted as important for anesthesiology.

Anesthesiology in Canada came up with a model based on 87 EPAs mapped to the stages of training, each with their own unique set of required workplace-based assessments (RCPSC, 2017). The stages can be as short as 2-3 months with 4 EPAs in transition to discipline or as long as 33-36 months with 44 EPAs in core of discipline (RCPSC, 2017). Each EPA requires between two and twelve competent observations within the defined parameters (e.g., minimum of 3 different assessors; minimum of 3 different surgical procedures; minimum of 2 different patient care settings) to achieve success (RCPSC, 2017). These expectations are taken under consideration but the final synthesis and decision rests with the competence committee. Upon implementation, the Anesthesiology program directors and residents found the number of parameters excessive and the discipline is seeking to reduce the number of EPAs. Disciplines that have yet to implement CBD are guided by the RCPSC to choose approximately 30-40 EPAs in their workshops at this time. I used a needs assessment as my methodology to determine other challenges, opportunities, needs, and gaps while implementing CBD and an electronic portfolio.

Needs Assessment as a Research Method

Altschuld and Watkins (2014) define needs assessment as "a measurable gap between two conditions – what currently is and what should be" (p. 6). Other researchers expanded their definition of needs assessment to include the prioritization of needs in order to help guide future decisions (Altschuld & Watkins, 2014; Leigh, Watkins, Platt, & Kaufman, 2000).

There are many needs assessment models. For example, Gupta (1999) reviewed needs assessment models that focused on employee performance. While these models were informative, they did not apply to the context of my research well. Other models can be described as hybrid models, integrating two or more models or approaches. For example, Altschuld and Watkins (2014,

p. 13) list Kaufman (2000 & 2002), Altschuld (2004 & 2010), Gupta et al. (2007 & 2014), and Watkins et al. (2012) as more hybrid needs assessment models. Two of these hybrid models included a more systematic approach to prioritization of needs and were applicable to my research question and my research context. These two were Kaufman's Organizational Effectiveness model and Witkin and Altschuld's three-phase approach (Altschuld & Watkins, 2014). I did not choose Kaufman's Organizational Effectiveness model for my thesis because it included looking at societal impacts and cost implications (Altschuld & Watkins, 2014; Leigh et al., 2000). Although those are important topics, they were outside of the scope of this research.

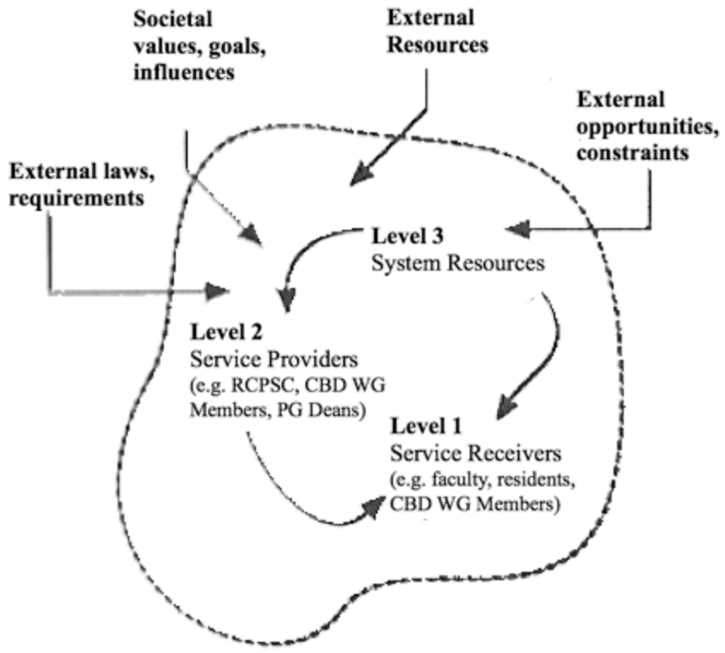
For this thesis, I chose Witkin and Altschuld's three-phase approach as described in the *Practical Guide for Planning and Conducting a Needs Assessment* (Witkin & Altschuld, 1995). Witkin and Altschuld's needs assessment model supports my research questions because it focuses on "…process improvement and achievement of the organization's goals for individuals and small groups" (Leigh et al., 2000, p. 91). Process improvement and achieving organizational goals are a main focus during the implementation of an innovation with the intention of linking these to larger external implications (Leigh et al., 2000). Witkin and Altschuld (1995) defined a needs assessment as: "A systematic set of procedures undertaken for the purpose of setting priorities and making decisions about program or organizational improvement and allocation of resources. The priorities are based on identified needs" (p. 4). This definition resonated with my understanding of the Canadian PGME system and provided a clear way forward in developing the methodology for my research. This model continues to be used by other researchers (Jackson et al., 2018; White & Altschuld, 2012).

One of the first important definitions following that of needs assessment is the complexity of a 'need' (Witkin & Altschuld, 1995). Defined as a noun, need refers to "the gap or discrepancy

between a present state (what is) and a desired end state future state, or condition (what should be) … in a sense, a need is like a problem or concern" (p. 9). When defined as a verb, need refers to "what is required or desired to fill the discrepancy-solutions, means to an end" (Witkin & Altschuld, 1995, p. 9). Solutions are often misconstrued as needs when the actual need should be defined as a problem. For example, one of the problems with increasing the number of assessments done within the clinical setting is that it increases the number of data points which becomes untenable to continue using current electronic or paper systems. Another important term defined by Witkin and Altschuld (1995) is "unmet needs which are predicated on the assumption that groups of people have needs that are not being met or not being addressed adequately" (p. 9). Some individuals have an awareness of these needs, termed 'recognized needs' and some of the needs have not yet been expressed, termed 'latent needs'. These needs all occur within a system where target groups have varying levels of need.

Witkin and Altschuld (1995) define a 'system' as "a regularly interacting or interdependent group of people forming a unified whole and organized for a common purpose…An important characteristic of a system is that all parts are interdependent. Anything that affects one part of the system has consequences for the whole" (p. 13). The system represented in this study included service receivers, service providers, and system resources inside the anesthesiology system with other external factors acting on and influencing that system (see Figure 1 - adapted from Witkin & Altschuld's system model 1995). This system included three levels of need. Level 1 (primary) is 'service receivers', the people for whom the system exists (Witkin & Altschuld, 1995). Without the residents requiring training and the faculty to train them there is no need for CBD or an electronic portfolio. Level 2 (secondary) 'service providers' included individuals that write policies, provide training, and govern the system. 'Service providers' still have needs within the system but my study

focused on primary needs. Level 3 (tertiary) 'system resources' included solutions to the problem at hand (Witkin & Altschuld, 1995). For example, an electronic portfolio is one proposed solution to the challenge of implementing CBD in Canada.



Legend: WG = Working Group; PG = Postgraduate.

Figure 1: Internal and external influencers who impact the overall anesthesiology system (model was adapted from Witkin & Altschuld, 1995, p. 11).

Service receivers in the anesthesiology system include faculty, residents, and the members of the anesthesiology CBD working group; the service providers in this system include the RCPSC, the members of the anesthesiology CBD working group, and the medical school PGME deans. System resources are part of the solutions required in moving forward with CBD implementation and should be a result of the needs assessment. The CBD working group overlaps both lenses of

service receivers and service providers, which helped to ensure I was looking at processes and functions across the system. It was my goal to uncover both the recognized and latent needs as viewed by the service receivers (Witkin & Altschuld, 1995). In accordance with Witkin and Altschuld (1995), service receivers (Level 1) were the stakeholder group identified for the interviews and focus groups to help identify what needs to occur at policy (Level 2) and system resource (Level 3) levels. Next, Witkin and Altschuld (1995) explained three phases of a needs assessment, which I used to inform my methodology: Each phase included criteria and questions to help guide the development of a sound approach to needs assessment.

The pre-assessment (Phase 1) is used to set up and define the general purpose of the needs assessment. This phase identified major need areas and/or issues and information regarding need areas, and determining which data to collect, from which sources, how, and the potential use for the data. Using the pre-assessment phase, I determined my focus and scope, my target group of participants, the best way to gather this data, target timelines and dates for the assessment phase, and a budget for meeting those timelines (Witkin & Altschuld, 1995). The design phase of my study was enhanced by my review of the literature and experience in the field.

Assessment (Phase 2) gathers and interprets the data based on the design determined in the pre-assessment phase. To determine requirements, I looked at identification of unmet needs for the service receivers, tried to get a sense of what needs were or were not being met, discussed processes for communication and interaction with the electronic portfolio, discussed requirements of each end user of the system, and weighed importance of each need based on expertise and number of participants discussing that particular issue (Witkin & Altschuld, 1995). This phase is captured within the methodology, results, and discussion chapters of my study.

Post-assessment (Phase 3) uses the interpretations from the assessment phase in order to form an action plan to implement the defined needs (Witkin & Altschuld, 1995). This means expressing recommendations based on prioritizing needs. The post-assessment phase is illustrated within the discussion and conclusion. One way to review the needs associated with this change is the utilization of force field analysis developed by Lewin (1951), which described driving and restraining forces (Witkin & Altschuld, 1995).

Chapter summary

I started by introducing the educational principles of CBME, which have been used to inform CBD in Canada. The newly established Canadian CBD framework was discussed next with concepts emerging or newly deployed such as stages of training, milestones, EPAs, training experiences, WBAs, and competence committees. Each of these concepts is important to understand the challenges faced and the reason an electronic portfolio will be an important enabler to achieving successful implementation of CBD. The literature on electronic portfolio requirements and challenges is important in exploring the needs of anesthesiology in moving forward. Next anesthesiology was defined as the informing discipline of this study. Finally, I discussed the needs assessment methodology and system, which explains the different levels of need. The chosen framework illustrated why I approached the study in this way and how I developed my methodology.

Chapter 3: Theoretical Frameworks

I used three theoretical frameworks to inform this research. The first was Lewin's change theory which proposes unfreeze, change, and refreeze states when implementing an organizational change (Brisson-Banks, 2010; Lee, 2006; Lewin, 1951; Manktelow et al., 2017). The second framework was Rogers' diffusion of innovations (Rogers, 2003) which, for the purposes of my study, includes systems of influence within medical education and describes the social systems involved with the innovation of CBD in Canada (van der Vleuten et al., 2014). The third was social constructivism (Creswell, 2013; Lincoln & Guba, 2013). All of these theoretical frameworks contributed to the methodology, interpretation and discussion of the results.

Lewin's Change Theory

There are many theories that describe change in individuals and organizations. I chose to use Lewin's change theory (1951) in my thesis for multiple reasons. First, the simplicity of Lewin's change theory was interesting to me and seemed to fit well with my research questions and context. Second, Lewin's theory was recognized as "one of the early pioneers of group dynamics and how individuals will usually go along with the group norm whether it is a positive or negative situation…" (Brisson-Banks, 2010, p. 244). This was relevant to my thesis topic and research method. Third, other theories are compared to Lewin's change theory, suggesting that Lewin's theory is treated as a standard. For example, in work done by Brisson-Banks (2010), Lewin is used as the baseline to compare with Beckhard (1969), Thurley (1979), Bridges (1991), and Kotter's (2007) theories for change. One potential disadvantage of Lewin's change model is that it doesn't incorporate continuous quality improvement (CQI) on the changes made (Brisson-Banks, 2010).

CQI is important and it applies to the refreezing stage since the RCPSC is applying it to their new accreditation standards (RCPSC, 2017). Most importantly, Lewin's three stages are applicable to how the RCPSC is changing to CBD (RCPSC, 2017). This is described below.

Stage 1, 'unfreezing' involves motivating people for the change and creating the need (Lee, 2006). It answers the question 'why', ensures all those affected know that reason, and deals with doubts and concerns as they arise (Manktelow et al., 2017). The 'unfreezing' began when the RCPSC developed a competency framework coined the Canadian Medical Education Directives for Specialists (CanMEDS) in the early 1990s and implemented this framework across all Canadian medical schools in 1996 (McMillan, 2014). This framework introduced the idea of competencies but did not offer a concrete way to implement them. ten Cate et al. (2016) stated that "in the past decade, a decrease in public confidence in health care systems has been observed…" (p. 191). In answer to critical incidents in healthcare, CBD is mandated by the RCPSC for Canadian Fellowship of the Royal College of Physicians (FRCP) disciplines (RCPSC, 2017; ten Cate et al., 2016). They are also seeking buy-in by utilizing experts in the field of medical education to highlight deficiencies in the current system. In terms of PGME in Canada, there are 17 medical schools each of which has many faculty and residents. NOSM is one of the smallest schools with over 1500 faculty but only 180 residents. This highlights the importance of ensuring consistent messaging across the stakeholders and addressing issues as they arise. The 'unfreezing' stage continues for CBD using conferences, word of mouth, and local experts to motivate and vocalize the need for this change (RCPSC, 2017).

Stage 2, 'change' involves the encouragement of individuals to adopt the new perspective that enables them to improve (Lee, 2006). Manktelow (2017) goes further to describe this as getting used to the new ideas, continued vocalization of the benefits from leadership, offering support, and

giving stakeholders time for adjustment. With the introduction of CBD as a way to integrate these competencies into the clinical setting, the RCPSC has moved some programs (such as anesthesiology) to the second stage of 'change'. This stage is the focus of my research because it focuses on implementation. This aligns with the literature that states the importance of involving stakeholders wherever possible to ensure understanding and buy-in of the change (Manktelow, 2017). In the current context of this study, some members are involved nationally in creating the competence framework but given the numbers, it is impossible to involve everyone in the change. For the change stage to be successful, it is important to find ways to be inclusive locally when implementing and rolling out the changes (Lee, 2006). Once implementation of the change is complete, the final step will be to refreeze.

Stage 3, 'refreezing' involves reinforcing the new patterns of behaviours and making it clear the change stage is complete (Lee, 2006; Manktelow et al., 2017). This means institutionalizing the changes and anchoring them in the new culture to ensure they are integrated into everyday practice (e.g., changing policies to match the new framework, adapting workflows; Manktelow et al., 2017). Without the refreezing stage, organizations can get caught in a 'transition trap' meaning that individuals feel uncertainty about how things should be done leading to nothing ever getting done to full capacity (Manktelow et al., 2017). Some of this stage will be done institutionally as problems arise but the main driver of refreezing within this context is the RCPSC accreditation. The change to CBD will occur over multiple years with programs launching in a staggered approach. At the same time, the RCPSC has launched the prototype for a new accreditation system and structure that will focus on continuous quality improvement (RCPSC, 2017). The new accreditation system will be applied to most schools in 2019 but the rollout for programs to change goes well past this date. The third 'refreezing' stage is not expected to occur until after implementation (Lee, 2006;

Lewin, 1951; Manktelow et al., 2017). As institutions and their stakeholders adopt and adapt, they will be better able to enforce policies, celebrate successes, and find closure (Manktelow et al., 2017). The RCPSC will need to be flexible in the refreezing stage until all programs have transitioned and found some stability.

The main focus of my study is to determine the needs of the individuals within the second stage, change, to help identify perceived needs and challenges for successfully implementing an electronic portfolio. The perceived needs and challenges of these stakeholders are influenced by the system comprised of individuals with varying and competing interests.

Diffusion of Innovation

Competence by Design (CBD) and its associated electronic portfolio tool is an innovation created by the RCPSC to be implemented in all Canadian specialty programs. Rogers (2003) defined the concept of innovation as:

> An idea, practice, or object that is perceived new by an individual or other unit of adoption…The perceived newness of the idea for the individual determines his or her reaction to it. If an idea seems new to the individual, it is an innovation. (p. 12)

Rogers identified five perceived attributes of innovations, which explain the rate of adoption. These are: relative advantage (the degree to which an innovation is perceived as better than the idea it supersedes); compatibility (the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of members of a social system); complexity (the degree to which an innovation is perceived as relatively difficult to understand and use); trialability (the degree to which an innovation may be experimented with on a limited basis); and observability (the degree to which the results of an innovation are visible to others; Rogers, 2003). These attributes

are useful in helping understand the stakeholder views within a social system when reading and interpreting results.

Rogers (2003) defined a social system as "a set of interrelated units that are engaged in joint problem solving to accomplish a common goal. The members or units of a social system may be individuals, informal groups, organizations, and/or subsystems" (p. 23). Currently, anesthesiology programs across Canada are banding together to accomplish the common goal of CBD implementation. In order to remain stable a social system requires a social structure (Rogers, 2003).

A social structure is defined as "the patterned arrangements of the units in a system" (Rogers, 2003, p. 24). "This structure gives regularity and stability to human behaviour in a system; it allows one to predict behaviour with some degree of accuracy" (Rogers, 2003, p.24). A social structure has reciprocal relationships with the social system that holds each accountable to one another for achieving success. These relationships can be described as inductive and deductive. Deductive meaning that you have rules or theories governing your reasoning, and inductive meaning that you are looking for the evidence to support these rules or theories (Creswell, 2013).

PGME in Canada can be perceived as a four-tiered social structure. The proposed tiers are based on alignment of stakeholder value systems and mandates for achieving success with respect to CBD. van der Vleuten (2014) uses the terminology macro (Tier 1 & 2), meso (Tier 3) and micro (Tier 4) levels. The macro level included national legal and university regulators (i.e., the policy-makers), meso level included the programs in charge of aligning curriculum and assessment with the overarching competency framework (e.g.,resident program committee), and finally the micro level included the individuals (e.g., learners and faculty) who perform the defined tasks to achieve success (van der Vleuten et al., 2014). The adapted model below explains the aforementioned levels as four tiers of stakeholders and their relation to CBD as follows: Tier (1) The Global &

Canadian context; Tier (2) RCPSC (Governing College); Tier (3) The Medical Schools and Individual Programs; and Tier (4) Individuals this change affects (see Figure 2).

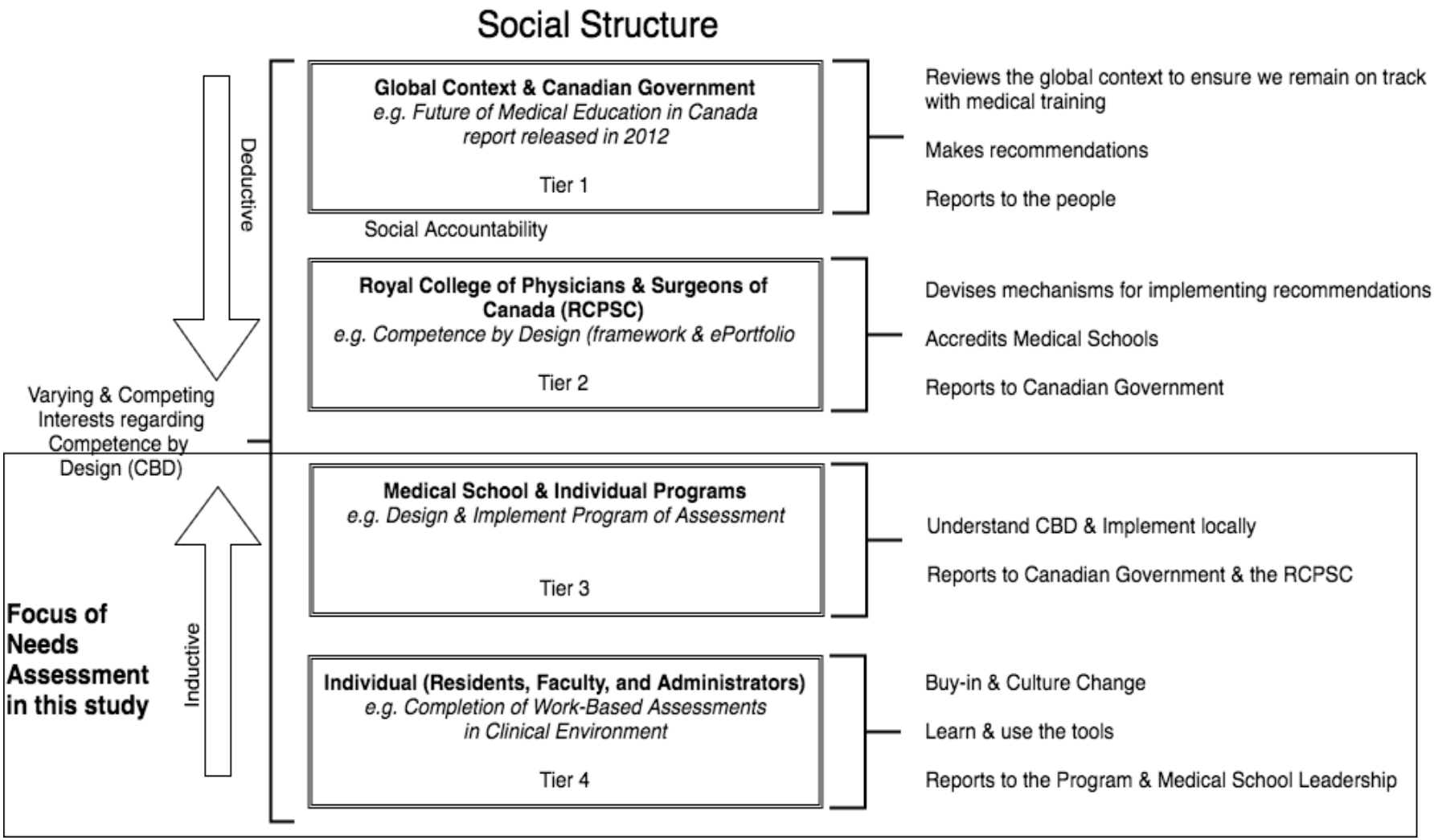


Figure 2: Social Structure of Royal College disciplines in Canada. This figure demonstrates a four-tiered social structure of stakeholders affecting Competence by Design implementation (adaptation of levels described by van der Vleuten et al., 2014).

Global Context and Canadian Government (Tier 1) and RCPSC (Tier 2) are mainly deductive because they make the rules regarding policies and theories that will guide the development of the innovation (i.e., Competence by Design). Medical Schools and Individual Programs (Tier 3) and Individuals including residents, faculty, and administrators (Tier 4) are mainly inductive because they seek to support the innovation by seeking evidence that residents are competent (see Figure 2). There is some overlap in deductive and inductive contributions while CBD is under development. After developmental stages are complete however, the accreditation standards will be set and monitored by the RCPSC (Tier 2) which is in turn accountable to the public (Tier 1).

In recent years, medical education has been met with a degree of cynicism and skepticism worldwide (Holmboe et al., 2010). This public outcry for better medical care has been one major driver in the shift to CBME and patient safety, which is an attempt to regain the trust of the public (Carraccio & Englander, 2013; Holmboe et al., 2010; Klass, 2007). There are numerous papers including the Future of Medical Education in Canada (FMEC) report released in 2012 that note the main driver for the change to CBME is to ensure we are training competent physicians and to increase patient safety (Bhatti & Cummings, 2007; Carraccio & Englander, 2013; Driessen & Scheele, 2013; Hodges et al., 2011; Klass, 2007).

To understand the perceived needs and challenges of this community I performed a needs assessment directed at Tiers 3 and 4. This aligns with Witkin and Altschuld's (1995) model for planning and conducting a needs assessment targeting the needs of those who are charged with implementing the changes. Implementation is key to the

success of any innovation and it is these stakeholders that must embrace and adopt this innovation at the local level.

Social Constructivism

I chose social constructivism as the interpretive framework for my research because my study sought to co-create an implementation strategy for a major change in Canadian medical education and therefore needed to be based on the lived experiences of my participants. Creswell (2013) described social constructivism as:

> Individuals who seek understanding of the world in which they live and work. They develop subjective meanings of their experiences – meanings directed toward certain objects or things. These meanings are varied and multiple, leading the researcher to look for the complexity of views rather than narrow meanings into a few categories or ideas. The goal of the researcher, then, is to rely as much as possible on the participants' views of the situation. (p. 24)

The understanding of the paradigm shift and its implications are socially constructed and based on context and social interactions with others (Creswell, 2013). This became even more of a challenge because my participants were still working to understand this new world of CBD.

This interpretive framework recognized my own constructions as the researcher which is one reason why I began by situating myself in the study, recognizing that my background shaped my interpretations from my own personal, cultural, and historical experiences (Creswell, 2013). It is important to recognize that changing the context or the individuals changes the reality, therefore, my study offers a systematic review of the

qualitative inquiry as understood within this particular context at this particular time (Lincoln & Guba, 2013).

My research was undertaken at a time when participants of this study were working to co-construct an understanding of CBD and how an electronic portfolio can act to enable this change. It was my hope that this shared understanding could help inform the direction taken by the RCPSC Resident ePortfolio, and other electronic portfolio providers. I also hoped to provide insights that could support institutions locally and the system of CBD in general.

Chapter Summary

Theoretical frameworks are key to navigating complex ideas and employing effective methodology. The first two frameworks I discussed were Lewin's change theory and Rogers' diffusion of innovations. These two frameworks can be linked to both the electronic portfolio and CBD as a new educational paradigm. Diffusion of innovation included the systems of influence to offer the reader a shared understanding of the influence each stakeholder has on medical education as a whole. Each of the stakeholders play a role in this paradigm shift in medical education but not all are reached with this study.

The third framework discussed in this chapter was that of social constructivism. I have used this framework to inform the design, analysis, discussion, and conclusions based on the literature, constructions of the participants, and my interpretations of each as a whole. I used interview transcripts to draw complex meanings from multiple viewpoints

as the first stage of my study and in the second stage I held focus groups to further understand and co-construct an understanding of their needs as service receivers.

Chapter 4: Research Methodology

I used a multiple-method qualitative needs assessment methodology to explore and analyze the unique social constructions of postgraduate anesthesiology program stakeholders in moving toward CBD. The methods used for this needs assessment included a comprehensive understanding of each participant's realities, aligned with a social constructivist theoretical approach. This approach also allowed for direct interaction with the participants, establishing an interpersonal rapport between parties, which is important in understanding the unique and complex challenges faced at different institutions.

The study was designed in two stages. Stage one consisted of semi-structured interviews with faculty members from anesthesiology programs across Canada in order to provide an environmental scan of progress related to the implementation of an electronic portfolio system. The second stage consisted of focus groups separated by either levels of involvement regarding CBD framework development or practice level. Methods for each stage are described separately.

Stage 1: Interviews

In the first stage of data collection, I conducted semi-structured interviews with anesthesiologists, and assessment experts engaged with CBD framework development from across Canada. Semi-structured interviews use an interview protocol (see Appendix B) to ensure consistency but allow for flexibility of new questions to emerge based on interviewee responses, which can then be used to adjust the interview protocol (Creswell, 2013; Witkin & Altschuld, 1995).

Selection and recruitment of participants. Study participants were purposefully selected from the working group dedicated to designing and developing CBD for anesthesiology in Canada. This ensured that all participants in this stage had expertise in anesthesiology, the CBD framework and some involvement with the CBD workshops tasked with developing the competency framework. Purposeful sampling aligns with Witkin & Altschuld's (1995) model for performing a needs assessment. They indicated that the individuals informing the needs must have expertise in the subject matter (Witkin & Altschuld, 1995). The interviewees for this stage were service receivers (Level 1) described as having the most informative perspective and opinion (see Figure 1). Furthermore, participants in this study were in a unique position given that they offered insight from both the service receiver and the service provider standpoint. This is because they interacted with the system regularly as an end user but also helped to develop policy and guidelines as we moved into implementation (Witkin & Altschuld, 1995).

Interview instruments. I worked with my supervisor and committee to develop an interview guide with 18 open-ended questions organized into four categories: current opportunities and challenges in using an electronic portfolio; future/perceived challenges and opportunities using an electronic portfolio; resources required for successful implementation of CBD; and future/perceived functionality required of an effective electronic portfolio. Interview questions followed a three-tiered structure, which looked at current program demographics, current assessment practices, and future perceived/desired state of the electronic portfolio that included the perceived opportunities and challenges. The interview questions were created based on my

literature review, my experience in PGME, and in consultation with the program director in the NOSM anesthesiology program, my supervisor, and my committee member.

The interview protocol was pilot tested with the first two participants of my study (a past program director and an assessment expert) and changes were made to the protocol as a result of the pilot test. The first change was a reduction of interview questions. Initially, there were two sets of questions: one for program directors and one for non-program directors. After the pilot test, I recognized that separate questions for program directors and non-program directors were not necessary. The questions for the program directors were used for all participants in the remainder of the research. The second change was an addition to the interview protocol. There was an unanticipated concept that emerged from the pilot interviews. This concept was relevant to the research, and an additional question was included in the revised interview protocol. This final revised interview protocol was used for the remaining interviews. See Appendix B for the interview instruments.

Interview procedure. I conducted 13 one-on-one semi-structured interviews with faculty from across Canada between November 2015 and January 2016. Due to geographical distance, twelve individuals were interviewed using web-conferencing software and one individual was interviewed face-to-face. Video was used in an effort to make the participant feel more at ease and to allow me to pick up on visual cues. Only voice data was recorded for later analysis. The interviews lasted between 45 minutes and 90 minutes. Participants were advised about confidentiality and given the opportunity to skip any questions or terminate the interview at any time.

Stage 2: Focus Groups

The second stage of the research consisted of three focus groups, which occurred after my preliminary analysis of the interview data from stage 1 (as described in the data analysis section).

Selection and recruitment of participants. The three focus groups were designed around three types of stakeholders: Competence by Design (CBD) experts from the first stage of my study, residents, and faculty members. The purpose of running three defined focus groups was to reduce any power dynamics among participants. This helped to ensure all members were as comfortable as possible with participating and contributing in an open manner. Confirmed participants received reminders via email the day before the focus groups.

The CBD focus group was selected through the same purposeful sampling as the first stage. Faculty members and residents were recruited using snowball sampling (Creswell, 2013) by sending recruitment emails to program directors and the CBD workshop members asking them to forward the recruitment email to residents and faculty at their institution who were going to be attending the Association of Canadian University Departments of Anesthesia (ACUDA) meeting on June 24-25, 2016 with a demonstrated interest in CBME.

Focus group instruments. Focus group questions were created in consultation with the NOSM Anesthesiology program, my supervisor, and my committee member. Questions were based on preliminary data analysis of stage 1, the literature review, and

my experience in PGME. The CBD focus group was comprised of a number of participants that had informed stage 1 of this study therefore some preliminary findings were reviewed in an effort to validate my interpretation of the data from stage 1. The participants in the faculty and the resident focus groups had not participated in stage 1 and were asked questions similar to the first stage. See Appendix C for focus group instruments.

Focus group procedure. All three focus groups were held face-to-face at the 2016 ACUDA meeting in Vancouver, British Columbia. This limited participation to in person attendance at the ACUDA meeting and availability within their schedules. Effort was made to ensure no overlap of scheduling occurred to allow for maximum participation. The focus groups were held in the same conference centre as the ACUDA meeting and refreshments were provided.

The estimated timing for each of the focus groups was 90 minutes. Actual timing ranged from 90 to 120 minutes. Prior to the focus group, participants signed and returned the consent form. Each focus group was audio-recorded for later transcription. The recordings were professionally transcribed for analysis.

Data Analysis

I analyzed the data from each stage of my study using theoretical thematic analysis (Braun & Clarke, 2006). Braun & Clarke (2006) described this analysis as occurring in six phases: "(1) familiarizing yourself with your data; (2) generating initial codes; (3) searching for themes; (4) reviewing themes; (5) defining and naming themes;

and (6) producing the report" (p. 87). I completed a preliminary analysis following stage 1 of my study, which included phases 1, 2, and 3. These preliminary results were used to generate focus group questions and preliminary themes were presented to participants to validate my interpretations from stage 1. Once all data were collected for stage 2, I completed phases 1, 2, and 3. I worked on phases 4 and 5 of the thematic analysis concurrently with data from both stages 1 and 2. Phase 6 is this resultant report and will not be described further.

Familiarization. This phase included the transcription of data, reading and re-reading data, and noting ideas (Braun & Clarke, 2006). After each stage of data collection, I sent the audio-recorded interviews to a third party for transcription. I reviewed interview and focus group transcripts for quality assurance purposes (i.e., accuracy and re-familiarization with the data). Once quality assurance was complete, transcripts were uploaded into the Atlas.ti software for reading and re-reading to identify codes. Data were reviewed, uploaded, and coded for stage 1 before collecting data for stage 2.

Initial Coding. This phase included "coding interesting features of the data in a systematic fashion across the entire data set, and collating data relevant to each code" (Braun & Clarke, 2006, p. 87). Braun & Clarke (2006) offered descriptions of the two thematic analyses used for coding: "inductive and theoretical thematic analysis" (p. 83). Inductive thematic analysis is described as "a process of coding the data without training to fit it into a pre-existing coding frame, or the researcher's analytic preconceptions"

(Braun & Clarke, 2006, p. 83). Theoretical thematic analysis is described as "driven by the researcher's theoretical or analytic interest in the area…more analyst driven" (Braun & Clarke, 2006, p. 83). I coded all interview data line-by-line using the preliminary codes as well as the three-tiers within the interview guide. As I coded, I journaled any emerging ideas that might be explored during the focus groups. My analysis used both theoretical and inductive thematic analysis.

After careful consideration of stage 1 data and my research question, I chose a preliminary coding framework that was derived from the research literature on electronic portfolios. This is consistent with theoretical thematic analysis (Braun & Clarke, 2006). This preliminary coding framework looked at challenges upon implementation of a web-based system into clinical medical environments. It included 10 topics found in the literature that described challenges with incorporating web-based systems into clinical medical environments. The initial codes were as follows: decrease in educational benefit with repetition, barriers in deployment, maintaining professional standards, volume license policies, resource limitation, lack of trained faculty, ethical challenges, organizational inertia, blurring of professional and personal boundaries, not knowing which applications to trust, unwillingness to change, variable computer literacy levels, and, technophobia (Amin et al., 2011; Basu et al., 2013; Chu et al., 2012; Cook & Ellaway, 2015; Wallace et al., 2012). Interviews were analyzed using this preliminary coding structure. Final coding structure was created based on the data as is consistent with inductive thematic analysis.

Focus group initial coding used interview codes as a preliminary framework. Although focus groups were influenced by the interview codes, a few new codes were

created based on the focus group data, which is consistent with inductive thematic analysis (Braun & Clarke, 2006).

Searching for themes. This phase "collated codes into potential themes, and gathered all data relevant to each potential theme" (Braun & Clarke, 2006, p. 87). Upon reviewing the codes, I identified themes by grouping codes that fit together into a theme as is consistent with inductive thematic analysis (Braun & Clarke, 2006). To help me achieve this task, I printed out my coded transcripts, creating piles representing the themes and re-read the quotes ensuring they were grouped with the appropriate theme. My supervisor and committee member reviewed the themes to ensure face validity and consulted on interpretations of the data before I created the focus group questions for the second stage of my study.

Reviewing the themes. This step included "checking themes against coded extracts, the entire data set, and generating a thematic map of the analysis" (Braun & Clarke, 2006, p. 87). For each of the themes, I re-read each of the coded extracts and wrote my interpretations of the participant comments. I also reviewed the number of coded extracts for each theme to see if either there were not enough or too many codes. For those with not enough coded extracts, I checked to see if this still formed a logical theme, if it still seemed important, and whether it actually belonged to a different theme. If there were too many coded extracts, I looked for similarities within the data and broke the theme down into multiple sub-themes to be able to identify importance and relevance.

Defining and naming the themes. This step included defining and refining to identify "the 'essence' of what each theme is about (as well as the themes overall)" (Braun & Clarke, 2006, p. 92). To complete this stage of analysis, I reviewed and discussed all of my finalized themes with my supervisor. This allowed me to identify converging themes, which were described by most if not all participants in stage 1, converging themes, which were discussed by all focus groups in stage 2, and diverging themes, which were discussed primarily by one focus group (although could still be important to the other focus groups).

Ethical Considerations

I previously described trustworthiness criteria as a methodology to evaluate qualitative research (Anney, 2014). Although my prolonged engagement in this field increased my credibility in undertaking this research, it was nevertheless challenging to ensure objectivity (Anney, 2014). Each of the mechanisms used to evaluate my research coupled with situating myself in the research was used to ensure my research remained open and transparent.

As a strategy to validate proposed themes, I used triangulation of different sources of data to corroborate my findings (Anney, 2014; Creswell, 2013). The second stage of my study was used as a form of member checking by presenting preliminary findings to each of the focus groups. Creswell (2013) defined member checking as "soliciting participants' views of the credibility of the findings and interpretations" (p. 252). In my study, focus group participants were asked if my interpretations and themes presented

seemed accurate based on their experience. Although most focus group participants were new to the study, four of the thirteen interviewees were present in the CBD focus group.

Early in the first stage of research analysis, my committee member reviewed and re-coded three anonymized interview transcripts to validate my codes, offer a different perspective, and add clarification to my understandings. Although not applied to all research data this process supported inter-coder agreement before continuing to code and re-code transcripts. Creswell (2013) described inter-coder agreement to be "based on the use of multiple coders to analyze transcript data" helping to ensure reliability (p. 253). Once I finalized codes and themes for the interviews and focus groups, I worked through each of them with my supervisor offering examples of text to validate my interpretations. We then debated which themes were most relevant to include as either diverging or converging based on experience and literature (Anney, 2014; Creswell, 2013).

Bowen (2008) lists two types of saturation in qualitative inquiry: data saturation and theoretical saturation. Data saturation is described as "bringing new participants continually into the study until the data set is complete, as indicated by data replication or redundancy" (Bowen, 2008, p. 140). Data saturation was reached in stage one of my study when interviewees started mainly reiterating points from previous interviews. At the time of my study, CBD was not broadly understood which led me to purposefully seek out experts in the field, which precluded more participation of faculty and residents until stage two where data saturation was further confirmed.

Research ethics

Approval to conduct this research study was obtained from the Research Ethics Board (REB project Number: 079 15-16) at Lakehead University. Renewals were granted as required.

Chapter Summary

This chapter outlined the methods and ethical considerations for each step of the study. The first stage interview questions were informed by my review of the literature and my personal experience in medical education. The first stage (13 interviews) occurred six months before the second stage (3 focus groups). This was to allow time for transcription and preliminary analysis, which informed focus group questions. The second stage questions were formed using the first stage of the study. The focus group data were used to validate my understanding of the issues and offer the viewpoint of faculty and resident stakeholders. These viewpoints were transcribed to be analyzed using coding, which led to the identification of themes for thematic analysis.

Chapter 5: Results

My results are reported by stage, in order to show how participants differed in each stage, to show how results from stage 1 informed stage 2, and to clearly report the themes identified from each stage of the study.

Stage 1: Interviews

Thirteen participants, representing 9 of the 17 medical schools across Canada (see Table 1), participated in personal semi-structured interviews. Each of the participants was involved with PGME in various ways. Participants were recruited by an email sent to all members of the anesthesiology CBD working group. The email asked for participation in a semi-structured interview via web conferencing for approximately one hour. One of the members on the CBD working group recommended two individuals outside of the core group because of their experience with assessment and exposure to CBD. These two individuals were sent an email invitation for interview, accepted, and were included in the sample. Additionally, of the thirteen interviewees, all but two were anesthesiologists. The two participants who were not anesthesiologists were taking part in this study due to their expertise in assessment (see Table 1). I chose to separate Ontario-based participants because they represent 6 of the 17 medical schools in Canada, which could skew the data if grouped with either eastern or western Canada. I then grouped institutions according to whether they were east or west of Ontario.

Table 1

Number of Interview Participants and Schools by Position/Area of Interest and Geographical Location in Canada

Position/ Area of Interest	Geographical Location in Canada			
	West (BC to MB)	ON	East (QC to NL)	Total
Assessment Expert	-	4*	-	**4**
Clinical Teacher	-	1	1	**2**
Current Program Director	-	2	1	**3**
Past Program Director	2	2	0	**4**
Total Participants	**2**	**9**	**2**	**13**
Number of Medical schools	5	6	6	**17**
Number of participating Schools Represented	2	5	2	**9**
Representation (%)**	**11.8**	**29.4**	**11.8**	**53**

Legend: BC = British Columbia; MB = Manitoba; ON = Ontario; QC = Quebec; NL = Newfoundland
*2 of the assessment experts are outside of the discipline of anesthesiology.
**Calculated as Actual Schools Represented/ 17 (Number of medical schools)

Participants varied in their professional roles. Program directors worked with a team of engaged faculty members, known as Resident Program Committees (RPCs), to run their specialty program in its entirety. Program directors were tasked with designing and delivering clinical and academic curriculum, providing resident assessment, developing resident assessment tools, performing program reviews and evaluations, developing remediation plans, and more. They had access to support personnel within various parts of the school (e.g., program administrator, educational support, research assistants, etc.). The 'Clinical Teacher' group included participants whose main task was interacting with teaching and assessing the clinical skills of the residents. Clinical teachers had varying exposure to CBD, CBME, and electronic portfolios. The 'Assessment' group included anesthesiology and non-anesthesiology faculty members with interest or expertise in assessment practices.

Although recruitment of research participants was the same for all schools, the majority of participants were from Ontario medical schools, probably because the RCPSC and NOSM are both located in Ontario, which may have created more interest in participating in my study.

I identified three themes that explain the interview participant comments: (1) balance between localization and common model; (2) information access; and (3) performance monitoring. These themes are described below. Please note that when quoting participants, I used P1 through P13 to indicate the participant number, ensuring anonymity.

Balance between Localization and Common Model

Each participant was asked about their preferences regarding standardized assessment tools versus creating their own tool. Most participants commented positively regarding maintaining a balance between localization and a common model with respect to assessments. They supported and recognized the advantage of standardization but did not want standardization entirely for fear of losing ability to foster local innovations. This feeling of fear focused mainly on shifting innovations and having inconsistent or low standards.

> *P11: "My gut tells me I think complete standardization is a problem, there needs to be some flexibility from site to site because complete standardization stifles innovation and we are too early in this process."*

Even when a participant described favouring standardization, they still wanted the ability to adapt their assessment forms based on local context:

> *P13: "I think you can embellish the form and individualize it to your program, not to squash creativity or pigeonhole everybody so that if you're a small program or a big program, certain things may not work for you. But I think the elements; the basic elements that can be utilized should be the same."*

This reflects a sense of inadequacy locally when developing assessment tools, particularly from smaller schools, which may not have the same resources as a larger institution. For this participant, standardization meant a peer review process and better assessments that are trusted nationally.

In general, participants did not want to lose control of assessment practices at the local level. A recurring issue was that programs across the country should be involved in

deciding which tools to use in order to effectively promote and achieve local buy-in. Also, flexibility in the process and design of CBME, electronic portfolios, and assessment tools was important to participants. This was important because medical schools are in a time of change, and schools would like the flexibility to address future problems in their local contexts.

Information Access and Ownership

All participants commented on access to information *during* residency training. Six of the 13 participants commented on information access *after* training. Both proved important in moving forward with an electronic portfolio.

Information access during training. All participants agreed that residents should have full access to their own data. This would exclude only the confidential notes arising from the competence committee meetings and/or their program director.

> *P9: "the resident has to, has a right to see their own data and they should be able to see most of it, if not all of it. There may be some confidential comments that are done by the competency committee and they may yet have to decide how to share that with the resident."*

All participants agreed that clinical faculty supervising residents on rotation (also called "observers") require access to resident data. Participants expressed different views on how much data faculty should see regarding their residents. The pros and cons of sharing previous resident assessment data with faculty were discussed when talking about observer access to resident data within the electronic portfolio.

> *"P10: So if you see everything then you may have a pre-conceived bias about this resident before they even start their training in your sub-specialty. On the other hand, if you know absolutely nothing about the resident then you may not be aware of something you need to do to adjust the training for that particular resident to help them be successful. So that is also a very fine line to tread in terms of how much information you should have about the resident or not."*

Some participants felt that the program director should decide on what content gets passed along to the next observer and others felt faculty should be able to see all assessments from a particular clinical experience, as a way of ensuring fairness and accuracy of the information that is accessible to the next rotation supervisor. Participants voiced a general sense of agreement that faculty observers should be able to access resident objectives and learning plans that are mapped to that particular clinical experience.

> *P7: "If I'm in charge of a rotation I would expect to see all the information from the resident going through my rotation. And I would, again, like to be able to … – get the aggregate result to compare with – with – with the previous, with his peers who did the rotation before."*
>
> *P9: "… for that purpose I think the less there is on the portfolio to look at other than the subscribed task, the better. There's little time in most clinical encounters … to devote a whole bunch of time just to, assessing where the required themes are, what to be filled in and how to navigate through panes and panels. So, all that is distraction. To me the idea would be just that EPA is unpacked or those milestones are highlighted and boom there we go, just do that."*

The quote from P9 suggests that, as an observer, they would not want to see a lot of information as it would just be a distraction, while P7 indicated that they would like to see everything for that rotation, a comparison to peers, and information from the previous rotation. It is worth noting that P7 was commenting regarding an observer in charge of a full rotation, versus P9 who was commenting on an observer taking the resident for one or 2 days throughout that rotation. This suggests that, within these scenarios, the level of accountability for resident progress is less for P9 than it would be for P7.

Information access after residency training. This theme reflected discussions around the anonymity, the purpose for accessing, and secure storage of data. All six participants who commented on information access after residency training agreed that the anonymized raw data should be accessible for research purposes. There was a question of whether this data should be kept locally or at the RCPSC. The location is likely to be partially decided by which system each university chooses as their electronic portfolio, that is, the RCPSC Resident ePortfolio system versus a local electronic portfolio. What was clear was that each medical school feels they own the resident assessment data for at least some duration of time post-residency.

> *P9: "So where should that repository be. Should the program be entrusted to keep all that data or should it be more accessible to the College of Medicine* (RCPSC) *as a more stable entity overall..."*
>
> *P12: "I think the program should have it and they should keep it, for probably a variety of reasons."*

For the data with identifiers retained, participants took opposing positions. The arguments for keeping the identifiers included:

(1) Lifelong learning:

> *P1: "if we're moving towards lifelong learning as a goal for competency-based medical education that shouldn't stop after residency, then this e-portfolio should extend into beyond residency, into one's practicing career, and you'll need that information from your residency days to continue that path."*

(2) The need to review and defend program decisions:

> *P12: "I think we should know who's had what. I can still go back to my University and get a transcript of how I did in my first year, physics course in 1987. Why is that threatening? ... just because they're afraid that somebody might learn that they didn't do so well in the middle of third year, that's not a justification for deleting all that information."*

(3) As a societal responsibility and obligation:

> *P13: "So, if a licensing body says to me, five years later that your resident or the staff physician that you graduated from your residency has killed ten people in this fashion or this, you know. I feel quite strongly that if there was performance within that resident's file that was that damning, or that outlying, that, that is of a societal nature, that, that's part of our societal responsibility."*

Although most participants who commented on this felt that the identifiable data should be kept for some duration of time, there was one participant who did not see the point of keeping the data in an identifiable format.

P10: "What is the point of keeping the information? If you have a training program that you think is the best that it can be in terms of determining competency, at the end of that training program if the resident is deemed competent, why do you need to keep any information other than the simple fact that yes they met the criteria and yes they're competent."

In summary, information access was seen as an important and complex issue that will need to be explored between the RCPSC, PGME Deans, Program Directors, residents, and other relevant stakeholders.

Performance Monitoring

Participants commented on performance monitoring related to 3 themes: (1) Clear demarcation of resident progress and flagging; (2) Comments and context are important; and (3) Consolidation of data for review.

Clear demarcation of resident progress and flagging. Participants described the importance of tracking and viewing resident progress on all EPAs in real-time. EPAs were mainly identified as important markers of performance but any additional required training information should also be captured in order for the resident and program leadership to have a clear picture of individual resident progress.

P5: "I mean they (the residents) *clearly want to see how close to getting their EPA done they are, and what they have left to do. I mean that's going to be their biggest thing that they want to see. And they want to see what else they have left in the program as required training elements that they have to do."*

Part of CBD involves the use of competence committees that review evidence of resident progress to promotion through the program.

> *P8: "Remember – no longer is it the default position that somebody goes through, but the default position is that somebody does not go through. So they have to show evidence of achievement before they can move from one stage to the next."*

An electronic portfolio would also need to flag whether a resident is falling behind their peers in some category of competence, if there are patterns of absenteeism, or if observers raised any other critical flags. To set the benchmarks required for flagging, stakeholders will need to view data in relation to other residents (i.e. norm-referenced data).

> *P11: "I'm looking at their progress to know that they're on track to where they need to be or ahead of where they need to be. So I want to see their completed EPAs. I want to see any flags, faculty flags, I want that to be very obvious and I need probably an email. Because of the infrequent nature of them, I need probably a trend flag, some way where multiple assessments have been filled out that have not been flagged but they aren't really that good."*

Participants in the study were asked to imagine what an effective dashboard would look like. They described the importance of a dashboard having flexibility in the way the data is portrayed based on the question being asked by people using the data, including the resident themselves.

> *P12: "I think it's going to have to be – there's going to have to be a home screen with a bunch of options, right, because I don't think one report is going to capture it all. Because I can think that there's going to be a lot of different questions that*

can be asked about a resident. You can ask if they're competent, but then someone's going to quickly say well, what does that mean? And you're going to have to drill down to a different level, or look at it from a different angle."

Participants felt that viewing resident progress compared to their peers was important and should be an option. Clinical training experiences differ among schools and may change resident trajectories. This may explain why participants felt it was important to include comparators within the same program, so that the comparisons would be more valid and interpretable given the program context. Participants recognized that the residents would not have access to this data until it could be sufficiently anonymized.

P6: "I'd like to be able to access, to be able to see all of my trainees and then to be able to drill down into each of their settings and figure out where they are on a progress curve. And I think I'd like that to be some kind of a graphical look where I could, at a glance, get a sense of where people are. Have some way to be able to set that graphic up so I could mark out areas where people are meeting expected progress…so I could see that's what was happening."

Collectively, this illustrates the importance of residents and program leadership having easy access to aggregate information tracking resident progress, such as in a dashboard.

Comments and context are important. Participants explained that comments and context are pivotal to understanding resident performance and therefore need to be effectively captured within reports:

> *P1: "It's the comments that I find the most valuable … trying to provide some context for these comments: what sort of case were you working, you know, with the resident with this, these particular comments were captured? … Was it a complex case, simple case, emergency, other extenuating circumstances, that might be illuminating in terms of … because I think when you tell a resident, you know, these are the comments, they sometimes look at you and say I don't remember that. Why would that comment come along? They forget the context. … if you provide the context … then they'll say 'oh yes, I remember now' …So it's much more valuable if you can provide the comment within the context of where and when it occurred."*

This participant described how residents are more willing to change their practice if they can understand where and why they are receiving a less than positive rating. Decisions of resident progress will be made at competence committee meetings a long time after the actual observation, which makes the contextual information incredibly important.

Consolidation of data for review. Participants described the need for a data reporting strategy that illustrated patterns of resident performance and behaviours and was easily accessible in one electronic system. This was especially important for those individuals responsible for reviewing resident performance. Currently, resident data is housed in multiple systems, which makes it harder for individuals to monitor trends across varying contexts.

> *P9: "having everything together in one place easily cross referenceable and easily interpretable. If I need to take more than let's say three minutes to make*

sense of data that's before my eyes, it's too much and the format isn't appropriate."

P2: "Oh for sure because you've got to look at patterns of performance over time, you know? If you're seeking weaknesses, they don't emerge often in one context, right? You see them across... you know, someone might be really good at anesthetizing adults, and not good at all at managing pain, you know?"

In summary, there was a common sense that the electronic portfolio should be an enabler for performance monitoring during the implementation of CBD. Implementation of CBD is dependent on a good electronic portfolio. These interview data were used to create questions for focus groups six months later.

Stage 2: Focus Groups

I ran three focus groups: a resident focus group, a faculty focus group, and a CBD focus group. Five individuals participated in the CBD focus group, and all but one had participated in stage 1 of this research (see Table 2). These focus group participants were both service receivers and providers as previously described (see Figure 1). Three individuals participated in the faculty focus group representing 2 medical schools. Four individuals participated in the resident focus group representing 3 schools. Residents ranged from entry level (PGY1) to almost finished their program (PGY5). Each residency program had varying assessment practices, including completely traditional (monthly assessment as the main source of resident assessment data), a hybrid of CBME and traditional with increased formative WBAs, and a program with individually tailored

education. None of the residents or faculty focus group participants had participated in stage 1 of this study and all were considered service receivers.

Table 2

Number of Focus Group Participants and Schools by Position/Area of Interest and Geographical Location in Canada

Position/ Area of Interest	Geographical Location in Canada			
	West (BC to MB)	ON	East (QC to NL)	Total
Resident	1	3	-	**4**
Clinical Teacher	-	3	-	**3**
CBD Working Group	1	3	1	**5**
Total Participants	**2**	**9**	**1**	**12**
Number of Schools in Canada	5	6	6	**17**
Actual Schools Represented	1	3	1	**5**
Representation* (%)	**5.8**	**17.6**	**5.8**	**29.2**

Legend: BC = British Columbia; MB = Manitoba; ON = Ontario; QC = Quebec; NL = Newfoundland

*Calculated as Actual Schools Represented / 17 (Number of medical schools)

A total of twelve individuals participated in the focus groups. Five schools were represented, three of which were located in Ontario. The reason for more participants from Ontario might be that the NOSM anesthesiology program and RCPSC have more influence in the proximal regions and medical schools that have more exposure to CBD. I first describe converging themes (commented on by all groups) and then I describe diverging themes (commented on by one particular group). Diverging does not mean that other groups wouldn't think these themes are important, but that they were only commented on by one of the focus groups. I use the codes Rx (Resident), Fx (Faculty), and Cx (CBD) to indicate respondents in each focus group.

Converging Themes

Three converging themes were identified within the focus group discussions; the need for training, mapped resident trajectory, and ideas about the new assessment form. The participant perspectives are illustrated below for each of these categories in descending order of priority. Priority was determined by examining the frequency of comments on a topic coupled with my personal judgment.

Need for Training. The top priority for which all focus groups agreed was need for training, more specifically for faculty observers to have a shared understanding of the assessment paradigm. Two recurring issues discussed with respect to need for training were the variations in understanding assessment domains and the need for standards. The resident quote below talks of using the actual tools to develop a shared understanding:

"R3: The problem for us right now is that there are - because everyone is thinking of different things and each module lead has their own thoughts about what they want, it's kind of a very scattered system…And something that I had our staff do and I think has been changed in the past for us is that exactly some of our staff will say I can't remember exactly what that CanMEDS role was and we just changed the name and so now I don't know what that stands for. And so, we have a dropdown menu that you can click on that lists what goes on under the CanMEDS roles, which our staff actually sometimes look at, especially one of the older staffs to make comments or they use the same wording to make it sound a little more constructive." Rx

The participants in the CBD focus group session raised a related concern. The concern raised was about all observers having a shared understanding of the meaning of 'entrustment' when assessing residents.

"C3: So maybe I just need a clarification because I've heard it explained a bunch of different ways. The entrustment decision that the faculty member is making on that day, is it the question, today I didn't need to do anything to intervene. Today, you did this all by yourself. Or is it, next time I would trust you to do this without me in the room because those are very different questions. Because sometimes I'm there and I didn't have to do anything, and that's fine because I can reflect on that.

C4: I think they are very different questions; I would agree entirely.

C3: And they require different faculty development.

C2: Yeah, we have to all understand. We have to agree on what we mean by it. And teach our faculty to make the same decision." Cx

The final quote is from the faculty focus group and speaks to the variation in standards between each of the observers. The concern raised here is that the residents will begin to game the system, seeking out those observers that will more easily pass them on a certain skill.

"F2: the big risks, I think, is for faculty to understand, and I don't really understand ... so it's about educating, but things like ... so, you know, who's going to say that the competency is met? Is it just three staff people give you a pass, a number seven, because the reality is I'll say there are some easy markers and some hard ass markers. That's just our nature... so only the program director really needs to be the one to actually sign off ...if we don't do that well residents will quickly know exactly which staff people are easy markers and which ones are hard markers, that's just going to be ... you know, so in the daily evaluations, I don't have the sense that they're what's generating the competency…So it's understanding that and making sure we pay attention to that. There's going to be tons of faculty development around this." Fx

In summary, participants agreed on the importance of training for faculty if this initiative is going to succeed. This includes training on tools, terminology, and the new framework to name only a few.

Performance Monitoring: Mapping Resident Trajectory. A second priority on which all focus groups agreed was the ability to map resident trajectories online as part of

the performance monitoring system (note that performance monitoring was one of the themes that was identified from the interviews during Stage 1 of this study). Although the theme of mapping resident trajectory online was a shared priority between groups, each group offered a unique perspective.

The resident focus group described a common need of knowing what needs to get done and when. It was felt that these could be portrayed as a mapped list of objectives to be used as a learning plan. They felt that the observing faculty should have access to all objectives and each resident's overall progress with respect to the objectives. The residents were clear that they meant for the observers only to see whether or not objectives were achieved, not the actual assessment data related to that achievement.

> *"R3: ... so they* (the faculty) *would be able to search by student name that's on their account and vice versa kind of thing. And I think it would be ideal for the staff to get a (sic) generic list of (sic) goals but not personal evals* (assessments). *Because I absolutely agree, I can easily see that being a very much bias process, which would be a negative for the residents' learning." Rx*

The faculty focus group spoke of the need to illustrate resident progress on the dashboard. Additionally, they proposed that some sort of warning should be given if a resident falls behind or is not on track to achieving competence during the expected timeframe. This flagging was also discussed in the interviews. What was new was that faculty would also like to see the flags.

> *"F2: I'm just trying to think of one that I saw, that our program director showed us, but it was, like a dashboard that showed that if your EPA said you had to have*

> *done three* [assessments] *for spinal by year one and whatever, and you're, like in year three... it would come up as a red on your dashboard." Fx*

The CBD focus group also described a need to be able to map resident trajectories using a dashboard that indicated whether a resident was behind or on track with expectations. They expanded this to include contextual mapping allowing the program to indicate if the resident is behind or on track relative to their peers in the program.

> *"C3: So that they* (the residents) *see the little bar progressing along and they want to try and finish this and finish that one and that sort of thing. And if ...you've got 30 months before you get to move to Level 4 in the game, you get bored with the game. And so it would be nice for them to be able to see progress faster than that. And you might be able to do that with individual EPA's, but without the ability to sort of break it into smaller chunks I think these big – the big ones might be challenging. That's my only thoughts about it. It gets logistically difficult to do that. It would require giving programs flexibility to actually break out a number of things and map them within the* [electronic portfolio]. *And I don't know if the College would ever let us do that. But as a system and an ideal system that I would want, I would want a program to be able to do that." Cx*

The CBD focus group added that it would be important to have the ability to map objectives to clinical experiences. This is similar to what the residents were describing although the objectives they referenced were the EPAs. All participants expressed the need for this to occur locally within their particular clinical context because clinical experiences vary across settings. There was some debate amongst the CBD focus group as to whether or not the mapping needed to occur in the electronic portfolio, although

participant C3 made the point that multiple systems are already a challenge and data in one place would be ideal.

> *"C8: I think the EPA must be mapped to the clinical experience, but it has to be within each program. It doesn't need to be on the* [electronic portfolio] *and can be very different from one program to the other. So this must be like as flexible as it can because to do an EPA…*
>
> *C2. I know. I couldn't agree more. And even within an individual program, residents will, for logistical reasons, come to different training experiences and hence master different EPAs at different, you know, chronologic stages within their career or their residency…*
>
> *C3: So I 100% agree that the flexibility needs to be at the program level with respect to the mapping. I don't agree that, that all has to be outside of* [the electronic portfolio]... *One of the challenges for learners is that they have to go to many different places. So if they have to go a different place – by definition, they need to go to a different place to find out what EPAs that they should be looking at right now." Cx*

In summary, all focus groups felt mapping resident trajectory to be an important concept when moving towards CBD. They offer different, yet very similar, lenses to the meaning of mapping resident trajectory.

Prospective Ideas: New Assessment Form. A third priority identified by all focus groups was the resident assessment templates proposed by the RCPSC. Much of this discussion centred on two generalized questions at the bottom of the proposed

resident assessment templates. These questions were separate from the EPA-entrustment scale and CanMEDS-based Milestone ratings. The questions they were asked in this regard were:

- Do you have any concerns regarding this learner's professionalism?
- Do you have any concerns regarding patient safety?

All groups agreed on the importance of patient safety and professionalism as part of being a good physician. There were no concerns raised about the clarity of the patient safety question, however all groups noted concern about the subjectivity regarding the question about professionalism. Participants called for a clear definition of professionalism as a way to improve validity and reduce subjectivity.

> *"R2: …in terms of patient safety I completely agree but this is going to become very dichotomous, very yes or no type of answer. In terms of professionalism, that becomes tricky and I do not think we should be asking specifically about it because I don't think that all of the staff know how to recognize what is good professionalism." Rx*

> *"F3: I think it's interesting that we have laid out these very discrete milestones but then we leave professionalism and patient safety open to the subjectivity of the assessor. So what is professionalism? Patient safety, I think, maybe most of us can agree on that, but it was just interesting there was no checklist underneath those… I think, maybe, those are two domains we have neglected to assess for a long, long time and I think this is a good starting point, and maybe having the words there is good because it lets you actually think about these two areas." Fx*

"C3: ...I think, as somebody fills in, or deals with remediation, it's almost always there, the professionalism component that goes along with whatever other components are going on. So I do think it's an important spot. I don't know how much it'll be used, but it's got to be there to be able to be aggregated.

C2: It raises it in people's sort of consciousness as they fill out the form." Cx

The Resident and CBD focus groups discussed the wording of the two questions regarding patient safety and professionalism. They indicated that the wording of these questions only left room for negative comments, given that each asks only about concerns. The opportunity to comment positively on these aspects of performance seemed to be desired by both of these groups. Participants in the faculty focus group did not mention this as a concern.

"R4: ... I'm not sure if the wording that you have on your presentation is kind of the wording that is the intention going forward. But to me it seems like there's really no opportunity from that wording to comment on or reward positive behaviour rather than more just discussing constructive criticism, which is important but it's only one component of the evaluation." Rx

"C3: It would be nice if there was a way that it wasn't every time that you tick it off, that, that means that something bad is happening. That there's something about professionalism that's spun in a good light… it would be nice if there was a way to sort of have a good and a (sic) negative." Cx

One last point that was discussed by the CBD focus group was the opportunity to have the resident and faculty sign off on having discussed the feedback. Although only

discussed within this group, it was agreed upon as valuable within the group and so it is included here.

> *"C2: ...if I ticked yes, I'd spoken to the resident when they then saw it, they had a separate box that said, "Yes, I had a chance to discuss it with my –" So they may not agree, you know, if I said I talked to them and they didn't, then I guess that's something to finally get sorted out. But I guess what I'm saying is the system could facilitate that veracity check.*
>
> *C3: ...We've got that on their paper forms…the resident and the staff…both sign the form before it gets submitted. So I think it's something that we certainly value at an institution as well." Cx*

In summary, although only one aspect of the assessment form is targeted for review here, all participants showed great interest in providing input on the content of the assessment forms used within their program.

Diverging Themes

Diverging themes are themes that were considered priority by one particular focus group but not mentioned by others. This reflects divergence in terms of what each focus group found to be priority based on their knowledge and experience. Priority was determined by examining the frequency of comments on a topic coupled with personal judgement. The most prominent theme was selected from each of the focus groups and is highlighted below.

Resident focus group: Risks. Risk factors were a particular priority for the residents. These included; risks of bias within faculty, reductionist feedback given the increase in assessment, the potential impacts on patient care, and potential legal ramifications if privacy of data is not maintained.

The risk of bias was mainly discussed with respect to the program having an increased perception of power over the resident promotion into practice. Previously, the examination was perceived to hold all of the power even though in actuality the program was intended to have final say. In CBD, the examination is held between 6 months to a year before final culmination of residency training, although the timing varies. The final authorization to practice is based upon culmination of transitional EPAs rather than successful completion of an examination. This highlights the fact that the program personnel make the final decision on promoting residents into practice.

> *"R2: I just heard about CBD and being like maybe lowering the* [importance] *of examination that you need in the end… if you've done one case perfectly well independent, are you competent? Do you need 10, do you need 19? I don't know….*
>
> *R1: … there is that risk of bias, especially in that I think a lot of the medical schools may feel that the success of their students is a reflection on them as well as the kind of emotional baggage as far as, like R2 said, raising a resident." Rx*

Another perceived area of risk was that of increasing the volume of assessments. Participants felt that the time allocated to each assessment would be inadequate to give feedback of any value to the residents if observers were inundated with too many assessments. The residents were concerned that faculty may suffer assessment fatigue or

burnout and therefore, might not take the time to offer valuable feedback. The 90-second timeline noted below is based on the RCPSC's indication that completing the EPA assessment form electronically generally takes about 90 seconds.

> *"R2: I don't think you're going to get valuable feedback because the best feedback that I got is sit down and this happened, what was going through your mind, why did you do this? And it's more of a debriefing rather than a feedback I'd say and that takes time. You cannot do a debriefing in 90 seconds.*
>
> *R1: Just 'cause it can take 90 seconds doesn't mean it should.*
>
> *R4: And if it is 90 seconds you're just going to get, like the feedback's like okay on a scale of one to five, you're doing four out of five on this particular scale, I have no concerns with you and your professionalism, communication, keep it up, read about this. And that'll be the extent I think of most of the evaluations." Rx*

One resident described experiences with on the spot feedback where she received feedback in the operating room during and just after a patient case before moving onto the next patient. This aligns with the idea of faculty observing a resident perform and immediately offering feedback. The quote below denotes a concern from a resident peer regarding patient care because of the timing and setting of this model of feedback.

> *"R4: I guess in most cases the evaluation is going to be positive for most residents, it's not going to be a big deal. But if something else is going on that it's not entirely positive or the resident takes it in a way where it's not positive, I mean that's going to have an impact on their ability to care for the patient and their ability to learn from what's actually going on in that third case. I mean I don't think it's completely an option we shouldn't consider but I do feel relatively*

strongly that evaluations should be done confidentially, privately between a staff and the resident in a non-clinical time, where both people are focused solely on the evaluation process, which means that there has to be time dedicated at the end of the day or at the end of the case to do that." Rx

Finally, although not discussed in depth, the idea of legal ramifications arose as a risk factor due to the increase of documented assessment of clinical performance within residency training.

"R2: Also for legal purposes we are starting to look a lot more like our American neighbours and I wouldn't want - no, but you have a bad event that happens as a staff and to go back into your residency training and can pinpoint something on you based on something that happened in your residency. I can see it happening because it happened with simulation (sic)." Rx

These risks will need to be addressed in order for the residents to buy into the CBD framework. Residents need to feel at ease and confident in order for implementation to work effectively.

Faculty focus group: scheduling. Scheduling was a priority for the faculty focus group. The term scheduling refers to how the resident spends each day within the clinical setting. Each day presents new patients with varying complexity of disease. Within CBD it will be important to ensure residents are scheduled for successful achievement of competence, as well as, exposure to various patient encounters ensuring a well-rounded and experienced clinician emerges into practice. The discussions of scheduling centred on

the challenges of ensuring residents are assigned to the right patient cases to achieve competence as prescribed by the specialty committee.

> *"F2: And I would, for sure, want to be something ... if you were a* [PGY3] *and you actually, you know, only done one or two or nothing of something, you know, it would just prompt somebody to assign you to the right rooms or create some sort of flexibility around that…Make it visible, I guess, is the word." Fx*

This highlights the increasing importance of transparency for faculty observers in charge of organizing clinical experiences for residents. Faculty observers feel they need an understanding of where the resident is on their learning trajectory and the expectations of upcoming learning opportunities.

Resident exposure to infrequent cases was also raised as a concern. Specifically, faculty were concerned that in the new model residents may become so competitive trying to complete EPA requirements that they fight over access to cases. Resident exposure to patient cases can only be controlled to the extent of their availability. This becomes a significant challenge in a setting where that particular competency is required of the resident to proceed in their training.

> *"F3: Yeah, so if you had to see so many esophagectomies and maybe there's only so many a month or so many a year and every PGY4 wants to get in and see them, trying to schedule so that everyone gets an opportunity to be in that room can be quite challenging too, so if one gets enough exposure to, really, subspecialties, that would be a risk. Everyone will be fighting over trying to be in that room on that day..." Fx*

It will be up to program leadership to ensure residents are exposed to a broad range of patient cases to achieve the required competence but they cannot control the patient population they serve. This means rearranging the local system to meet these needs. It is also possible that smaller hospitals will need to use simulation or send residents to larger hospitals to achieve competencies if cases are rare. The extent of the rearrangement would likely vary based on local practices and opportunities.

CBD focus group: Information access after training. Information access after training was a unique priority for the CBD focus group. Six of the thirteen interviewees also discussed information access after training, which prompted more exploration through the focus groups. This theme focuses on the topic of who has access to assessment data, for what purpose, and at what times after graduation. The CBD focus group was in support of keeping identifiable resident data after training unless presented with a convincing argument otherwise.

> *"C4: I think there would have to be a purpose to get rid of it. The only thing that might impact how long we were there is probably storage capacity. I don't know why we would want to –*
>
> *C2: Ever delete.*
>
> *C4: I think there'd have to be a purpose to get rid of it.*
>
> *C2: Yeah. So unless there's privacy legislation or something like that, something controls it.*
>
> *C4: I think it requires it." Cx*

Participants did not have a clear idea about how long the resident data should be kept but they did list reasons to keep it. Further, they were aware that there might be a policy related to deletion of data, which I address in the discussion. The next quote speaks of quality assurance, recognizing that the CBD paradigm is new and EPAs need to be evaluated for performance to modify, delete, or add other EPAs. To meet this purpose, participants felt that data should not be anonymized.

> *"C2: after five or ten years we could go back and look at the – how old EPAs were assessed five years ago versus now and which EPAs are useful and which are non-discriminatory or are they in the right stage of training, etcetera. If every resident's data is deleted as soon as they graduate, how could you ever do that?... C4: And if we're talking about the question of, you know, which EPAs are good, are discriminating. Well, they got to discriminate something. And it's something they're going to discriminate is success in practice, right? That's what we want to know. There would be no way that we could track that.*
>
> *C3: If it was anonymized." Cx*

There was much discussion around the potential for anonymizing data but the group rejected this idea. There were strong opinions that the information needed to be identifiable in order to be of use. One suggestion to help maintain confidentiality was to assign resident numbers rather than names. This seemed agreeable to participants as long as identifiers were still kept and the key accessible to those who require it.

> *"C4: I think the kind of thing that you're speaking about is, perhaps, our unknown unknowns, that is, the things that we don't even know that we could potentially use this information for that was there. Put another piece out, and it*

> *really would be an argument for keeping the non-anonymized information. As CBD rolls out – I mean the purpose of our training programs is to produce anesthesiologists. To produce high quality anesthesiologists, whatever that is, because we would struggle to actually define what that is." Cx*

Although mainly discussed as quality assurance needs for keeping identifiers, scholarship was also noted.

> *"C2: Well, I'll give you a perfect example. One of the studies that* [the RCPSC] *likes to quote when we started this, was the one about the competence of individual obstetricians and tracking that back to their institution of training and so on. If the national data pool gets anonymized on graduation you can never link what happens in your career back to any aspect of your performance in residency." Cx*

One of the shifts with CBD is removing emphasis on the RCPSC exam in favour of promoting program accountability for resident promotion into practice. This change coupled with an increase in resident data highlights the importance of program decision support.

> *"C2: There's some potential advantage to keeping identifiable data if it was even accessible for, you know, perhaps someone's competence is challenged and I'm challenged for having promoted them and letting them out into the real world. I don't believe that happens a lot. And it may not happen a lot in the future either. But the only way you could defend yourself would be to have their data to show what the assessments were." Cx*

It is worth noting that these arguments seem to go against one of the risks discussed earlier by the resident group around potential legal ramifications. It will be important that the RCPSC and Postgraduate offices address this when deciding what to do with resident data upon graduation.

Chapter Summary

This chapter highlighted the needs and challenges participants faced or are anticipating with the move to CBD and an electronic portfolio. Stage 1 of my study illustrated themes that were common among most, if not all of the participants. Stage 2 was organized into converging and diverging themes to first illustrate commonalities between group priorities followed by priorities unique to each group. This is not to say that other groups would not find concepts important, just that these were discussed in more depth with one particular group illustrating a stronger pattern of concern with that particular theme. Each of these concepts will be further elaborated in the next chapter.

Chapter 6: Discussion

This chapter reviews and discusses how results from this research answered my research question with a focus on perceived needs and their associated challenges.

Balance between Localization and Common Model

Participants voiced their perceived need for standardization of assessment forms with flexibility built in for innovation on many occasions through interviews and focus groups. They struggled with balancing the need to use standardized tools to allow comparison of EPA performance and using preferred tools specific to their own context. This perceived need is related to the second attribute in diffusion of innovation, compatibility (Rogers, 2003). For an innovation to be compatible, the adopter needs to see and believe that the innovation fits well with the way they like to work (i.e., within their given context) so it will be important for schools to maintain this flexibility (Rogers, 2003). The RCPSC has indicated that programs are permitted to continue using their local assessment tools as long as they adhere to the essential elements of the assessment model (Observe, Coach, Document) and ensure their program of assessment covers all of the EPAs (RCPSC, 2017). This latitude should allow programs developing or using a third party electronic portfolio to use standardized or program-specific tools. There were particular challenges identified for programs using the RCPSC Resident ePortfolio. Although RCPSC Resident ePortfolio is free of charge to Canadian Medical schools and is specifically intended to support CBD, at the time of this study, it only incorporated assessments required by the specialty committee. This compounded the problems of using multiple disparate systems, while allowing the flexibility required to maintain the

authenticity of data interpretation by the competence committee members (Donato & George, 2012; Rao et al., 2012).This is important for CBD to be successful and manageable at the program level. Outcomes-based individualized CBD programming quickly becomes overwhelming if residents, competence committee members, and other program leaders cannot easily access all of the resident assessment data. The challenge presented to each school will be to balance the resource implications with the need for flexibility and versatility when choosing which electronic portfolio to use.

The need for a clearer definition of professionalism has been discussed for several decades (Lurie et al., 2009). By separating out the idea of professionalism, participants in my study noted that the RCPSC had highlighted its importance to the assessor, but without giving any parameters to describe what warrants a concern. Residents who participated in this study seemed most concerned that without parameters, this may lead to faculty falsely identifying concerns that later become punitive in nature. For instance, if professional behaviour is not clearly outlined by the program, faculty may indicate concerns regarding professionalism for a behaviour that the resident was not aware they should be demonstrating. Although a risk, this might have been designed intentionally by the RPCSC so that resident professionalism can be judged by the competence committee in context. The final judgment will be left to the competence committee and reflected back to the resident in a timely manner. Lurie et al. (2009) explained that even when a definition of professionalism is agreed upon by raters, it can still get lost in the minutiae of psychometric analysis making it challenging to assess using scales. This would seem to indicate that synthesizing comments would be a preferred method. For example, work done by Guraya et al. (2016) listed the main tools used to assess professionalism from the

literature. These were multisource feedback, WBAs, objective structured clinical examinations, and a cognitive assessment of professionalism. Further, Guraya et al. recommended that assessment of professionalism involve "several assessors and uses more than one assessment method and assessment in different settings" (p. 4). These data would later be triangulated to form a decision on resident performance. Guraya et al. suggest that it remains important to offer residents a clear understanding of the judgment criteria around professionalism at the school and at a program level to allow transparency and inform the competence committee decision. If no such definition exists, competence committee members are likely to have varying definitions of what it means to be professional within their context, resulting in increased ambiguity and decreased transparency. Driessen and Scheele (2013) described other challenges of WBAs. They suggested that WBA programs are "bureaucratic, overly complex, subjective, not stimulating trainees to strive for excellence, and too much of a burden to busy trainees and their supervisors" (569-570). They suggested some ways to overcome challenges when implementing WBA programs such as: building curriculum around EPAs, providing faculty development, determining how much time supervisors and trainees can feasibly spend on these assessments, making sure the assessments align with practices in the workplace, basing summative judgements on trainee performance on multiple assessment sources, and shifting from assessment of trainee to the learning of the trainee. Based on work by Driessen and Scheele, I developed a series of questions that might guide an exploration of WBAs in the context of PGME. For example, What type of evidence would suggest a resident should require further training in a certain area? How many clinical observations are enough if the recommended number of observations are

not met? How can programs ensure progress decisions are consistent and fair from resident A to resident C?

Without clear parameters and processes, schools will be vulnerable to residents appealing competence committee decisions, even with the additional documented WBAs that CBD requires. The challenge is that we do not know the answers to these questions without looking at trends locally and nationally. To do this it is necessary to access and share data, but data sharing has not been popular within schools, and it is likely to become even more challenging at the national level (Ellaway, Pusic, Galbraith, & Cameron, 2014).

Information Access and Ownership

There are two distinct periods of time when access to resident progress data will be required: information access during training and after training. Throughout each of these periods five stakeholder groups representing three of the four social structure tiers could be identified which include tier 1: the residents and faculty; tier 2: program leadership and administration, and the PGME Dean and education specialists; and tier 3: the RCPSC (see Figure 2). The utilization of resident progress data by each of these stakeholder groups varies for each period. Figures 3 and 4 denote whether each stakeholder group requires data entry capabilities, data viewing capabilities, or both and their potential purpose for utilizing the electronic portfolio system.

An important consideration for information access, both during and after training, are policies that exist outside of the RCPSC, medical schools, and programs. These include federal and provincial legislature. Federally, the legislature is called the Personal

Information Protection and Electronic Documents Act (PIPEDA), which includes governance on evaluation as one of the personal information items (PIPEDA, 2018). Each province has it's own legislature. In Ontario, the legislature is called the Freedom of Information Protection and Privacy Act (FIPPA, 2017). One of the purposes of this act is "to protect the privacy of individuals with respect to personal information about themselves held by institutions and to provide individuals with a right of access to that information" (*Freedom of information and privacy manual*, 2018, p. 2). This would need to be considered in data access and management. Also this is relevant for sharing data for the purposes of scholarship, quality assurance, and decision support (i.e., determining if the EPAs are correct). This was important for the participants in this study. Each province will have to work within the confines of the federal and provincial legislature to keep and share resident data.

Information access during training. Throughout training, residents' assessment data are gathered in a format that can be aggregated for competence committee review and decision-making. Figure 3 is a visual representation of my interpretations based on the opinions of participant, experience, and the literature. Some stakeholders will hold multiple roles within the electronic portfolio. For example, the program director will also be a faculty observer; the resident may also be an observer when they become more senior.

Resident assessment data represents all relevant resident assessment data, ideally collected through an electronic portfolio (see Figure 3). At the time of the study many schools were still using multiple systems, including paper, all of which were included in

making decisions on resident progress. Each stakeholder group is represented in the squares around the electronic portfolio. The types of interactions with the resident assessment data vary depending on the stakeholder. An interaction with an arrow directed to the resident assessment data indicates when the stakeholder is entering information into the system (i.e., data entry). An interaction with an arrow directed to the stakeholder group indicates when a stakeholder is looking at visual representations of data (i.e., data viewing). Each interaction with the electronic portfolio includes the type of information that stakeholders would require for data entry or data viewing during the resident's training (see Figure 3).

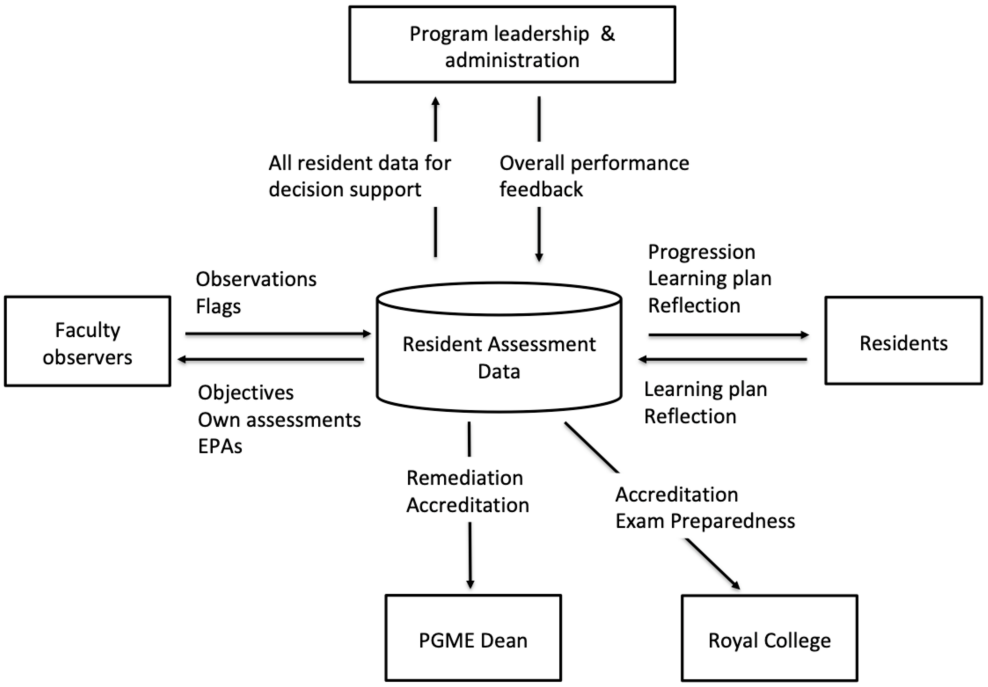


Figure 3: Data entered and retrieved from electronic portfolio by stakeholder groups during residency training.

The resident will require clear information on their progress in their training program. Residents should, ideally, have the ability to see and report on all assessment information clearly and in real-time, as well as, input educational planning and reflections (see Figure 3). This should support an outcomes-based approach, one of the core principles of CBME and CBD (Taber et al., 2010; ten Cate, 2012). Residents acting as observers would only see their own previously completed assessments.

Faculty observers should also be able to view their residents' progress. Participants described this as: allowing faculty observers to view EPAs achieved by the resident and relevant objectives they are working to achieve. Participants were clear that this would not include any actual assessment data. It would only include where they were on their anticipated learning trajectory. This information could also help with educational planning (note that this is one of the six primary functions of the electronic portfolio I identified in my literature review; Cambridge, 2008). Assessment has thus far been the major driving force in the CBD paradigm. This is likely due to the fact that meaningful assessment is one of the most challenging components to achieving successful implementation of CBME (Bhatti & Cummings, 2007; Carraccio & Englander, 2013; Carraccio et al., 2002; Jefferies et al., 2011; Klass, 2007; Lurie et al., 2009; Schuwirth & van der Vleuten, 2011; Swing, 2007; Talbot, 2004; ten Cate & Scheele, 2007; Torbeck & Wrightson, 2005) but faculty and resident participants were clear in wanting the ability to plan their education through the electronic portfolio as well as completing assessments. Each school will have unique needs, requirements, and policies regarding how much information can be shared with observing faculty. This again emphasizes the need for a flexible and versatile electronic portfolio system.

Program leadership and administration stakeholders include anyone with decision-making power in the program (e.g., the program director, competence committee members, academic advisors, and other lead positions, educators, etc.). These stakeholders would need access to all of the resident assessment data to be able to provide residents and faculty with the coaching required to run a successful program. Administrators and educators fall into this category because they support, provide training, and help drive processes in the program. Participants were mainly asked about the program director role in which case they indicated that the access and utility should be the same as each of the residents with the added functionality of flagging resident under-performance issues.

PGME deans would also require access to monitor remediation plans and accreditation concerns. As overseers of all PGME at their schools, PGME deans should not have limitations on their access to this information.

Finally, the RCPSC is an important stakeholder requiring access to some of the resident information as the governing body for RCPSC programs. At this time, the minimum data being requested is when the resident will be ready to sit their RCPSC examination and access to some data for quality improvement purposes. There are many discussions still occurring between the RCPSC, program leadership, and the PGME deans regarding how this would occur.

Information access and ownership after training. Once a resident has graduated, data ownership and access become even more complicated. The Resident focus group did not feel that they would want or need to access the system post-residency

training. That said, the current CBD model is intended to follow the resident from undergraduate medical education, through residency training, and into practice with continuing medical education (RCPSC, 2017). Figure 4 is a visual representation of my interpretation of the participant needs taking into consideration alignment with the CBD model along with participant views. Stakeholders remain largely the same with two changes: (1) Faculty are now denoted as 'researchers' rather than 'observers'; and (2) The 'resident' stakeholder changes to practicing clinician therefore are now denoted as 'resident graduate'. In this model, only the 'resident graduate' would be entering data into the system but all stakeholders still require a view of the data.

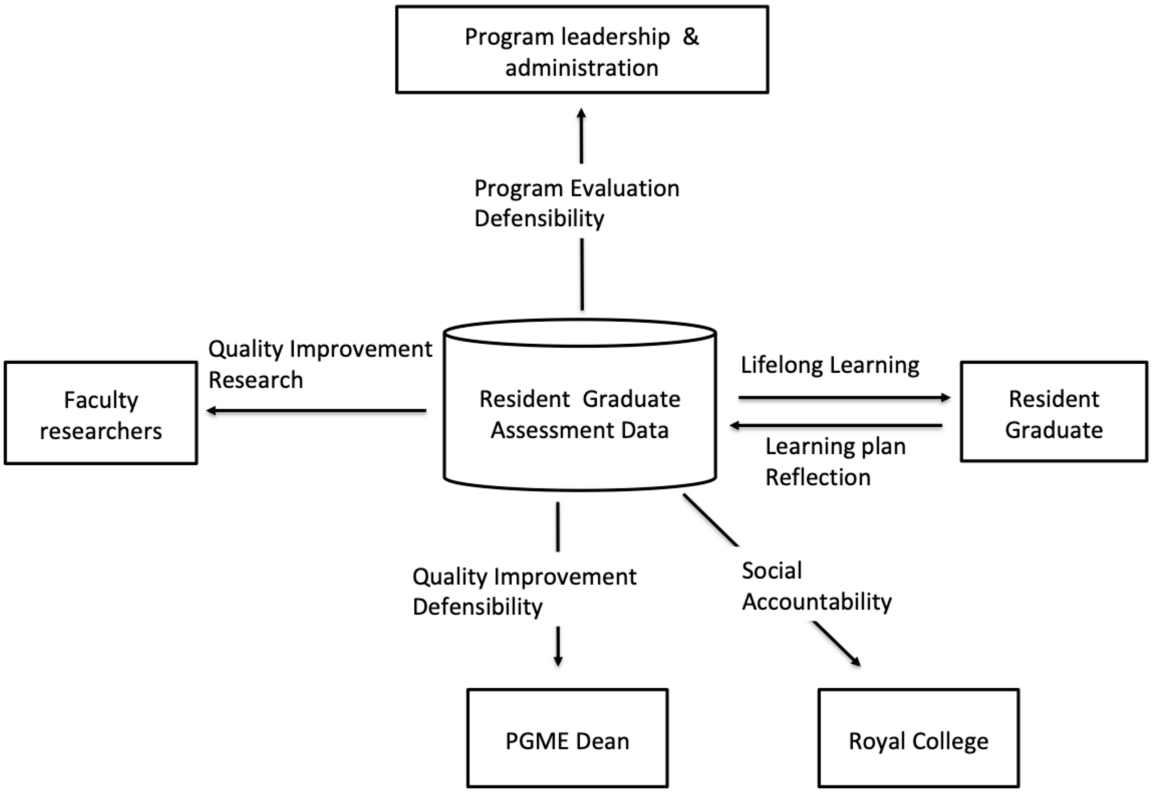


Figure 4: Data entered and retrieved from electronic portfolio by stakeholder groups after residency training.

If this model were successful, the resident graduate would still have access to data required to continue their lifelong learning trajectory. At the time of writing, there was no resolution regarding what will occur with resident data post-residency. If data is retained, the use of electronic portfolios also could allow residency programs to collect a large amount of data on a national basis. Generally this is noted as 'Big Data' (Chahine, Cristancho, Padgett, & Lingard, 2017; Ellaway et al., 2014; Jin, Wah, Cheng, & Wang, 2015; Triola, Hawkins, & Skochelak, 2018) although it is also referred to as longitudinal research databases in medical education (Cook, Andriole, Durning, Roberts, & Triola, 2010). Longitudinal education research database is defined as "an information repository containing prospectively collected measurements over time on individuals from multiple educational/training programs and professional settings with the intent of conducting analyses to answer specific research questions relevant to medical education" (Cook et al., 2010, p. 1342), while 'Big Data' is defined in broader terms as "the aggregation of large and heterogeneous datasets" (Ellaway et al., 2014, p. 216). Both are applicable to the growing dataset of PGME. For example, a NOSM anesthesiology resident requires one assessment per day of clinical work throughout five years of training, at four days per week this calculates to 208 X 5=1040 assessments for one resident. Larger schools can take 50+ residents per year in a five-year program so, in comparison to the previous data set of one aggregate assessment per month, this could represent a very large amount of data across Canada. This is one example of new data that will be generated by CBD. Cook, Andriole, Durning, Roberts, and Triola, (2010) list many more opportunities to capture longitudinal data for research. This might include data from before medical school (e.g., examinations, degree, demographics), during medical school (e.g., national

board exam scores, research activities, debt, curriculum details), during postgraduate training (e.g., leadership positions, elective rotations, board certification, site demographics), and in practice (e.g., maintenance of certification, continuing medical education hours and topics, practice type, teaching activities). They generated this list based on datasets available in the United States but the authors posit that it could help "enhance educators' awareness of and ability to access individualized learner data for medical education research" (Cook et al., 2010, p. 1345). I suggest using this list as a starting point for data sharing collaborations in the Canadian context.

'Big Data' has potential in a number of ways for learners, medical schools, researchers, and governing bodies (e.g.,RCPSC). For the learners, it could allow them access to personalized competency data to help foster lifelong learning skills (Ellaway et al., 2014; RCPSC, 2017). For medical schools it helps to capture longitudinal assessment data which could help defend decisions and drive quality improvement initiatives (Cook et al., 2010; Ellaway et al., 2014; Triola et al., 2018). For researchers and governing bodies it could include the parallel capture of data across different institutions for the same time period helping to create benchmarks on resident performance, identify how EPAs are performing, and correlate to patient outcomes (Cook et al., 2010; Ellaway et al., 2014). Participants in this study spoke of two needs with respect to the usage of this national data by remaining stakeholders (program leadership, faculty researchers, PGME deans, educators, and the RCPSC) after training: (1) the relatively short-term need as it related to updating and evaluating the performance of EPAs to ensure we are measuring the right things in the right way; and (2) the long-term need of linking this performance data to patient outcomes (see Figure 4). These needs are linked to the first attribute in the

diffusion of innovation model, the ‘relative advantage’ for service receivers (Rogers, 2003). Alignment of this ‘Big Data’ with patient outcomes could be a major benefit to incorporating these web-based tools within the programs as it could help respond to the patient safety concerns of the public (Chahine et al., 2018; Cook et al., 2010; Ellaway et al., 2014; Triola et al., 2018).

Linking medical education to health outcomes is one of the major drivers of moving to CBME. This is an important issue that requires attention sooner rather than later (Chahine et al., 2018; Cook et al., 2010; Ellaway et al., 2014; Triola et al., 2018). The issue of linking medical education to health outcomes relates to Rogers’ fifth attribute, ‘observability’ (Rogers, 2003), by, for instance, demonstrating that CBD is responding to the social requirement for better clinicians. The added complexity in terms of legal and political issues associated with using health data for health professional education would require additional firewalling, encryption and other capabilities that generic systems cannot provide (Ellaway et al., 2014). The challenge here is to gain the ability to regularly and systematically track and analyze health professional education across multiple contexts and methods over an extended period of time (Cook et al., 2010; Ellaway et al., 2014; Jin et al., 2015). To meet that challenge it is recommended that the RCPSC and schools work together to both set and meet metadata standards (as developed by “MedBiquitous,” n.d.) to decrease variability in electronic portfolio data quality and utilization (Chahine et al., 2017; Ellaway et al., 2014; Rao et al., 2012).

There are strengths and weaknesses of research using longitudinal databases outlined by Cook et al. (2010). Strengths included the larger sample size which facilitates research, the ability to collect data for an extended period of time to detect outcomes that

emerge slowly, the ability to look at multiple programs in multiple stages of training, greater generalizability, and more sophisticated data analysis (Cook et al., 2010). Note that participants in my study advocated for longitudinal data capture which would keep data linked to the individual and their institution. This is consistent with recent calls to action regarding linking patient health outcomes to training and institutional data (Chahine et al., 2017; Ellaway et al., 2014; Triola et al., 2018). Weaknesses of research using longitudinal databases included; information obtained through databases may not be as specific as required, using de-identified data would not make it possible to add additional local data, information available may not be representative of the target population, incompatible data formats, and lack of awareness of the research databases (Cook et al., 2010). Note that participants in my study did not comment in-depth on these weaknesses.

It is important to consider what types of data should be included if a research database is created (Chahine et al., 2018; Cook et al., 2010; Ellaway et al., 2014). Ellaway et al. (2014) illustrated the links between the type of data and their uses within the context of health professions education. They used a domain-based model of health professions education and linked specific data with specific domains of interest. For example, for the domain entitled "teaching and learning" they identified learning analytics (i.e., data) that would inform this domain (Ellaway et al., 2014, p. 218). As a second example, Triola et al. (2018) identified key research questions that call for specific types of data. These questions were:

> Is medical education, with all of its resources, costs, and societal burdens, doing its job and meeting our nation's needs? Are we preparing our graduates for the

> future of clinical practice? Do we teach our students the emerging skills needed by physicians and care teams? (p. 826).

The data needed will vary by question.

Although the importance of information access after training was articulated, there are still many challenges to overcome. These included the navigation of legislation to share data (e.g.,FIPPA, PIPEDA), ensuring highly sensitive information is guarded from inappropriate use or accidental disclosure, capturing team-based decisions rather than focusing only on the individual, and considering circumstances where identities may need to be exposed if a researcher identifies ethical issues (Cook et al., 2010; Ellaway et al., 2014; Triola et al., 2018). Jin et al. (2015) indicated that the major challenge with 'Big Data' isn't actually in the volume of data since computers can be leveraged for that but instead the diversified data types, timely access, and the veracity of the data. Multiple existing databases, plus each medical school choosing their own electronic portfolio with differing capabilities will exacerbate this challenge. Finally a clear delineation of who owns the data during and after residency training will need to be resolved before 'Big Data' in Canadian health education can exist.

One recommendation to help navigate some of the confidentiality challenges included using a third party who is uninvolved in either data collection or research activities to provide data subsets (Chahine et al., 2018; Cook et al., 2010). Information access and ownership will therefore be one of the major challenges faced over the coming years if we are ever to capture the benefits and pitfalls for each of the competency frameworks within the disciplines and link health education to patient outcomes.

Performance Monitoring

The RCPSC's model of CBD begins with definition of outcomes (i.e., EPAs) to allow for a high-level clear demarcation of progress in each of the disciplines. These EPAs are created in workshops, where an expert group of engaged faculty (i.e. the specialty committee) identifies the integral competencies of a discipline and then maps them to workplace-based assessments and stages of training that will be used to monitor resident performance (Oswald & Abbott, 2017).

Clear demarcation of resident progress and flagging. One of the challenges for medical schools is to monitor individual resident progress (ten Cate, 2012). Specifically, for electronic portfolios this means the ability to contextualize assessment information to the program's context and present it for residents and other stakeholders illustrating real-time progress through residency. This is a key component of CBD. The ability for electronic portfolios to meet this challenge varies greatly between systems and remains a challenge (Driessen & Scheele, 2013). Compatibility with different platforms is highlighted in the literature as one of the barriers to deployment (Amin et al., 2011; Basu, Parvizi, & Chin, 2013; Chu et al., 2012; Cook & Ellaway, 2015; Wallace et al., 2012). Study participants indicated they currently use multiple disparate systems to collect assessment data. This makes it challenging to offer stakeholders a clear demarcation of progress (Rao et al., 2012). One participant spoke of using manually entered Excel spreadsheets to integrate all of the data and demark resident progress. Although a step in the right direction, this would not be available to residents or faculty in real-time and would be extremely labour intensive, if not impossible, to upkeep for the larger programs.

In addition to tracking resident progress within an electronic portfolio, participants requested tools to flag resident under-performance. Although participants recognized that the ability to identify trends would take time to develop because the EPAs will not have any performance data until they are launched in each of the disciplines they still noted the importance of this feature. In contrast, participants in the study by Hauer et al. (2015) did not identify flagging as important in the new developmental model of a competence committee. It is possible that a need to retain old practices (such as problem identification through flags) stems from some hesitation toward this paradigm change but benchmarking (which is equivalent to flagging) is indicated as important for the new CBD model as described by Ellaway et al. (2014).

Hauer et al. (2015) identified the ability to assess residents' performance using benchmarks or milestones as one of the developmental needs for competence committee member engagement. Participants described these needs locally and nationally. Locally, programs would use cohort information to set the benchmarks but this will still take time and may present a bigger challenge for small programs where anonymity becomes difficult to maintain. Developing national benchmarks is a secondary and perhaps more difficult discussion because it will require schools from across the country to agree on sharing data (Ellaway et al., 2014).

Comments and context are important. Benchmarking or flagging may be made somewhat more challenging when we think of the value added from qualitative aspects of assessment (i.e., comments). Although recognized as important, offering good coaching

comments remains a challenge in need of faculty development (van der Vleuten et al., 2014).

Edwards and Petra (2013) found meaningful feedback to be a challenge for observers even when they were trained to do so. Nonetheless, observers will require additional development in this area as CBD moves forward. The electronic portfolio should offer the ability to deconstruct poor comments, further enhancing feedback capabilities of observing faculty which could lead to better comments (Donato & George, 2012).

Participants noted the importance of context for residents and faculty to show there is a wide breadth of clinical experiences, as well as, to help jog the memory of the resident on what occurred during that observation. As discussed in the review of the literature to date, contextual information such as exposure to various clinical experiences has been captured with simple clinical logs (Cambridge, 2008; McEwen et al., 2015; Roark et al., 2006). In the traditional system, log completion varies from resident to resident and they are not tied to assessment. The specialty committee has defined contextual variables for each of the EPAs but it is unclear what will occur with clinical/procedure logging to capture the overall breadth of clinical experience in residency training. The purpose of clinical logging needs to be questioned and, if deemed a requirement in CBD, it would be important for schools to factor this in when choosing an electronic portfolio.

Consolidation of data for review. In CBME there is a need for multiple assessment tools and raters in order to verify competence and illustrate these patterns for

review by the competence committee (Baartman, Bastiaens, Kirschner, & van der Vleuten, 2007; Benjamin, Robbins, & Kung, 2006; Gaytan, 2005; Pereira et al., 2009). Each EPA has a suggested a minimum number of assessments determined by the specialty committee (RCPSC, 2017). Programs are meant to use this as guidance and are encouraged to include additional assessments necessary for their context (RCPSC, 2017). Getting all of these assessments into one electronic portfolio to offer an aggregate of information for the competence committee for synthesis has proven to be challenging even with its marked importance to successful CBD implementation (Bhatti & Cummings, 2007; Chan & Sherbino, 2015; Holmboe et al., 2010; Metheny et al., 2005; Sherbino et al., 2008; van der Vleuten et al., 2014). I have found, from professional experience that reporting is inadequate for providing a comprehensive representation of resident performance. This is likely because of multiple disparate systems holding pieces of resident information and the fact that this change is still in its infancy.

Achievement of EPAs must be mapped to local clinical experiences, which highlights the importance of local context. Recall anesthesiology's complex set of 87 EPAs with assessment plans and other recommendations set out by the specialty committee. It is probable that as a first iteration, anesthesiology may have written too many EPAs. This could lead to reductionism rather than emphasizing patient care at the risk of exhausting the faculty members and residents (Bhatti & Cummings, 2007; Chan & Sherbino, 2015; Holmboe et al., 2010; Metheny et al., 2005; Sherbino, Bandiera, & Frank, 2008; van der Vleuten et al., 2014). Each of the 87 EPAs has a defined number of observations associated with them in order to be marked as achieved. These are intended only as recommended guidelines for the competence committees to make progress

decisions but there is a risk that they become the determining factors of competence. Finding a balance between a reasonable number of EPAs and observations, definitions of competence, and offering transparency to residents will be key to a successful implementation of CBD and the selection of an appropriate electronic portfolio system.

Once EPAs are mapped to clinical experiences for each stage of the program, they need to be aligned with the resident daily clinical schedules. Within the CBD paradigm, each discipline writes specific contextual parameters that need to be met for each EPA. Given the context of medicine (i.e., caring for sick patients), in many cases which patient will be walking through the door cannot be dictated simply to meet educational needs. This speaks to the individualized contexts within training (ten Cate, 2012), which means that it is no small feat for the program leadership to ensure resident experiences within the clinical setting match the educational needs at that stage of training. The challenges, as raised by participants in my study, may encourage residents to fight over uncommon cases forming a hierarchy in the residency training programs, additional monitoring required of the program to ensure residents are receiving proper exposures, and finding time in simulators for those that will not be achieved otherwise.

Faculty Development

There are three areas in which participants clearly indicated a need for faculty development. These areas were developing a shared understanding of the CBD paradigm, training the faculty to make entrustment decisions using the new assessment tools, and training on the use of the electronic portfolio. The first two areas are intertwined with the

third being a little more straightforward although still challenging to meet with a large number of dispersed faculty members.

The need for a shared understanding of the CBD paradigm and for making entrustment decisions using new assessment tools was pronounced throughout the interviews and the literature where the understanding of competencies is listed as one of the barriers to successful implementation due to its complexity (Beard, 2011; Donato & George, 2012; Green & Holmboe, 2010; Malik et al., 2012; Whitehead, Kuper, Hodges, & Ellaway, 2015). Complexity is the third attribute in the diffusion of innovation theory talking about how easy the innovation is to learn (Rogers, 2003). Rogers (2003) described the complexity of an innovation, as perceived by members of a social system to be negatively related to the rate of adoption. Complexity ranks third in importance in diffusion of innovation but was noted as a very important barrier to successful implementation throughout the interviews. For example, if you need a high level of expertise to adopt the new model, those who are not interested in being experts in the innovation will become disengaged and adoption rates will fall (Rogers, 2003). The participants in my study were chosen due to their expertise and commonly described this innovation as very complex in nature. It is and will continue to be imperative that each school develops a way to engage a broad faculty audience when implementing CBD locally, using any available expertise and tools. This emphasizes the need for proper resourcing of this change to CBD within the first three tiers in the systems of influence model (i.e., 1: Global Context & Canadian Government; 2: RCPSC; 3: Medical School and Individual Programs; see Figure 2). In my professional experience, schools are sharing nationally and the RCPSC has offered programs, many video recordings,

PowerPoint presentations, and frameworks for change, assessment, and feedback to help implement CBD. The quantity of information is proving overwhelming, and NOSM has been struggling locally to define what resources are actually required to make this change. One area that is lacking is the local human resources and expertise within the current context, particularly because of the newness of the innovation and busy clinical schedules. A commitment from leadership to make this initiative one of the top priorities for success and offer continual training to all stakeholders along the way will be needed.

The third concept of training on the use of the electronic portfolio relates to Rogers' (2003) fourth attribute of trialability. That is the degree to which an innovation (i.e., the electronic portfolio) can be used before adoption (Rogers, 2003). This will be dependent on which electronic portfolio each school chooses to adopt. For example, Queens University has decided to move forward with CBD in all programs at once, facilitated by an electronic portfolio they created (Dagnone et al., 2017). A school using the RCPSC Resident ePortfolio cannot move forward until the RCPSC has input the EPAs into their system, which means the trialability, is more limited. Programs using the RCPSC Resident ePortfolio and wishing to pilot EPAs beforehand need to use other means such as paper-based or local electronic solutions. Training for faculty can and should only occur once forms are ready and access is granted to the electronic portfolio to try within their program. It is important that faculty have the opportunity to actually log into whatever system they are learning and use it directly following training or the value of the training will be lost.

Risks

The Resident focus group spoke of four main risks associated with the new CBME system. These include the bias of faculty when promoting residents, reductionism resulting in a loss of valuable feedback, lack of time and space impacting patient care, and potential legal ramifications. To be able to move forward with effectively implementing CBD, these risks will need to be discussed and addressed.

The risk of faculty bias when promoting residents was expanded upon by Carraccio and Englander (2013) who described the biggest problem in evaluating competencies to be the "inconsistent use and interpretations of assessments *(sic)* available by unskilled faculty" (p. 1069). This further emphasized the need for training faculty observers and competence committee members in using the assessment forms, providing coaching comments, and interpreting resident data. Although bias is generally perceived negatively, Dickey explained that it "is normal and common" (Dickey, Thomas, Feroze, Nakshabandi, & Cannon, 2017, p. 162). As such, it will be important to increase competence committee member awareness and create a shared vocabulary on the different types of bias at play in CBD (Dickey et al., 2017). Participants described this risk of bias to be especially great at the time when residents are ready to be promoted into independent practice. The residents thought that faculty in the program may feel too invested in the resident to hold them back, thus adding bias into promotion. The electronic portfolio was described as enabling competence committee members to detect problems in performance. Since the electronic portfolio handles all resident data equitably and with transparency it may reduce concerns about "summarizing objective observations, cognitive overload, and biased decision making" (Dickey et al., 2017, p.

163). Dickey (2017) goes on to explain that the competence committee members will have the opportunity to override the electronic portfolio, giving explanations and considering bias upon reviewing the resident's performance data.

A second mechanism to ensure competence committees are operating effectively is to consider group composition and follow a defined group process (Hauer et al., 2015). Hauer et al. (2015) made recommendations for membership and size of competence committees based on a review of the literature, indicating that larger committees perform better than smaller committees, membership should be diverse, and committees should consider rotating membership to stimulate new perspectives. Work done by Bourke (2016) is consistent with that of Hauer in advocating for diversity. Bourke recommended that groups should include people with knowledge of the content, a leader with willingness to attend to another point of view, someone with visible racial diversity, and having a gender balance between 40-60% to ensure higher levels of psychological safety. One tactic programs in Canada have been using to reduce bias is to add an external member to their competence committee (RCPSC, 2017). Some examples of this include a clinician from another discipline or a professional from the community. This reflects an attempt at having someone less connected to the residents in the program help with progress decisions. This is challenging due to concerns regarding resident data confidentiality. In Canada, structuring a competence committee is left largely to the discretion of the programs. Each program will need to weigh pros and cons with resource availability when choosing membership of the committee. The goal is to ensure shared understanding of goals and a robust process beginning with data aggregation for review

by diverse competence committee members. Each resident and situation will require unique discussion and review by the competence committee.

Hauer et al. (2015) also identified the importance of content knowledge (a shared mental model) and a group leader that encourages all members to share and discuss their point of view. To facilitate a shared mental model, each committee member should have access to the same resident assessment information, discussions should be structured, and the chair should encourage elaboration by inquiring on additional information (Hauer et al., 2015). Sonnadara et al. (2014) listed some questions that the competence committee might consider discussing as they create their shared mental model:

> How many times should a dyscompetent resident be allowed to repeat a module? Are faculty members prepared to fail a resident after a set number of poor assessments? How do programs deal with rehabilitating a resident who may be in trouble? Should an existing approach of remediating failing residents be incorporated, or is a new tactic for this competency-based paradigm required? (Sonnadara et al., 2014, p. 154)

This is just one example of a process that might be used by a competence committee to structure a discussion, however each committee is responsible for defining their own process.

Participants identified that reductionism was a risk, that is, that resident competence might be reduced to a task rather than the whole person. To address this challenge the RCPSC recommended that the competencies would be used only as an organizing framework for educators to design the learning experiences that stress observable abilities (Maudsley et al., 2014). The concern of reductionism is echoed in

the literature as one of the main concerns when moving to a model of CBME (Carraccio et al., 2008; Hodges, 2013; Talbot, 2004; ten Cate & Scheele, 2007; van der Vleuten & Schuwirth, 2005; Whitehead, 2012; Zibrowski et al., 2009). When applied to the context of anesthesiology, even as a guiding framework, it becomes a gamification of meeting the EPAs (recall the math of 87 EPAs = minimum of 87 assessment forms with 2-12 successful observations each). This makes receiving 'unsuccessful' observations impractical because residents require too many 'successful' observations. If residents are only asking for observations once they are competent we are missing the opportunity to assess for learning, which is one of the important components of CBD (Earl, 2006; RCPSC, 2017). Talbot (2004) argues the importance of not simply measuring technical skills but also a broader more holistic picture of competence. In this context, it would be impossible with the sheer volume of assessments required in anesthesiology. In the NOSM context, this has not allowed room for more general comments to be captured on resident performance overall (as was captured previously) unless additional assessments were to be added. Adding more assessments would compound the challenge of increasing an already heavy faculty workload (Beard, 2011; Holmboe et al., 2010; Malik et al., 2012; Whitehead, 2012). The assessment forms are meant to be easy to complete within 90 seconds as advertised by the RCPSC (2017). The residents felt that this would not be enough time to get valuable feedback and, with such an increase in assessment, there were concerns that faculty may no longer provide a face-to-face component of feedback.

Anesthesiology is currently looking to reduce the number of EPAs and observations to achieve a more practical and holistic view of resident performance. In the meantime, allowing EPA assessment forms to capture more general comments on

performance could be addressed by adding a general comments section to the EPA assessment form. This would increase the time to complete the assessment but allow programs that important piece of data, without adding another form for faculty observers to complete. The RCPSC Resident ePortfolio does not allow that functionality at this time unless required by the specialty committee. As an attempt to stop future disciplines from having the same problem, the RCPSC is recommending disciplines have no more than 30-40 EPAs, which should help alleviate part of this problem. These numbers are still a best guess and will need monitoring.

A third risk is the impact on patient care. Participants were concerned that if assessment was taking place right after a patient encounter with others in the room, it may affect patient care (either the current patient or the next). This was a particular concern for feedback that may appear negative in nature. With the expectation of timely feedback, this becomes both a time and space problem when observers attempt to offer valuable feedback to residents (Kogan et al., 2012). This risk relates to culture change. In Lewin's change model, he speaks of adapting the organizational structure as necessary to support the change in the refreezing stage (Manktelow et al., 2017). Space for confidential feedback in the clinical setting has been a recurring problem at NOSM and participants noted this challenge as well. This is due to the fact that hospitals are primarily focused on patient care rather than education and space is always at a premium. With the increase in WBAs this may just compound that problem if the organizational structure is not modified to support this change (Taber et al., 2010). Having safe space for offering performance feedback to residents could also be said to ensure better patient care. With culture changing to one of assessment for learning, it was also hoped that

some of the stigma of receiving negatively perceived performance feedback would also be reduced.

The fourth risk for discussion is the potential legal ramifications. This relates to information access previously discussed and will need to be considered when choosing an electronic portfolio. Privacy and security are discussed as one of the issues when incorporating web-based systems into the clinical environment (Amin et al., 2011; Basu et al., 2013; Chu F et al., 2012; Cook & Ellaway, 2015; Wallace et al., 2012). The RCPSC and schools will need to work together in facing this challenge head on, ensuring residents are protected regardless of which electronic portfolio is used. Policies and guidelines need to be developed for electronic portfolios and schools to adhere to, in order to ensure resident information remains private and secure. Once developed, residents should be oriented to these policies and guidelines regarding the privacy and security of their assessment data upon entering residency.

Chapter 7: Conclusion

In conclusion, I will consider some of the limitations of the study, summarize recommendations based on the identified gaps, and illustrate some areas for future research. My study adds an understanding of the needs for anesthesiology in successfully adopting both CBD and an electronic portfolio system. It is hoped that with this knowledge, schools will be able to make effective decisions about how to invest their time and resources with respect to this initiative. Thinking about implementation in a strategic manner will be important as Canadian schools continue moving to CBD over the next several years and as CBME is adopted internationally.

Limitations of the Study

Stage 1 included purposeful sampling of 13 in-depth interviews representing 9 of the 17 schools. Although each school was given equal opportunity to participate in the study, this represents only 53% of the schools in Canada with 29.4% of those coming from Ontario. This means that the voice of Ontario was overrepresented relative to the rest of Canada. Stage 2 included snowball sampling for 3 in-person focus group sessions representing only 5 of the 17 medical schools' faculty, residents and CBD expertise within the discipline of anesthesiology. Stage 2 recruitment was limited to individuals participating at the ACUDA meeting and available when the focus group sessions were scheduled. Due to this limitation, representation of various schools was low, only 29.2% of schools were represented, with 17.6% of represented schools coming from Ontario. Again, Ontario's voice was represented with more strength than the east or west of the country although perhaps less prominently given that these groups involved participants

from multiple institutions. Two reasons that may account for this overrepresentation include, NOSM and the RCPSC being located in Ontario with greater influence locally, and the fact that the province of Ontario alone has 6 medical schools which is an anomaly in comparison to other provinces that have 1-2 schools.

Another limitation of this study was that participants were attempting to predict their perceived needs and the associated challenges without clear understanding of the innovation. The RCPSC is still working to conceptualize CBD and this study asked participants what the electronic portfolio would require in order to be successful. Although an important line of inquiry, participants were, to an extent, speculating based on ever changing circumstances.

This study looked only at one of the 84 RCPSC specialties and subspecialties. Anesthesiology was chosen due to my involvement in the program and because it was the larger of the first two specialties to launch CBD. The needs of anesthesiology as a discipline are not representative of other disciplines even if the results are represented in a broad manner with hopes that they will resonate outside of this one discipline. Each discipline is very different, with one of the major differences being that some are procedure based and others are not. Examples of procedure based RCPSC programs include anesthesiology, emergency medicine, and general surgery, while non-procedural RCPSC programs include psychiatry, pediatrics, and internal medicine. Programs perceive needs differently when utilizing an electronic portfolio and schools should work in consultation with their programs to choose an effective system.

In terms of methodology, I did not go back to study participants to provide further validation of my analysis of the focus group data. This was due to time constraints and

because I felt it was adequate to have performed member checks with the interview data. The implications of not performing a member check of this data are that my interpretations of the focus groups data were not tested by the participants to help eliminate researcher bias when analyzing and interpreting focus group results (Anney, 2014). My interpretations were however, tested by my thesis supervisor as an attempt to meet this trustworthiness criteria.

Lastly, this study only captured a very limited view of resident perception and needs, representing only four residents within three schools. Residents may well be impacted most by this change and it will be important to capture their perspectives in future research initiatives.

Recommendations

I have outlined some of the important questions schools should consider when choosing an electronic portfolio for CBD, as well as, some of the associated resource implications based on the findings of this study.

Choosing an electronic portfolio. The importance of context was described many times by the participants in this study. Context is affected by location of the school, discipline, program director, dispersion of residents throughout communities, and more. It is therefore important that each school speak to their individual stakeholders when determining what system to use. Feasibility of the electronic portfolios is as important as functionality when schools are choosing between electronic portfolios. The electronic portfolio will not be able to perform to the standards required for success if sufficient

resources cannot be found to maintain it. I sought to determine the perceived needs and associated challenges as they related to the functionality of an electronic portfolio because the feasibility question will vary greatly between schools. Based on this research, the contextual questions that should be posed when choosing an electronic portfolio include whether an electronic portfolio can:

1. Provide a comprehensive dashboard for residents to review performance as they relate to local program expectations?
2. Offer clinical scheduling and logging tools to ensure variety of clinical experiences meet the required training experiences?
3. Make it easy for stakeholders to access in hospital setting on a daily basis? (e.g., have an 'app', various ways of triggering an assessment, various ways of accessing that assessment, offline access)
4. Provide residency programs sufficient opportunity to pilot new assessments before RCPSC required CBD implementation?
5. Allow programs the flexibility and versatility to collect all assessment data in one system with the ability to innovate resident assessment forms locally within the same system? If not, is it able to connect with other electronic systems to import data?
6. Have the ability to set local benchmarks once the resident assessment data can be confidentially aggregated?
7. Have the ability to identify and monitor trends in resident performance?
8. Offer curriculum and assessment mapping?

9. Allow residents the opportunity to monitor and adapt individualized learning plans? If so, is it based on curriculum and assessment mapping?
10. Offer the ability to regularly and systematically track and analyze resident data for the competence committees to synthesize and formulate decisions of resident progress?
11. Have the flexibility to set resident data viewing parameters based on program preferences and needs? (e.g.,academic advisor access, observer viewing options, etc.)
12. Export agreed upon data to a centralized repository of resident performance data to evaluate EPA performance nationally?
13. Create versatile reports based on accreditation requirements, program needs, PGME office needs, faculty development needs and other needs as identified?
14. Meet confidentiality and privacy standards determined by governing bodies and medical schools?

With all of the potential flexibility and versatility of electronic portfolios, expertise will be required to help programs understand and set up the systems locally. Once set up, each user subgroup (e.g., competence committee members, academic advisors, faculty observers, program directors, program coordinators, etc.) will require training on effective use of the electronic portfolio. Schools, therefore, need to create the capacity to train faculty, residents, program administrators, and other stakeholders on the proper usage of electronic portfolio. It is important to note that this is just one tool when making a major shift in medical education. Some additional system resources for successful implementation of CBD using an electronic portfolio are discussed below.

System resources. As mentioned in the discussion, the shift to CBD will require buy-in from leadership and a commitment to ensuring proper resourcing for success. All stakeholders still have to work toward a shared understanding of what their CBD programs will look like. This will require local training and engagement of faculty needing system support and resources from each school. Stakeholders also need to be recognizing that they are not going to immediately get this right. If system changes are not working, they will need to be adapted and changed until a model is found that will work.

It will take time and resources for schools to update current policies and procedures to reflect the new CBD paradigm. Some of the policies affected reflect remediation and appeals. With the increase in electronic records, schools should also revise their policies on data storage, usage, privacy, and confidentiality at the local level. The RCPSC and schools work together to ensure privacy and confidentiality of data while not inhibiting programs to defend decisions, research initiatives, and program evaluation.

Programs will need to create new processes with clear parameters for promoting residents to ensure fair decision-making at the competence committee level. These processes should include steps taken to ensure the least amount of bias when making important promotion decisions. Although the program director has always been the one signing off on resident promotion into practice, it is more explicit now and describing the associated process for making this decision should be equally explicit.

Continuous monitoring and feedback of EPAs should be occurring to address any chances of reductionism, reduced validity, and/or reduced reliability. If EPAs are not performing, steps should be taken by the discipline to remove or alter them as required. Recognizing that this will be a long-term process, schools should ensure that expertise is consistently being developed and fostered with multiple leaders to ensure success and reduce the chance of burnout.

Designated teaching hospitals should address barriers such as physical space to enable confidential face-to-face feedback. If no additional space can be allotted, instructions for residents and faculty on how to find a quiet space for feedback within each hospital setting should be created and disseminated to faculty and residents. This initiative should be undertaken in conjunction with shifting the culture to one where feedback is not seen as a negative repercussion, but instead a positive learning experience.

Future Research

Building on this research, a follow-up study could focus on evaluating the use of electronic portfolios in different contexts using my recommended questions. This research could look across multiple disciplines within an institution to identify variable practices and review whether or not these questions are generalizable to other programs when choosing an electronic portfolio. This could then be followed up with a study to explore the usage of the revised criteria within other schools.

A second research study could look further into the resident point of view regarding CBD implementation and electronic portfolio usage. This change impacts

every resident on a daily basis and they are impacted most if this system fails to effectively implement this major change. The importance of capturing the resident point of view cannot be understated.

A third research study might focus on evaluating the performance of EPAs in a discipline to propose EPA performance criteria. This will only be possible if we find a way to share data nationally for research purposes. At this time, EPAs are defined by a group of experts, sitting in a boardroom, making decisions about what they think is important. We need a way to verify that these EPAs are in fact important and measuring what we want them to measure.

A fourth research study might focus on applying the more advanced EPAs on practicing clinicians within that discipline. This study could help to evaluate the EPAs, and start the transition into the continuing professional development of practicing clinicians.

A fifth research study might focus on clarifying to what extent people agree on the characteristics of a high quality anesthesiologist and who should be involved in that dialogue. Once clarified, this description could be used to revise educational outcomes and EPAs.

My study illustrated many similar needs and challenges perceived in the implementation of an electronic portfolio system from stakeholders across Canada. Even with varying backgrounds, contexts, and experiences there were similar themes identified throughout. These themes included finding a balance between localization and a common model of assessment, information access during residency training, performance monitoring, and training needs. These themes were expanded by the themes identified in

each of the focus groups, which included information access after training, concerns of clinical scheduling requirements, and the risks of moving to CBD and an electronic portfolio. Each of these themes are important in defining and refining the questions each school needs to pose when determining which electronic portfolio to choose and how best to implement it within their setting.

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Appendix A: Ethics Documentation

Lakehead UNIVERSITY

Research Ethics Board
t: (807) 343-8283
research@lakeheadu.ca

November 5, 2015

Principal Investigator: Dr. Christina van Barneveld
Co-Investigator: Christina Tremblay
Faculty of Education
Lakehead University
955 Oliver Road
Thunder Bay, ON P7B 5E1

Dear Dr. van Barneveld and Ms. Tremblay:

Re: REB Project #: 079 15-16 / Romeo File No: 1464864
Granting Agency: N/A
Granting Agency Project #: N/A

On behalf of the Research Ethics Board, I am pleased to grant ethical approval to your research project titled, "Online Competency-Based Resident Assessment for the Discipline of Anesthesiology: A Needs Assessment".

Ethics approval is valid until November 5, 2016. Please submit a Request for Renewal to the Office of Research Services via the Romeo Research Portal by October 5, 2016 if your research involving human participants will continue for longer than one year. A Final Report must be submitted promptly upon completion of the project. Access the Romeo Research Portal by logging into mylnfo at:

https://erpwp2.lakeheadu.ca/

During the course of the study, any modifications to the protocol or forms must not be initiated without prior written approval from the REB. You must promptly notify the REB of any adverse events that may occur.

Best wishes for a successful research project.

Sincerely,

Dr. Lori Chambers
Chair, Research Ethics Board

/scw

Christina Tremblay <ctremblay@nosm.ca>

Approval of Human Ethics Renewal - Online Competency-Based Resident Assessment for the Discipline of Anesthesiology: A Needs Assessment

1 message

research.ethics@lakeheadu.ca <research.ethics@lakeheadu.ca> Thu, Oct 13, 2016 at 1:14 PM
To: "Dr. Christina van Barneveld (Primary Investigator)" <cvanbarn@lakeheadu.ca>
Cc: "Miss. Christina Tremblay (Student)" <ctremblay@nosm.ca>, research.ethics@lakeheadu.ca

Date: October 13, 2016

To: Dr. Christina van Barneveld, Primary Investigator

From: Dr. Lori Chambers, Chair, Research Ethics Board

Subject: Renewal of REB Project #079 15-16 / Romeo #1464864

On behalf of the Research Ethics Board, I am pleased to grant *renewal of ethical approval* to your research project titled, "Online Competency-Based Resident Assessment for the Discipline of Anesthesiology: A Needs Assessment".

Ethics approval is valid for one year. A Request for Renewal can be applied for through the Romeo Research Portal. A Final Report must be submitted promptly upon completion of the project, also available through the Romeo Research Portal.

During the course of the study, any modifications to the protocol or forms must not be initiated without prior approval from the REB. You must also promptly notify the REB of any adverse events that may occur.

If you have any questions, please contact Sue Wright, Research Ethics & Administrative Officer.

Best wishes for continued success with your research project.

/tm

Christina Tremblay <ctremblay@nosm.ca>

Approval of Human Ethics Renewal, Romeo #1464864

research.ethics@lakeheadu.ca <research.ethics@lakeheadu.ca> Tue, Sep 26, 2017 at 11:56 AM
To: "Dr. Christina van Barneveld (Primary Investigator)" <cvanbarn@lakeheadu.ca>
Cc: "Miss. Christina Tremblay (Student)" <ctremblay@nosm.ca>, research.ethics@lakeheadu.ca

Date: September 26, 2017

To: Dr. Christina van Barneveld, Primary Investigator

From: Dr. Lori Chambers, Chair, Research Ethics Board

Subject: Renewal of REB Project #079 15-16 / Romeo #1464864

On behalf of the Research Ethics Board, I am pleased to grant *renewal of ethical approval* to your research project titled, "Online Competency-Based Resident Assessment for the Discipline of Anesthesiology: A Needs Assessment".

Ethics approval is valid for one year. A Request for Renewal can be applied for through the Romeo Research Portal. A Final Report must be submitted promptly upon completion of the project, also available through the Romeo Research Portal.

During the course of the study, any modifications to the protocol or forms must not be initiated without prior approval from the REB. You must also promptly notify the REB of any adverse events that may occur.

If you have any questions, please contact Sue Wright, Research Ethics & Administrative Officer.

Best wishes for continued success with your research project.

/sm

Christina Tremblay <ctremblay@nosm.ca>

Approval of Human Ethics Renewal, Romeo #1464864

1 message

research.ethics@lakeheadu.ca <research.ethics@lakeheadu.ca> Wed, Sep 26, 2018 at 2:40 PM
To: "van Barneveld Christina(Primary Investigator)" <cvanbarn@lakeheadu.ca>
Cc: "Tremblay Christina(Student)" <ctremblay@nosm.ca>, research.ethics@lakeheadu.ca

Date: September 26, 2018

To: Dr. Christina van Barneveld, Primary Investigator

From: Dr. Lori Chambers, Chair, Research Ethics Board

Subject: Renewal of REB Romeo #1464864

On behalf of the Research Ethics Board, I am pleased to grant *renewal of ethical approval* to your research project titled, "Online Competency-Based Resident Assessment for the Discipline of Anesthesiology: A Needs Assessment".

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If you have any questions, please contact Sue Wright, Research Ethics & Administrative Officer.

Best wishes for continued success with your research project.

/sm

Education
t: (807) 343-8330 f: (807) 344-6807
e: cvanbarn@lakeheadu.ca

Letter of Invitation

Dear Potential Participant,

I am a Masters of Education student at Lakehead University and my thesis topic is '**Online Competency-Based Resident Assessment for the Discipline of Anesthesiology: A Needs Assessment.**' The purpose of this study is to determine what is needed for the successful implementation of an online competency-based resident assessment system in the discipline of Anesthesiology. This study is supervised by Dr. Christina van Barneveld, Associate Professor, Faculty of Education, Lakehead University.

You are invited to participate in this study because your perspective on what is needed to successfully implement an online competency-based resident assessment system is important. Your perspective will contribute to a comprehensive understanding of the motivations, challenges, and opportunities associated with the assessment of residents within a Competency-Based Medical Education (CBME) framework.

If you volunteer to participate in this study, there will be two stages of data collection. In stage 1, I will contact you to schedule a 60-minute, semi-structured interview on the topic of online competency-based resident assessment. The interview will be conducted in person where possible or via web-conferencing during late November/early December, 2015. These interviews will be audio-recorded, and transcribed.

In stage 2, three separate face-to-face focus groups will be held with 8-10 faculty, program directors, and residents to further discuss the topic of online competency-based resident assessment. The focus group will be approximately 60-90 minutes in duration, audio-recorded and transcribed. These focus groups will be held at the Canadian Anesthesia Society meeting held in Vancouver in June of 2016.

Your participation is voluntary, you may refuse to participate in any part of the study, and you may withdraw at any time. You may also decline to answer any question.

There is no foreseeable harm, potential risk, or inconveniences to you. There are no benefits to participating, other than contributing your perspective and suggestions about the challenges and opportunities regarding resident assessment in a CBME framework.

Your name and location are confidential. You will not be identified on reports of results. Data will be published in aggregate form. Please note that we cannot guarantee confidentiality for the focus groups since other focus group participants will be present. Data and consent forms from participants will be stored by Dr. van Barneveld in a locked cabinet in her office at Lakehead University for 5 years.

Results of the study will be disseminated via peer-reviewed journal publications and conference presentations. A summary of results will be provided to you at the end of the project via email upon request.

Lakehead University Research Ethics Boards (REB) approved this study. If you have any questions related to the ethics of the research please contact Sue Wright, Lakehead REB at 807-343-8283 or research@lakeheadu.ca. If you have any questions about the research, please do not hesitate to contact me or my supervisor, Dr. Christina van Barneveld.

Thank you for considering this invitation.

Christina Tremblay, M.Ed. Student
ctremblay@nosm.ca
(705) 662-7152

Christina van Barneveld, PhD
cvanbarn@lakeheadu.ca
(807) 343-8330

Education
t: (807) 343-8330
f: (807) 344-6807
e: cvanbarn@lakeheadu.ca

Informed Consent

Study Title: Online Competency-Based Resident Assessment for the Discipline of Anesthesiology: A Needs Assessment

Student Investigator:
Christina Tremblay, M.Ed. Student,
Education, Lakehead University

Supervisor:
Christina van Barneveld, Ph.D.
Education, Lakehead University

By signing this consent form, I agree that:

- I have read and understood the cover letter for this study.
- I agree to participate.
- I understand the potential risks and/or benefits of the study and what those are
- I am a volunteer and I can withdraw from the study, or decline to answer any question at any time without consequence by notifying the principal researcher.
- I agree to be audio recorded.
- I will not be identified in published results without my explicit consent.
- Raw data will be viewed only by Dr. Christina van Barneveld and Christina Tremblay.
- Data will be published in aggregate form.
- Data will be securely stored at Lakehead University for a period of 5 years.
- Research findings will be made available to me via email upon request.

I have read and understood the information letter for this study, agree to participate, and acknowledge that I have received a copy of this consent form.

Signature (Participant): _____ Date: _____

I agree to be contacted for an additional focus group interview:
□ Yes □ No

Copies of the research project results will be made available to all participants. I would like to receive a copy of the final report of the study:
□ Yes □ No

If yes, please provide your e-mail address: _____

Lakehead University Research Ethics Boards (REB) approved this study. If you have any questions related to the ethics of the research please contact Sue Wright, Lakehead REB at 807-343-8283 or research@lakeheadu.ca. If you have any questions about the research, please do not hesitate to contact me or my supervisor, Dr. Christina van Barneveld.

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You are invited to participate in stage 2 of this study because your perspective on what is needed to successfully implement an online competency-based resident assessment system is important. Your perspective will contribute to a comprehensive understanding of the motivations, challenges, and opportunities associated with the assessment of residents within a Competency-Based Medical Education (CBME) framework.

If you volunteer to participate in stage 2 of this study, you will be participating in a focus group with 8-10 of your peers, with will be approximately 90 minutes in duration, audio-recorded and transcribed. Some of the preliminary findings from stage 1 will be presented here. These focus groups will be held at the Canadian Anesthesia Society meeting held in Vancouver in June of 2016.

Your participation is voluntary, you may refuse to participate in any part of the study, and you may withdraw at any time. You may also decline to answer any question.

There is no foreseeable harm, potential risk, or inconveniences to you. There are no benefits to participating, other than contributing your perspective and suggestions about the challenges and opportunities regarding resident assessment in a CBME framework.

Your name and location are confidential. You will not be identified on reports of results. Data will be published in aggregate form. Please note that we cannot guarantee confidentiality for the focus groups since other focus group participants will be present. Data and consent forms from participants will be stored by Dr. van Barneveld in a locked cabinet in her office at Lakehead University for 5 years.

This research is supported by a grant from the Dedicated Anesthesiology Research Enhancement Fund of the Sudbury Anesthesia Local Education Group. Results of the study will be disseminated via peer-reviewed journal publications and conference presentations. A summary of results will be provided to you at the end of the project via email upon request.

Lakehead University Research Ethics Boards (REB) approved this study. If you have any questions related to the ethics of the research please contact Sue Wright, Lakehead REB at 807-343-8283 or research@lakeheadu.ca. If you have any questions about the research, please do not hesitate to contact me or my supervisor, Dr. Christina van Barneveld.

Thank you for considering this invitation.

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Informed Consent

Study Title: Online Competency-Based Resident Assessment for the Discipline of Anesthesiology: A Needs Assessment

Student Investigator:
Christina Tremblay, M.Ed. Student,
Education, Lakehead University

Supervisor:
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Education, Lakehead University

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- I agree to participate.
- I understand the potential risks and/or benefits of the study and what those are
- I am a volunteer and I can withdraw from the study, or decline to answer any question at any time without consequence by notifying the principal researcher.
- I agree to be audio recorded.
- I will not be identified in published results without my explicit consent.
- Raw data will be viewed only by Dr. Christina van Barneveld and Christina Tremblay.
- Data will be published in aggregate form.
- Data will be securely stored at Lakehead University for a period of 5 years.
- Research findings will be made available to me via email upon request.

I have read and understood the information letter for this study, agree to participate, and acknowledge that I have received a copy of this consent form.

Signature (Participant): _____ Date: _____

Copies of the research project results will be made available to all participants. I would like to receive a copy of the final report of the study:
□ Yes □ No

If yes, please provide your e-mail address: _____

Lakehead University Research Ethics Boards (REB) approved this study. If you have any questions related to the ethics of the research please contact Sue Wright, Lakehead REB at 807-343-8283 or research@lakeheadu.ca. If you have any questions about the research, please do not hesitate to contact me or my supervisor, Dr. Christina van Barneveld.

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Christina van Barneveld, PhD
cvanbarn@lakeheadu.ca
(807) 343-8330

Lakehead UNIVERSITY

Northern Ontario School of Medicine
École de médecine du Nord de l'Ontario

What are the important elements to successful implementation of an online competency-based resident assessment system?

When: **Friday, June 24th, 2016** (The day prior to CAS Annual Meeting)
Resident Focus Group: 13h00 – 14h30
Faculty Focus Group: 16h00 – 17h30

Where: **Vancouver Conference Centre**
Rooms at the Conference Centre: TBA
See Conference Details: https://www.cas.ca/English/AM-2016

Interested in Participating?

Contact: Christina Tremblay
Email: ctremblay@nosm.ca
Phone: 705-662-7152

Preliminary Results from Stage 1 of this Study: Presented Here!

Additional Information:
I am a Masters of Education student at Lakehead University and my thesis topic **is 'Online Competency-Based Resident Assessment for the Discipline of Anesthesiology: A Needs Assessment**.' The purpose of this study is to determine what is needed for the successful implementation of an online competency-based resident assessment system in the discipline of Anesthesiology. This study is supervised by Dr. Christina van Barneveld, Associate Professor, Faculty of Education, Lakehead University (cvanbarn@lakeheadu.ca) and has received ethics approval from the Lakehead University ethics committee. If you have any questions related to the ethics of the research please contact Sue Wright, Lakehead REB at 807-343-8283 or research@lakeheadu.ca.

Thank you for considering this invitation.

Appendix B: Interview Instruments

Draft 3: Interview Questions

- **Introduction & timing**
- **Consent Form**
- **Questions & Start Recording**

Section 1: Your program

1. Please describe your role in the move to CBD.
2. *Please describe your Anesthesiology residency program. (Number of residents, faculty, sites, distributed or not?)*
3. *In what way is your Anesthesiology program different from others in Canada?*
4. *How ready do you feel your program is to implement CBD?*
5. What supports (within and outside of your school) do you have for implementing CBD?
    - Have they been sufficient for your needs?
    - Are there resources and supports not yet in place that you think will be needed?

Section 2: Assessment

6. What are your current practices/processes for assessing your residents?
    - Are you currently using any form of online learning or assessment?
    - What experience have you had with online assessment?
7. Do you have any plans for implementing online assessment for your Anesthesiology program? If so, what are they? If not, then why not?
8. IF NO DAILY ONLINE ASSESSMENT:
    - Do you think learners and preceptors in your program would be prepared to complete a daily online assessment?
        - What features of a system for online assessment would enable your learners and preceptors to complete a daily assessment?

IF DAILY ONLINE ASSESSMENT:

- You spoke of an online assessment system; can you explain that to me?
- What has your compliance rate been? What would make it better?

9. Do you envision one assessment per EPA or something different? I.E., How do you envision the assessment workflow in the new CBD environment?

Section 3: Online assessment/ePortfolio

10. What main opportunities do you foresee (have you encountered) in moving to online assessment?
11. What main challenges do you foresee (have you encountered) in moving to online assessment?
12. Should the RCPSC Resident ePortfolio (MAINPORT) connect to other online systems you use? (e.g.,logbook, scheduling, learning)
    - What information should be maintained within RCPSC Resident ePortfolio versus your program?
13. If you are a PD looking at your dashboard in the ePortfolio system, what do you see? Is this different from the residents? Faculty?
14. Do you anticipate that your program will use the ePortfolio tool differently than other programs in your institution?
15. If the RCPSC asked that you standardize assessment tools across the country, how would you feel about that?
16. What type of reporting would be important to you as a program director? (e.g.,program evaluation, resident progress report – what could this look like?)
    - What types of reporting do residents need to be able to see?
17. What should occur with the assessment data once the resident has graduated from your program?
18. That is the end of my questions, is there anything else you'd like to add before we end?

Appendix C: Focus Group Instruments

CBD focus group Questions:

Q1. Briefly, have your thoughts about CBD and its implementation changed within the past few months?

Q2: Features of MAINPORT may include:

- Electronic WBA forms
- Mobile friendly and familiar system
- Mapped EPAs and IMs to CanMEDS and stages of training
- Schedule and record private notes on progress meetings (PD)
- Access to raw assessment data
- Overview of Resident
- Progress regarding completion of EPAs
- Flags to PD
- Personal Learning Plans
- Resident Reflections
- Reporting & Analytics
- Personalized Dashboards
- Assessment completion monitoring (faculty & resident)

What are your preliminary thoughts regarding the strengths and weaknesses of using this system?

Q3: What's more important to you, flexibility or standardization?

Q4: How important is it to be able to map EPAs within your program context? (Clinical & Academic)

Q5: When residents are triggering an assessment for faculty, is there any information in addition that they should be sending?

Q6: What influences do you see that may impact how long we keep the resident's personal assessment data?

Q7: What information, if any, should remain attached to the anonymized data?

Q8: Royal College Assessment:

- EPA& Milestone ratings of:
  - Achieved/In Progress
- Contextual Information
  - location, age, procedure
- Overall Resident Feedback
- Concerns on professionalism and patient safety.

Do you feel like this form will allow for a balance of richness and usability in practice?

Q9: If the context is captured on an assessment form, does it also need to be logged separately in Resident Logbook?

Q10: Would it be of benefit to have any of the following on each:

  - Exceptional Events
  - Education Prescription

Q11: Is it important to have Professionalism targeted specifically as an area of concern?

Q12: Risks found through the preliminary review of interview data include:

- Faculty/Assessment burnout

- Multiple systems (Inefficient)
- CBD is a moving target
- Technology dependent
- Timeliness of feedback
- There is no money to support this enormous change
- Running two programs at once

Are there any other important risks that aren't noted here?

Q13: How can timeliness be maximized when completing daily assessments?

Q14: How can we measure if the benefits of CBD outweigh the costs?

Q15: Can you explain what the processes might look like when altering a form at a local or national level?

Q16: If you are proposing a change, how long is reasonable to wait for 'approval'?

Resident and faculty focus group Questions:

Q1: Briefly, what experience have you had with using online systems in your training and career?

- How do you feel about them?

Q2: Should every form have an exceptional event component?

- e.g.,did you see anything today that you thought was exceptional? Please comment for better or for worse.

Q3: Does the system need to be specific about professionalism and patient safety?

- could it be broader?
- e.g.,where would you feel this resident would benefit from coaching in terms of the all the intrinsic CanMEDS roles?

Q4: How do you think the delay could be minimized when completing daily assessments?

Q5: RCPSC Resident ePortfolio may offer:

- Progress in achieving EPAs & IMs
- EPA & IM Mapping to CanMEDS
- Generation and aggregation of mandatory assessments
- Faculty form for exceptional events
- Review of forms on individual basis
- Uploading additional evidence of achievement
- Monitoring Faculty and Resident completion rates
- Reflections

- Ability for PD & Competency Committee to set an agenda, indicate progression, and make private comments

What are your reactions to this prototype given the move toward CBD?

Q6: What if anything is missing that would be essential to moving forward?

Q7: What risks and benefits do you anticipate in moving toward Competence by Design with multiple low stakes assessments?

Q8: What information do you see yourself reviewing regarding the progress of a resident who is on service with you for a day?

  - What if you are the supervisor for the rotation?

Q9: What type of research or scholarship would prove that the benefits are outweighing the costs of CBD?

Q10: Anything else you'd like to get on record?

Appendix D: List of Acronyms

Short Name	Long Name
ABA	American Board of Anesthesiology
ACGME	Accreditation Council for Graduate Medical Education
AFMC	Association of Faculties of Medicine of Canada
CanMEDS	Canadian Medical Education Directives for Specialists
CBD	Competence by Design
CBME	Competency Based Medical Education
CFPC	College of Family Physicians of Canada
EPA	Entrustable Professional Activities
FMEC	Future of Medical Education in Canada
GMC	General Medical Council
NOSM	Northern Ontario School of Medicine
PGME	Postgraduate Medical Education
RANZCP	Royal Australian & New Zealand College of Psychiatrists
RCPSC	Royal College of Physicians & Surgeons of Canada
WBA	Workplace-based assessment

Appendix E: Glossary of Terms

Application or 'Apps': "programs developed to run on a device for a specific purpose; there are hundreds of thousands of applications available in the wide range of categories including some tailored to specific medical fields, such as infectious disease and neurosurgery" (Wallace et al., 2012, p. 2).

Assessment for learning: Emphasizes individualization while recognizing there are predictable patterns and pathways that can be used to modify teaching and learning activities. Carefully designed assessments used to determine how, when and whether or not knowledge is used (Earl, 2006).

Assessment of learning: Primarily used to confirm knowledge (e.g.,written examination), focuses on ensuring the assessment is reliable and valid (Earl, 2006).

Competency: an observable ability of a health professional that develops through stages of expertise from novice to master clinician (RCPSC, 2017).

Competency-based medical education (CBME): an approach to designing medical training that is focused on outcomes in the form of the abilities of graduates (RCPSC, 2017).

Competence by Design: a multi-year initiative to implement a Competency Based Medical Education approach to residency education and specialty practice in Canada and to align Royal College policies and processes with a CBME approach (RCPSC, 2017).

Electronic portfolio: an electronic system designed to automate the process of collecting standard written assessments and providing efficient means of accomplishing various administrative tasks consistently and simultaneously (Benjamin, Robbins, & Kung, 2006).

RCPSC Resident ePortfolio: as part of the CBD, the RCPSC has launched a project to integrate the CanMEDS Framework with the RCPSC Resident ePortfolio. The project aims to provide each resident and fellow with a personalized electronic portfolio to support lifelong learning and assessment (RCPSC, 2017).

Encounter Cards: a method of direct assessment that helps the assessor to capture observations of clinical competence from brief encounters with learners (Bandiera, Sherbino, & Frank, 2006, p.39). *(When reviewing the literature, encounter cards include many names such as daily evaluation card, work-based assessment, and micro or mini clinical examinations).*

Entrustable professional activity (EPA): a key task of a discipline that can be entrusted to an individual who possesses the appropriate level of competencies (Wallace et al., 2012, p. 2).

Gap: the difference between what is and what should be – the difference between an actual state (what results are) and a desired state (what results should be; Gupta, 1999).

In-Training Evaluation/Assessment Report: based on CanMEDS principles (Communicator, Collaborator, Medical Expert, Health Advocate, Scholar, Professional, and Manager), this document serves as the standard 'report card' for each rotational experience (Zibrowski et al., 2009).

Milestones: observable markers of an individual's ability along a developmental continuum (RCPSC, 2017).

Mobile computing device: " a handheld device which provides constant connection to the Internet via email, text messaging, video-conferencing and social networking software, often integrated with additional functions such as a camera; the device can also be used to access multimedia content such as podcasts and videos." (Wallace et al., 2012, p. 2)

Multi-source feedback (360 Degree Assessment): an assessment that gathers data from multiple observers regarding particular resident behaviours or professional constructs (e.g., professionalism and communication skills) of the learner. In educational settings, observers may include physicians (e.g., resident peers, supervising physicians and medical students), allied health professionals (e.g., nurses, pharmacists and

psychologists), patients, and family members. A self-assessment is frequently included (Bandiera, Sherbino, & Frank, 2006, p. 29).

Need: a discrepancy or gap between "what is," or the present state of affairs in regard to the group and situation of interest, and "what should be," or a desired state of affairs (Witkin & Altschuld, 1995, p. 4).

Needs assessment: A systematic set of procedures undertaken for the purpose of setting priorities and making decisions about program or organizational improvement and allocation of resources. The priorities are based on identified needs (Witkin & Altschuld, 1995, p. 4).

Objective Structured Clinical Examination: a sample of learner performance as they rotate through a series of stations representing various clinical scenarios. At each station, learners may encounter a standardized patient, a structured oral examination, visual information (e.g., x-ray films, electrocardiograms], a high- or low-fidelity simulation (e.g., part-task trainer), or a written task. Learners are usually asked to perform a specific skill, to simulate part of a patient encounter, or to answer questions based on the presented material (Bandiera, Sherbino, & Frank, 2006, p. 23).

Observers: faculty in charge of completing assessments daily on the residents to give the evidence of competency to the committees (RCPSC, 2017).

Online Assessment: refers to any computer or mobile-based assessment form used to assess resident performance (e.g.,tests, simulations, workplace-based assessments) (Amin et al., 2011).

Portfolios and Logbooks: a flexible, multifaceted means of collecting evidence of the achievement of competence over time. Logbooks are structured instruments for documenting that a learning activity has taken place (Bandiera, Sherbino, & Frank, 2006, p. 32).

Program Director: is responsible for the overall conduct of the integrated residency program and must be assured of sufficient time and support to supervise and administer the program. The Program Director is responsible to the head of the department concerned and to the postgraduate dean of the faculty. The Program Director should be certified by the Royal College in the discipline concerned (RCPSC, 2007).

Program of assessment: "individual assessments, purposefully chosen in such a way that the whole is more than the sum of its parts. Not every individual assessment, therefore, needs to be perfect. The dependability and credibility of the overall decision relies on the combination of the emanating information and the rigour of the supporting organizational processes" (van der Vleuten et al., 2014, p.1).

Training Experience: policy regarding discipline specific recommendations and requirements regarding clinical experiences throughout residency training (RCPSC, 2017).

Service providers: "Direct relationship to those in level 1, providing system resources for the needs outlined by service receivers", they are considered level 2 (Witkin & Altschuld, 1995, p. 11).

Service receivers: "The people for whom the system ultimately exists", they are the focus of the needs assessment and considered level 1 (Witkin & Altschuld, 1995, p. 11).

Simulation-Based Assessment: the artificial recreation of a clinical environment or circumstance for the purpose of allowing a learner to undertake a specific task in a controlled manner that presents no risk to patients (Bandiera, Sherbino, & Frank, 2006, p. 36).

Specialty Committee: a group of dedicated faculty members (Program Directors) charged with deciding the training requirements for Canadian residency programs within their respective discipline (RCPSC, 2017).

Specialty Training Requirements: The STR outlines the required duration, content and sequence of training in the form of a rotation-based road map. A trainee who has

successfully completed the STR should be able to demonstrate all of the competencies outlined in the OTR (RCPSC, 2017).

Stages of Training: four developmental periods of training for which EPAs are created and mapped to chunk learning into the transition to discipline stage, foundations of discipline stage, core of discipline stage and transition to practice stage (Oswald & Abbott, 2017).

Structured Oral Examination: an opportunity for an assessor or panel of assessors to pose a series of questions to a learner in order to assess and react to the learner's responses (Bandiera, Sherbino, & Frank, 2006, p. 18).

System Resources: These are the tangible solutions (e.g.,technology, time allocation, training programs) required to meet the perceived needs outlined by service receivers, they are considered level 3 (Witkin & Altschuld, 1995, p. 10).

Resident: a medical graduate engaged in specialized practice under supervision in a hospital (RCPSC, 2017).

Appendix F: Code Groups and Sub Codes

ATLAS.ti Report

Interview Data

Code groups

Report created by Christina Tremblay on Nov 29, 2018

ACW Assessment: Current Workflow

Members:

● ACW Assessment: Current Workflow ● ACW WBA Form ● ACW_Electronic WBAs ● ACW_Other Assessments ● ACW_Paper Based WBAs ● ACW_Previous technical problems/variant practices ● CuT Current Technology Use

AF Attitudes & Feelings RE: CBD

Members:

● AF Attitudes & Feelings RE: CBD ● AF_CBD is hard to understand ● AF_Doubts, worried ● AF_Overwhelmed, No time, Burnout ● AF_Prospective hoped for enabler ● AF_Resources insufficient or Feeling Unsupported ● AF_Risks ● AF_Skepticism ● AF_Technological advantage ● AF_Uncertainty

AFW Assessment Future Workflow

Members:

● AFW Assessment Future Workflow ● AFW_Aggregation & Reporting ● AFW_Choosing and Generating Form ● AFW_Cross mapping multi-Assessments to EPAs & vice-versa ● AFW_Examples of Workflow in Use for WBA/CBD

APF Assessment: Future practices

Members:

● APF Assessment: Future practices ● APF_Assessment: Prospective regarding new form ● APF_Balance between localization and common model ● APF_Balance richness with usability ● APF_Comments are Most Important

BEN Future: Potential Benefit

Members:

● BEN Future: Potential Benefit ● BEN_Lifelong Learning ● BEN_National certifications/recertifications ● BEN_Quality Improvement

CBD Perceived Readiness

Members:

● CBD Perceived Readiness ● CBD: Model still under development ● CBD: Reasons to change ● CBD: Support & Resources Available ● CBD: Support & Resources Needed ● CBD: Transferability of innovations/Communication

CHA Perceived challenges with CBD & OAS

Members:

● CHA Perceived challenges with CBD & OAS ● CHA_Accurate & Valuable Feedback ● CHA_Barriers to deployment ● CHA_Immediacy of logging, feedback is important ● CHA_Logistical challenges ● CHA_Money ● CHA_Need for Training ● CHA_Privacy & Security ● CHA_Program overlap from new and old systems ● CHA_Resource Limitations & Buy In ● CHA_Scheduling

IC Institutional Culture

Members:

● IC Institutional Culture ● IC_Accountability ● IC_Change agents ● IC_Coaching & Mentorship ● IC_Competency committee ● IC_Culture Change, Change Management ● IC_Frequent, low stakes Assessment ● IC_Not using/used to technology

OAS Online Assessment System

Members:

● OASA Online Assessment System Access to data ● OASA_Host of the data ● OASAa_Information Access after training ● OASAd_Information Access during training ● OASAdD_Information Access Dean ● OASAdF_Information Access Faculty ● OASAdPC_Information Access PD & Coach ● OASAdR_Information Access Residents ● OASAdRC_Information Access RCPSC ● OASF Online Assessment System Functionality requirements ● OASF_Flexibility & Interconnectivity ● OASF_Systems integration ● OASF_User Friendly & Efficient/Usability ● OASN Online Assessment System Needs ● OASN_Clinical Logging ● OASN_Clinical Rotation Schedules ● OASN_Comparison between residents ● OASN_Educational Planning ● OASN_Mapped resident trajectory ● OASN_Performance Monitoring ● OASN_Program & Faculty Evaluation ● OASN_Reflective Component ● OASN_Resident self assessment ● OASN_Tracking