Advanced Practice Coordinator: Role Extension or Advanced Practice?
A Canadian Multi-Case Study

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Abstract

Introduction: Increasing demands for medical services concurrent with the shortage of healthcare personnel has forced a change in the delivery of healthcare services. In response to these challenges, allied health professions began expanding and extending their practices into the realms of medicine. A number of these emerging practices have been branded as advanced practice. One such practice is the advanced practice coordinator role in Ontario Canada, successfully implemented at two health institutions but failed at another. This research explores whether the advanced practice coordinator role is advanced practice or role extension, and whether it influences patient outcomes. Further, the research objectives also included the development of a framework to inform the development and implementation of emerging practices in medical imaging along with informing advanced radiographic practice curricula. Professional practice designation is important as it contributes to professional identity, builds the professions' body of knowledge, and influences professions' scopes of practice, practitioners' satisfaction, staff retention, and patient satisfaction. Further, the explicit designation of professional practice is needed for practitioners to provide a clear, concrete and consistent explanation of their professional roles and responsibilities to patients, the general public, other healthcare workers and healthcare policymakers. This research, therefore, contributes to knowledge in the areas of health sciences and higher education by informing the development of emerging practice roles and practice curricula.

Methods: Three healthcare sites were studied using a mixed-methods multi-case study research strategy. Program documents, interviews of key stakeholders, surveys of advanced practice coordinators, and measures of patient wait times were gathered and analysed. Each case was studied as an independent case with subsequent cross-case analysis performed.

Results: The advanced practice coordinator role was developed out of the need to better utilise technologists' skills and competencies and the need to facilitate enhanced hours of diagnostic imaging services. The role has enjoyed some amount of success

with recorded reductions in patient wait times, improved patient education and improvement in patient satisfaction. Additionally, the role failed at a third institution owing to local labour laws restrictions, and incompatibility between department layout and role functionality. More importantly, interviewees felt that the role was more consistent with the emerging practices of role extension than advanced practice.

Conclusions: The advanced practice coordinator role as practice at two healthcare institutions in Ontario Canada did not meet the criteria for advanced practice designation. The practice is consistent with role extension. Nonetheless, the role does influence patient outcomes. Moreover, the findings of this research also assist in shaping the radiographic research landscape and improving the evidence-base practice approach of the radiographic profession. The findings also can possibly contribute to the development of advanced radiographic practice curricula that compliments clinical practice by providing form and structure to radiographic role development. Further, this research suggests two emerging practice frameworks - a collaborative approach to role extension and a framework to inform advanced practice in medical imaging.

Keywords: Emerging practice, Advanced practice, Role extension, Advanced radiographic practice, Advanced practice coordinator, Medical radiation technology, Collaborative approach to role extension, Advanced radiographic practice framework.

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Glossary of Terms

Advanced Practice: implies the development of a role and the application of knowledge to benefit and modernize clinical practice.

Advanced Practice Coordinator: is a certified and licensed medical radiation technologist in Canada, who has taken on some of the responsibilities of the radiologist with the aim of optimizing imaging services.

Advanced Radiographic Practice: describes a level of radiographic practice, not speciality or role, that should be evident as being beyond that of first level registration.

CT Radiographer: is the non-medically trained radiographic practitioner who has specialised training in the field of computed tomography.

CT Technologist: the radiologic technologist who has specialised training in the modality of computed tomography to provide diagnostic and to a limited extent, therapeutic imaging services.

Diagnostic Imaging: is the application of ionising and non-ionising energy sources for the diagnosis of diseases and the visualisation of the human anatomy and physiology. Also known as diagnostic radiography.

Emerging Practices: approaches to healthcare practice that have evolved owing to the challenges facing healthcare service delivery and aimed at improving patient care services and meeting the needs of patients.

Medical Radiation Science: is a healthcare field using radiant energies for the diagnosis and treatment of injuries and illnesses. The field includes professions such as Radiation Therapy, Radiologic Technology, Medical Resonance Imaging, Nuclear Medicine, Molecular Imaging Technology, to name a few.

Radiologist Technologist: is the non-medical personnel who perform diagnostic imaging examinations and administer radiation therapy treatments. He/she may specialise in a specific imaging technique such as bone densitometry, cardiovascular-interventional radiography, computed tomography, mammography, magnetic resonance imaging, nuclear medicine, sonography or general radiography.

Medical Radiation Technologist: The Canadian professional designation for the non-medical practitioner who had undergone a period of studying at the higher education level, demonstrated clinical competencies, passed a prescribed examination and therefore licensed to produce images of the human anatomy and pathological conditions using ionising and non-ionising energy sources.

Medical Radiation Technology: is the application of ionising and non-ionising energy sources to diagnose and treat diseases. Areas of specialization include bone densitometry, cardiovascular-interventional radiography, computed tomography, mammography, magnetic resonance imaging, nuclear medicine, quality management, sonography or general radiography.

Radiation Therapy: is the application of ionising radiation and other forms of radioactive sources to treat cancerous diseases.

Radiation Therapist: The radiologic technologist who specialise in radiation therapy, which is the delivery of high doses of radiation to treat cancer and other diseases, are radiation therapists and medical dosimetrists.

Radiography: the application of ionising (x-rays, gamma rays) and non-ionising (ultrasound and magnetic resonance) energies to produce images of the human anatomy and pathological conditions to aid in the diagnosis and treatment of diseases. Also referred to as radiologic technology (US term).

Radiologist: the medically trained doctor who holds specialised training in radiology. He/she is the leader of clinical practice in the department of radiology/radiography and therefore has ultimate responsibility for all patient care activities within the department.

Radiology: a branch of medicine dedicated to the interpretation of medically produced images and the use of ionising and non-ionising energies for the diagnosis and treatment of diseases.

Role Extension/Expansion: implies supplementary skills and responsibilities that expand beyond the statutory responsibilities and competencies at the point of professional registration.

Introduction to the Practitioner Research

Introduction and Overview

The objective of any healthcare system is to provide safe, effective and efficient patient care services. However, over time, achieving this objective has become problematic. Many challenges have plagued the healthcare sector, forcing changes to be made in the way that services are delivered. These challenges include healthcare reform, increased demand for healthcare services, a decreasing global healthcare workforce (Gqweta, 2012; May, Martino & Mc Elveny, 2008), an aging population (Field & Snaith, 2013; Smith, Yielder, Ajibulu, & Caruana, 2008; Martino & Odle, 2007), mass migration (Hardy et al., 2008), geopolitical war, increases in communicable and non-communicable diseases, rapid expansion of new medical technologies (Watson, 2014) and decreasing healthcare budgets. Though these challenges can be traced back a few decades, the advent of the technological era (more computers in medicine and faster, more complicated, and more expensive specialised equipment, such as computed tomography and magnetic resonance imaging scanners) has accelerated the need for change in the delivery of healthcare services.

The healthcare sector has, therefore, been forced to evolve by instituting new and innovative approaches to the delivery of patient care services. Clark, Radford and Rastrick (2017) observed that new solutions are needed in the provision of healthcare services to meet the needs of the public. Therefore, professions allied to medicine including nursing, radiography, speech-language therapy, and pharmacy professions, have extended their reach into areas of practice once reserved for the medical profession. New ways of working, new roles and new behaviours are being developed and implemented (Price & Masurier, 2007; Clark et al., 2017). These new and non-traditional approaches to patient care continue to emerge and change the healthcare landscape and are referred to as “emerging practices”. A variety of emerging practices led by the nursing profession, have evolved, with most designating their roles as advanced practice. However, the advanced practice descriptor continues to be applied inconsistently

(Clarke et al., 2017) in professions allied with health, especially in medical radiation science professions (Harnett et al., 2018). One emerging practice role is that of the advanced practice coordinator, as currently practiced at two hospitals in Toronto Canada. This research, therefore, examines this role to determine whether it meets the criteria for role extension or advanced practice designation and whether it influences patient outcomes. This research also aims to develop frameworks to inform the development and implementation of emerging radiographic practices, along with informing advanced radiographic practice curricula.

Healthcare Today

Emerging practices are approaches to healthcare practice that have evolved owing to the challenges facing healthcare service delivery and are aimed at improving patient care services and meeting the needs of patients (Canadian Association of Medical Radiation Technologists [CAMRT], 2015). There are different approaches to emerging practices, namely role expansion, expanded role, enhanced practice, role extension and advanced practice. However, according to CAMRT (2015), these roles are not similar, as they denote different levels of clinical practice, responsibility, accountability and practice autonomy. CAMRT (2015, p. 25) presented the understanding that role extension, enhanced practice, expanded practice and extended practice are “practices or roles that extend beyond the principal expectations of practice”, whereas advanced practice denotes “roles that incorporate advanced activities into a practitioner’s primary day-to-day work and that reflect all the principles of advanced practice.” Advanced practice roles, therefore, reflect a full job description, as opposed to the description of a single activity. CAMRT (2015) further explained that advanced practice is different from other emerging practices, such as role extension and enhanced practice, because of key principles. These key principles (autonomy, improved patient outcomes, critical thinking, complex decision-making and leadership) are distinct elements that set advanced practice apart from entry-level practice and other forms of emerging practices (CAMRT, 2015).

Recognition of the different formats of emerging practice and the marked difference between role extension and advanced practice are essential as professional demarcations are blurred today than they were in the past (Hardy et al., 2008; Nightingale & Hogg, 2003A; Kelly, Piper, & Nightingale, 2008). A recent observer has noted that with advanced practice for radiographers in the UK, it has become difficult to distinguish the radiographer's task from that of the radiologist. Nightingale and Hogg (2003A) concurred and presented a list of advanced radiographer practice tasks that looked more like a list of radiologist's responsibilities. Consequently, claims of practice ownership by any given healthcare profession has become difficult (Kelly et al., 2008).

Professional practice designation is therefore critical, because it contributes to professional identity, builds professions' body of knowledge, and influences professions' scopes of practice, practitioners' satisfaction, staff retention, and patient satisfaction (Nightingale & Hogg, 2003B; Williamson & Mundy, 2010). Additionally, the explicit designation of professional practice and scopes of practice are needed for practitioners to provide a clear, concrete, and consistent explanation of their professional roles and responsibilities to patients, the general public, other healthcare workers, and healthcare policymakers (Department of Health UK, 2010). Role designation is essential in the new approach to patient care, because the inconsistent application of role descriptors has led to confusion and hence to the continued scholarly debate regarding what constitutes advanced practice. Therefore, the accurate representation of professional roles is central to the provision of patient care services via new and nontraditional approaches (Department of Health UK, 2010).

The professional objective of the majority of allied health practitioners is to base their practice roles on principles of advanced clinical practice. For allied health practitioners, advanced clinical practice represents a practice level that is highly similar if not equal to medical practice, because it provides not only increased responsibilities but recognised professional autonomy. However, not all practice roles meet these criteria and therefore would not enjoy professional independence as a result of added responsi-

bilities. Thus, not all practice roles would provide the same benefits to healthcare service delivery as would an advanced practice. The National Health Services (NHS) in the United Kingdom (UK) consequently cautioned employers and practitioners against the use of the term *advanced* in practitioners' role descriptors if they were not practicing at an advanced level. The caution regarding the incorrect application of the descriptor *advanced* was intended to prevent ‘misunderstanding by the public and the multidisciplinary team’ (Clarke et al., 2017, p.11).

From the perspective of radiography in the UK, radiographers are traditionally operators, but the advanced practicing radiographer would function as a referrer, operator, and interpreter of the procedure. The referrer orders radiological procedures, the operator performs radiological procedures, and the interpreter provides a report on the radiological procedure (Nightingale & Hogg, 2003B). The advanced radiographic practitioner can function as the referrer, operator and interpreter, but the role extension radiographer may function only at one or two of the three levels, operator or/and interpreter. The role extension radiographer would not be able to order or refer patients for imaging procedures. Justification for the procedure (medical exposure) is reserved for the advanced practitioner (Holmes & Hogg, 2000). The UK’s College and Society of Radiographers, therefore, views advanced practitioners as practitioners who have developed significant depth and breadth of clinical practice, can deliver patient care in a wide range of care settings, and can develop innovative approaches to practice to improve quality and service delivery for patients (SOR, 2018). These practitioners are therefore highly respected by the public and their colleagues and are accordingly compensated at a higher level compared to entry-level practitioners. This study consequently addressed the following question: Is the advanced practice coordinator role advanced practice or role extension, and does this role influence the quality of patient care? Additionally, this study sought to identify the origin of the APC practice and to develop an explanation of why the APC role was successful at two hospitals but failed at another?

The Advanced Practice Coordinator

The APC role was first instituted at two hospitals in Ontario, Canada, in April 2015. It was tested at another hospital in Ontario but failed. The APC practice was designed to optimise diagnostic imaging (DI) services by delegating to the APCs some of the responsibilities previously performed by the radiologist, such as the coding of computed tomography (CT) requisitions. Other duties of the APCs role include, but are not limited to, working with the emergency and inpatient departments to execute patient requests for imaging services by triaging, resolving issues, scheduling, and expediting patient transportation to and from their departments. Additionally, the APC functions as the supervisor in the absence of the direct modality supervisors. However, the APC role continues to evolve and is envisioned to play a pivotal role in improving access to DI services and the quality of patient care from a DI perspective. Discussions are afoot to expand APC coding responsibilities to include the coding of MRI requisitions.

A search of the literature for roles similar to that of the APC in Canada yielded no results. However, I believe that there are roles related to the APC role in Canada that may not have been designated as an advanced practice — hence the lack of results. Further, a search for advanced practice in radiography/MRT yielded mostly information from a UK's perspective. The Canadian results were primarily academic reports on practices in other countries. This study therefore contributes to the discussion and list of emerging practices in MRT and offers insight into a role that may be beneficial to other MRT practices. It also enhances the development of advanced practice in MRT curricula by contributing to the evidence-based practice knowledge of the profession. Additionally, the only documented advanced practice role in the MRT profession in Canada is that of the advanced practice radiation therapist working with Cancer Care Ontario (CAMRT, 2018). Early available results on this practice indicate that this role has enhanced patient care by improving patient satisfaction and access to radiation therapy treatments (CAMRT, 2018).

My Professional Practice Perspectives

I have worked as a diagnostic radiographer for 25 years, having graduated from the University of Guyana in 1994. Since graduation, I have acquired extensive international experience in many of the modalities of medical radiation sciences, notably general radiography, emergency radiography, mammography, fluoroscopy, computed tomography (CT), forensic radiography, and interventional radiography. I started my radiographic career in Guyana at 21 years of age with a zest to be the best practitioner with a focus on caring for my patients. Therefore, I saw continuous professional development not as a necessity but as a requirement to actualise my patient care responsibility. Hence, I have invested much time and finance in pursuing postgraduate learning and specialised certifications to match the changing needs of my patients and my employing organisation. In 2002 I graduated with a Master's degree in radiographic image interpretation and was unofficially permitted by my head of department to provide plain-film radiographic reports on emergency cases. At that time there was little discussion of advanced radiographic practice in the Caribbean. Instead, the coined phased within the radiographic community was role extension. At no time did I considered my role as an advanced practice role. Instead, I saw my role as a radiographer who was responding to the patient care needs of his patients and employing organisation by providing radiographic reports to reduce patient wait times in the emergency department. I was also assisting the radiologists by allowing them more time to attend to complexed cases.

In April 2015, I joined the staff at Western General Hospital (WGH) as a casual CT Technologist. After four months at this institution, I applied for a casual advanced practice coordinator position, because I wanted to practice at an advanced level. I also wanted to challenge my *current practitioner self* and to improve my financial situation; this role offered a higher hourly premium. However, after completing the short in-house training and functioning in the position for a few months, I began to question the advanced practice attributes of this role. There were increased responsibilities and opportunities to draw on my multimodality knowledge to improve patient access, along with some amount of leadership. However, the other attributes of advanced practice (**autonomous practice**, **critical thinking**, and **complex decision-making**) were absent. I

found myself using more of my specialised technologist knowledge and experience than that provided at the APC training session, and I therefore concluded that any experienced specialist technologist would be able to function in this role. My experience of this role, coupled with the use of the *advanced practice* descriptor, motivated me to examine the role and its implications for the continued evolution of the MRT profession and the advanced practice in MRT initiative, which led to the current thesis: 'Advanced Practice Coordinator: Role Extension or Advanced Practice? A Canadian Multi-Case Study'.

The Research Environment

The three healthcare institutions from which the data were collected are located in Eastern Canada, in the province of Ontario. The APC practice is currently practiced at Western General Hospital (Case 1) and West Central General Hospital (Case 2) in response to increasing patient care demands. The APC practice was attempted at Central General Hospital (Case 3) but failed. The names of these institutions have been changed to preserve confidentiality.

Western General Hospital (WGH) and West Central General Hospital (WCGH) are large, independent hospitals that operate under the same umbrella organisation. WGH is regarded as Ontario's largest community hospital and one of the busiest in Canada. It serves a population of approximately 1.3 million multicultural residents. I worked at WGH as an APC for 22 months on a part-time basis, distributing my full-time hours amongst the APC role, CT, and interventional radiography (IR). WCGH is the sister institution of WGH and is a bustling community hospital serving the northwestern corner of Toronto. It provides a wide range of outpatient and inpatient services and receives approximately 70,000 emergency visits annually.

The third hospital, Central General Hospital (CGH), is located in the Greater Toronto Area and serves a population of approximately 850,000 residents. CGH is regarded as one of Canada's largest regional acute care hospitals, with a total bed capac-

ity of 656. CGH was recognised as the most advanced hospital in North American owing to its digital and computerised infrastructure. CGH's new facility was formed by amalgamating of three hospital sites.

Application to Medical Radiation Technology

This study answered the call for increased research output from the radiographic profession (Sim & Radloff, 2009; Adams & Smith, 2003; Gambling, Brown & Hogg, 2003; Kurmis, 2003; Williams, 2002) by informing the advanced radiographic practice initiative and grounding it in evidence. Many studies have argued that grounding technologists' practice in evidence is vital because it improves technologists' image within the multidisciplinary team. The literature has also suggested that it is essential for the medical imaging profession to follow other allied-health professions in articulating a clear, concrete, and consistent explanation of practitioners' roles to consumers, healthcare policymakers, and other healthcare professionals on the basis of research findings produced by medical radiation technologists (Nightingale & Hogg, 2003A).

Additionally, the lack of a guiding framework for the development and implementation of approaches to emerging methods in MRT, notably role extension and advanced practice, makes it possible to apply haphazard approaches to role development by hospitals, states/provinces, and countries (NHS, 2017; Byran-Lukosius & DiCenso, 2004). A framework that guides the development and implementation of advanced practice roles in MRT would therefore facilitate consistency in the development and implementation of these roles (Department of Health, 2010). Therefore, one of this study's objectives is to present a framework that can inform the successful development and implementation of these two approaches to emerging practices in MRT.

A Brief Introduction to Medical Radiation Technology

The radiology profession and the radiography occupation were formed after the discovery of ionising radiation (x-rays) on 8 November 1895 by German physicist Professor Wilhelm Conrad Roentgen (Ballinger & Frank, 2003; Decker & Iphofen, 2005).

Radiology is a branch of medicine dedicated to the interpretation of medically produced images and the use of ionising and non-ionising energies for the diagnosis and treatment of diseases. Radiography is the application of ionising and non-ionising (ultrasound and magnetic resonance) energies to produce images of human anatomy and pathological conditions to aid in the diagnosis and treatment of diseases (Ballinger & Frank, 2003). Today, terms such as medical radiation sciences (MRS), medical radiation technology (MRT), and diagnostic imaging (DI) are used interchangeably to refer to radiography. A radiologist is a medically trained doctor who had specialised training in radiology. He/she is the leader of clinical practice in the department of radiology/radiography and therefore has ultimate responsibility for all patient care activities within the department. The radiographer is the non-medical practitioner who had undergone a period of study at the higher education level, demonstrated clinical competencies, passed a prescribed examination and therefore licensed to produce images of human anatomy and pathological conditions using ionising and non-ionising energy sources.

The professional designations used to describe non-medical practitioners who work in MRT/radiography depend on the country of practice. They include medical radiation technologist (Canada), radiographer (the UK, Australia, South African, and Barbados), radiologic technologist (USA), medical imaging technologist (Bermuda), and medical imaging practitioner (Guyana). These terms are used interchangeably to refer to the same radiographic practitioner role. I have encountered at least 20 different professional titles used around the world to describe radiographic practitioners. However, in Canada, the radiographic practice is referred to as MRT to explain the science of the occupation and medical radiation technologist (MRT) to represent the professionals who practice this profession. This research, therefore, is grounded in radiological and radiographic practices, as well as reports on the emerging practice in MRT from a Canadian perspective. Additionally, this research provides clarity on the approaches to emerging practice in MRT and supports the profession’s quest for full professional status recognition by assisting in the understanding of advanced practice in MRT.

Contributions to Practice in the area of Higher Education

With the growing need for approaches to counteract the challenges faced by the healthcare sector, medical radiation technologists (MRTs) and other healthcare practitioners continue to seek out ways of meeting the patient care needs that are outside the realms of the medical profession. The team approach to healthcare dictates collaboration and the sharing of roles between the medical and non-medical professions. With this understanding and the ever evolving healthcare practice approaches, industry and higher education have very important roles to play in ensuring that the non-physician practitioner is equipped with the knowledge and competencies to fill the void in patient care, created by the many challenges. The findings of this research illuminate a practice that can inform human resources decisions by informing managerial personnel of possible ways of better utilizing recognised technologies and other practitioners skills and competencies. But more importantly, the finding of this research along with the proposed emerging practice frameworks can inform the development of not only medical radiation technology curricula, but also healthcare management curricula.

This thesis therefore presents a collaborative framework for role extension in medical education and a framework for the development and implementation of advanced practice in medical imaging. The collaborative framework for role extension presents a possible avenue for industry and higher education to work together towards recognizing and awarding practitioners for their learning at a level below that of postgraduate degree. Further, the advanced practice framework presents a comprehensive framework that spells out what is required for educators to facilitate the transition from entry level practice to advanced practice. More importantly, the transitional requirements presented in the proposed advanced practice framework would aid curricula and practice developers in the assessment of practice conditions when considering advanced radiographic practice or curricula geared towards informing such practice development.

Summary: Thesis Overview

The healthcare landscape continues to change. Healthcare practices continue to emerge. There are many approaches to healthcare practices within allied health professions, notably role extension and advanced practice. Establishing a precise distinction between role extension and advanced practice, and providing a concise differentiation between role extension and advanced practice is vital in curbing the inaccurate application of role descriptors. Such an outcome should reduce the confusion over some aspects of the role development literature. Therefore, identifying and articulating the attributes, rationale, and competencies for an advanced practice MRT role are paramount to advancing the advanced practice in MRT initiatives. This study examined the APC role to determine whether it fulfilled the criteria of the advanced practice or role extension designation. It also addresses many important questions related to the APC role and offers a preliminary framework for the development and institution of advanced practice and role extension in MRT.

This chapter presented an overview of the research by offering a brief overview of the catalyst behind emerging practices in MRT, the APC practice, my professional practice perspectives, the research environment, this study's application to medical radiation technology, a brief introduction to medical radiation technology, and the research's contributions to practice in the area of higher education. **Chapter 2** presents a review of the literature on advanced practice, its principles, and its benefits, introduces the research questions, presents the rationale for the study, and the underlying theoretical perspective that guided this research. **Chapter 3** presents the research methodology and design, including a discussion of the study's ethical implications. **Chapter 4** presents the case-by-case findings of the three cases studies. Each research site is presented as an independent case. The interview findings, APC survey, and patient outcome measures are presented. **Chapter 5** presents a discussion of the findings as a cross-case analysis of the three case studies. The discussion also includes examina-

tions of the various themes developed from the findings and an explanation of the possible association between the self-determination theory (SDT) and improved patient outcomes. The perspectives of the advanced practice nurses at the case sites are used to inform the discussion. The limitations of this study are also discussed. **Chapter 6** presents the study's implications, emerging practice frameworks, conclusions, and recommendations for future research.

A Review of the Literature Review

Introduction and Overview

Healthcare sector practice including radiography and radiology continue to change to meet the demands of the changing healthcare landscape (Hardy et al., 2008; Gqweta, 2012; May et al., 2008). The radiologist's practice has grown to include areas once dominated by other medical professions, and consequently, the radiographer's practice has expanded (emerging practices) to incorporate roles/tasks once performed by radiologists. Professional practices and roles, therefore, continue to be introduced to the healthcare environment to address the challenges associated with the delivery of healthcare services.

Emerging practices are approaches to healthcare practice that have evolved in response to the challenges facing healthcare service delivery, and they aim to improve patient care services and meet the needs of patients. As with nursing and other professions supplementary to medicine, researchers have used a variety of terms to describe emerging practices (CAMRT, 2015; Hardy et al., 2008; White & McKay, 2004). The terms role expansion, extended practice, expanded practice, role extension, and advanced practice are more commonly used in the role development literature. However, this list of role descriptors continues to create confusion, because it attempts to represent these roles as equivalent with respect to their scopes of practice, professional autonomy, clinical competencies, and the importance of their practice (White & McKay, 2004; CAMRT, 2015; Department of Health, 2010). Further, these different role descriptors can in fact represent different levels of practice, responsibility, accountability, and autonomy. This study therefore illuminates two of those approaches in medical imaging — role extension and advanced practice — by examining the APC role. The overarching research question is as follows: Is the advanced practice coordinator role advanced practice or extension, and does it influence patient care?

The introductory chapter presented the perspectives on emerging practices, the driving forces behind these practices, the dynamics of the MRT profession, and the potential impact of this study on radiography practice. This literature review presents an examination of the evolution of advanced practice, a brief international perspective on emerging practices in radiography/MRT and a discussion of role extension versus advanced practice to determine whether the APC role meets the criteria of the advanced practice designation. Further, to examine the APC practice, it is necessary to discuss the adopted definition for emerging practice concepts and explore the principles associated with advanced practice. The benefits of advanced practice initiatives for the health and care sector, which are also crucial to the discussion, are presented. Further, the concept of autonomous practice as an underlying principle of advanced practice is examined, because the literature has attributed the success of advanced practice to autonomous practice (Weston, 2010; Cherow, 1994). An examination of the self-determination theory is also included, because the literature has suggested a link between autonomous practice and intrinsic motivations.

The Evolution of Emerging Practices

Early discussions of the classification of professions, occupations, and jobs asserted that medicine, law, and engineering dominate the job-profession's continuum and are therefore considered true professions (Friedson, 1970, cited in Lewis & Warriner, 1971). Health-allied professions, such as nursing, physiotherapy, pharmacy, and radiography, were viewed as facilitators of the medical physician's practice role. This hierarchical relationship, in which decision-making was reserved for the 'all-knowing' medical physician continued until 1877, when nurses in the United States (US) started administering anaesthesia (Armstrong, 2002; Murphy-End, 2002). A review of the literature on role development revealed several international commonalities, namely, the catalysts of role development in nursing practice, which include the shortage of medical personnel, technological innovations in medicine, recognition of the capabilities of nurses, and the changing needs of the health care customer (Murphy-Ende, 2002; Sheer & Wong, 2008; Yesalis, Holt, & Politzer, 2013). From a nursing perspective, however, the notion that role development has been a smooth journey is questionable.

According to Duffield et al. (2009) and Bryan-Lukosius & DiCenso (2004) an ad hoc approached to the development and implementation of role development in nursing with different nomenclature and scopes of practice, once existed globally. In Canada, Dunn and Necklin (1995) therefore recommended the use of prescribed steps to guide the development and introduction of advanced nursing practice roles. Their recommendations were made on the heels of the restructuring of the Canadian healthcare sector, which resulted in an increased demand for advanced practice nurses. The radiographic literature presented a similar ad hoc approach to emerging radiographic practice internationally. This dilemma is illustrated later in this chapter where the international perspectives on emerging radiography practices in radiography are briefly examined.

The nursing profession continues to lead the advanced practice movement globally (Duffield et al., 2009; Murphy-Ende, 2002) and therefore dominates the literature on advanced practice in healthcare. Nursing's leadership role and its dominance of the role development literature can be attributed to the early recognition of the importance of advanced practice in nursing (Bryan-Lukosius & DiCenso, 2004). This early recognition motivated the International Council of Nurses and advanced practice nurses to collaboratively establish the International Council of Nurses, Nurse Practitioner/Advanced Practice Nursing (ICNNP/APN) network. The ICNNP/APN network aims to be an international resource for advanced practice nurses as well as policymakers, educators, regulators, health planners, and registered nurses interested in advanced nursing practice (*ICNNP/APN*, n.d.). A search of the literature for the radiographic equivalent to the ICNNP/APN network proved futile. Such a network for advanced radiographic practice may help to further the advanced practice in radiography initiative internationally. Therefore, the radiographic perspectives and approaches of other countries will illuminate the motivations of this study.

International Perspectives on Emerging Practices in Medical Radiation Technology

Practices within medicine and medicine-allied professions are not static and therefore change with time (Paul, 2009). However, though the forces driving change in the delivery of radiology and radiological and general health services are similar internationally, the approaches to role development designed to respond to these challenges vary from country to country. The diverse approach to role development in radiography has also contributed to varying levels of responsibilities and autonomy and undoubtedly to different roles and practice designations. Nevertheless, role developments have resulted in a decrease in the dominance of medicine in the healthcare sector (Armstrong, 2002). Consistent with this empowering of allied health practitioners is the trend of allowing practitioners to be innovative in their practice by identifying and implementing quality service improvement initiatives (Society of Radiographers UK, 2018).

From a radiographic perspective, emerging practices such as role extension and advanced practice began only in the 1960s, with the introduction of the red dot system (a system in which radiographers placed a red dot on radiographs to indicate the presence of an abnormality) in the UK (CAMRT, 2015). Since then, some countries have established scopes of practice that confirm advanced practice, whereas for others advanced radiographic practice remains an aspiration because the support for such practice is lacking and/or the legislative framework is absent.

The UK's model of emerging practice in radiography, notably advanced practice, is recognised as the advanced practice template within the international radiographic community (Field & Snaith, 2013). The UK's impetus for the development of advanced practice for radiographers is similar to that in other countries such as the US, Canada, and Australia: financial constraints, increasing demands for radiological services concurrent with the shortage of radiological professionals, and other factors (Forsyth & Robertson, 2007; Shay, Silva, Mohabir, & Erinjeri, 2017). To meet projected demands

for radiological services in the UK in the early 2000s, an estimated doubling of the required number of attending radiologists was necessary (Kelly et al., 2008; Nightingale & Hogg, 2003). Similarly, according to May et al. (2008), between 1992 and 2002, the number of radiologists in the US increased by 1–1.5% while the radiologists' workload increased by 25% (11,100 to 13,900 examinations) per annum.

The shortage of radiologists forced the UK health system to be adaptive and supportive of change. Diagnostic radiographers, therefore, began extending their roles from *red dotting* to formal plain radiographic image interpretation. Since then, the UK has led the way in advanced practice in medical radiation sciences — so much so that the UK's National Health Service (NHS) developed and instituted a four-tier skills model of the assistant practitioner, practitioner, advanced practitioner, and consultant practitioner (Price & Masurier, 2007; Williamson & Mundy, 2010; Martino & Odle, 2007). The framework, the Career Progression Framework, constitutes part of the UK's Agenda for Change Reform, the goal of which is to link pay and career progression to competency (Williamson & Mundy, 2010; Martino & Odle, 2007, p.5). This framework helps to maintain practice standards, promote new and extended roles, encourage lifelong learning, widen access to clinical careers, and improve recruitment and retention of staff (Kelly et al., 2008; Price & Masurier, 2007; Martino & Odle, 2007). Additionally, the career progression framework spells out the advanced practice roles that are permitted, educational requirements, and scopes of practice (Kelly et al., 2008).

The US approach to combating the shortage of radiologists fostered a collaborative approach amongst major US radiology stakeholders. The American Society of Radiologic Technologists (ASRT), the American College of Radiology (ACR), the American Registry of Radiologic Technologists (ARRT), educational programs, and government agencies met to formulate, develop, and institute an advanced practice role for registered radiologic technologists (Petree, 2015; May et al., 2008). By 2005, the first batch of advanced radiologic technologists — registered radiologist assistants (RRAs) — was licensed to practice in the US (Martino & Odle, 2007; Paul, 2009; May et al., 2008; Shay et al., 2017). At the end of 2014, RRAs were permitted to practice in 29 states (Petree,

2015). The RRA designation entails high levels of responsibility and accountability but undeservedly moderate levels of practice autonomy when compared to nurse practitioners in the US (Petree, 2015; May et al., 2008). However, a similar role, the *radiology practitioner assistant* (RPA), predates the RRA role. The University of Utah had been producing RPAs since the mid-1990s (May et al., 2008). However, the tasks associated with the two roles are identical (Martino & Odle, 2007).

As in the US, the Canadian approach to emerging practices could be considered to be in its infancy, because it began only at the end of 1999. The Canadian emerging practice journey can be traced to roles such as technologists performing barium enema studies at the Queen Elizabeth Hospital, Prince Edward Island; upper gastrointestinal studies at St Joseph Health Care, London Ontario; and peripherally inserted central catheter (PICC) insertion at St Michael's Hospital, Toronto, Ontario (Paul, 2009). However, the CAMRT refuted the classification of these roles as advanced practice roles but more so as role extension or extended practice roles (Topham, 2014). The CAMRT took the position that these roles neither exhibited the principles associated with advanced MRT practice nor met the body's consensus on the need for MRTs to receive education and training beyond their entry-level qualifications (Topham, 20014). The CAMRT is the national licensing body for both diagnostic and therapeutic medical radiation technologists in Canada. The CAMRT regulates MRT practices in Canada; however, some practice responsibilities are governed by provincial authorities such as the College of Medical Radiation Technologists Ontario (CAMRTO), in the province of Ontario.

Canada's late entry to both the emerging practice and advanced radiographic practice movement is attributed to the lack of a formal definition of advanced practice (Topham, 2014; CAMRT, 2015). Therefore, after lengthy discussions, many committees, and collaborations with other stakeholders and practitioners in advanced practice, the CAMRT was able to develop a guiding definition of advanced practice in MRT. The CAMRT had also established a draft of a framework for advanced practice in MRT,

which aimed to harness support for advanced practice and present a shared understanding with which to guide the discussions of advanced practice in MRT in the Canadian healthcare sector (Topham, 2014).

To date, the only advanced practice MRT role recognised by the CAMRT is the clinical specialist radiation therapist (Ontario)-palliative radiation therapy (CAMRT, 2018). This is a therapeutic role and therefore falls outside the scope of this study for several reasons. Firstly, I was educated and continues to practice in the realm of diagnostic radiography. Second, in Canada, diagnostic radiography and radiation therapy are viewed and practiced as distinct professions. And third, the APC role is situated in the diagnostic medical imaging realms of healthcare practice.

Though Australia does not have provisions for advanced radiographic practice (Smith, 2009; Cowling, 2008), the country continues to actively work on the development and adaptation of an advanced practice framework for both diagnostic and therapeutic radiographers. A report by the Advanced Practice Working Group of the Australian Institute of Radiography published in May 2009 proposed the establishment of advanced practice roles in both radiography and radiotherapy. Smith, Harris, Woznitza, Maresse, and Sale (2015) attributed the delay in the establishment of advanced practice for radiographers in Australia to three factors: (1) a surplus of radiologists, (2) greater privatisation of healthcare, and (3) the separation between professional and industrial responsibilities, with the former two under the control of the government and the latter by trade unions. However, it was reported that some Australian senior radiographers had extended their clinical roles to include image interpretation, performing barium studies, intravenous cannulation, contrast media injection, and providing initial ultrasound reports to radiologists (Smith et al., 2008).

Other players in the emerging radiographic practice forum include South Africa and Barbados. South Africa’s approach to emerging radiographic practice is grounded in role extension. In the 1980s, the red dot system that originated in the UK was adapted in some hospitals in South Africa owing to a severe shortage of radiologists

(Williams, 2006; Gqweta, 2012). In 2006, there were nine radiologists per million population in South Africa (Williams, 2006) compared to 95 per million in the US, 60 per million in Canada, and 36 per million population in the UK, all in 2004 (Nakajima, Yamada, Imamura, & Kobayashi, 2008). Additionally, like most developing countries, South Africa continues to lose its professionals (radiographers and radiologists) to developed countries (Gqweta, 2012). This brain drain phenomenon continues to negatively impact the delivery of healthcare services in South Africa, especially in the primary healthcare sector.

However, South Africa continues to work assiduously on initiatives aimed at advancing from red dotting to image interpretation. These initiatives are aimed at formalising the role extension approach in order to provide radiographers with the knowledge, skills, and legal framework to provide image interpretation after completion of an accredited educational program (Williams, 2006). It is hoped that this will improve patient care by reducing long waiting times (currently about 14 days) for reports on plain radiographs as well as improve job satisfaction and professional recognition (Williams, 2006; Gqweta, 2012). A lesser known player, Barbados has also explored some version of emerging practice in medical imaging. Richardson (2002) reported on a radiographer who was educated at the master's degree level and was providing opinions on plain radiographs at the permission of the lead radiologist. Table 1 summarises a brief examination of international perspectives on emerging practices in diagnostic radiography.

These varied international perspectives on emerging practice in radiography illustrate the differences amongst implemented approaches and the lack of a unifying framework with which to guide role development in radiography. This lack of a unifying framework can be attributed to the absence of a guiding framework for the development and introduction of advanced practice in the MRT profession. The lack of a framework continues to create confusion for aspiring advanced radiographic practitioners, because it reinforces the ad hoc development and branding of roles as advanced practice without grounding practice and roles in the principles of advanced practice. The casual approach to branding roles as advanced practice has the potential to negatively affect the

profession's image and the public's perception of the profession and its practitioners (Hardy & Snaith, 2006). This prompted the UK's National Health Service to issue a caution to employers. To avoid misleading the public and the multidisciplinary team, the NHS had cautioned that employers should examine their workforce for roles with the advanced practice descriptor to ensure that these roles were providing patient care services at the advanced practice level (2017). An essential tenet of the emerging practice role development initiative is the accurate representation of practices and roles. Therefore, this study addresses the following question: Is the APC role extension or advanced practice?

Table 1. Summary of international perspectives on emerging practices, according to Paul (2009) and Cowling (2008).

County	Approach to Emerging Practice	Model/Practice	Year approach began.
United Kingdom	Role extension	Red dotting	The 1960s
	Advanced practice	Advanced Practitioner	1998
		Consultant Practitioner	1998
USA	Advanced practice.	Radiology Practitioner Assistant (RPA)	1996
		Registered Radiologist Assistant (RRA)	2005
Canada	Role extension.	GI Technologist	1999
		PICC Line Technologist	2006
	Advanced practice.	Clinical Specialist Radiation Therapy	2004
Australia	Role extension.	GI Radiographer	Unknown
		Image Interpretation	
		Contrast Media Injection	
South Africa	Role extension	Red dotting	The 1980s
Barbados	Role extension.	Reporting Radiographer	2002

Role Extension versus Advanced Practice

Advanced practice in MRT has been the focus of much debate and discussion over the last two decades, not only from the perspectives of the UK, where the advanced radiographic practice is established within the national career framework, but also internationally. However, the literature has noted the continued confusing use of the terms role extension and advanced practice as interchangeable descriptors of clinical practice performed at a level higher than the entry level, with added responsibilities and accountability and increased recognition of one's practice: in other words, role extension is presented as advanced practice (CAMRT, 2015; White & McKay, 2004; Williamson & Mundy, 2010; Health Education England, 2018). This inconsistent application of these terms to practice roles may have proven counterproductive to the growth and recognition of the radiographic profession and the advanced radiographic practice initiative (DoH, 2010; Snaith & Hardy 2007). It was therefore imperative that this study adopted working definitions of role extension and advanced practice from an MRT perspective. These definitions are presented to illuminate differences between the two approaches to role development.

According to Hardy and Snaith's definition, role extension in the healthcare sector '**implies supplementary skills and responsibilities that extend beyond the statutory responsibilities and competencies at the point of professional registration'** (2006, p. 328). Their understanding of role extension, which is shared by this author, is logically derived from the meaning of the word ***extend***, to add to something to increase its size or length (Agnes, 2002). From an MRT perspective, role extension means technologists extending their reach by developing competencies and accepting added responsibilities for tasks once performed by either the radiologist, radiology nurse, or another healthcare practitioner (Williamson & Mundy, 2010; Gqweta, 2012; White & McKay, 2004). The tasks associated with MRT role extension may include the administration of intravenous contrast, intravenous cannulation, plain radiograph pattern recognition, patient monitoring during interventional procedures, and pre- and post-interventional-procedure patient chart review and documentation, to name a few. However,

Daly and Carnwell (2003) questioned when tasks associated with role extension become a part of the core competencies and responsibilities of the adapted profession. Kelly et al. (2008) and Williamson and Mundy (2010) also expressed this concern. Further, White and McKay cautioned technologists to be careful about being reduced to the 'technical assistant for the medical profession' (2004, p.219). In a similar vein, Gqweta (2012) observed that South African radiographers' complacency concerning role development has reinforced the view that they are technical assistants to the radiologist.

Hardy and Snaith (2006) argued that role extension should result naturally from professional maturity and the espousal of the professional practice of lifelong learning. However, they also mentioned that role extension is locally driven and designed to address the needs and demands of the local department or employing hospital to optimise service delivery by fostering a versatile, skilled staff base. Role extension therefore requires practitioners to conform their practice to the needs of an organisation to ensure continuity of service. However, it has been argued that the skills and competencies acquired as a result of the extended roles might not be transferable to other institutions or countries, because such roles are locally designed, they lack certification recognition, and the associated competencies can be acquired via experiential learning or in-house training programs (Kelly et al., 2008). The locally situated position of role extension has been viewed as counterproductive to the development of advanced MRT practice, because it does not require formal education or postgraduate qualifications (Hardy & Snaith, 2006). However, some practitioners (Yielder, Young, Park, and Coleman, 2014) have taken the position that a postgraduate diploma would suffice for role extension practitioners.

Yielder et al. (2014) cautioned that over time, role extension activities might become part of the routine duties of practitioners. Therefore, proponents of advanced radiographic practice should be warned that 'progressing from practitioner to advanced practitioner is not as simple as undertaking an extended role' (Snaith & Hardy, 2006, p. 145). Taking a similar stance, Nightingale and Hogg (2003, p. 81) cautioned that when developing advanced practice, roles should not be 'exclusively tied to activities that will

be absorbed into standard practice.' Therefore, the argument forwarded by some scholars of advanced practice (Bolderston, 2004; Bolderston, 2005) that the term advanced practice serves as the umbrella term for role development concepts such as role extension and role expansion can be seen as misguided. According to empirical evidence presented later in this chapter, neither role expansion nor role extension modernises radiographic practice nor grows the profession's body of knowledge. On the other hand, there is evidence that advanced practice contributes to these areas (Ruel & Motyka, 2009; Smith et al., 2015; Woodford, 2006).

Hardy and Snaith's (2006) defined advanced practice as practice that '**implies the development of a role and the application of knowledge to benefit and modernise clinical practice'** (p.329). This definition is adopted by the present study; applied to the MRT profession, it refers to the development of an MRT role that requires the application of new knowledge to improve and modernise practice. Both published and anecdotal evidence (Hardy et al., 2008; Hardy & Snaith, 2006; Kelly et al., 2008) indicates that advanced practice denotes an independent practice that defines the scope of practice of other practices and professions and is continuously developing within its specialised field. Therefore, advanced practice requires greater accountability and responsibility for patient care within its dedicated area, because accountability and responsibility are the hallmarks of autonomous practice (Kramer & Schmalenberg, 2008). Also required are higher levels of critical thinking and clinical decision-making skills — attributes that require practitioners be educated at the postgraduate level, such as those holding a master's degree or even a doctorate. It is envisioned that postgraduate education would facilitate the development of the advanced practice knowledge and skills needed to transform the delivery of patient care services. Brown (1998) argued that graduate education prepares practitioners for the superior role by providing them with an expanded practice knowledge base. Martino and Odle (2007) affirmed that expanded breadth and depth of advanced practice necessitate additional education and training. Training and scopes of practice should therefore be standardised, because it would be challenging for advanced practitioners to practice without institutional, state, and even country limitations (Martino & Odle, 2007). Standardisation of training and scopes of

practice would also improve the transferability of competencies and recognition of advanced practice roles. Presenting the nursing perspective on the policies, education, and role development associated with advanced nursing practice, Furlong and Smith (2015, p. 1064) cautioned that 'much more needs to be done to ensure advanced nurse practice [ANP] roles are legitimised through uniform criteria, education standards and regulation'.

The literature has cited many elements, principles, and attributes that constitute an advanced practice: knowledge, service, practice development, and research (Snaith & Hardy, 2007; MacDonald, Herbert, & Thibeault, 2006; Mantzoukas & Watkinson, 2006), complex decision-making skills and leadership (Snaith & Hardy, 2007; Mantzoukas & Watkinson, 2006; CAMRT, 2015), education and training (Snaith & Hardy, 2007; MacDonald et al., 2006), and improving patient outcomes (Snaith & Hardy, 2007; MacDonald et al., 2006; CAMRT, 2015), as well as critical thinking and analysis (McDonald et al., 2006; Mantzoukas & Watkinson, 2006; CAMRT, 2015) and autonomy of role (CAMRT, 2015). Therefore, in view of the varying perspectives and the growing international dialogue on advanced radiographic practice, this study adopted the following principles: improving patient outcomes, critical thinking, complex decision-making, the autonomy of role, and leadership, as proposed by the CAMRT in 2015.

Principles of Advanced Practice

In 2015, the Canadian Association of Medical Radiation Technologists identified improving patient outcomes, critical thinking, complex decision-making, autonomous practice, and leadership as its principles of advanced practice (CAMRT, 2015). Because this study is situated in the Canadian context, it is necessary to briefly discuss the fundamental principles of advanced practice from a Canadian perspective. Each principle is discussed to illuminate how the principles are interwoven to enhance the patient care experience and fulfil the objective of advanced practice to effect optimal patient outcomes.

Improving Patient Outcomes

Improving patient outcomes is central to the development and implementation of advanced practice (Martino & Odle, 2007; Brown, 1998; CAMRT, 2015; Kelly et al., 2008). Improving patient care experiences by increasing access to care, quality of care, and patient satisfaction are the goals of the evolution of role development. It has been argued that the combined efforts of medical and nonmedical practitioners can improve patient outcomes (Grumbach & Bodenheimer, 2004). Such combined efforts are confirmed by the understanding that nonphysician professionals can contribute to cost containment because they are lower paid and possess some caregiving skills not possessed by physicians (Grumbach & Bodenheimer, 2004). These premises may be essential motivations for the development and implementation of advanced practice for medicine-allied professions. However, improving patient outcomes is inextricably linked to the concept of practice autonomy (Weston, 2010; Cherow, 1994), because independent clinical practice practitioners possess the ability to act according to their knowledge and judgment to provide patient care within their full professional scope of practice (Weston, 2010).

The Autonomy of Role

Independent practice is the hallmark of all real professions (Fleming, 1998). Independent clinical practice is defined as the capacity to make clinical practice judgments and decisions freely and independently, and without hindrance, and in the best interest of the patient (McParland, Scott, Arndt, Dassen, et al., 2000). Practice independence is also the desire of advanced practitioners (Brown, 1998; Department of Health, 2010; Martino & Odle, 2007; Kelly et al., 2008; HEE, 2018). However, the ability to be independent in one’s realm of practice is dependent on one's ability to demonstrate sound professional judgment and decision-making as well as accountability and responsibility for patient care (Hardy & Snaith, 2006; Kelly et al., 2008; Smith et al., 2015). The ability to practice independently can be developed with advanced professional knowledge and experience. However, this ability should be exercised within existing professional, regulatory, and organisational parameters (Weston, 2010).

Autonomous practitioners are therefore considered leaders in their professions (Smith et al., 2015). The UK's NHS four-tier workforce framework has recognises advanced practice radiographers' and consultant radiographers' abilities equal to nurse practitioner and other allied health advanced practitioners as 'the provision of health services should be dependent on the ability of staff, not their job title' (Nightingale & Hogg, 2003, p.78). The UK's General Medical Council supported this position in the following statement:

> Medical practitioners may delegate medical care to non-medical health care staff, but the medic must be sure that such staff is competent (General Medical Council, 1995, paragraph 28)

The General Medicine Council's clarification meant that in the UK, healthcare professionals such as advanced practice radiographers and consultant radiographers are permitted to refer patients for radiographic/radiological examinations, perform the radiographic studies, divulge the examination findings to patients, and refer patients to medical specialists (Nightingale & Hogg, 2003). Advanced radiographic practitioners in the UK are therefore experiencing increased autonomy in their practice (Nightingale & Hogg, 2003; Greeson & Pitts, 2011; Petree, 2015). However, as a hallmark of advanced practice, independent practice requires being held accountable and responsible for complex decision-making (HEE, 2018).

Complex Decision-Making

The healthcare environment is complex. The multidisciplinary approach to patient care increases this complexity. Advanced practice therefore requires practitioners to embrace a multiperspective approach to problem-solving and decision-making (HEE, 2018; Kelly et al., 2008; Martino & Odle, 2007). Analysing, synthesising and integrating information from a variety of sources and being objective in their approach to decision-making aids practitioners in improving their complex-decision-making abilities thereby increasing their level of responsibility and practice autonomy (Hardy & Snaith, 2006; CAMRT, 2015; UK Department of Health, 2010). Every day, radiographic practitioners

are required to exercise critical decision-making skills, be it on the quality of their images, whether to irradiate the patient a second or third time, performing supplemental views to demonstrate pathological conditions accurately, or knowing their limitations and practicing within them (Snaith & Hardy, 2006). However, those practicing at an advanced level are required to make life-altering decisions that can affect patient care outcomes and are therefore required to be objective in their evaluation of up-to-date practice knowledge and reliable research evidence (Smith et al., 2015). Advanced practitioners are therefore required to possess sound knowledge of research principles and to be adept in the interpretation of research findings that can inform judgments about patient care. They are therefore required to think critically in the provision of patient care services.

Critical Thinking

Critical thinking is a core element of professional practice because it is essential to the evidence-based practice paradigm (Snaith, 2013; Smith et al., 2015; SCoR, 2018). Critical thinking requires advanced practitioners to interpret, analyse, synthesise, evaluate, infer, and reflect on evidence to inform their professional practice and complex decision-making (Department of Health, 2010; Hardy et al., 2008). Cirocco (2007) argued that critical thinking is a desired attribute of professionals because it is pivotal to good decision-making ability. Similarly, Swanwick et al. (2014) argued that practice can be analysed and developed through critical thinking. Swanwick et al. (2014) also maintained that concepts developed through critical thinking may be evaluated and revised through reflective practice. Though critical thinking and reflective practice have differing orientations towards enquiry, they do overlap at the practice level. Therefore, in the process of complex decision-making, advanced practitioners reflect on their profession and practice in an effort to improve. Cirocco (2007) argued that reflective practice may be influential in judgement and knowledge acquisition and can result in higher-level thinking and analysis.

Reflective practice is widely accepted not only as a learning tool but also as an evaluation tool designed to improve practice by continually evaluating practice introspectively (Sim & Radloff, 2009). Practitioners who engage in reflection before, during, and after practice are better able to critically examine their practice to improve practice and better address patient needs (DoH, 2010). Sim and Radloff (2009) argued that reflective practitioners assume ownership for their learning, are open to new ideas, strive for practice improvements, and are holistic in their approach to problem-solving.

Leadership

The CAMRT (2015) posited that leadership is a central attribute of advanced practice because it presents the profession's role to other professionals in the multidisciplinary practice environment. Snaith and Hardy (2006, p.145) defined leadership as the ‘ability to motivate and inspire others …to maximise their potential and optimise service delivery’. Hence, advanced practitioners are considered leaders in their profession and amongst the interdisciplinary team, because they are tasked with increasing workflow, creating efficiencies, and decreasing waiting times (Yielder et al., 2014). Advanced practice therefore includes leadership in areas such as research, mentoring, education, and patient advocacy (HEE, 2018; Nightingale & Hogg, 2003). Examples of leadership may include both teaching and curriculum development for higher education programs, giving talks at local and international conferences, mentoring of undergraduate and postgraduate students, participating in career showcases, serving on the profession’s journal editing committees, initiating continuous professional development activities, patient advocacy, and so forth.

It can be inferred from the discussion presented above that practices grounded in the principles of advanced practice are beneficial to patient care services, the profession, and practitioners.

Benefits of Advanced Practice

The literature has identified a myriad of driving forces behind emerging practices in the healthcare sector along with a clear indication that the goal of emerging practice remains improving patient outcomes. The primary catalyst behind the introduction of advanced radiographer practice is improvement in the quality and efficiency of radiology services. The literature has provided many examples of the benefits of advanced radiographic practice (Thom, 2018; Lockwood, 2016; Plessis & Pitcher, 2015). These benefits are of importance to this paper, because one of its aims is to determine whether the APC practice influences patient care. Further, there are other empirically documented benefits to service delivery, professions, practitioners, and practice. Therefore, a case can be made that advanced radiographic practice initiatives that are profession-led and patient-focused should be embraced by policy- and decision-makers to meet the ever-increasing demand for healthcare services and curb the associated costs (Smith, 2009).

Discussing a potential framework for advanced practice nursing, Brown (1998) cited several meta-analyses of studies on advanced nursing practice that highlighted the benefits to patients and service delivery. Benefits such as higher patient satisfaction, compliance, and fewer hospitalisations or shorter length of stays were recorded as a result of nursing care when compared to physicians' care (Brown, 1998). Naylor and Broken (1993) and Brown and Grimes (1993) reported similar improved patient outcomes as a result of care received from clinical nurse specialists and nurse practitioners, respectively, versus care by physicians. Similarly, the newly created clinical specialist radiation therapist--the only advanced practice role for MRTs recognised by the CAMRT-has resulted in improvements in the provision of radiation therapy services in Ontario Canada. According to Harnett et al. (2018), the inclusion of the advanced practice radiation therapist has resulted in increased access to care and reduced wait-times for patients to access radiation therapy services in Ontario Canada.

The radiographic perspective is somewhat different from that of nursing. Most of the available empirical studies addressed either one or a combination of the following: cost reduction, waiting times, adverse patient incidence, patient satisfaction, efficiency

and productivity, value to the organisation, and benefits to the practitioners and the profession. Brown and Desai (2002), Brealey et al. (2005), Jones and Robinson (2008); Ludwig and Ferrara (2008), Hardy et al. (2013A), Lockwood (2016), Woodford (2006), May et al. (2008), and Thom (2018) reported reductions in service cost owing to the introduction of advanced radiographic practice. In all of their findings, the reduction impacts were attributed to the differences in hourly rates between the radiologist and the advanced radiographer performing studies once performed by the radiologist.

In support of the advanced radiographer practice impact on cost reduction, May et al. (2008) cited a study that showed that American advanced radiographic practitioners (RRAs) potentially saved radiologists some 100 minutes per day of image interpretation time by performing radiological procedures and managing patients' outcomes. This time equated to approximately US$300,000 per year (May et al., 2008). These savings may be the factor behind the increasing popularity of the RRA practice. In Massachusetts and New Hampshire, 70% and 80% of radiologists surveyed, respectively, indicated their willingness to employ an RRA in 2007 (May et al., 2008). Lockwood (2006) also reported an approximate savings of £300,000 and £145,000 in the UK when radiographers reported on CT heads and MRI scans, respectively.

Because the advanced radiographer now performs tasks once performed by radiologists with a high rate of accuracy, the services are provided to patients not only at a lower cost but more quickly. By freeing radiologists for more involved tasks such as interventional procedures, advanced practice radiographers contributed to a reduction in both the radiologist workload and the wait times for reports and procedures (Snaith et al., 2006; Torres-Mejia et al., 2015; Plessis & Pitcher, 2015; Lockwood, 2016; Page, Berth, & Davidson, 2014; Reid et al., 2016; Field & Snaith, 2013; Craven, 2003; Woodford, 2006; Nightingale & Hogg, 2003; & Thom, 2018). In their examination of the advanced radiographer's impact on time to treatment, Hardy et al. (2013B) operationalised time to treatment as a measurement of the time of arrival at the emergency department (ED) to the time of discharge or referral from the ED. They reported a reduction in the overall patient journey.

Brealey et al. (2005) and Hardy et al. (2013A, 2013B) reported a reduction in adverse patient incidence (discrepancies in reports that resulted in the readmission of patients to either the ED or x-ray department within three months of first attendance). Their report of a low incidence of discrepancies in the reports of reporting radiographers suggested that radiographers' reporting is highly consistent and comparable to radiologist reporting of musculoskeletal trauma images.

Evaluating patient satisfaction associated with the advanced radiographer practice, McIlroy, McIntyre, Ross, Gallagher, and Brown (2008), Rozanec et al. (2014) and Shay et al. (2017) reported high patient satisfaction scores resulting from the review clinic practitioners' (RRAs or nurse practitioner) ability to discuss all aspects of treatment and postprocedure-related concerns. Patients highlighted as important the advanced practitioners' ability to address most of their patient care needs, which thereby reduced the need for consultations with other medical practitioners (Rozanec et al., 2014). Such a practice can result in more efficient healthcare services. Ten Nepel, Sanders, and Wright (2014) observed that improved patient satisfaction is a positive indicator in the approach to move patient satisfaction to the forefront of healthcare. They maintained that satisfied patients are likely to return to the same provider for care in the future and refer others (Ten Nepel et al., 2014).

Shay et al. (2017) reported increased efficiency and productivity. They performed a retrospective analysis of the interventional department's procedure duration and start times and found that the presence of an RRA resulted in 'punctual start times and shorter procedures times' (Shay et al., 2017, p.333). They advised other radiology departments to explore the services of RRAs in order to improve their workflow and create a balance between higher patient volumes and quality patient care (Shay et al., 2017).

To determine whether the advanced practice in radiography benefits the healthcare system, Thom (2018) performed a literature review of 15 articles. He con-

cluded that advanced radiographic practice does benefit the healthcare system, because his findings included benefits to practitioners and the profession. His results are consistent with those of other studies and demonstrated that the benefits of advanced practice clearly outweigh the risks and that it is therefore a potential solution to the challenges facing the delivery of healthcare services.

Overall, the literature has presented a compelling argument in support of advanced radiographic practice improving patient outcomes in the form of reduced wait times, increased availability of services, improved patient satisfaction, increased compliance, and reduced need for seeing multiple medical physicians.

The Concept of Autonomous Clinical Practice

Autonomy is derived from the Greek words autos and nomos, which mean self and law, respectively (Ballou, 1998). Autonomy is therefore the ability for self-rule or to rule oneself (Skar, 2009). Synonyms include to be independent, to self-govern, to be self-directed, to be self-deciding, and to be **self-determining** (Wade, 1999), to name a few. It contrasts with hegemony, the dominance of one state or group by another, a phenomenon that was apparent in the previous dominance of allied health professions by the medical profession. Autonomy, or the ability to be self-governing, is dependent on a system of principles and laws (Ballou, 1998). The concept of autonomy is linked to Kant's philosophical work *Groundwork on the Metaphysics of Morals* (Ballou, 1998). Kant argued that to be autonomous, one must be moral and therefore govern oneself — that is, act — in compliance with universally accepted moral laws and principles. According to Ballou (1998), the attributes of autonomy are the determination of one's own actions, the ability to competently act on one's own decisions, the basing of actions and decisions on critical reflection, the aligning of one's actions and decisions with one's own internally espoused systems of principles and laws, and the independence of one's decision-making. These attributes are similar to the principles of advanced practice as outlined by the CAMRT (2015).

Autonomous clinical practice can therefore be defined as the ability to make clinical decisions and the freedom to act on those decisions in compliance with one's professional knowledge base and within one's scope of professional clinical practice (Skar, 2009; Wade, 1999). Independent clinical practice is considered a requisite for full professional status (Ballou, 1998). Freidson, writing on the *profession of medicine* in 1970, understood autonomy as 'the prize sought by virtually all occupational groups' (cited in Ballou, 1998, p. 103). The nursing and speech-language pathology/audiology professions have been advocating for full independent clinical practice for decades, with some amount of success (Wade, 1999; Cherow, 1994). According to Cherow (1994), some audiologists have ventured into private practice to realise their desire for full practice autonomy. However, Ballou (1998) correlated ability, capacity, and competence with the achievement of autonomy, because knowledge and capacity are required for self-control or self-governance. The possession of current professional knowledge and the astute application of that knowledge in the complex-decision-making process can demonstrate genuine professional autonomy. Leddy and Pepper (1985) concurred with the importance of integrating knowledge when discussing autonomy.

Clinical practice autonomy is dependent on professional practice autonomy, and therefore, autonomous practitioners thus possess high levels of expert knowledge, power, and authority in order to make informed decisions about the management of patient care needs. Discussing independent practice from a physical therapy perspective, Hardage et al. (2010) presented three case studies in which physical therapists utilised independent practice to improve patient outcomes. Their case studies illuminated the importance of a profession's scope of practice in empowering its practitioners to make independent judgments, which resulted in a patient's life being saved or the reduction of further harm. They argued that patient outcomes could be improved with collaborative practice and independent, self-determined, professional judgment, and action (Hardage, et al., 2010). Further, in their work on identifying strategies to support and enhance independent practice based on nurses' understanding of autonomy, Stewart, Stansfield, and Tapp's (2004) found that nurses attributed the accomplishment of patient care goals to their ability to make autonomous patient care assessments and decisions.

However, decisions may be made independently and interdependently with other members of the healthcare team (Kramer & Schmalenberg, 2008; Wade, 1999).

Nonetheless, it is important to recognise that autonomy changes over time (Kramer & Schmalenberg, 2008), as is demonstrated by the nursing profession's growth of independent nursing practice over years and decades. Moreover, as other health professions mandate autonomous practice as a high priority, scopes of practice will change to reflect this position and will result in the reduced dominance of the medical profession. The physical therapy profession has crafted independent clinical practice as the centrepiece of its 2020 vision (Sandstrom, 2007). However, it must be understood that autonomy or autonomous practice does not free practitioners from professional responsibility and accountability (Wade, 1999; Cherow, 1994). Professional responsibility and accountability are characteristics of autonomous practice and being accountable for one's decisions is central to clinical practice and professionalism (Cherow, 1994; Wade, 1999). Autonomous practitioners, therefore, are responsible and accountable for their patient care decisions and thus engage in careful deliberations before deciding on the best approach to patient care. Owing to their critical thinking and complex-decision-making abilities, autonomous practitioners — that is, advanced practitioners — are considered self-determining in the execution of their patient care responsibilities.

According to Wade (1994), a synonym of autonomy is self-determination. It is therefore possible that advanced clinical practice succeeds in improving patient outcomes as a result of the autonomy that is associated with advanced practice. Further, is it possible that the self-determination theory (SDT) can explain the success of advanced clinical practice owing to autonomous clinical practice?

Developed by Edward Deci and Richard Ryan, the SDT is currently one of the major approaches in the psychology of motivational processes (Cate, Kusurkar, & Williams, 2011). Though it is still the subject of ongoing research, the SDT is a theory of motivation, development and wellness. SDT focuses on types of motivation and their links to predictors of performance, relational, and well-being outcomes. SDT proposes

that basic psychological needs for autonomy, competence, and relatedness are affected by social conditions and the type and strength of motivations. More importantly, the SDT examines a person's life goals and aspirations and how social conditions enhance or diminish motivations (intrinsic and extrinsic) and their link to performance (Deci & Ryan, 2008).

The current SDT applications include education, healthcare, relationships, psychotherapy, psychopathology, organisational management, sports and exercise, and health and well-being. The seven general principles of SDT, according to Cate, Kusurkar and Williams (2011), can be summarised as follows:

1. Humans are growth-oriented and therefore naturally inclined to develop psychological elements to create a unified sense of self and to integrate into social structures. Further, the tendency to develop can be stimulated or hampered by forces internal or external to one's self.
2. Three innate psychological needs are essential in the ongoing growth of human beings: a need for autonomy, a need for competence, and a need for relatedness to the social world.
3. Motivations that foster human behaviour vary on a scale from lack of motivation to extrinsic motivation to intrinsic motivation. However, the difference between extrinsic and intrinsic motivations is noted. Extrinsic motivations are activities driven by external control or rewards. Intrinsic motivations are engaging activities that evolve out of genuine interest or internal satisfaction.
4. Motivations can be altered through an internalisation process. The internalisation process results in the adoption of values once outside of one's value system, thereby resulting in a feeling of being self-regulated and valued. Should the internalisation process fail, the adopted behaviour or value system will either cease to exist or fall below its initial level after the rewards have been removed.
5. Intrinsic motivations require the accomplishment of autonomy, competence, and relatedness.
6. Higher levels of intrinsic motivations are associated with better outcomes (higher levels of well-being) than high extrinsic motivations.

7. One's behaviour is associated with the type of motivation.

The SDT therefore addresses a concept of motivation that is central to improving productivity and patient outcomes. 'Motivation is highly valued because of its consequences: motivation produces' (Ryan & Deci, 2000, p. 69). However, for motivation to flourish, an environment conducive to the promotion of autonomy (the desire to be one's own origin or source of behaviour), competency (the desire to feel effective in one's actions pursued or performed), and relatedness (the desire to feel connected to others, to be cared for, to care for, a sense of belonging) must exist (Ryan, Patrick, Deci & Williams, 2008; Cate et al., 2011). From a clinical practice perspective, the intrinsic aspirational needs of clinical practitioners can be considered motivations for their practice and the resultant improvements in patient outcomes. Deci and Ryan (2008) concurred that aspirations are a measure of the degree to which the needs for autonomy, competence, and relatedness are satisfied. Further, intrinsic ambitions are aligned with the internal feelings of worth associated with need satisfaction. Kramer and Schmalenger (2008) reported on the direct relationship between professional job satisfaction and desires for autonomous practice among 20,000 nurses in 14 magnet hospitals. They found a strong relationship between the degree of autonomy and the rankings of job satisfaction and quality of care. Kramer and Schmalenger (2008) therefore called on nurse managers and others to support nurses' desires for clinical nursing autonomy.

An important finding of early SDT research was that extrinsic rewards, such as money and punishment, reduce intrinsic motivation (Deci, 1971, cited in Cate et al., 2011). This finding supports the argument that in the absence of external incentives, humans naturally develop tendencies for autonomy and self-determination. This is consistent with the aspirations of the nursing, speech-language, radiographic, and other allied health professions. All of these professions aspire to attain advanced practitioner or full professional status, because 'choice, acknowledgment of feelings, and opportunities for self-direction were found to enhance intrinsic motivation because they allow people a greater feeling of autonomy' (Ryan & Deci, 2000, p. 70). The intrinsic motivation of al-

ways doing good and doing one's best for one's patients is ingrained in the thought process of healthcare workers, especially those who have direct responsibilities for the delivery of patient care (Kramer & Schmalenberg, 2008). After all, SDT proposes that individuals' experience of autonomy, competence, and relatedness can foster the most volitional and high-quality forms of motivation and engagement for activities, including enhanced performance, persistence, and creativity (Ryan et al., 2008).

The SDT is therefore applicable in explaining the possible association between improved patient outcomes and advanced clinical practice. Because advanced practice is the use of knowledge to benefit and modernise clinical practice, practitioners of advanced practice would possess high intrinsic motivations consistent with their levels of autonomous clinical practice. Active participation in clinical decision-making means that autonomy in clinical functioning is valued at the practice level. If the practitioner role is taken seriously, practitioners' competence is likely to be boosted (Ten Carte, 2011). The practitioner is more motivated to adopt patient well-being into his/her personal value system and is therefore more motivated to effect positive patient outcomes. Therefore, the practice recognition that is consistent with advanced practice may be the motivation that pushes advanced practitioners to work towards effecting improved patient outcomes. According to the SDT, better learning, better academic achievement and performance, better conceptual understanding, and high levels of well-being are associated with high intrinsic motivations, such as learning out of interest, curiosity or enjoyment, and autonomous forms of self-regulation (Ten Carte et al., 2011).

High intrinsic motivations are therefore needed for healthcare practitioners to realise their true patient care potentials and responsibilities for the healthcare system to effect improved patient care outcomes. It is widely accepted that the knowledge and skills attained by healthcare practitioners in their undergraduate courses of studies establish a base for their career but could not sustain them in their future years of practice (Colin et al., 2012; Henwood & Flinton, 2012; Kusurkar & ten Cate, 2013). Mezirow (1997) posits that the learning needs of today's workforce implicitly indicate the need for

lifelong autonomous learning and learners. This is important as several healthcare professional bodies, including the CAMRT, have mandated the espousal of a culture of lifelong learning by active participation in continuous professional development.

Continuing professional development (CPD) is a constituent of the life-long learning process (Rouse, 2004). The terms '*continuing professional development' and 'lifelong learning'* are often used interchangeably to denote "the means by which people maintain the knowledge and skills related to their professional lives" (Collin et al., 2012, p. 156). From a healthcare perspective, continuing professional development is the process whereby healthcare practitioners continuously update their practice knowledge and skills to meet the needs of patients, the healthcare service, and their professional development (Peck et al., 2000; Rouse, 2004). Further, CPD acknowledges the wide-ranging competencies necessary to practice in the multidisciplinary patient care context. CPD can be seen as a mixed and multifaceted educational concept as it entails formal and informal approaches intended to develop professional expertise and experience that generates learning (Marsick & Watkins, 1990; Collin et al. 2012). In its most recognizable form in medical radiation technology and other healthcare-related professions, CPD dictates the updating of professional practice knowledge by attending formal short courses, viewing live or recorded webinars, undertaking research or practice audits, or reading journal articles accredited by the professional body.

According to Mezirow (1990, 1997) and, Lave and Wenger (1991), learning may be defined as a participatory process where new or revised interpretations of the meaning of experiences guide ensuing understanding, appreciation and action. Lave and Wenger's (1991) situate learning theory posits learning from experiences as a result of co-participation in the social learning context where all learners are legitimate peripheral participants. Learning occurs through discovery and the redefining of problems (Mezirow, 1997). A popular and well-recognised adult learning theory used by clinical practitioners, including medical radiation technologists, to achieve their CPD requirements is experiential learning or learning in practice (Taylor & Hamdy, 2014). Learning experientially in authentic clinical contexts has been the hallmark of teaching and learning in

medical and healthcare education for many decades. Learning in practice or learning from practice is presented by Marsick and Watkins (1990) as informal learning where learners engage in cycles of the problem-solving outside of formal structured, class-room-based activities that are institutionally sponsored.

Experiential learning is presented as learning from experience. Hoover and Whitehead (1975, p. 25) defined experiential learning as learning which:

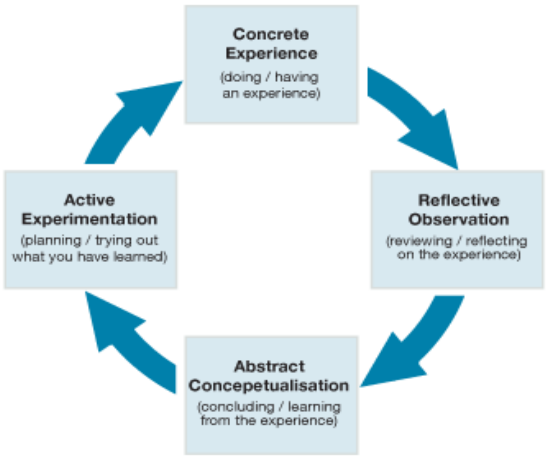
> exists when a personally responsible participant cognitively, affectively, and behaviourally processes knowledge, skills, and/or attitudes in a learning situation characterized by a high level of active involvement.

Other terms have been used to refer to experiential learning include active learning, learning by doing, experienced-based learning, interactive learning, and trial and error learning (Gentry, 1990; McCarthy, 2010). Irrespective of the term used to describe learning from experience, there is the understanding that experiential learning has resulted in positive outcomes as it requires learners to take an active role in their learning process.

Experiential learning has its roots in the experiential learning theory (ELT) of Dewey, Lewin, and Piaget (McCarthy, 2010; Yardley et al., 2012). ELT is a holistic adaptive learning process that integrates experience, perception, cognition, and behaviour. ELT defines learning as “the process whereby knowledge is created through the transformation of experience. Knowledge results from the combination of grasping and transforming experience” (Kolb, 1984, p.41). Kolb’s experiential learning model is a cyclical process of learning experiences. Learners must experience the entire cycle for effective learning to transpire. The philosophical underpinning of experiential learning is constructivism, which acknowledges that there may be many competing truths (Yardley, et al., 2012). However, constructivism does not present its philosophical perspective as better or worse than others. Therefore, Kolb’s experiential learning cycle can be described as “a constructivist theory concerning how learners take experiences from the

external world into their private worlds of thought and emotions" (Yardley et al., 2012, p. e103).

Figure 1: Kolb's (1984) learning cycle.



Kolb's presented his experiential learning cycle as a four-stage model (Figure 1) that starts with concrete experience (starting point of learning in the experiential world) moves onto reflective observation (learners making sense of experience), abstract conceptualisation (the extraction of the essence of learning from experience), and active experimentation (learners try out what they have learned in response to further experiences) in that order (Kolb, 1984). The four tenets of experiential learning, learning by doing, learning from real-life experiences, learning through problem-solving, and learning through projects align experiential learning with the theory of authentic learning (Marsick, 1998; Knobloch, 2003). Authentic learning occurs through real-life activities, task, and assessments that are meaningful to learners, and is a constructivist approach to learning based on some common constructivist assumptions (Knobloch, 2003). Further, owing to experiential learning being grounded in propositions that experience is the stimulus for learning, learners actively construct and deconstruct their experiences, learning is a holistic process, and learning is socially and culturally situated make it an authentic learning theory (Knobloch, 2003).

However, Kolb's four-stage learning theory has received numerous criticisms for many reasons including the presentation that learning is a neat four-stage process, its failure to consider the fragmented and chaotic realities of learning, and the neglect for the social context of learning and its influence on what is learned (Yardley et al., 2012). Though there are several adult learning theories applicable to practitioners learning in practice, what is clear is that no one adult learning theory alone fully describes learning in the clinical environment as learners learn differently and each learning theory has its strengths and areas of concerns. Therefore, by combining learning theories such as Kolb's experiential learning with Schon's reflective practice, and Lave and Wenger's situated learning, learning in the clinical environment is positioned to effectively facilitate the development of advanced clinical knowledge and skills, and the actualisation of autonomous clinical practice to improve patient care outcomes.

Summary of Literature Review

The forces driving the development of emerging practices in the healthcare sector are consistent internationally. However, different countries are adopting different approaches to the development and implementation of emerging practice in radiography. The different approaches to emerging radiographic practice are being fuelled by the lack of a unified framework or an advanced practice network such as the International Council of Nursing Practitioner/Advanced Practice Nursing Network. However, the Canadian Association of Medical Radiation Technologists joined the advanced practice debate with the aim of defining and differentiating advanced practice from other emerging practice approaches by presenting an advanced practice in medical radiation technology framework. This framework accurately presented principles of advanced practice but failed to address concepts that enhance and/or prevent the realisation of advanced practice for medical radiation technologists. Barriers such as local needs, local labour, institutional support, radiologist support, MRT motivations for advanced practice, financial compensation, employment opportunity, and availability of training were not presented. Additionally, the framework also fell short in identifying possible advanced practice in medical radiation technology roles, hence the current haphazard development and branding of emerging practices as an advanced practice even though some of these practices were not grounded in the principles or attributes of advanced practice.

More importantly, the benefits of advanced practice are well articulated in the literature as a significant number of studies have concentrated on investigating the benefits of advanced radiographic practice. However, a further review of the literature found a lack of studies that have focused on practitioners' motivations for wanting to be advanced practitioners, a gap my research intends to address. What is also not clearly presented in the literature is an explanation in support of the position that advanced practice guarantees improved patient outcomes. Also absent is an explanation of the association between the concept of autonomous clinical practice and improved patient outcomes. Therefore, the self-determination theory is examined as it is one of the major approaches in the psychology of motivational processes and may provide an explana-

tion of the possible association between autonomous clinical practice and improved patient outcomes. The self-determination theory focuses on types of motivations and their links to predictors of performance, relational, and well-being outcomes. Further, the SDT proposes that basic psychological needs of autonomy, competence, and relatedness are affected by social conditions and the type and strength of motivation. But more importantly, the SDT examines individuals' life goals and aspirations and how social conditions enhance or diminish motivations (intrinsic and extrinsic) and their link to performance. The self-determination theory may provide an explanation for advanced practitioners' motivations to effect improved patient outcomes via their practice. Advanced practitioners have aligned their motivations with that of the medical profession and hence have adopted the medical profession's value system and made it theirs to benefit patients.

More importantly, it is widely accepted that these motivations are not enough to sustain practitioners in their future years of practice. Therefore, practitioners are required to espouse to a culture of lifelong learning to ensure their knowledge and competencies are up to date to meet the evolving patient care needs that are outside the realms of the medical profession. Practitioners, therefore, have to engage in continuous professional development. The required knowledge and competencies for future practice in the complexed clinical environment may be inculcated through a combination of a number of adult educational models including formal postgraduate courses, experiential learning and mentoring, to name a few.

Practitioner Research Questions

Primary Research Question:

Is the Advanced Practice Coordinator role in Canada, a role extension or an advanced practice role, and does it influence the quality of patient care?

Research Sub-questions:

1. What is/are the catalyst/s behind the development of the APC practice from an Ontarian perspective?
2. Does the emerging APC practice influence the quality of patient care?
3. What phenomena explain the APC success at two hospital sites and failure at another?
4. What future is there for the APC practice according to key radiographic/radiologic stakeholders?
5. What theoretical framework can govern the successful development and implementation of emerging practice roles in medical imaging?

Methodologies, Project Design, and Ethical Considerations

Introduction and Overview

Our daily lives are guided by questions. Questions of ourselves, our practice, our decisions; questions of others; and finding answers to those questions. Similarly, research is about finding answers to questions and developing hypotheses as we attempt to understand our world (Hancock & Algozzine, 2011). A part of the process of understanding our world is understanding the various phenomena that surround us. Importantly, the way we view the world influences the types of research we are drawn to, the methodological aspects of our studies, and how we analyse our research data. This chapter, therefore, presents a brief examination of previous methods used in emerging radiographic practice research, my worldview, and how that links to the research methodologies. Also presented are the research methods, project design, and ethical considerations that guided this research to explore the advanced practice coordinator (APC) phenomenon.

Previous Methods Used in Emerging Radiographic Practice Research

Research methods including grounded theory (Eddy, 2010), randomised controlled trial (Hardy & Snaith, 2011), survey method (Price & Measurer, 2007), and ethnography (Snaith et al., 2016), have been used to study emerging practices in radiography. However, the survey method (Forsyth & Robertson, 2007; Price & Masurier, 2007) seems to be popular among researchers of advanced radiographic practice owing to the ability to collect extensive data from a large sample population that may be distributed over vast geographical areas (Gray, 2014). Nevertheless, as a practitioner—researcher, many questions remain regarding the best methods to research emerging

practice in radiography, analyse the data, and apply the findings to inform curricula and pedagogy, and research and practice.

Researcher's Worldview

Our beliefs and philosophical assumptions are informed by our lived experiences, by the journals we read, the professional societies we belong to, and the theoretical perspectives that guide our professional education (Creswell, 2013). These assumptions play a pivotal role in our decisions on the type of topics we research, what research questions we ask, our choice of theories that guide our research, and even how we decide to gather our data. However, the difficulty lies in acknowledging these beliefs and assumptions, and on deciding to incorporate or not to incorporate them into our research studies (Creswell, 2013; Yin, 2014). As a practitioner-researcher who is informed on the current challenges facing the healthcare sector and has observed how these challenges, directly and indirectly impact patients and their families, as well as practitioners, I am motivated to find solutions to combat these challenges.

My overarching research question was crafted after being introduced to the APC role in April 2015, followed by working as an APC for 22 months and examining the literature on emerging practices in healthcare. Hence, this research on the APC role is to address the following research questions:

1. Is the advanced practice coordinator role, role extension or an advanced practice, and does it influence the quality of patient care?
2. What are the catalysts behind the development of the APC practice?
3. Does the emerging APC practice affect the quality of patient care?
4. What phenomena explain the APC success at two sites and its failure at another?
5. What future is there for the APC practice according to key radiographic/radiologic stakeholders?
6. What theoretical framework can inform the development and implementation of emerging practices in medical imaging?

The pragmatic principles of healthcare practice have shaped my beliefs and philosophical assumptions. It is this pragmatic approach to professional clinical practice that has guided me to strive to do the best for patients and to ask questions such as What can I do better? Am I doing the right thing? Is my performance acceptable? Moreover, if the answers are in the negative, how can I improve? I see the development of knowledge as a way to improve and a path to a better future, a position consistent with the pragmatic research paradigm (Goldkunl, 2011). However, I have not always held a pragmatic view of the world. My high school and undergraduate educational experiences inculcated positivist perspectives of the world. It was either black or white, right or wrong, left or right, or up or down. I was blinded to the 'in-betweens'. I developed a singular reality ontology. However, this began to change as I pursued postgraduate studies where I was forced to examine my own ideology along with those of my research participants'. My philosophical perspectives started to change to embrace varied realities along with a respect for others lived experiences. Further, having experienced the challenges of providing care in a third-world healthcare service I began to embrace a pragmatic approach to problem-solving in the clinical arena. My pragmatic philosophy of personal experience of the challenges that are facing medical radiation technologist drove me to seek the processes and strategies that would help us improve in our delivery of healthcare services to our patients. The advanced practice coordinator was one such strategy implemented by the department of medical imaging, however, I firmly believed that ascribing the advanced descriptor to a role does not make that role an advanced practice role. That role should meet the criteria associated with its designation, hence my research to determine whether the advanced practice coordinator role meets the criteria for role extension of advanced practice designation.

Pragmatism is an old philosophy that purports an ideology is valid only if it works (Creswell, 2013; Gray, 2014). Pragmatic researchers support the position that there are many ways of understanding our intricate world. Therefore, a single point of view cannot provide the entire picture as there may be multiple realities (Saunders, et al., 2012). Ac-

cording to Gray (2014), pragmatism was invented by Charles Pierce (1839–1914), popularised by William James (1842–1910), and its use advocated by John Dewey (1859–1952). Pragmatism has an established history of seeking out the best processes to find the truth about our complex world (Smith, 2019). Although pragmatism lost its influence after the first three decades of the twentieth century, its resurgence gained momentum in the 1970s owing to excellent applications in management and organisational practices and its perceived epistemological freedom for mixing approaches and methods (Gray, 2014). Creswell (2013) proposed that researchers who identify with pragmatism focus on the outcomes of their research. They are more interested in the situations, actions, and consequence of their enquiries (Gray, 2014), with what works, and solutions to the problem (Creswell, 2013; Gray, 2014).

Pragmatism is, therefore, a viable alternative to purely quantitative or qualitative research paradigms and offers tremendous benefits when methods are combined, such as in mixed-methods research (Creswell, 2013; Yin, 2009; Yin, 2014). Onwuegbuzie and Leech (2005) argued that because pragmatism encourages the mixing of methodologies in the same enquiry, it offers five broad purposes. These purposes include triangulation (seeking convergence and confirmation); complementarity (clarification of results from one method through the results from another method); and development (using findings from one method to inform the other process). Further, initiation (discovery of contradictions and paradoxes) and expansion (using different methods for a separate enquiry to expand the depth and range of investigation) are also included. The five broad purposes of pragmatism are essential in understanding the APC practice, and for that reason, were employed in this research and are presented later in this paper.

Methodologies

The perspectives of the stakeholders in an APC practice are crucial for investigating the APC role. The commonality of lived experiences of research participants' interactions with and functions of the APC role across three hospital sites are thus central to the success of this research. A qualitative or quantitative approach may have been

appropriate in addressing these research questions. However, purely quantitative or qualitative perspectives were rejected because the answers to this study's research questions lie somewhere on a continuum between qualitative and quantitative research.

Therefore, a phenomenological approach was adopted to study the APC practice. According to Creswell (2013), Gray (2014), and Fleming et al. (2003), the phenomenological approach to research entails bringing something (the phenomenon—the APC practice) into the light to show itself by examining people's experiences of the phenomenon. It also involves the examination of critical individual radiological staff members and the shared lived experiences of the event (the APC practice) across the three hospital sites. At two hospital sites, the APC practice continues to evolve, and at the other, the practice was abandoned. Each site, therefore, presented the opportunity to study the APC practice in a unique environment. Further, the varied lived experiences of stakeholders of the APC practice across the three hospital sites presented opportunities for convergence and divergence of findings, to ascertain why the practice was abandoned at the third site and to inform the development of emerging practice curricula. Therefore, a merging of the qualitative and quantitative approaches (mixed-methodologies) to answer the research questions and better understand the APC role was a pragmatic choice. This choice is aligned with my relational philosophy (my research questions guide my determination of what relationships are essential to my research). Also advocated were non-singular reality ontology (there is no singular reality), a mixed-methods methodology, and a value-laden axiology (doing beneficial research) (Kivunja & Kuyini, 2017). These and other thoughtful reflections on my practice are what led me to adopt a phenomenological approach and a case study research strategy to investigate the APC program with the aim of determining if it is an advanced practice or a role extension role and whether it improves patient outcomes. The phenomenological approach was woven into the case study research strategy to study the APC practice at each hospital site as an individual and unique case.

Case study research strategy is a systematic critical enquiry into a contemporary phenomenon in its natural, real-life context where the boundaries between phenomenon

and context are not clearly defined (Darke et al., 1998; Simons, 2009). A case study research strategy typically combines data collection techniques such as observation, interviews, questionnaires, and document analysis in its quest to investigate a predefined phenomenon. This research strategy can be used to describe the event, develop theory, and test theory (Darke et al., 1998). Proponents (Creswell, 2013; Crowe et al., 2011; Yin, 2009) of the case study research strategy firmly believe that it is ideal when there is a need to obtain an in-depth understanding of a phenomenon in its natural, real-life context. It is also ideal when explicit control or manipulation of variables is not possible. The attributes of the phenomenological approach complement the case study research strategy, especially for the purpose of examining the APC phenomenon. Creswell (2013) posits that a phenomenological approach is best suited in the situation where it is important to understand multiple perspectives of a common or shared phenomenon—in this case, understanding the APC practice from the viewpoint of various categories of radiological personnel across three hospital sites.

Therefore, I employed a theory-led evaluative multi-case study research strategy because of the availability of suitable case study sites where the APC role currently exists or was practised. Also, influential in the decision-making process was the opportunity for an in-depth understanding of the phenomenon in its natural settings and cultural contexts (Creswell, 2013; Darke et al., 1998) alongside the unavailable prior development of emerging practice theoretical propositions (Simons, 2009) to guide the data collection.

An evaluative case study's objective is to explore the theory of the programme or practice being investigated and what it aspires to achieve. Although the evaluative case study research strategy employed is theory-led, it is not the same as testing a specific theory but is, rather 'determining a specific theory of the programme to guide data collection in the case' (Simons, 2009, p. 21). The critical message is not that that case study is itself a methodology, but that it is in itself heuristic, and ultimately, it is the specific methods used for the collection of evidence on a phenomenon that matter (Van

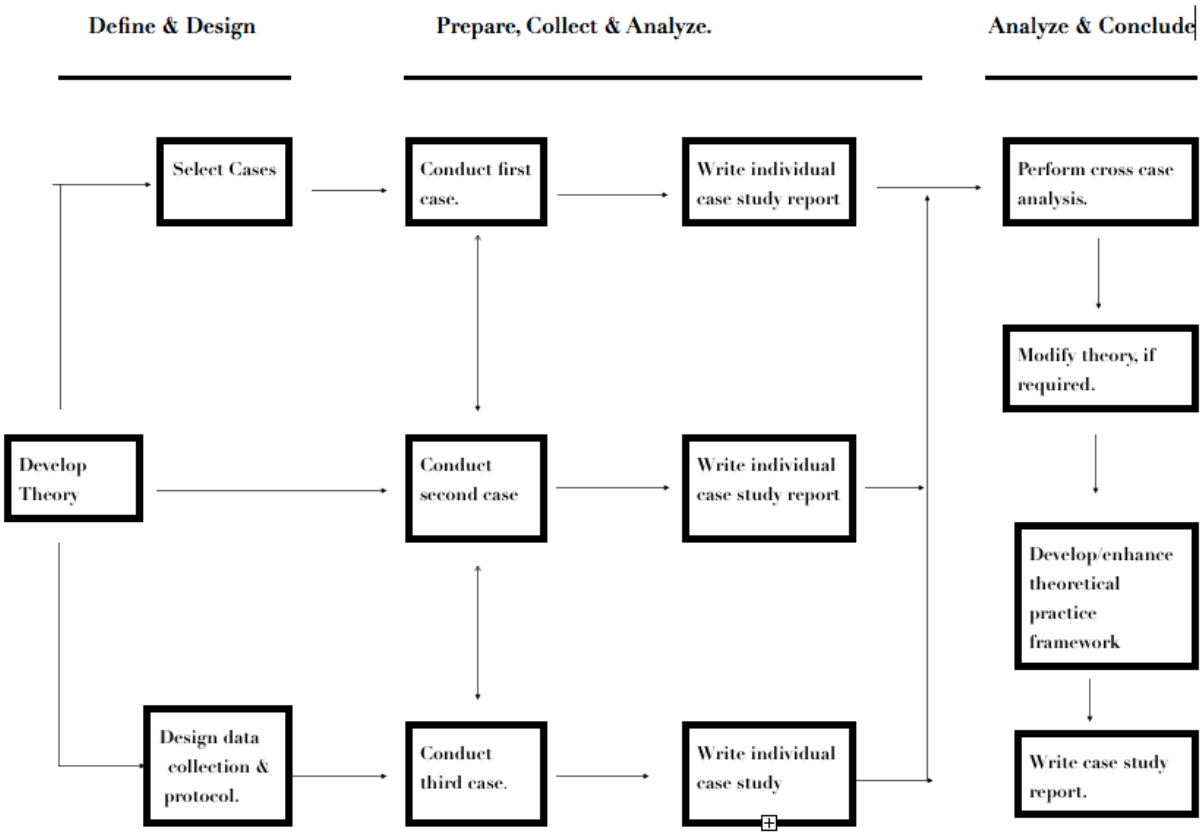
Wynsberghe & Khan, 2007). In this case, the theoretical propositions on advanced practice and role extension were applied to guide the data collection and analysis processes to determine if the APC role met the criteria for advanced practice or role extension designation.

Project Design: Data Collection Tools, Processes, and Analyses

The data collection processes used for this examination of the APC role included the review of program documents, semi-structured interviews, surveying of APCs, and measures of patient outcomes. The program documents and critical stakeholder interviews were run sequentially, thereby impacting and influencing the proceeding data collection process, where some interview questions were generated using the information gathered from the program documents. Further, responses to interview questions provided by some interviewees were used to create follow-up questions for other interviewees. Additionally, a short survey of all APCs was undertaken to gather the perspectives of a majority of APC practitioners. Measures of patient outcomes in the form of procedure times before and after the introduction of the APC practice were assessed to determine the practice's influence on patient outcomes.

Three hospital sites equal to three cases were studied. The three cases were conducted and analysed as independent case studies, thereby allowing for a detailed within-case analysis (Creswell, 2013) to identify possible unique patterns in each. A cross-case analysis was also performed to assist in the robustness of the findings (Yin, 2014) as the findings of each case can produce converging evidence that replicates the data from the other (Gray, 2014). This is presented diagrammatically in Figure 2.

Figure 2 Diagrammatic representation of the research process.



Program Documents Collection and Analysis

The development of the first data collection process—for program documents—was informed by one of the sub-research questions: What is the origin of the APC practice at these institutions? It was, therefore, essential to locate and review any program document that could have provided information on the origin of the APC practice or how it came to be. E-mails, minutes of meetings, protocols, job vacancy postings, and department communiques before and after the introduction of the APC practice that were kept in the APC electronic folder on the Western General Hospital's (WGH) intranet were accessed and reviewed. Access to program documents at West Central General

Hospital (WCGH) and Central General Hospital (CGH) were not gained as requests for access were unacknowledged. However, cross-site documents such as job vacancies and protocolling guides were accessed via an APC network that was shared between WGH and WCGH. Central General Hospital did not have any materials about the APC practice as they are now operating from their new hospital site and on a new data platform.

Documentary Analysis

A coding process and sheet were developed using the attributes of role extension and advanced practice. Documentary coding was performed in three stages. In stage 1, professionals in the diagnostic imaging department that interacted with the APC practice were assigned an alphabetic code (Figure 3). This was done to identify the professional category of a document. This way, policies addressed to radiologists were assessed under the radiologist category and not the technologist or any other category. Stage 2 entailed the sorting of policy documents and communications according to which of five categories the document targeted. The categories—task-oriented, skills, responsibilities, accountability, and scope of practice—were developed guided by the attributes and principles of role extension and advanced practice, respectively, according to the literature. Stage 3 of the document coding process encompassed the assignment of documents to one of six groupings under role extension, or advanced practice, or both. Formulation of these six groupings was guided by the attributes and principles of role extension and advanced practice as presented in the literature. Each grouping describes an identifiable attribute or principle of the emerging practice approach. This coding sheet is shown in Figure 3.

Figure 3. Document coding sheet.

Coding 1

1. Categories of staff documents addressed to:
    a. APC
    b. Technologist
    c. Clerical

d. Radiologist

e. Manager/program director

Coding 2

For each category of staff targeted,

a. Task-oriented

b. Skills

c. Responsibilities

d. Accountability

e. Scope of practice

Coding 3

ROLE EXTENSION	**ADVANCED PRACTICE**
1. Post-registration skills, responsibilities & competency	**1**. Develops judgement/decision making/teaching & leadership skills.
2. Areas previously reserved for another profession/extended practice.	**2**. Autonomous/self-regulating/self-directing.
3. Task-oriented/role specialization/site limited	**3.** Functions at an advanced level/greater responsibility and accountability.
4. Optimizing service delivery/local needs.	**4.** The role developed to benefit the profession and patients/requires the application of knowledge.
5. It is limited to clinical practice.	**5**. You are not restricted to clinical practice.
6. Formal education not required/knowledge and skills gained via experiential learning/education and learning locally initiated.	**6**. Requires postgraduate training, qualifications and credentialing.

Additionally, content analyses were performed on the program documents to identify unique characteristics (classes and categories) within each grouping. The documents were read and re-read at least three times to identify theoretical themes or areas of practice that linked the document to the research questions or to the concepts of role extension and advanced practice. Once themes were identified, each record was reassessed and then assigned to one or more categories of role extension, advanced practice or both using the constituents of these two approaches. For example, a communique from the lead APC dated August 25 2015 outlined tasks that APCs working the evening shifts should complete. That document was assigned to the role extension category three and categorised as '***task-oriented/role specialization/site limited***' because the text outlined tasks specific to the APC role on specific shifts. This was important as it allowed for complementarity, initiation, and expansion of the findings of the documentary analyses by interviewees.

Interviewing and Analysis

The development of the interview questions was guided by information extracted from the document analysis and the literature on emerging practices (CAMRT, 2015; Hardy & Snaith, 2006; Hardy et al., 2008; Nightingale & Hogg, 2003). The documentary analyses failed to provide a clear understanding of the origin of the APC role. This question was therefore presented directly to all interviewees except the advanced practice nurses. However, other questions focused on gathering an understanding of the necessity, future initiatives, contribution to patient outcomes, as well as whether the practice met the criteria for role extension or advanced practice designation. These were developed from the documentary analysis and presented to interviewees as open-ended interview questions.

The final two questions presented to all interviewees required them to identify the blinded partial definition that best described their understanding of the original intentions of the APC program and the one that best represented the current APC practice. The definitions were modified by removing the terms *role extension* and *advanced practice*.

This was done to prevent the stem of each definition from influencing respondents' selections, hence the blinded partial definitions. This along with a sample of interview questions is presented in Appendix A.

It was envisioned that sufficient research participants would include the APC lead, two radiologists, two medical radiation technologists, three APCs, and two clerical associates for WGH and WCGH along with the radiologist who initiated the APC program. For CGH, the plan was to interview two radiologists, two technologists, and two clerical associates who were associated with the failed APC practice there. Additionally, to inform the advanced radiographic practice initiative, two nurse practitioners were to be interviewed per site to compare their advanced practice journey with that of the APC. Ultimately, 16 interviews out of the originally planned 33 face-to-face interviews were conducted at WGH, WCGH and CGH.

For the selection of research participants to interview, the intention was to employ random sampling at all three research sites to provide everyone who met the inclusion criteria with an equal opportunity for participation. However, consistent with undertaking research in the real world, this did not materialise; hence, a necessary change in sampling strategies. Random sampling was still accomplished at WGH, but convenience sampling (only accessible, and willing subjects) was used at WCGH and CGH owing to the difficulty in recruiting research participants.

At the time of the data collection, WGH and WCGH were in the process of unionisation. Rumours of redundancies were being circulated, which affected potential participants at WCGH. The decision was taken to accept research participants on a first-come, first-accepted basis. Despite the adoption of this sampling strategy (convenience sample), the required sampling quota was not entirely achieved. Several technologists and APCs indicated their interest in participating in the research. They also expressed fear of being recorded or being *on the record* as participation required them to express their view and opinions of the APC role and might include criticisms of the organisation and its management. After negotiations, they agreed to participate once the interview

questions were converted to an online survey and posted to Survey Monkey (Appendix B). Although this was done, the response rate was low; only two APCs and two technologists responded. Nevertheless, the technologists and APCs represented critical professional groups in the data collection process.

Similarly, at CGH, convenience sampling was employed as the APC practice had been tried at this site but failed. Recruitment was hampered by the merger of three hospital sites to form one new medical facility. With this merger, practitioners with knowledge of the APC trial either opted for early retirement or severance. Attempts to contact these persons for inclusion in the research proved futile. Significantly, the ethics application process at CGH took approximately 12 months, which resulted in a significant delay in the commencement of the data collection process. By that time, one technologist with knowledge of the trial APC program had retired, moved to another province, and was uncontactable. It was, therefore, difficult finding research participants with knowledge of the APC role. Additionally, no nurse practitioner responded to the invitation to present their practice journey at Central General Hospital.

It was, therefore, essential to accept anyone within the diagnostic imaging department with knowledge of the APC practice trial. However, one person with some understanding of the APC practice did not want to volunteer but was willing to provide her perspective via casual unrecorded conversations. Further, questions about the practice success at WGH and WCGH and its failure at CGH were often casually discussed by fellow technologists at CGH. These technologists were not included in the interviews as they did not possess knowledge of the practice appraisal, nor did they volunteer to participate in the research. Interests in the study were out of curiosity and being informed of changes to professional practice within the profession. These discussions, therefore, presented limited information on the APC practice at CGH.

All interviews were audio recorded. The interviews provided research participants with the opportunity to present their perspectives on the APC practice in their own

words. At WGH, 12 out of the expected quota of 13 face-to-face interviews were performed. At WCGH, two telephone interviews were conducted with the APC lead and one nurse practitioner, and information was gathered from two technologists and two APCs via an online open-ended interview questionnaire, a representation of six out of 13 proposed interviews. Likewise, at CGH, only two face-to-face interviews were performed; the manager and the technologist currently performing a task similar to the APC role. In total, 16 interviews ranging from 20 to 40 minutes were conducted. Overall, data were collected from 20 out of the proposed 33 participants. A list of the sites and categories of research participants is presented in Table 2.

Table 2 Presentation of Participants

Research Sites	**Participants description by job title and workplace site.**
Site A: Western General Hospital	Lead APC 1
	Chair of Radiology
	Radiologist 1 & 2
	CT Technologist 1 & 2
	Clerical Associate 1 & 2
	APC/CT Technologist 1, 2, & 3
	Nurse Practitioner 1
Site B: West Central General Hospital	Lead APC (telephone interview)
	CT Technologist 1 & 2 (online questionnaire)
	APC 1 & 2 (online questionnaire)
	Nurse Practitioner 2 (telephone interview)
Site C: Central General Hospital	Practice Leader/manager
	In-patient flow technologist

Participants: Rationale for Inclusion

Having gone through the hands-on experience of sharpening my technical research skills and ensuring the correctness of what I was doing, I realized I was not only challenged to develop my skills as a researcher but even my basic virtues as a practitioner. I had to find the correct frame and flow of questions, research participants, and make sense of responses from the participants in order to draw the essential data constitute and support my research. The research focus remained to gather a comprehensive understanding of the APC practice phenomenon owing to its newness. Hence, it was decided to only include categories of diagnostic imaging professionals who had knowledge of the APC practice and interacted with the APC practice in the execution of their daily professional duties. Patterns of the practice or practice nuances had to be supported by evidence or collaborated by other interviewees. Therefore, only radiologists, clerical associates, medical radiation technologists, APCs, and management were included in the sample population.

Participants: Rationale for Exclusion

With the research study focused on gathering a comprehensive understanding of the APC practice, diagnostic imaging professionals who had no knowledge of nor interacted with the APC practice as part of their daily professional duties were excluded from the sample. It was felt that these individuals would not add value to the research owing to their lack of knowledge about the practice.

Interview Analysis

The 16 audio recorded interviews were transcribed verbatim by the practitioner—researcher. These audio recordings and transcripts were reviewed numerous times during the analysis phase, when content analysis was performed to analyse the interview data individually and per site. Each interview transcript was analysed at least five times

(during transcription, twice independently, and twice under a site). As one of the most common approaches used to analyse qualitative data (Gray, 2014), content analysis was employed to answer the research questions, for each case. According to Gray (2014), content analysis involves the making of inferences about text data by identifying unique characteristics (classes and categories) within that data. This process required the creation of special rules referred to as “criteria of selection” (Gray, 2014, p. 607), which was established before the data analysis process commenced. The special rules posit that the information provided should pertain to the question asked or to any of the research questions or objectives. The special rules or criterion of selection used to analyse the interview data had direct relevance to answering the research questions, aligned with attributes or principles of role extension or advanced practice, and had a relationship to self-determination theory. The identification of unique characteristics (classes and categories) therefore provided linkages of the interviewees’ perspectives to the research questions and patterns of the practice.

Further, a summarising content analysis approach, where the text data were categorised with similar paraphrased groups was also performed (Gray, 2014), and less relevant passages were discarded. Direct quotations were identified for inclusion in the presentation of the research findings to lend power to the research participants’ voices.

A theoretical framework was developed to further analyse the interview data. This required the assignment of a specific colour to each of the four leading research questions. Content applicable to answering any one or more research question was highlighted using the colour highlighter marker corresponding to that question. Further, along the left margin of the interview transcripts, next to the coloured text, were inscribed one or more of the attributes of advanced practice or role extension. Therefore, next to each highlighted paragraph, one of the following notations was written: improving patient outcomes, complex decision-making, critical thinking, leadership, autonomous practice, or role extension. Texts identified as attributes of role extension or advanced practice were further analysed to ascertain if they accurately describe the allocated attribute.

Additionally, along the right margin of the interview transcripts was written common themes such as workflow management, teamwork, description of the APC role, challenges of the APC role, et cetera. These emergent themes were used to identify commonalities among the interviewees and sites perspectives of the APC practice.

Survey Initiative and Analysis

The development of the APC survey (Appendix C) was informed by the need to document the perspectives of a larger sample of the APC population as it was felt that three APCs per site, or six out of 18, excluded a significant percentage of the APCs. A short survey with 14 items was developed using the principles and attributes of advanced practice and role extension, respectively. This survey presented 13 survey statements. One item was an open-ended question that allowed respondents to provide a productive text response. Additionally, the statements were worded to imply a positive or negative view to identify respondents with strong opinions. A neutral point was used to indicate neither agreement nor disagreement with the statements (Sullivan & Artino, 2013).

This survey used a three-point Likert scale to measure APCs' agreement or disagreement with the statements. Likert scales typically have a four-or five-point scale (Gray, 2014) but may include seven or even nine precoded responses and is an example of an ordinal scale. Nonetheless, this survey reduced that scale to three to force responses to either agree, disagree, or remain neutral to the statements. In this way, the potential volume of survey data that would be collected could be somewhat controlled.

Survey Analysis

The survey provided three options for respondents and assumed that respondents perceived the responses to be equidistant, although there is ongoing debate as to whether or not Likert scales are equidistant or not (Harpe, 2015; Jamieson, 2004). It was decided that having three options for respondents provided the perception that

there existed equal distance between the intervals, but no test was done to support this assumption.

It is widely believed that when analysing ordinal data, one should use the median or mode as the measure of central tendency (Jamieson, 2004) as the means (standard deviation) are inappropriate for ordinal data. However, Harpe (2015, p. 840) advised: “scales that have been developed to be used as a group must be analysed as a group, and only as a group” to align the measurement approach and the analytical approach. Therefore, the modes of the13 survey statements were analysed individually and as one of two groups (either role extension or advanced practice) as they were designed to measure the APCs attitudes towards their practice. Responses were tallied for each measure and category. Further, tallies were performed for all measures consistent with advanced practice and for those compatible with role extension to determine if APCs identified their practice as either advanced practice or role extension. Further analyses were done to determine the simple frequencies of responses to specific items to describe the data quantitatively. No sophisticated statistical analyses were performed because of the small sample size, and in such cases there is no need for a complex analysis (Gorard, 2010; Leppink et al., 2016).

Patient Outcomes Measurement

As the literature had presented numerous data that supported the argument that advanced practice contributes to improvement in patient outcomes, it was necessary to measure to what extent the APC practice influences those patient outcomes. According to the literature, improvements in patient outcomes are measured in different formats, such as increased access to care, increased quality of care, reduction in waiting times, reduced hospital visits, improvement in patient satisfaction, and reduced length of stay in hospital. The Picture Archiving and Communication System (PACS) departments at WGH and WCGH were contacted to analyse the wait times for diagnostic imaging procedures for patients from the emergency department. However, wait times were only received from the WGH. Correspondences sent to WCGH were unanswered. Wait times were broken down into three categories—the request to procedure time, the procedure

to report time, and the request to report time. Procedure wait times before and after the introduction of the APC role were collected so that the analyses covered the periods March 1–31, 2015, one month before the introduction of the APC practice, and March 1—31, 2017, two years from the first analysis period and 23 months after the introduction of the APC practice. These time frames were chosen because one month before the practice introduction would provide a perspective of the patient wait times before the APC program. Two years post introduction of the practice was selected because it was as close as possible to the data collection period and would therefore, provide a more up-to-date perspective of the diagnostic imaging procedure wait times. All procedures requested electronically are time stamped.

The request to procedure time represented the time between when an electronic request was made by the emergency department for a diagnostic procedure and the time the procedure was started by the technologist. ***The procedure to report time*** represented the period between the technologist completing the procedure and the time the procedure report became available in the hospital information system/radiology information system (HIS/RIS). Next, ***the request to report time*** represented the time between when an electronic request was made by the emergency department and the time the radiological procedure report became available in HIS/RIS. It was decided to concentrate on those times for radiological procedures ordered from the emergency department as there were too many variables that affect the inpatient procedure wait times, variables such as a patient's preference for having the procedure conducted at different times, patient condition, availability of results for physiological assessments, imaging department patient volumes, and availability of patient transporters, among others.

In Case Analysis

Each case’s data collection was conducted and analysed as an independent case study. Figure 2 presents a graphical outline of the entire research process undertaken. Independent case analysis also allowed for answering the research questions

from each research site's perspective. The same process of content analysis of the interview data was performed separately for the three sites, and each being analysed as an independent case made it easier to answer the research question about what phenomena could explain APC success at two hospital sites and failure at another. Differences in approaches to DI practices and service provisions heavily influenced the success of the APC program at WGH and WCGH, but its failure at CGH emerged owing to the independent case analysis.

Combined Case Analysis

Cross-case analyses were performed to answer the leading question as to whether the APC practice met the criteria for designation as role extension or advanced practice. The themes generated by the data from each site were compared to ascertain convergence and divergence of practices from site to site. Further, performing cross-case analyses also assisted in generating more robust findings (Gray, 2014; Yin, 2014). The results from WGH and WCGH were compared to those from CGH to determine why the APC practice failed at CGH. Cross-case analyses were therefore critical because previously held perspectives of the APC practice were replaced by new understandings and information about the practice, which in turn assisted in concluding whether the APC practice is role extension or advanced practice. The combined case analysis also involved the determination of possible future pathways for the APC practice. Table 3 presents a summary of the different data collection methods used to triangulate the data and inform the research findings.

Table 3: A Summary of the Different Data Collection Methods Employed

Research Questions	Program Documents (Qualitative)	Interviews (Qualitative & Quantitative)	Survey (Quantitative & Qualitative)	Procedure Times (Quantitative)
Q1: Advanced Practice Coordinator: Role extension or advanced practice?	X	X	X	X
Q2: What is/are the catalyst/s behind the development of the APC practice from an Ontarian perspective?	X	X	X	
Q3: Does the emerging APC practice influence the quality of patient care?	X	X	X	X
Q4: What phenomena explain the APC success at two hospital sites and failure at another?	X	X		
Q5: What future is there for the APC practice according to key radiographic/radiologic stakeholders?	X	X	X	

Ethical Approval and Ethical Issues

The standards or principles that guide research mean conducting research in a way that recognises our responsibilities to participants and their communities and that preserves relationships with others (Gray, 2014). Therefore, ethical practice in research in general and especially in healthcare is of paramount importance, especially from a student practitioner—researcher perspective. My practitioner—researcher perspective required the awareness of research participants' emotional and psychological states throughout the process, along with issues related to privacy, confidentiality, and informed consent. Political and authoritative powers at play were also recognised, and measures such as separating my professional and student roles to mitigate the perception of practice bias were put into practice.

Ethical Approval

Formal ethical approval was received from the Ethics in Research Board of the University of Liverpool (Appendix D). Ethical approvals were also secured from the ethics boards for Western General and West Central General Hospitals, and Central General Hospital. Access to study participants was gained via an authorised letter of invitation from the heads of the ethics boards and the directors of medical imaging at the research institutions. However, during the data collection processes, amendments were made to the data collection methods and tools. All Research Ethics Committees approved a minor adjustment to the data collection process to include a short survey of all 18 APCs.

Ethical Issues

As a practitioner—researcher, my insider perspectives motivated the examination of the APC role to determine whether it met the criteria for advanced practice designation as presented by some stakeholders. This insider researcher role required the questioning of the decisions of my colleagues and authoritative figures within our organisation. This research, therefore, placed me in a position to comprehensively examine an emerging practice that was established within the diagnostic imaging department and recognised as a practice with questionable intentions. I was thus required to address issues relative to privacy, confidentiality, informed consent, the accuracy of representation, power relationships, and positionality. These and other matters related to ethics in the research were addressed in the participant information sheets and ethics review applications. The following sections provide more details.

Privacy and Anonymity

Participants were asked via the participants' information sheet (PIS) to identify the location of their choice for interviewing. This was done to protect participants from unauthorised intrusion and breach of privacy. Additionally, all participants’ identifiers were removed from the data before the publication of the research findings.

Confidentiality

Confidentiality was preserved by encouraging interviewees to provide descriptions in generic terms (withholding patients' or colleagues' identifiers) when providing examples of clinical practices or personal clinical experiences involving patients and colleagues. Additionally, during the consent process, participants were encouraged to use fictitious names or pseudonyms during interviews and throughout the research process to mitigate against breaches to confidentiality. Pseudonyms such as technologist 1, APC 2, radiologist 3, and so on were used during the transcription of interviews and the publication of the research findings. Additionally, all data collected were aggregated and anonymised to pose no risk to participants or institutions. The names of the institutions were also changed to preserve their identities.

Informed Consent

Informed consent was facilitated by the use of the participant information sheet and the consent forms, which were institutionalised to reflect the mandates of their respective ethics boards. Research participants were provided with the PIS at least seven days before the deadline for making an informed decision on participation, after which participants were required to sign consent forms. For the APC survey, a separate PIS was also included, which was similar to the general PIS but had been customised for the survey and therefore included a clause explaining that ***completion of the survey indicated implied informed consent.***

Accuracy of Representation

Once the interviews were completed and transcribed, interview participants were provided with a copy of their interview transcript for approval. Participants were encouraged to read their entire interview transcript and make any changes to their responses before providing approval. This ensured the data used to inform the findings of the research accurately represented the participants' perspectives given that direct quotations would be used to lend power to their voices.

Power Relationship

Power relationship refers to the inequities between myself and the researched (Merriam et al., 2001). This issue was addressed very early in the research process by clearly outlining on the PIS what measures would combat the power relationship. As an insider practitioner—researcher, the research participants and I worked for the same organisations and are professional colleagues; hence, the issue of a power relationship was pertinent. Further, during the research, I worked as an APC. I also acted as the modality supervisor on the evening shift, and there existed the potential for my colleagues to feel an obligation to support my research. However, the issue of power relationship was somewhat mitigated by the letter of invitation clearly stating that participation was voluntary and opting not to participate would not jeopardise personal or professional relationships. Further, the use of a randomised selection process for participants who volunteered in combination with the preservation of participants' confidentiality and privacy were included in the approaches to dealing with the issue of power relationship.

Positionality

My positionality during the research is described as an external insider (I rejected much of my indigenous radiographic community and endorsed that of another culture, the APC practice, becoming an adopted insider), according to Merriam et al., (2001). However, I do see my positionality or external insider position as a strength. My proximity to the APC role, being a CT technologist/APC, provided me with the advantage of acceptance by the research participants as one of their peers and therefore provided me with access to participants. Further, my positionality provided me with a direct and intimate role in data collection and analysis along with the assurance of the validity of findings, given my familiarity with the APC practice (Dwyer & Buckle, 2009; Merriam et al., 2001). At the same time, I acknowledge the potential for insider biases toward the data and data analysis processes owing to my closeness to the phenomenon (the APC practice). On this point, I share Merriam et al.'s (2001) position that all research exhibits researcher bias as researchers hold assumptions about the phenomenon under investigation, selection of research participants, and data selection techniques. However, I worked to reduce my personal biases by exercising detailed reflection on the subjective

research process and practising disciplined bracketing (suspending judgement about my professional world of APC practice) (Dwyer & Buckle, 2009).

While the process of coding and selecting findings demands tedious work, it showed me the value of being concise and accurate in identifying categories within the datasets, and to be always mindful of detaching my own interpretation at these stages of data processing. It taught me how to be discriminating in culling core and fundamental data from those that were non-essential to give due importance to the information provided by my research participants. As I listened to my research participants' descriptions and views of the APC practice and role, I came to appreciate how the interviewees can simply define the practice strengths and weaknesses but also their visions for the practice in the future. I admire the participants' resilience in dealing with the challenges of healthcare practice. In the process, I came to examine my own experience of the APC role and healthcare practices and became more appreciative of the potential practice and educational implications of my research.

Methodologies, Project Design and Ethical Considerations Summary

This chapter presented the theoretical and methodological foundations of the research along with the associated ethical considerations, selection criteria for participation, and data collection and analyses processes performed during the investigation. My pragmatic research paradigm that included a relational epistemology, a non-singular reality ontology, a mixed-methods methodology, and value-laden axiology influenced my undertaking of this research. However, the phenomenological approach combined with the case study research strategy was informed by the research questions. It included data collection of program documents, stakeholder interviews, APC interviews and surveys, and quantitative patient outcome measurements. The next chapter will discuss the findings of the research for the three research sites.

CASE-BY-CASE FINDINGS

Introduction and Overview

This chapter presents the findings of the investigation into the advanced practice coordinator (APC) role. The results of the three case studies are presented as three independent cases followed by a summary of findings for each case. A cross-case analysis is presented in the following chapter.

To inform the findings of this research program documents, face-to-face interviews, telephone interviews, online responses to interview questions, survey data and imaging procedure times were collected and analysed. The types and quantities of data collected from each research site are presented in table 4.

Table 4: Types & Quantities of Data Collected from each Research Site.

Western General Hospital	West Central General Hospital	Central General Hospital
Program documents - 30	Limited program documents - 9	Face-to-face interview data - 2
Face-to-face interview data -12	Telephone interview - 2	
APC survey data returned by internal mail - 11	Online response to interview questions - 4	
Imaging procedure times pre and post introduction of APC practice – 23 months data set	Online APC survey data - 2	

CASE 1: Western General Hospital

Western General Hospital (WGH) is regarded as Ontario's largest community hospital and one of the busiest in Canada. It serves a population of approximately 1.3 million multicultural residents. To generate this analysis, 30 program documents, interview data from 11 radiology staffers, and survey data from 11 APCs were reviewed and analysed. Additionally, imaging procedure wait times pre and post introduction of the APC practice were also analysed. The 30 program documents included APCs meeting minutes, program protocols, email communications, job vacancy postings, job interview protocols, interviewees' presentations, and APCs training checklist. Table 5 presents a document inventory per case/site.

The 11 interviewed radiology staffers included the APC lead, the previous chair of radiology, radiologists, technologists, clerical associates, and APCs. Survey data were collected only from APCs, including those who were interviewed. The following themes emerged from the analyses of the accessed program documents, interviews and survey data at WGH.

Table 5: Document Inventory per case/site

Western General Hospital	West Central General Hospital	Central General Hospital
CT Protocolling Workflow – 03/2014	CT Protocolling Workflow – 03/2014	**No available documents**
MRI Protocoling Workflow – 03/2014	Online job positing – APC-Casual – 18/09/2015	
Diagnostic Imaging Quick Reference – 8/5/2014	APC/Technologists Assigns Pre-approved Protocols for CT – 23/03/2015	
CT Coding Protocol- 13/11/2014	CT – Screening for Intravenous Contrast Administration – 18/07/2016	
APC/Technologists Assigns Pre-approved Protocols for CT- March 2015	Ultrasound Procedure Times & Booking Guide – No date	
CT Indications- Protocols Guide – 17/03/2015	Rank of the Substitute Decision Maker – No date	
Return ED CT and Ultrasound studies protocol – 25/05/2015 (Email from APC leader)	Online Protocol Tool – ED/Inpatient – No date	
Online job posting: APC Part Time – 12/06/2015	CT Booking Cheat Sheet – No date	
Online job posting: APC Casual – 12/06/2015	Ultrasound appointments & Booking Cheat Sheet – No date	
Evening APC – 17/07/2015 (Email from APC leader)		
Policy – APC/Technologists Assigns Pre-approved Protocols for CT – 28/07/2015		
APC- A new beginning of a dynamic journey – 30/07/2015. Candidate's presentation		
APC – Early Shift Task & Notes- 25/08/2015		
APC Role – 1/09/2015 (Email from APC leader)		
APC Monthly Meeting Agenda – 24/09/2015		
APC Meeting Minutes – 24/09/2015		
X-ray Notes and Examination Guide – 1/05/2017		
Update to Protocols – 19/06/2017 (Email from APC leader)		
Ultrasound Procedure Times & Booking Guide – No date		
APC/TECH Online Protocoling Quick Reference Guide – No date		
Diagnostic Imaging – Corporate Downtime Process – No date		
Online Protocol Tool – ED/Inpatient Future State – Draft – No date.		
Online Protocol Tool – ED/Inpatient – No date		
Explanation of Examinations CT – No date		
Behavioural Based Interview Guide: APC Diagnostic Imaging – No date		
Behavioural Based Interview Guide for Interviewers – No date		
APC Orientation Checklist – No date		
APC Evening Duties – No date		
Intravenous Needle Guide for CT Procedures – No date		
Closing Procedures – No date		

Birth of the APC Practice

The APC role commenced on 1 April 2015. The birth of the APC practice was traced to the then chair of radiology's recognition of the ability of the technologist staff and belief that there should be some way to better utilise their vast experience and competencies to improve patient care and departmental efficiency. During the interview, the chair shared the position that radiologists were being consulted on issues that could be dealt with by any well-experienced technologist. He felt these consultations were preventing radiologists from attending to their workload and were, therefore, creating unnecessary delays for patients, especially emergency and inpatients, in accessing the services of the diagnostic imaging (DI) department. According to this radiologist, the number of medical radiation technologists on staff exceeds 50, and they have a combined 400 plus years of clinical experience, with some of the technologists in their third and fourth decades of professional practice.

However, the APC lead presented the understanding that the APC role had been created after the radiology department leadership had discussed with the emergency department the possibility of extending the DI department hours of service.

> T*he role was created at this facility because of enhanced hours. . . .what emerge (emergency department) wanted was to have the hours extended. Quite honestly, they wanted it to be extended . . . to 24/7 (24-hour coverage), but it was decided that we would extend to 20 hours, seven days per week instead* (WGH APC Lead).

The APC role was, therefore, developed with the intention of better utilising technologists' skill sets and experience and to improve patient access to DI services. The latter focus was described as patient flow management by several interviewees. This position is consistent with several reviewed job vacancy postings and other hiring documents. One reviewed behavioural based interview guide indicated that a candidate's presentation should include descriptions accompanied by relevant examples for "***effective and efficient patient access and flow***".

Defining the APC Role

Predating the APC role was the inpatient coordinator role, which primarily dealt with inpatients by coordinating their travels between the inpatient floors and the imaging department. The inpatient coordinators were technologists working extra hours in this role. After the management of the DI agreed to offer extended hours of coverage for CT and ultrasound imaging, the team sought possible ways of providing such coverage. The management morphed the inpatient coordinator role into the APC role with added tasks and responsibilities. The added tasks and responsibilities resulted in the coordinator's classification of the APC role as a senior position compared to other technologists. The reviewed program documents outlined the required qualifications, which included professional designation in the imaging profession; five years of relevant clinical experience; the effective use of communication skills; the ability to coach and mentor others; demonstration of clinical leadership, advanced judgement, and high levels of professional knowledge, skills, and ability; and the ability to closely consult with emergency department physicians, clinical nurse specialists, and radiologists. These documented specifications are consistent with advanced practice principles of leadership, critical thinking, and complex decision-making. However, none of the accessed documents presented a detailed description of the APC role, nor did they detail the minimum required academic qualifications.

Nonetheless, a candidate's presentation found on the WGH intranet presented his or her understanding of the objectives of the APC role: to improve productivity by increasing patient access to DI services, enhance the quality of patient care, confer with the multidisciplinary team, consult with radiologists, code requisitions, and coordinate with technologists. This candidate highlighted his/her vast medical radiation sciences knowledge and experience along with interpersonal skills such as effective communication, working well as a team member, and patient-centred and colleague supportive skills as attributes that would ensure success in the role. This candidate had stated that the measure of success in this case would be improved productivity in the DI, emergency, and inpatient departments. Additionally, increased patient access to DI services, improvements in the overall quality of patient care departmentally and institutionally,

and satisfying healthcare team members, the candidate identified as other measures of success. It was, therefore, inferred from this candidate's presentation and the associated evaluation forms that the APC role was designed as a patient flow coordinator role.

To achieve these objectives, APCs are tasked with ensuring that orders for imaging services are complete and appropriate. They are also tasked with assigning protocol codes to some CT requisitions, acquiring patient consents, preparing patients for procedures, arranging transportation for patients to and from imaging procedures, and ensuring requests for expedited procedure reports are facilitated according to the APC lead. Further, the APC functions also extend to emergency patients and inpatients, unlike the predecessor role, which only facilitated inpatient requests. One of the clerical associates presented a concise explanation:

> *The APC helps in coordinating patient care and patient flow from the emergency department and the inpatient floors. It is an approach to ensure that all patient examinations are done in a timely fashion* (WGH Clerical Associate #2).

The APC role, therefore, requires a disciplined approach to time management, work organisation, and patient-centred care. This understanding is supported by the role description on a job vacancy posted 10 June 2015 and the interview evaluation document.

Patient Flow Management/Improving Access

The introduction of the APC role has not only changed the way the DI department functions by increasing patient access but has also positively affected the workflow of several professional groups within the department and hospital. Importantly, the APC practice is achieving its mandate of improving patient access to DI services by managing the flow of patients from emergency and the inpatient floors into and out of the modalities within the department. This finding is discussed in more detail under the subheading of improving patient outcomes later in this chapter in terms of the resultant reductions in procedure times.

A typical APC workflow case scenario according to APC #1, includes researching the patient's history, protocolling the requisition, consenting the patient, assigning a time for the procedure, requesting patient transportation to the procedure, and following up on procedure reports. Typically, when the emergency department requests an imaging procedure such as a CT scan of the abdomen and pelvis, the clerical associate forwards the printed order set to the APC office. The APC then researches the order set for appropriateness of the study and checks the patient's electronic medical records for creatinine, eGFR (test of kidney function), allergies, and pregnancy results, if the patient is female. Once these are within normal limits, the APC assigns the appropriate code (e.g. 1C) to the requisition. The APC then consents the patient, provides the patient with oral contrast to drink, checks to ensure intravenous access has been established, and ensures the patient is in a hospital gown before assigning a time for the patient to have the procedure and booking transportation. Once that patient arrives and has the CT scan, the APC may follow up to ensure the patient has returned to the emergency department and that the nurse is aware of any post-procedural instructions. A similar format is required when a request for DI procedures is received from the inpatient floors.

However, in the absence of the APC this process can be complicated and extensive. According to an interviewed clerical associate, the clerical associate would research the patient's medical record for the appropriate blood results, and would then take the CT order set to the radiologist for protocolling. This may take some time as the radiologist may be busy reporting on previous studies, attending to a patient, or providing a consultation on another patient. Once the radiologist assigns the protocol, the clerical associate then goes to the emergency department to instruct the patient's nurse of the pre-procedural requirements, assigned time for the scan and any other patient requirements. The clerical then requests transportation for the patient. Once the patient arrives in the CT department, the CT technologist rechecks the order-set and the patient's blood results for appropriateness of the study before consenting the patient and proceeding with the study. Should the patient be unable to speak English or the same language as the technologist, an interpreter would be sourced. This can take some

time, according to clerical associate #1. The APC performs all of these roles to reduce the patient's wait or delay times. So, the APC's role is paramount in improving access to the DI department for emergency patients and inpatients.

APC as Intermediary Between Radiologist, Radiology Staff, and the Rest of the Hospital

APCs are also integral in representing the DI department's position to the multi-disciplinary team. As the point person for the department, the APC is the first person contacted by the emergency and inpatient departments when there is a need for information on the appropriate procedures to order, patient preparations, or delays in the department's operation. One radiologist described the APC practice this way:

> *The APC is an intermediary or coordinator between the radiology staff and radiologist and the rest of the hospital, including the emergency department. So their task is to coordinate tests, preparation of the patient, et cetera. . . .It was to reduce the amount of time spent by the technologist and radiologist in coordinating and organising to get patients ready, and moreover, to try to reduce cancellations of tests owing to inappropriate preparation* (WGH Radiologist #2).

Owing to the intermediary nature of the role, APCs are often required to venture into other professions' terrain to help both patients and professionals. According to APC #3, they often detect safety issues with some patients via the review of patient's chart along with the doctor's request. APC #2 shared situations where they often have to venture into other professional realms by guiding the emergency physicians on the most appropriate procedure to order along with the complementary pathophysiological assessments.

APC as Helper

The APC not only helps the radiologists execute their responsibilities but also assists the clerical associates and technologists. In particular, they have significantly reduced the workloads of some technologists. Without the APC, CT technologists would have to allocate time to preparing emergency patients and inpatients. Asked to describe a CT technologist's perspective before and after the introduction of the APC practice, a CT technologist who is also an APC described the situation as having fewer delays:

> W*e were definitely responsible for doing a lot more as a tech before the APC program was in place. We were consenting all our patients, ensuring they were prepared, sometimes we spent much time attending to contraindications that would be discovered during the screening process. I think there were a lot more delays in us getting patients in and out of the scanner. It took a lot more time, and on weekends we would coordinate all our own patients as well, and that, again, was very time consuming. I think since the APC role has been implemented, our scan times are a lot faster. We are not dealing with the minor issues that would have caused delays in the past* (WGH APC #1).

CT technologists, therefore, depend heavily on the assistance or coordinating activities of the APC given that CT is considered an integral modality in emergency management.

Improving Patient Outcomes

Improving patient outcomes is the leading mandate of emerging practices, be it role extension or advanced practice. Therefore, it was essential to ascertain if the APC practice contributed to improving patient outcomes from the perspectives of members of the DI department. Every interviewed member of the DI team was convinced that the APC practice positively influences patient care. They described patient care improve-

ment mechanisms such as reductions in the request to procedure and the request to report times (for imaging results) and improved patient satisfaction owing to the reduced times for procedures and results.

A closer look at improved patient satisfaction found several underlying factors. From the perspectives of interviewees, and backed up by recorded procedure times (pre and post APC practice), improved patient satisfaction was represented by factors such as appropriateness of the procedure (the right procedure for the right patient), improved patient education, and improved patient preparation. Also represented were improved patient compliance, reduction in wait times for a procedure and the results, and patient-expressed satisfaction in the services when leaving the department.

Patient Safety: Right Procedure for the Right Patient

Patient safety is vital in the provision of patient care services. Patient safety not only includes safety from harm but also having the procedure that best matches or investigates the presented medical indications. APCs are at the forefront of ensuring that patient requests are appropriate by researching the patient's history, checking to see if the patient has had prior imaging at another facility, and ensuring the patient's readiness for the examination. The chair of radiology described the patient safety role played by the APC in this way:

> *Sometimes there is a miscommunication between the physicians caring for the patient on the floor. It is quite possible in the past for that patient to come down for the inappropriate exam, having it done, and it was never really appropriate for the patient in the first place. We have all seen that, so the APC would be able to identify that this is not the right exam or procedure and discuss it with the doctor . . . then we can get it right* (Chair of Radiology).

So APCs have to be meticulous in their performance of patient care tasks, which includes educating patients about their imaging procedures.

Patient Education

Patient education is integral to healthcare practitioners' role in the provision of effective and efficient patient care services. An educated patient is a more compliant patient. APCs educate their patients by discussing with them what procedure they will be having, what is required of them for successful completion of the procedure, any contraindications for the procedure, and any post-procedure care. A clerical associate described this vital role in the following way:

> *Many patients are unsure of the test they are having done because the doctors do not always explain things . . . there is better contact with the patient as far as explaining the procedure and obtaining consent before the patient even comes to the department, and maybe if they have any questions or concerns, those are addressed before coming to us* (WGH Clerical Associate #2).

Patient education is a composite of the patient preparation process as consenting requires the provision of all pertinent information on the procedure and allows for the patient to ask questions and express concerns. Patient education also contributes to reductions in wait times and the time to complete the procedure.

Reduction in Wait Times

The reduction in patient wait times is a measure used to determine the efficiency of service provision. Patients often complain about the amount of time spent waiting on procedures in both the emergency department and on the inpatient floors. In addition to obtaining the perspectives of DI stakeholders to determine if the APC practice influences patient care, the APC's impact on patient wait times was assesses through quantitative analyses.

The radiology information system's department performed analyses on wait times pre- and post the introduction of the APC practice. Two 30-day period wait times were compared, March 1 to 31, 2015, one month before the practice was commissioned, and March 1 to 31, 2017, 23 months after the introduction of the APC practice. The three

times analysed to determine the influence of the APC practice on patient care were the request to procedure time, the procedure to report time, and the request to report time. Further, the three analysed time period evaluations were performed for the periods when there was resident radiologist coverage (7 a.m. to 9 p.m.) and when coverage was provided remotely (9 pm to 7 am). These analyses only considered emergency requests and included modalities such as CT, sonography, MRI, and X-ray. The times are presented in Table 6.

WGH recorded significant reductions in wait times over the two years of the APC practice. There was a 33–44% reduction in the request to procedure times, a 50% reduction in the procedures to report times, and 50–60% reduction in request to report time. The request to report time is an aggregate of the request to procedures and procedure to report times. Further, the procedure to report time is also a measure of the radiologist's productivity. Before the APC role, it took three personnel (clerical associate, radiologist, and technologist) to prepare a patient for an examination. Therefore, the APC practice facilitated the expedition of requests for patients and the reduction in the request to procedure time as ***"they attend to it (procedure requisitions) right away thereby getting the patient to the department much faster"*** (WGH Clerical Associate #1).

However, there is always opposition to change and the APC role has certainly changed the way the DI department functions.

Table 6. Comparisons of the Procedure Times Pre and Post introduction of the APC Practice.

	Recorded Times: Pre APC Practice	Recorded Times: Post Implementation of APC	Recorded Times After 9 p.m. Pre APC	Recorded Times After 9 p.m. Post APC
Request to procedure time	60–90 minutes	20–40 minutes	120 minutes	45–60 minutes
Procedure to report times	20–30 minutes	10–15 minutes	30–60 minutes	15–30 minutes
Request to report times	75–120 minutes	approximately 45–60 minutes	120–140 minutes	60–75 minutes.

Resistance to the APC Practice

Although the benefit of having the APC practice is indisputable according to most interviewees, there were expressions of resentment from some of the interviewed technologists. The APC lead had attributed the resistance to the removal of a task the technologists were performing, '***I would say CT was the most vocal against it, against having the role because they felt it was something they were doing***' (WGH APC Lead). However, when the APC role was created, it was presented as . . . ***a higher level of activity than an ordinary technologist . . . more equivalent to a charge technologist*** (Chair of Radiology). Consistent with the higher level activity and the equivalency of a charge technologist position is a higher rate of remuneration for the APC position. And this higher rate of remuneration was the source of the resistance to the APC practice by CT technologists. Both CT technologists interviewed expressed displeasure at a higher rate being offered to APCs for a task any experienced technologist would be capable of performing.

> *We are able to take care of and prep the patients when the APCs are not here, which we do, especially early in the morning (5:00 to 5:30 a.m., 12:00 and 01:00*

> *a.m. and on call). So I do not really agree on their pay scale in that they are being paid higher, which I believe is a big difference, maybe $5 more per hour. I'm not exactly sure how much it is (WGH Technologist #2).*

The technologists' resentment about the higher pay scale for APCs was associated with the technologists' position that whilst they recognised the benefits of the APC program, there are shortfalls in the APC practice. One interviewed technologist attributed the shortfalls of this program to some APCs lacking an understanding of the workflow for various modalities; hence, some patients are not adequately prepared for their imaging procedures. As CT is the modality that commands the greatest need for the APC practice, it was the opinion of the interviewed clerical associates and CT technologists that APCs who are also CT technologists are more effective and efficient in the role than non-CT technologists.

An APC who also works as a CT technologist explained the advantages of being a CT technologist:

> *I think it helps immensely considering 80% of the workload has to do with facilitating CT workflow. So I think that it is definitely an asset, and a lot of the skills I have gained in CT, even something as simple as putting in an intravenous line, helps me ensure that the patients coming to CT are prepared for their exams . . . I consent patients all day long, so I know the things I need to look out for so we can catch them before they (patients) get into the department* (WGH APC#1).

Other factors that were attributed to the preference for CT technologists performing the APC duties included their vast medical imaging experience that averages between 10 and 20 years per CT technologist and their close working relationship with the radiologist, so they know the radiologists' preferences. Also cited were their post-primary training in CT, requiring attention to detail given that CT is a very complex modality, and their performance of APC duties outside the hours of APC coverage.

Motivations for Applying for the APC Role

As is typical with a new practice approach, challenges from within and outside the practice can present significant obstacles to success. However, an essential part of the success equation is the right personnel for the position. A search of the role development literature did not provide roles or practices similar to the APC role. Therefore, as an approach that had no blueprint to replicate, understanding practitioners' interest in the practice was essential. When asked what motivated them to apply for the APC role, all three APCs posited the opportunity to practice at a higher level and the desire for personal and professional challenges. Similarly, all the interviewed APCs were MRTs practising in CT, with two also working in MRI at other institutions. The sense of something new to the profession and their practice along with the opportunity to gain new knowledge motivated these technologists to apply for the APC position.

The intrinsic motivations of wanting to learn more and of wanting to be a part of something new within the profession can, therefore, be seen as an espousal of a culture of lifelong learning. However, other forms of motivations expressed included the desire for increased patient interactions, the opportunity to work closely with the radiologists, the opportunity to be more involved in a patient's care plan, and the "***authority to protocol CT requisitions***" (WGH APC#3).

Inadequate Training for the APC Position

Interestingly, all three interviewed APCs felt that the training they received was inadequate. One APC credited her professional imaging knowledge and experience as a significant factor in her successful execution of the role, given that the training primarily entailed an outline of administrative duties. This is an issue that the APCs hope leadership will address "***as I have not received any formal education related to this position***" (WGH APC#1). APC#1 being a part of the role since its inception, spoke of promises of time spent with the radiologists and other training. Neither has materialised according to this APC. Instead, APCs were provided with on-the-job training through shadowing either the then inpatient coordinators or current APCs.

Additionally, they were provided with several imaging protocolling guides to inform their protocoling task. APCs were also provided with an orientation package aimed at providing new APCs with the information that would allow them to be comfortable and productive in their new position and working environment. The package also covered areas such as accessing patient information from the hospital and radiology information systems, each modality workflow for weekdays, weekends, and holidays, MRI safety, patient care and safety, quality assurance, collaboration with other healthcare professionals, and specific modality knowledge and requirements.

Future of the APC Practice

It has been established that the APC practice was developed to afford technologists opportunities to expand their patient care responsibilities owing to their vast knowledge and competencies. Additionally, they can apply that knowledge and skills to improve patient access to departmental services, thereby functioning as a workflow manager. However, crucial questions posed to interviewees included whether there is a future for the practice and how would they like to see the practice in the future. The responses ranged from increasing practice autonomy to expanding the APC role to include the provision of services to outpatient referring physicians. Additionally, the potential of developing the practice to the level that it can be offered as a postgraduate certificate in higher education was also indicated. Below is a list of the summarised themes:

1. Expansion of APC services
2. Evolving the practice to a postgraduate certification level
3. CT technologists only as APCs
4. Consistency in practice among APCs
5. Improving APC training
6. Increasing accountability of APCs
7. Increasing practice autonomy

Role Extension or Advanced Practice?

Thirteen surveys were sent out at WGH. Eleven were returned, representing an 85% return rate. For the survey, the APCs were required to indicate their agreement, neutrality, or disagreement with the provided statements that were components or attributes of role extension and advanced practice. The frequency of findings is summarised under these two headings and presented, respectively, in Tables 7 and 8.

Of the possible responses for advanced practice, 42 of the 66 item responses agreed that the statements were consistent with the attributes of advanced practice. Though the items were equally weighted, according to some scholars of advanced practice some attributes are more indicatives of advanced practice than others. A position adopted by this research. These included improving patient outcomes and autonomous practice.

From the analysis, it can be seen that only four APCs indicated that the APC practice provided autonomous, self-regulated, and self-directed practice. Additionally, nine APCs agreed that the APC practice was ***developed/designed to benefit the medical imaging profession and patients*** and ***requires the application of medical imaging knowledge***. However, of importance was the statement on **the need for postgraduate training, qualifications, and credentialing to practice** as an APC. Six respondents disagreed with this statement, and two were neutral. Only three respondents found this statement to be an accurate reflection of the APC practice. The need for postgraduate training and qualifications are essential to the actualisation of advanced practice in general, and in radiography, specifically. Please see table 8.

Role Extension.

Table 7. WGH APC survey results.

Statements	Accurate	Neutral	Not Accurate
1. The APC practice/program entails practices previously reserved for another profession/extended practice.	7	3	1
2. The APC practice/program is task oriented, provides role specialisation, and is site limited.	9	2	
3. The APC practice/program is designed to optimise delivery and satisfy local needs.	11		
4. The APC practice/program is limited to clinical practice.	1	5	5
5. The APC practice/program does not require formal knowledge; knowledge and skills are gained via experiential learning/education, and learning is locally initiated.	5	2	4
6. The APC practice/program requires post-registration skills, responsibilities, and competencies.	8	3	
Totals	41	15	10

Advanced Practice.

Table 8. WGH APC survey results.

Statements	Accurate	Neutral	Not Accurate
1. The APC practice/program requires postgraduate training, qualifications, and credentialing.	3	2	6
2. The APC practice/program does not restrict me to clinical practice.	6	4	1
3. The APC practice/program was developed/is designed to benefit the medical imaging profession and patients, and it requires the application of medical imaging knowledge.	9	2	
4. The APC practice/program requires me to function at an advanced level and requires greater responsibility and accountability.	10		1
5. The APC practice/program provides autonomous, self-regulated, and self-directed practice.	4	5	2
6. The APC practice/program develops judgement, decision-making, teaching, and leadership skills.	10	1	
Totals	42	14	10

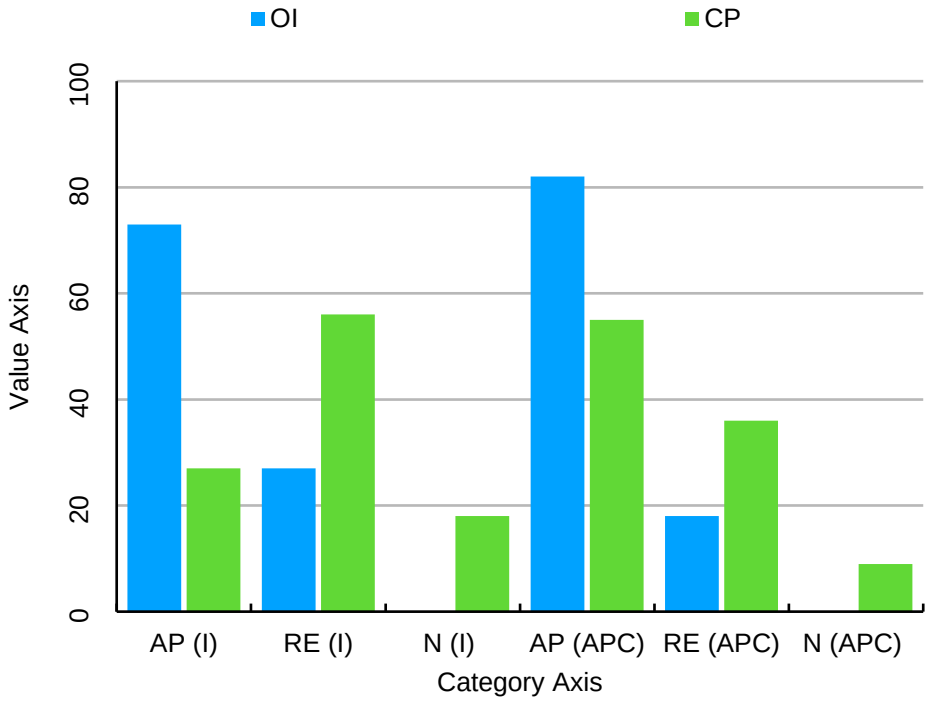
In the analysis of the statements on role extension (Table 7), all 11 APCs agreed that the statements ***the APC practice/program is designed to optimise delivery and satisfy local needs*** accurately described the APC practice. Seven respondents felt that the APC practice entailed practice previously reserved for another profession, and nine out of 11 respondents felt the APC practice was task oriented, provided role specialisation, and was limited to one site. Further, five APCs agreed with the statements ***that the APC practice/program does not require formal knowledge***; ***knowledge and skills are gained via experiential learning/education, and learning is locally initiated***. Two APCs neither agreed (accurate) nor disagreed (not accurate). This is important as it indicates the lack of transferability of the APC role's knowledge and skills.

Further analyses of the findings indicated that whilst the frequencies of the responses to advanced practice and role extension were equally distributed, those indicative of autonomous practice (statements 1 and 5) and the requirement for postgraduate qualifications to practice are significant to advanced practice. These two statements should, therefore, have recorded higher frequencies if the APC role was consistent with advanced practice. Additionally, the role extension statements (1, 2, 3, and 5) recorded high agreement. A comparison of the survey results indicated that, according to the surveyed APCs, the practice was more aligned with role extension than with advanced practice.

When asked which partially blinded definition best represented their understanding of the original intentions of the APC practice and the current APC practice, the below percentages were recorded for interviewees and surveyed APCs (Figure 4).

Additionally, analysis of the interview data indicated that 73% of interviewees at WGH believed that the partially blinded definition of advanced practice best described their understanding of the original intentions of the APC practice. However, 56% thought that the role extension definition best defined the current APC practice, Figure 4. Further, when asked in the survey, which partially blinded definition best represent APCs understanding of the original intentions, and current practice of the APC role. Eighty-two per cent of surveyed APCs believed that the advanced practice definition best defined the original intentions of the APC practice. Only 36% of respondents, however, found that current practice could be interpreted as advanced practice. 55% believed the current practice could be defined as role extension. The other 9% were neutral.

Figure 4. Interviewee responses to partially blinded definitions.



Advanced Practice (Interviewees) - AP (I); Role Extension (Interviewees) - RE (I); Neutral (Interviewees) - N (I); Original Intentions (OI); Current Practice (CP); Advanced Practice (APC) - AP (APC); Role Extension (APC) - RE (APC); and Neutral (APC) – N (APC).

Case 1: Western General Hospital: Summary of Findings

The origin of the APC practice was attributed to local needs, better utilisation of human resources (technologists' skills and competencies), and service provision (extended/enhanced hours). However, the unveiling of the practice can be seen as anything but smooth as APCs complained of receiving pushback from technologists owing to their higher pay scale and the perception that they 'bringing work" to the technologists.

Nonetheless, not all categories of the interviewed DI professionals expressed reservations about the APC practice. The radiologists and clerical associates were very supportive of the practice as it alleviated some of their practice problems. Two of the interviewed technologists also partially acknowledged the APCs contribution to the smooth execution of their patient care responsibilities.

Consistent with emerging practices, the APC practice did influence patient care as it contributed to a reduction in patient wait times, increased patient education, and improved patient satisfaction. These findings are consistent with those presented in the literature. Importantly, interviewees agreed that the original intentions of the APC program are consistent with attributes of advanced practice, but that the current practice is more aligned with role extension than advanced practice.

Case 2: West Central General Hospital (WCGH)

West Central General Hospital (WCGH) is the sister institution of WGH. It provides a wide range of outpatient and inpatient services and receives approximately 70,000 emergency visits annually. The APC practice was instituted at WCGH at the same time it was initiated at WGH. It was, therefore, essential to ascertain if WCGH's approach to the practice, its successes, its challenges, and its practice implications were similar or contrasting to those of WGH.

Birth of the APC Practice: Adapted Practice

The APC practice at WCGH was adapted from the WGH. The impetuses for the development of the APC practice at WCGH are similar to those at WGH, the better utilisation of technologist knowledge and skills and the need to coordinate the department's workflow during periods of enhanced hours of service. Furthermore, WCGH was allowed to tailor the practice to meet its departmental and institutional needs. According to the lead APC at WCGH, the APC role was already in existence when she joined the organisation, but her understanding of the objectives of the practice was consistent with that presented by the chair of radiology and the lead APC at WGH. WCGH's APC lead presented her understanding of the practice as:

> *They (management) wanted a one-point person to coordinate the flow in and out of the department from an emergency and inpatient perspective because different modalities were organising in different ways, so it would be the one-point contact. . . .The main objective of the role is to ensure that there is a smooth flow through the DI department* (WCGH Lead APC).

However, the opportunity to tailor the practice to meet departmental and institutional needs created problems, primarily inconsistencies in practice and having specialised non-technologist APCs. According to the APC lead, APCs who were part of the

practice at its inception morphed the role into what they wanted it to be. This created inconsistencies in practice standards. Some APCs executed their responsibilities according to the department's vision of the role, whilst others tailored the practice to suit their personal practice preferences. Examples presented included only attending to emergency patients, not wanting to visit the inpatient floors to consent and educate patients on their pending procedures, designating their responsibilities to the clerical associates, and at times leaving the consenting process to the technologists.

Another problem created by WCGH's opportunity to tailor the practice was the assignment of specialised APCs. These are non-technologists functioning in the capacity of APCs. Again, this resulted in inconsistencies in practice as non-technologist APCs lacked the understanding of the modalities operations and workflow styles. As a result, technologists were required to spend more time doing what the APCs should have done and, therefore, the role was branded as "***useless and a waste of money***" (WCGH Technologist #2). Moreover, the perception that the APC role was a waste of money can be attributed to a lack of understanding of the objectives of the role and lack of communication.

Resistance to the APC Practice

Resistance to the APC role was illustrated by the two technologists at WCGH who responded to the online interview questions. WCGH Technologist #2 presented a cadre of problems with the role including

> *Cannot plan our own workflow, do not know the details of cases pending, disconnected from the flow of our own work, APCs not completing all the tasks they are supposed to, APCs not checking the IVs, APCs not consenting properly, APCs not explaining the test correctly, APCs who are not CT techs do not know our cases and cannot speak to them properly, and radiologists use APCs as their secretaries.*

The resistance to the practice was further compounded by "***the fact that the APCs make a higher salary grade***" (WCGH APC Lead). The technologists saw this as problematic as they are equipped with the skill set to perform the task of the APCs but yet are at a lower pay grade. This has resulted in technologists withdrawing their support for the role and a breakdown in communication. However, WCGH's lead APC saw this as an opportunity to correct the wrongs of the practice and has started working on measures to prompt a change in the practice approach to the APC role.

Future of the APC Practice: Change is Needed

The lead APC at WCGH identified the urgent need for change. She has identified the need to tailor the practice similar to that at WGH where "***the role would be better suited as working technologists rotating through the role of APC so that they have both the knowledge of the front line aspect of the job as well as the coordination aspect of the job***" (WCGH APC Lead). Further, she would also like to utilise CT and MRI technologists or other technologists "***who have the attention to detail and what not for doing more invasive procedures or that skill set***" (WCGH APC Lead).

The lead had also identified the need to increase the presence of the APCs by making them more visible to other categories of staff. She has proposed the moving of the APC's office from a back office to one that is more central in the department, where they can observe the department's operations and patient flow mechanisms. This would mean that the APCs would be better positioned to implement measures aimed at preventing backlogs, thereby improving the department's efficiency. Another area proposed for change was the communication between the modalities and the APC office. The lack of effective communication was identified as an area that needs attention in the department's staff engagement and staff satisfaction survey, according to the lead. Staff felt that the style of communication by the APCs was more authoritative rather than productive.

From the technologists' perspectives, the feedback on the future for the APC role was mixed. One technologist called for the removal of some APCs from the role,

and another saw the need to increase their modality-specific knowledge. However, the technologist who identified the need to remove some practitioners from their role felt "***the role is a technologist role and nothing advanced about the skills***" (WCGH Technologist #2). In a sense, technologists felt they performed the role before, and therefore, there is no need for the APCs.

Improving Patient Outcomes

Attempts to measure the quantitative impact of the APC practice on patient care at WCGH proved futile as correspondence to their Picture Archiving, and Communication Systems (PACS) department were unanswered. Therefore, calculating the request to the procedure, procedure to report and request to report times, as was performed at WGH, was not possible at WCGH. However, other research participants expressed appreciation for the practice. The lead APC, APCs, and the other technologist attributed the department's increased efficiency and improved patient care to the APC practice.

Role Extension or Advanced Practice?

When research participants at WCGH were asked to identify which partially blinded definition best represented their understandings of the original intentions of the APC practice, 60% indicated that the definition was consistent with advanced practice. Moreover, 60% felt that current practice was consistent or aligned with role extension. Again, caution is advised as the sample did not include representation from the radiologist and clerical associates. Those perspectives are equally integral to the APC practice.

Only two of the five APCs practising at WCGH responded to the APC survey. This represented a return rate of 40%. Considering the statements on advanced practice, both responding APCs disagreed with the statements; ***the APC practice requires me to function at an advanced level and requires greater responsibility and accountability*** and ***the APC practice/program provides autonomous, self-regulated, and self-directed practice;*** as they did not accurately represent their practice. About the statements consistent with role extension, the two surveyed APCs agreed that the

statements were accurate reflections of their practice. However, caution should be exercised when seeking to draw inferences from these findings as 60% or three out of five APCs perspectives are not represented.

Case 2: Summary of Findings

The origins of the APC practice at WCGH was traced to its sister institution, WGH. The decision to implement was also consistent with WGH—improving access and better utilisation of technologist resources. The APC practice role intentions, therefore, were seen as patient flow management, amongst others such as modality supervision, radiologist assistants, patient education, and department coordination. However, one technologist expressed reservations about the practice. That technologist cited the APC practice as a waste of money. This resentment was attributed to the higher pay scale of the APCs compared to that of the technologists.

The quantitative findings indicated that most (60%) research participants at WCGH believed that the original intentions of the APC practice were consistent with advanced practice and that current practice is aligned with role extension. Two out of the five APCs also felt that the statements associated with role extension were representative of their current practice. However, caution is advised as the two APCs represented 40% of the APC population at WCGH.

Case 3: Central General Hospital (CGH)

Case 3: Central General Hospital (CGH) is the third healthcare institution that was studied in this research. CGH is located in the Greater Toronto Area (GTA) and serves a population of approximately 850,000 residents. CGH is regarded as one of Canada's largest regional acute care hospitals with a total bed capacity of 656. This hospital was recognised as the most advanced hospital in North America owing to its digital and computerised infrastructure. CGH trialled the APC practice for one month but abandoned the practice. The hospital site where the practice was tried no longer exists. Three hospital sites were merged to form the new and current CGH. However, ascertaining why the APC practice failed at this institution remained of interest to this research as CGH's failure can inform the development and institution of emerging practices in medical imaging.

Why the APC Practice Failed

Failure of the APC practice at one of the then three sites of this multifaceted institution was attributed to local labour law restrictions and the physical layout of the then DI department at the time. According to the practice leader, "***We do not have that specific APC position. Being a unionised institution, we are not allowed to make up stuff, so we have to follow what is available in our collective bargaining agreement in terms of titles***" (CGH PL). According to their labour agreement, newly created positions must be approved by the union before they can be advertised and instituted. Further, newly created job descriptions should not be similar to those currently in existence. This agreement restricted the leadership of the DI department from creating new positions without justification.

Further, the DI department where the APC practice was trialled was fragmented and therefore posed a challenge to coordinating departmental activities according to an APC at WGH who was involved in the trial APC practice. The modalities in the DI family were housed on different floors, whilst the emergency department was stationed on

the ground floor. With the separations between modalities and the emergency department, coordinating patient access to the DI department was impossible.

However, the new CGH has swiftly moved into a digital healthcare environment and therefore needed a practice that complemented their vision of revolutionising the delivery of healthcare services. After some searching, the CGH found an approach similar to a command or disaster centre. They, therefore, adopted the command centre approach from a world-renowned healthcare institution. However, CGH's version includes the DI perspective, which is not represented in the original. Nonetheless, the DI perspectives are addressed by a lead CT technologist with a role branded as the ***inpatient flow technologist***. This person coordinates the imaging department's inpatient activities from the command centre.

Digital Environment Required a New Approach: The Command Centre

The command centre is a highly advanced data-driven mission control centre similar to an airport's control tower or a disaster management centre. The command centre is staffed by a large integrated, interdisciplinary, highly skilled and highly independent team of healthcare practitioners from crucial departments of the hospital that work as a team to monitor and manage the flow of patients at every stage of their patient care journey at the institution. Represented are professionals from the emergency room, medicine, surgery, nursing, operations, and DI, to name a few. The objective is to ensure that patients are moving through the hospital in a timely fashion and smoothly. From the command centre, the team can identify potential patient flow bottlenecks or other delays or problems and take immediate corrective action.

Patient Flow Manager: The Inpatient Flow Technologist

Since commencing service at the new state-of-the-art facility, a modified version of the APC role was instituted for the DI department. According to the practice leader

(PL) in the DI department at the CGH, "***The person is a charge technologist assigned to specific functions within the hospital's command centre and functions in a capacity similar to a coordinator***" *(CGH PL).* This new position is branded the ***Diagnostic Imaging Flow Technologist*** and represents the DI department in the hospital's command centre. A senior or lead technologist position was converted to the inpatient flow technologist role but retained the technologist identity. The retention of the technologist's identity meant the inpatient flow technologist is still required to meet the requirements of a medical radiation technologist and is therefore governed by the ethical and practice standards of the Canadian Association of Medical Radiation Technologist (CAMRT). Additionally, the retention of the technologist identity in the job title fulfilled the institution's bargaining agreement with the union under Canada's labour laws.

The patient flow technologist duties are similar to that of the original inpatient coordinator's duties at WGH. Asked to describe her position and role, the technologist representing the DI department stated

> *My current role is described as inpatient flow technologist. So my role is to coordinate different modalities to enable patients to come down and have their exams done in a timely fashion . . . I was supposed to coordinate patients for MR, CT, and US to ensure patients were having their imaging and were not going up and down multiple times for imaging unnecessarily. If all imaging could be done in one trip, that would be good as we would be reducing the number of portering needs, and it is a better use of the resources* (CGH Flow Technologist).

As there were no examples of patient flow technologist to copy, the then assigned inpatient flow technologist spent two days shadowing an APC at Western General Hospital, one month before the opening of the command centre. She was able to briefly examine the structure, functioning, and challenges of the APC role. However, she attributed her decades of technologist experience as the source of her knowledge and organisational skills that enabled her to successfully function in this new role.

Improving Patient Outcomes

According to the practice lead at CGH, within six months of the commissioning of the command centre, they recorded reductions in inpatient wait times for DI procedures by 30% for CTs and 13% for ultrasound studies. The PL explained how the command centre achieved its patient flow objectives that assisted in the department recording such reductions in inpatient wait time:

> *Via technology and numerous data points, the team monitors the patient flow elements to ensure patients move through the hospital swiftly. The multidisciplinary team in the command centre monitors elements such as ER volume, bed allocations and assignments, room cleaning, critical care capacity, imaging procedure volumes, surgical scheduling, and discharge planning* (CGH PL).

Though members of the DI department acknowledged the benefits of a reduction in inpatient wait times as a result of the implementation of the inpatient flow technologist role, challenges exist. Consistent with change and similar to those found at WGH and WCGH, the challenge associated with the inpatient flow technologist was receiving pushback from within the DI department. Technologists felt the inpatient flow technologist was bringing them unnecessary or unwelcome work and therefore did not share the patient care focus of the role. However, the recognised benefits of the role complement the objectives of the command centre.

Future Plans for the Inpatient Flow Technologist Role

*C*onsistent with emerging practices, the inpatient flow technologist role continues to evolve, and the practice has evolved from what it was at the opening of the command centre. The inpatient flow technologist shared, "***It might have started as one role and evolved into another, and in the future, it will become something totally different***" (CGH Inpatient Flow Technologist). The evolution of this role continues as the PL and the practitioner hope for changes of their own.

The practice leader would like to see the role expanded to identify the inpatient flow technologist as "***a quality improvement champion***" (CGH PL). This includes the improvement in the provision of quality patient care from the perspective of the seven modalities housed within the DI department. Another change that is envisioned is the enhancement of hours from Mondays to Fridays 8 a.m. to 4 p.m. to 24 hours seven days per week to match other professional groups in the command centre. The inpatient flow technologist also shares the practise leader's vision of enhanced hours of service.

Role Extension or Advanced Practice?

The accurate identification of emerging practice is vital in the initiative to effectively sell professions and practitioners to the general public, other members of the healthcare team, and curriculum designers in higher education. It was, therefore, essential to ascertain from the perspectives of the PL and the inpatient flow technologist if this new practice met the role extension or advanced practice designation criteria.

When presented with the blinded partial definitions and asked to select one description that best described the inpatient flow technologist's role, the PL selected the partial definition consistent with advanced practice. However, making a selection was a challenging task for the flow technologist, who was unable to make a selection.

Case 3: Summary of Findings

The one-month trial of the APC practice as presented at the WGH failed at one of the previous sites of CGH owing to labour regulations and departmental layout. However, elements of the APC practice, such as coordinating inpatient access to DI modalities were retained when CGH decided to go digital to transform the delivery of patient care services. CGH adapted the command centre format from a world-renowned institution, a format akin to an airport control tower or disaster management centre. Moreover, the command centre at CGH included DI representation, a representation that is absent at the original command centre.

To gain the support of the labour union, the department retained the technologist's identity and focus by assigning a change technologist to represent the department's patient care interests at the command centre. The newness of the inpatient flow technologist role resulted in pushback from technologists as they felt the flow technologist was acting like their boss. However, owing to the implementation of this role, the DI department recorded reductions in turnaround times. Notwithstanding, the position continues to evolve with the hope of the flow technologist becoming a champion for quality improvement and the extension of the hours of coverage from 8 hours for five days per week to 24 hours for seven days per week.

Summary of Findings

The APC practice originated because of the identified need for better utilisation of the skills and competencies of the technologists in the DI department. This was coupled with the department's objectives to provide extended hours of service. The APC practice was therefore presented as a patient flow manager but provided much more than patient flow coordination. Other responsibilities included patient education, management responsibilities, and assistance to the radiologist, to name a few. Owing to the increasing obligations and the perception of the APC practice being advanced practice, practitioners were rewarded at a higher level than technologists. However, this resulted in opposition from technologists with some referring to the role as a waste of money. Nonetheless, the role continues to receive praises from practitioners in and outside of the DI department.

The APC practice has resulted in improved patient care in the form of reduced waiting times, increased patient education, and enhanced patient satisfaction. These improvements in patient outcome are consistent with the emerging practices literature. However, according to the measures applied to this practice, most participants felt that the original intentions of the APC practice were grounded in advanced radiographic practice, but the current practice is more aligned with role extension.

Though the APC practice continues to succeed at WGH and WCGH, it failed at CGH owing to labour practices and the physical layout of the department. The bargaining agreement as agreed to by CGH and the labour union requires the union's approval for all newly created positions. Owing to this, the CGH morphed the senior CT technologist's role into an inpatient flow technologist role, representing the DI department's interests in the multidisciplinary command centre. The objective of this new approach is to coordinate inpatient access to the DI services to ensure the smooth flow of patients through the hospital.

A cross-case analysis of the three cases will be presented in the discussion chapter, along with an examination and theoretical explanation of the patterns and implications of the findings. The discussion chapter will be followed by a conclusion and recommendations resulting from this research. These recommendations include the presentation of possible frameworks on advanced practice and role extension that can inform the development and implementation of emerging radiographic practice and postgraduate radiographic curricula.

Discussion of Findings

Introduction and Overview

The APC role originated as a result of the need for better utilisation of technologists' talents and the department's objective of providing extended hours of service. Three sites affiliated with the practice of the APC role were studied as individual cases to determine if the APC role met the criteria for advanced practice or role extension designation and whether it influenced patient outcomes. This chapter presents a cross-case analysis that examined the underlying explanations for the findings as presented in the previous chapter. It also presents a discussion of the limitations of this study.

Cross-Case Analysis

What is the Origin of the APC Practice?

The findings of the research demonstrated that the APC role originated at WGH as a result of local needs—better utilisation of technologist resources and the offering of extended service hours. The APC practice was also tried at one of CGH's old sites but failed. However, CGH eventually adopted a modified version of the APC role at their new site owing to local need—the need to operate in a digital space. These reasons are consistent with the emerging practice literature that indicates practices often originate out of local needs for service improvements (Bryant-Lukosius & DiCenso, 2004; Cowling, 2008; Ford, 2010; Hardy et al. 2016; Paul, 2009; Sim & Radloff, 2009).

Local need is a driver of emerging practices and is present in various forms such as practitioner shortage, increased patient visits, expanded patient services, budgetary measures, and demands for patient care services (Snaith et al., 2016; White & McKay, 2002; Woodford, 2006). Further, as the focus of emerging practices remains the meeting of patients' health needs (Bryant-Lukosius & DiCenso, 2004), other forms of efficien-

cies should also be recognised. WCGH faced similar demands for DI services as its sister hospital and therefore adapted the APC role. However, each site was allowed to shape the role to suit its individual needs. Moreover, WCGH's tailoring of the APC practice resulted in inconsistencies in practice and calls from technologists for change within the practice, according to the lead APC. Therefore, role development should be a thorough process that examines the various implications, positive and negative, of any role being developed.

In 2003, the UK's College of Radiographers published the results of a longitudinal study on role development. The study examined the extent of radiographers' role development and classified role development into three categories: namely widespread, well-established, and other (The College of Radiographers, 2003). ***Widespread practice*** referred to common practice within the profession, practices such as intravenous injection and pattern recognition***. Well-established practice*** referred to a practice that had found roots in the profession but was not widely practised, practices such as report writing and independently performing gastrointestinal studies as did the small group of medical radiation technologists (MRTs) at St Joseph's Health Care in London, Ontario (Paul, 2009). ***Other practices*** referred to practices in response to local needs such as the MRTs at St Michael's Hospital in Toronto, Ontario, performing peripherally inserted central catheter (PICC). The APC's coding of CT requisitions can be categorised as other practices as the APC practice resulted from local needs and may not be applied on a widespread basis. A search of the literature for similar practice roles proved futile.

However, there are complications or limitations for emerging practices resulting from the needs of the local organisation. They are often limited to the needs and demands of the local healthcare institution or department "as a method of optimising service delivery by maximising the flexibility of the staff base" (Hardy & Snaith, 2006, p.328). Opportunities for practitioners to extend their practice and utilise their acquired skills may not exist as only the local organisation may recognise the training and acquisition of the new skill set. Additionally, developing their role further outside of the local institution may not be possible as the skills are often task specific and fostered to meet

local needs. According to Hardy and Snaith (2006, p. 329), a practice developed to meet local needs “may be seen to limit the parameter of clinical practices rather than 'expand’ them.” Practitioners of 'other practices’ therefore may find that to retain the newly acquired skill set, they have to remain with the sponsoring organisation as their skills may not be transferable to other institutions, provinces, or countries. For the newly acquired skill set to be easily transferable, the approach to the development of these practices or roles needs to change. However, the change should be aligned with a role development focus of either role extension or advanced practice, both of which require regulatory approval to formalise.

Another change required for the recognition of the 'other practice’ role is the formal development of the learning experience to a level that meets the requirements for a postgraduate award of either a certificate or diploma. Role development requires new rules and regulations as it is becoming more difficult for anyone profession to claim ownership of a particular practice. Formalising the experiential learning will provide formal recognition of the practical (know-how/know-what) and theoretical (know why) knowledge and their application (praxis) in clinical practice. Formalising the experiential learning would also be beneficial to the radiography profession as the profession continues to develop and change dramatically.

A collaborative educational approach between WCG, WCGH, and CGH and an institution of higher learning in Canada may facilitate the development of the APC and inpatient flow technologist practices to that level where the responsibilities and accountabilities of these roles are commensurate with the educational level. A collaborative approach that can facilitate the development of role extension practices is presented later in this paper. This is especially important in the current era as clinical practices have moved away from the traditional role of only certain practitioners being allowed to perform certain duties towards a team approach to patient care. The UK’s National Health Services’ agenda for change motivates the recognition and rewarding of practitioners according to their knowledge and skills regardless of profession or place of work (Hardy

& Snaith, 2006; White & McKay, 2002). The focus is not on the profession the practitioner belongs to but on the patient care needs that the practitioner can fulfil for clients, families, and the community. The framework defines patient care by the multidisciplinary teams, not by profession (Martino & Odle, 2007). In such case, the APC's practice patient care capabilities would need to be clearly articulated.

Does the Emerging Role Influence Patient Care?

Across the three research sites, the findings have demonstrated that the emerging roles (APC practice and inpatient flow technologist) have positively influenced patient care (patient outcomes). Reductions in wait times, improvement in patient education and satisfaction and improved access to the DI modalities were documented. Improvement in patient outcomes is the objective of emerging practice, be it role extension or advanced practice. This is important as the focus in the delivery of patient care services has migrated to team-based care instead of a practitioner-based care. The team-based care approach is driven by the understanding that when medical and non-medical professionals work together as a team, improved patient outcomes can be achieved. The APC role at WGH contributed to 33–44% reductions in the request to procedure time over the first two years of the program, meaning that APCs were able to educate and prepare patients 33-44% faster than if there were no APCs, representing an equivalent increase in the department's efficiency and objective to increase patient care access to diagnostic imaging procedures. Likewise, a 50% reduction in the procedure to report times meant that the radiologists were more productive in their work times as the APCs attended to coding of requisitions thereby decreasing the interruption of the radiologist workflow. Similarly, CGH's inpatient flow technologist has contributed to 30% and 13% reductions in inpatient wait times for CT and ultrasonography studies, respectively, within the first 6 month of the role. Measurements of procedure times were not available for WCGH.

Nonetheless, the debate continues as to whether healthcare teams can improve primary care practice. The literature has presented evidence that radiographic role de-

velopment, be it role extension or advanced practice, does contribute to improved patient outcomes. Shay et al. (2017), Judson and Nightingale (2009), and Paul (2009) have also cited extended patient wait times, patient procedure times, and image review times as top patient complaints. Ten Napel at al. (2016) and McLeod and Montane (2006) found that long wait times for imaging procedures were major contributors to patient dissatisfaction. Of the three times recorded in this study, the procedure to report time is a primary measure of the radiologist's productivity. Benzitez et al. (2018) attributed severe constraints on departmental productivity to the radiologist's reporting activity. Judson and Nightingale (2009) found that radiographers performing gastrointestinal procedures reduced patient wait times. Similarly, Nightingale and Hogg (2003) reported a reduction in imaging procedure wait times owing to radiographers performing barium enema studies. And Lockwood (2016) attributed the faster availability of MRI results and consequently improved patient management and treatment to reporting radiographer services. My study credited the APC role for improvements in procedure to report times owing to the APC's coding of CT requisitions, a task that radiologists had attributed to major disruptions of their workflow.

Likewise, Shay et al. (2017) recorded shortened interventional procedure times (6 minutes) as a result of the inclusion of a radiologist assistant in interventional procedures. Six minutes meant less opportunity for complications, less bleeding, less sedation, fewer anticoagulants, and shorter procedures. Likewise, the inclusion of the APC in the patient care equation has resulted in significant reductions in wait times at WGH. Hardy et al. (2013) found that the time spent by patients waiting on their radiographic reports added approximately 5 minutes to their time to treatment (time of arrival at the ED department to time of discharge/referral). Though insignificant, this time contributed to the patient's journey, service experience, and even the perception of service received. In a study aimed at investigating differences between patients' perceptions of the quality of radiological care and demographics, Blomberg et al. (2010) found that long wait times induced patient perceptions of reduced quality of care. They, therefore, recommended imaging departments periodically provide patients with updates on waiting times, which is something that the interviewed APCs attested is a routine task for them.

Improved Patient Satisfaction

Other forms of improved patient outcomes recorded as a result of the introduction of the APC role included improved patient education, improved patient preparedness, and improved patient satisfaction. Patient satisfaction is essential in the measure of service efficiency as Ten Napel et al. (2014) reported. The more satisfied patients are, the more likely they would use the same service provider in the future, as well as refer others to that provider. Improved patient education and preparedness are components of the patient satisfaction measure. The more information that is provided to patients, the more informed and better prepared they are to participate in the patient care decision-making process. McLeod and Montane (2010) investigated the radiologist assistant as a possible solution to radiology workforce needs. They reported a lack of communication and insensitivity to patient needs as pivotal reasons for patient dissatisfaction. Similarly, in an approach to examining the level of patient satisfaction with radiologist assistants in the United States, Saunders (2014) surveyed 359 patients, and the results of the study indicated a high level of patient satisfaction with the patient care services provided by the 20 radiologist assistants in diagnostic and interventional imaging procedures.

Patient satisfaction is, therefore, an important indicator of the quality of care patients received and the quality of the service provider and its staff. Although my research did not measure the level of patient satisfaction with the APC service, the research participants indicated that improved patient preparedness and education were contributors to improved patient satisfaction. Further, the patient care providers' perspectives are also important in the assessment of improved patient satisfaction. Most of the research participants felt that patients were more satisfied with their service as a result of the APC practice. The inclusion of APCs in the patient care equation meant that patients accessed their DI procedures much faster than when APCs were not a part of the equation. APCs described their pleasure at interacting with patients and their families and being able to prepare them for their procedures. This satisfaction equated to

accomplishing the mandates of the APC role and contributing to positive patient experiences. Ford (2010) illustrated the outstanding contributions of consultant radiographers to the patient care experience. The radiographers in Ford's (2010) study felt accomplished in making services accessible to patients and attending to their needs.

Autonomous Clinical Practice

Nonetheless, there remains an underlying concept that permeated the cited studies' findings of improvements in patient outcomes. Most of the studies cited were advanced radiographic practice studies, and therefore, the practitioners enjoyed a high level of practice autonomy. Autonomous clinical practice is the fulcrum of advanced clinical practice. Advanced clinical practice is characterised by an increased level of autonomy consistent with the increased level of responsibility and accountability of the role.

Further, autonomous clinical practice is a practice where the practitioner is qualified, responsible, and accountable for the provision of patient care services within the profession's scope of practice (Cherow, 1994; Holden, 1991; Weston, 2010). Autonomous clinical practice is dynamic and thus changes over time (Wade, 1999). This is a position confirmed by nurse practitioner #2, "***No decision could be made on a patient without consulting with your physicians***" (WCGH NP2). However, this changed as the physicians became comfortable with the nurse practitioner's practice and work ethics. Nurse practitioner #1 presented a similar challenge where her scope of practise allows her to convey a diagnosis, provide intervention below 1 cm of the skin barrier, prescribe narcotics, apply ultrasound technology to assist with a diagnosis and admit and discharge patients from healthcare institutions. However, neither WGH nor WCGH permit their nurse practitioners to apply ultrasonography in patient assessment or to admit and discharge patients. Evidently, the aspiration to full independent clinical practice by nurse practitioners has not been fully actualised. Nonetheless, nurse practitioners, like other healthcare professionals, continue to strive for fully autonomous clinical practice.

Of importance is the realisation that autonomous clinical practice includes some amount of monitoring and regulation from within and external to the profession. According to Skar (2009) nurses-related autonomous clinical practice meant the ability to make patient care decisions with the patient and their family, having full control over patient care, and the ability to make independent clinical judgements, choices, and actions about a patient's care. Kramer and Schmalenberg (2008) cited that physicians rated nurses' autonomous decision-making as the greatest indicator of their competence. Therefore, to be independent in practice means having that ability to take a holistic view of the patient's care and work towards meeting those needs, to know that they know (practice knowledge), and to dare or challenge one's practice in the best interest of the patient (Wade, 1999). Some APCs felt they were autonomous in their practice; however, interviewed technologists presented a different picture as they often ignored or questioned the APC's instructions on the need for expedience with some patients. One interviewed APC had also cited the need for improved practice autonomy as his aspirations for the role. Additionally, the fact that APCs are permitted to code only category 1 or 2 CT requisitions and require co-coding with the radiologist of category 3 cases indicates the limited independent nature of this practice.

In describing the autonomous practice of speech-language pathologists and audiologists, Cherow (1994) argued that when given a choice of care between a physician and speech-language pathologists and audiologists, patients often choose the non-physician (speech-language therapist or audiologist) care over physician care. He attributed their choice to patients learning from experience that physicians have little to offer in the management of communicative disorders (Cherow, 1994). Weston (2010) attributed improved patient outcomes to autonomous clinical nurse practice. A position shared by Lane and Friese (2006) and Aiken et al. (2008). However, the question to be asked is what explains the relationship between improved patient outcomes and autonomous clinical practice? It is this author's position that the theory of self-determination may explain the relationship between improved patient outcomes and autonomous clinical practice.

According to Edward Deci and Richard Ryan, the self-determination theory (SDT) "examines people's life goals or aspirations, showing differential relations of intrinsic versus extrinsic life goals to performance and psychological health" (2008, p. 182). The SDT inextricably links the type or quality of a person's motivations to the predicting of outcomes such as psychological health, performance, problem-solving ability, and conceptual learning (Ryan et al., 2008). According to SDT, autonomous motivations where one identifies with the activity's value and links it to one's sense of self results in experiencing self-endorsement of one's action. Autonomous motivations therefore energise and direct practitioners' actions to advocate for the best management of patient conditions. All of the interviewed APCs spoke of their desires to closely engage with patients and the opportunity to help patients beyond that afforded by their technologist role as motivations for joining the APC practice. Additionally, the other research participants also indicated their desire to contribute to positive patient outcomes for all patients in their care.

When practitioners' psychological needs (mental needs that motivate one to achieve goals and perform certain activities) are supported or actualised, practitioners tend to feel more accomplished and a valued member of the multidisciplinary patient care team (Deci et al., 2008). According to Ryan and Deci (2000), research has revealed that threats, tangible rewards, imposed goals, deadlines, directives, and pressured evaluations diminish intrinsic motivations. In contrast, opportunities for self-direction and choice enhance intrinsic motivation as they provide a greater feeling of autonomy. This position is supported by the application of SDT in several research settings, especially in healthcare, where it has been used to investigate attendance in alcohol treatment programmes, adherence to medication regimes, participation in weight loss programmes, and smoking cessation, to name just a few (Ten Cate et al., 2011).

Interestingly, Williams et al. (2003) found that learner-practitioners' perception of competence is linked to medical teachers' support of autonomy. Likewise, Reeves (2002) concluded that students thrive when teachers support their autonomy and that students who are autonomously motivated tend to thrive in educational settings. Ten

Cate et al. (2011) argued from a medical education perspective that medical educators should recognise at an early stage that students' intrinsic patient care motivations could have positive impacts on medical physicians' training. Therefore, as decision-makers and policymakers in the healthcare sector continue to debate the best approach to the many challenges plaguing the delivery of healthcare services, it may be worth supporting advanced practice initiatives for MRTs and radiographers. The APCs interviewed for this research highlighted their intrinsic patient care motivations as the reason for joining the APC team and wanting to extend the role to include coding of category 3 cases.

APCs Also Help Radiologists in Their Workload Management

Workflow interruption and its causation of errors in the medical process is an important aspect of patient safety. So important that the effects of workflow interruptions on patient safety in the medical environment has been extensively studied from the nursing perspective (Hall et al., 2014; McGillis et al., 2010; Sorensen & Brahe, 2014) and the surgical operating room (Arora et al., 2010). Froehle and White (2013) identified inefficiencies, workplace stress, and medical errors that can impact patient safety as a result of interruptions in the workflow in the DI department.

The chair of radiology who is credited with initiating the APC practice at WGH reported the need to utilise technologists' knowledge and skills to reduce the frequency of radiologists' interruptions. He felt these interruptions were unnecessary and that any competent technologist would be able to provide answers to some of the frequently asked questions. A typical radiologist's workday includes image interpretation and report, in-person physician consultations, patient consent, technologist supervision, frequent telephone communications, and management of intravenous contrast injections and adverse reactions, to name a few. These tasks add complexity to the radiologists' workflow and can be distracting and detracting from their primary work of image interpretation (Kansagra, Liu, & Yu 2016). Kansagra et al. (2016) postulated that the complex radiologist workflow has the potential to be counterproductive and contribute to errors in the radiological process. According to Yu, Kansagra, & Mongan (2014), workflow interruptions are a significant contributor to medical errors in the radiologist's workflow.

By virtue of the APC practice performing some of the radiologist's tasks (coding CT requisitions and providing consultations on the appropriateness of studies), the role can be attributed with reducing medical errors as radiologists are interrupted less and can concentrate on their workloads. Additionally, the inclusion of the APCs in the patient care equation also contributed to improved departmental efficiencies by reducing radiologists' interruptions thereby improving their productivity.

In documenting radiologists' perceptions of radiographer role development in Scotland, Forsyth, and Robertson (2007) found that 62% of the radiologists saw the potential benefits as a reduction in overall service and workload pressures on them. Field and Snaith (2013), Lockwood (2016), Henderson, Gray and Booth (2012), Reid et al. (2016), and Plessis and Pitcher (2015) made similar conclusions on the reduction to radiologists' workload as a result of advanced radiographic practice. The reduction in workload pressure can also be seen as potentially cost effective. May et al. (2008) cited a study that showed the registered radiologist assistant saved radiologists some 100 minutes per day of image interpretation time by performing radiological procedures and managing patients' outcomes. This time equated to approximately USD $300,000 per year (May et al., 2008). These savings may be the factor behind the increasing popularity of the RRA practice; 70% of radiologists surveyed in Massachusetts and 80% of those surveyed in New Hampshire indicated a willingness to employ an RRA in 2007 (May et al., 2008). Similarly, Lockwood reported an approximate savings of £300,000 and £145,000 when radiographers report CT heads and MRI scans, respectively (2016), allowing radiologists time to concentrate on more sophisticated procedures. Though quantifying the APC's contribution to the radiologists' workflow is outside the scope of this study, it is suspected that such contribution is significant.

Why the APC Practice Succeeded at Two Hospital Sites but Failed at Another

The success of the APC practice at WGH and WCGH can be attributed to the APC practice being a good fit for the needs of these two hospitals. At the same time, the

APC role was not a fit for CGH owing to labour agreements and the physical layout of the DI department.

Local labour laws play a significant role in the development of emerging clinical practice as these laws are meant to protect not only practitioners but also the general public. The labour unions work with organisations to ensure workers' rights are not violated and that their best interests are always represented. In CGH's case, management is prohibited from creating new positions without the endorsement of the union. All newly created positions require the approval of the union, and the approval process requires the examination of the position's job description, required qualifications, position type (full-time, part-time, or causal), duty hours, and pay scale. Further, once that position is approved, the bargaining agreement requires current employees to be offered first preference in applying for the position before it is advertised to external candidates. When the APC practice was instituted at WGH and WCGH they were both non-unionised institutions and, therefore, were not required to adhere to bargaining agreements. However, during the research process, both institutions became unionised and thus would be required to adhere to similar rules if they were instituting the APC practice today.

Additionally, the physical layout of the departments plays a role in the success or failure of practices. Evidence-based medicine and evidence-based design in radiology (Haar, 2016) have motivated clinical managers to research the impact of departmental design on staff performance, patient outcomes, and overall departmental efficiency (Stein, 2007). A growing body of research has demonstrated that the departmental layout may directly impact patient safety (Joseph & Rashid, 2007; Reiling, 2005; Tourgeman-Bashkin et al., 2013). Further, poor departmental layouts have been linked to compromised departmental efficiency and productivity (Benitez et al., 2018).

This study found the physical layout of the DI department contributed to the abandonment of the APC role at CGH. The primary patient flow coordination function of

the APC role necessitated easy access to most or all modalities, and CGH's DI department was fragmented. Some modalities were located on the ground floor next to the emergency department, and others were located on another floor. This presented an impossible task of coordinating emergency and inpatient access to some modalities of the DI department. Patient flow coordination also requires the positioning of the APC in a centralised position to monitor patient flow patterns into, within, and out of the department. Having the DI department on different floors would present obstacles for the functions of the APC role. It would be challenging for the APC to improve patient access and departmental efficiency from a location that did not afford direct observation of the department's flow mechanisms. This was the reason cited by the lead APC at WCGH for relocating the APC desk to a more centralised position that afforded the practitioner direct observation and access to the department's patient flow mechanisms. The APC office at WGH also has easy access to the department's workflow. The physical layout of radiology departments is, therefore, essential when considering workflow and workflow management, as a suboptimal departmental layout has been implicated as a source of workflow interruptions (Kansagra et al., 2016).

Most DI departments are centralised and located close to the emergency department, allowing for easy access to emergency patients. Additionally, most DI departments are located on the ground floor or the first floor with all modalities on the same floor. This allows for the employment of proper radiation protection measures, easy access for ambulatory and non-ambulatory patients, and workflow management. Research has found that interruptions in the radiology department's workflow can create inefficiencies, which in turn contribute to workplace stress and negative patient safety incidents (Snaith et al., 2016).

What Changes or Developments are Envisioned for the APC Practice

Emerging practices, by design, are structured to change over time. They usually start as one practice approach but then evolve into another approach or format of practice. It was, therefore, important to ascertain the stakeholders' perspectives on the future for the APC and inpatient flow technologist roles. The future practice of these roles, according to research participants across the three research sites, were grouped under three categories: increased patient care responsibility, increased practice autonomy, and increased education.

Increase Patient Care Responsibility

Owing to the recorded improvements in patient outcomes as a result of the introduction of the APC and inpatient flow technologist roles, management at the three research sites would like these emerging roles to evolve to include increased patient care responsibility. WGH and WCGH would like to see the APC role extended to include outpatient services. According to the lead APC at WGH, they are exploring the possibility of extending the APC service to outpatient family physicians. They would like to see APCs in a consultative role to guide primary care physicians in the ordering of DI procedures. It was felt that by assisting primary care physicians, APCs would also be able to provide imaging procedure consultation and furnish physicians with the pre-procedure requirements at the same time. This extension of responsibility, according to stakeholders, would reduce the need for radiologists to request additional information when coding outpatient requisitions for imaging procedures and would improve patient access by decreasing the hurdles and wait times associated with the provision of outpatient imaging services.

Similarly, stakeholders at CGH envisioned the expansion of the inpatient flow technologist to include extended hours of service and advocacy for improved patient care, both within and outside of the DI department. Since the introduction of the inpatient flow technologist, CGH’s DI department has recorded a 13% and 30% reduction in

wait time for ultrasonography and computed tomographic procedures, respectively. It is envisioned that extended hours of service would further reduce these wait times and would also extend services to other modalities such as magnetic resonance imaging and interventional radiology. After all, the primary focus of most DI departments and other healthcare service providers is improving the quality of services provided to patients and clients. However, the multidisciplinary team approach to patient care and other scopes of practices must be considered when discussing the possibility of increasing responsibility for patients with both the APCs and the inpatient flow technologist. This is essential, as radiographic technologists are not the only ones extending their roles. Other healthcare practitioners and professions are also extending their patient care roles into areas once controlled by professionals in other areas.

Increase Practice Autonomy

Autonomous clinical practice is the aspiration of many allied health professions, especially nursing, physical therapy, and speech therapy and audiology (Sandstrom, 2007). However, it must be acknowledged that there are three levels of clinical practice autonomy, namely, professional autonomy, practitioner autonomy, and patient/client autonomy. It should also be understood that “autonomous practice is not a revolution — it is an evolution” (Steve McDavitt, cited in Zeigler, 2009, slide 3). Therefore, the APC’s request for improved practice independence would require the time to examine the implications of the practice, in terms of the law and patient care. With increased autonomous practice and advanced practice, the radiologist would have less contribution, responsibility, and accountability for patient care under the APC practitioner.

However, Hardy et al. (2008) warned that the occupation that gains professional autonomy status and security becomes exposed to increased employer regulations, greater risk of litigation, and higher training costs. In a conference presentation aimed at discussing becoming an autonomous practitioner in physical therapy, Zeigler (2009, slide 23) correctly stated, “Clinical autonomy does not reside in the individual practitioner but, rather, in the contractual space which they practice.” Therefore, autonomous

clinical practice for the APCs and other radiographic practitioners would need to be considered from both the profession's scope of practice and the practice institution's perspective. This position was shared by the two interviewed advanced nurse practitioners working at WGH and WCGH. Both shared their desire for increased autonomous practice consistent with the nurse practitioner's scope of practice. However, some of their scope of practice consistent with autonomous practices were curtailed by their practising institutions.

More importantly, there are antecedents to independent clinical practice that should be addressed and achieved. Knowledge, capacity for decision-making, judgement, independence, and self-determination are precursors to autonomous clinical practice (Hardage et al., 2010; Sandstrom, 2007). The radiologists at WGH are supportive of added responsibilities (extending the coding protocol to include category 3 cases) for the APCs. However, the radiologists support for increased autonomy versus that of shedding responsibility and reducing their workload is questioned. Moreover, it must be restated that the ultimate patient care responsibility for DI patients remains with the most responsible physician—the radiologist. Therefore, increased practice autonomy may be realised but to a very limited level.

Another factor is the desires for increased autonomous clinical practice and advanced practice is the need for undertaking postgraduate education at the master's or doctoral levels. The physical therapy profession mandated the requirement of a doctorate of physical therapy for its autonomous practitioners in the profession's 2020 vision (Zeigler, 2009). Pharmacy practice also requires a doctoral degree for its advanced practitioners. Nursing and speech-language therapy and audiology accept a minimum of a master's degree, but doctorates are preferred. Where does the technologist/APC stand in comparison to these professions? Most of the interviewed research participants did support the vision of developing the APC role and training material to a postgraduate level. Some felt the role did not require much formal training, whilst others felt there was a need for formal training, especially about patient presentations, triaging, and radi-

ological pathology. Developing the APC practice to a postgraduate level could be problematic for several reasons. First, the role does not have enough material for postgraduate qualifications. Second, most of the practice skills and knowledge needed to function in the role can be developed through professional maturity. Third, developing the APC practice to a postgraduate level may create role specialisation and most interviewees were against this move as they felt CT technologists performed better in the role owing to their knowledge of the modality. Additionally, WCGH's APC lead shared the problem of having non-technologist APCs. She attributed this to a lack of consistency in the performance of the role as the non-technologist APCs lacked the modalities workflow knowledge.

Increase Training

In defining advanced practice in medical radiation technology and its attributes, the CAMRT (2015) articulated a position that the advanced practitioner role requires graduate-level education for practitioners to develop advanced clinical and theoretical knowledge, skills, and judgement. The training for the two emerging practice roles examined in this research relied heavily on experiential learning. According to the APCs interviewed, they were promised one-on-one sessions with radiologists to develop their knowledge of clinical presentations, radiographic pathology, appropriateness of imaging procedures per patient presentation, and related laboratory assessments. Instead, they were presented with specific modality cheat sheets and shadowing of other APCs for a five- to seven-day period.

When asked to reflect on the training received and what knowledge APCs used to succeed in the role, all the interviewed APCs indicated their clinical technologist experience to a great extent and the cheat sheets they had available to support their decision-making. Similarly, the inpatient flow technologist at Central General Hospital also attributed her decades of technologist experience as the source of her knowledge and skills. Further, those non-CT technologist/APCs were often cited as the ones to solicit guidance from CT technologists or the radiologist whenever faced with complex cases.

Graduate-level educational preparation is, therefore, important in preparing technologists for emerging roles in the radiology department. Several emerging practice and advanced radiographic practice experts (Ford, 2010; Kelly et al., 2008; May et al., 2008; Snaith & Hardy, 2007; White & McKay, 2004) have identified the importance of graduate-level education for emerging and advanced practice roles. However, most of the literature on advanced radiographic practice address the UK's perspective and present the required qualifications of masters and doctoral degrees for the advanced practitioner and consultant practitioner, respectively (Ford, 2010; Kelly et al., 2008; White & McKay, 2004). The radiologist assistant in the United States requires a master's degree similar to the nurse practitioner and advanced practice nurse. However, this is below what is required of the pharmacist, physical therapist, speech-language therapist, and audiologist.

Therefore, the APCs' identification of a lack of training necessitates the need for not only increased training but also a structured format of training for APCs. Such formal training includes patient presentations, radiological pathology, radiographic pattern recognition, and pathophysiology, according to the interviewed APCs. Training, education and evaluation are very important in the development, institution and sustainability of the advanced practice in medical radiation technology initiative. Only via training, education and evaluation can MRTs bring advanced clinical, technical and professional competencies to the multidisciplinary team to assist in the improvement of patient care services.

Role Extension or Advanced Practice?

To examine the APC role and determine if it constituted the criteria required for role extension or advanced practice designation, this research adopted the concept definitions as presented by Snaith and Hardy (2006). They defined the concepts of role extension and advanced practice as implying "**supplementary skills and responsibilities that extend beyond the statutory responsibilities and competencies at the point of profession registration**" (p. 328) and "**the development of a role and the**

application of knowledge to benefit and modernise clinical practice" (p.329), respectively. Snaith and Hardy's (2006) study also considered the attributes of advanced practice as presented by the CAMRT (2015). The CAMRT (2015), which had given its perspectives on the advanced practice for MRTs and articulated its recognition of the principles of advanced practice to constitute **improving patient outcomes**, **critical thinking**, **complex decision-making**, **leadership,** and **the autonomy of the role**.

By applying the measures of the principles of advanced practice as presented by the CAMRT (2015), the APC role exhibited these principles; however, only to a deficient degree. Owing to the reduction in patient wait times and improvements in patient education and satisfaction recorded by this research, it can be accepted that the APC role does contribute to improving patient outcomes. Further, the APC role has also demonstrated the need for critical thinking and some amount of complex decision-making as exemplified by APC decision-making pertaining to coordinating departmental patient flow and the allocation of human resources. However, the complex decision-making threshold was low, given that cheat sheets were often used to guide decision-making. Additionally, the act of critical thinking and complex decision-making depended on the APC's experience and primary area of clinical practice. It was often mentioned by research participants that CT technologists functioned better in the role because a significant amount of the work included facilitating requests for CT procedures. However, CT technologists' ability to perform better in the APC role may be attributed to factual knowledge rather than critical thinking ability.

The principle of leadership was demonstrated in the APC's role of being a multidisciplinary team member. Owing to the nature of their role, APCs can enhance and strengthen collaboration by sharing their DI knowledge and expertise within the multidisciplinary healthcare team. APCs also function as the modality supervisor in the absence of a designated supervisor and therefore are often required to step outside of their APC and technologist roles. Further, APCs guide emergency physicians in the appropriateness of their requests for DI procedures. They also provided similar guidance to other physicians, nurses, and members of the multidisciplinary team on DI procedures and

the requisite patient preparations. However, on the principle of autonomy of role, the threshold was shallow. APCs are constrained to act within defined boundaries as established by the protocolling manual developed by radiologists and the DI department.

The autonomy of role usually evolves and requires the development of responsibilities and accountability as presented by the scope of practice of the profession and the environment within which it is practised. The autonomy of practice also requires participation in postgraduate education. The interviewed APCs requested further education as they expressed their disappointment with the training, describing it as insufficient and inefficient. Additionally, APC patient care decisions were often overturned by either the attending radiologist or technologists performing the procedure. Further, the nature of the APC role is not holistic as it entails the handing off of patient care to other professionals (technologists) thus resulting in the lack of ability to see the provision of patient care through to the end. However, the role continues to achieve its mandate of improving patient access to DI services.

The findings of the assessment of the principles of advanced practice are also supported by the survey data. The advanced practice statements that aimed at measuring autonomy of role, decision-making and required educational levels recorded low scores. However, statements aligned with role extension scored high for being ***task oriented, designed to optimise and satisfy local needs***, and ***practice entailed a practice previously reserved for another profession***. Similarly, 83% of research participants felt the original objectives of the APC role were more aligned with advanced practice. However, 56% felt that the current practice of the APC role was more aligned with role extension. Therefore, after analysing the findings of this research and considering the definitions of role extension and advanced practice adopted by this study, along with the principles of advanced practice for MRTs as presented by the CAMRT (2015), it can be stated that the advanced practice role did not demonstrate the criteria for advanced practice designation. Instead, the APC role as presented at WGH and WCGH is more consistent with the emerging approach of role extension. Nonetheless, the role has contributed to improved patient outcomes at WGH.

Limitations of This Research

There are limitations to the findings of this study. These limitations primarily have to do with the inability to fulfil the recruitment of research participants and the random selection of participants from West Central General and Central General Hospitals. I had initially proposed the sampling and performance of 33 semi-structured face-to-face interviews over the three research sites. Instead, a compromise was required at WCGH. This institution was in the process of unionisation and therefore personnel pertinent to the gathering of information on the APC practice were reluctant to participate. These practitioners refused to participate because they feared that participation could compromise their employment status. Those who did volunteer refused to be recorded and eventually insisted on the interview questions being converted to a survey format. This was done, and as a result, it eliminated the ability to randomly select participants and probe responses to questions. However, for the two APCs from WCGH who participated, it would have been profound to perform face-to-face interviews with them to deeply explore their practice nuances. The limited data collected from WCGH indicated that WCGH has some practice divergences from that of Western General Hospital. Face-to-face interviews with the opportunity to perform follow up questioning have the potential to hermeneutically and phenomenologically enrich my findings and research.

Similarly, at CGH, it was difficult to locate personnel who participated in the trial of the APC role at one of the hospital's previous sites. The amalgamation of the three sites into one resulted in the redundancy of some staff who either opted for early retirement or accepted severance packages. Therefore, few current staff at the new hospital site had knowledge of the APC practice. The few who did know refused to participate, aside from one person offering conversational information. Again, random sampling was not possible, and therefore, the two radiology personnel who volunteered to participate were the only providers of information on the APC practice that had been tried at CGH. Neither was part of the trialled practice. Greater participation from these two sites would

have increased the robustness of the findings of this study and influenced the conclusions drawn. However, sufficient information was collected from WGH to answer the research questions.

Another limitation is the generalisability from a small sample. Data were only collected from 20 out of the proposed 33 research participants. Additionally, access to program documents and quantitative measures of patient outcomes were not attained for WCGH. However, the data collected at WGH was sufficient to inform the findings and draw conclusions.

Discussion Summary

The APC role was designed to meet the local needs of improving the productivity of radiologists and the DI department. The APC practice originated at the Western General Hospital where it has positively contributed to improving patient outcomes in the form of reductions in patient wait times for diagnostic studies and improved patient satisfaction. It can be assumed that the APC role has provided similar improvements in patient outcomes at West Central General Hospital, the sister hospital of Western General Hospital. However, with regard to Central General Hospital, the practice was tried at one of the original sites but failed owing to labour mandates and the layout of the DI department. Moreover, the current Central General Hospital has adopted a modified version of the APC practice, called the inpatient flow technologist. The difference between this role and the APC role is that the inpatient flow technologist only attends to inpatients whereas the APC role attends to both emergency room patients and inpatients.

From the cross-case analysis performed, it was determined that the APC role demonstrated the principles of advanced practice as presented by the CAMRT (2015), but did so to varying degrees. The APC role demonstrated adequate levels of improved patient outcomes, critical thinking, and leadership. However, the principles of complex decision-making and autonomy of role were felt to be below adequate. It was decided that the APC role did not meet the criteria for professional designation of advanced practice. Instead, this emerging practice role was more consistent with role extension.

The time is therefore overdue for the examination of whether new models of practice for medical radiation technology are needed, especially given that population growth continues, and healthcare practitioner numbers are on the decline. Professional boundaries and practices are more blurred than ever before, and it seems as though everyone is extending their practice into other professions. As the MRT profession contemplates advance practice, other professions are organising their approach to include practices once performed by technologists. To date, the only recognised Canadian advanced MRT practice is in radiation therapy (CAMRT, 2018) though MRT roles in Can-

ada continue to be developed and branded as advanced practice roles. Notwithstanding, perhaps the CAMRT advanced practice framework should have considered the inclusion of advanced roles or specialists according to modalities. The Australian Advanced Practice Working Group outlined several advanced practice specialist roles for both diagnostic and therapeutic radiographers (Advanced Practice Working Group[APWG], 2009). Their proposed model included diagnostic imaging specialists in accident and emergency imaging, fluoroscopic and interventional imaging, and ultrasonography. Also included are breast imaging, computed tomography, and medical resonance imaging specialists (APWG, 2009). It is the opinion of this author that had the Canadian framework included advanced MRT practice roles, role development and branding would have taken an organised format, with advanced practice roles meeting the criteria for advanced practice designation. The APC role is an example of an emerging role that is branded as an advanced practice role without meeting the criteria for such a designation.

Implications, Emerging Practice Frameworks, Final Conclusions, and Recommendations for Future Research

This chapter presents the significant implications of the research study. It takes into account all methods and cases, along with the reviewed literature. Also presented are two possible frameworks that could be used to guide the development and introduction of emerging practice roles in medical imaging. Final conclusions and recommendations for future research are also presented.

Implications from the Research

After analysing all the data collected from this research, along with the published literature, several lessons were learnt. The themes of these lessons are 1) advanced practice takes time, 2) title protection is important, 3) practice autonomy evolves, 4) there exist possible associations between the self-determination theory and the improvement of patient outcomes, and 5) role extension also improves patient outcomes. In addition, and more importantly, an understanding is gained that advanced practice is not about defining tasks associated with a role but more about an approach that expands a profession's clinical responsibilities to meet real patient needs.

Advanced Practice Designation Takes Time

The CAMRT (2015), has recognised that there exists a place for advanced MRT practice in Canada. The CAMRT, therefore, started working towards the development of advanced MRT practice sometime around 2005. However, it was only in 2015 that the CAMRT was able to publish its vision of advanced MRT practice in Canada through the publication of its advanced MRT practice framework. The establishment of a working definition of advanced practice took approximately 10 years and entailed lengthy discussions with several professional groups including the Canadian Association of Radiologists (CAR), the Canadian Association of Radiation Oncologists (CARO), provincial partner organisations, and other professional groups (CAMRT, 2015). At the same time,

the CAMRT was working on the development of advanced MRT practice, the Ontario advanced practice radiation therapist project also commenced exploring advanced practice roles for radiation therapist (Harnett et al., 2018; Harnett et al., 2019). Seventeen years onward, the introduction of the advanced practice role for radiation therapist has resulted in increased patient access and quality of cancer care in Ontario Canada (Harnett et al., 2018).

Similarly, in 2001, the American Society of Radiologic Technologists (ASRT) initiated discussions with other organisations regarding advanced practice for radiologic technologists (May et al., 2008). Their discussions were based on the success of the advanced radiographic practitioner in the United Kingdom. However, it was not until 2006 that a radiologist assistant curriculum was finalised and adopted by the ASRT (Paul, 2009). According to the two interviewed advanced nurse practitioners and Paul (2009), advanced practice in nursing arrived in Canada in the 1960s. However, after close to six decades, the nurse practitioner's role continues to evolve and be defined as nurse practitioners continue to aspire to practice according to their college's scope of professional practice. These time frames inculcate the understanding that the establishment of advanced practice takes a considerable amount of time, effort and resources.

Title Protection Is Important

The Medical Radiation Technologist (MRT) designation is a protected title in Canada, similar to registered nurses and nurse practitioners. The Canadian College of Nurses regulates the nursing profession in Canada and restricts the use of the nurse practitioner designation to only registered nurses who have completed both a master's degree in nursing and courses specific to the nurse practitioner's role. Similarly, a person who was successful at the CAMRT registry examination can use the title of MRT. Title protection lends credibility to the profession, assures the transferability of skills, and protects the general public from fraud and unsafe practices (CAMRT, 2015). According to the CAMRT (2015, 2018), the only recognised and, therefore, certified advanced MRT practice is the advanced practice registered technologist (therapy) as presented in the Ontario initiative.

Therefore, roles such as the advanced practice coordinator and others are not certified by the CAMRT and are not recognised as advanced practice registered technologist roles. This is important as only the CAMRT can provide title protection for MRTs in Canada. However, provincial regulating bodies in Canada can perform the role of the CAMRT by setting educational standards, regulations, and legislation that govern the advanced MRT practice in that province. A recent check of the College of Medical Radiation Technologists of Ontario proved futile for advanced roles in diagnostic imaging in Ontario province. Similarly, the use of the term “registered” with the radiologist assistant role in the United States denotes ARRT certification as a registered radiologist assistant. Notwithstanding this, state regulatory bodies play the role of gatekeeper to practices in their states and, therefore, dictate the terms for practising within state lines. In 2008, registered radiologist assistants were permitted to practice in 29 out of the 50 states in the United States (Petree, 2015).

Concomitant with title protection is the establishment of the scope of professional practice for advanced MRT practice. For nurse practitioners, the College of Nurses regulates their practise through the establishment and publication of the nurse practitioner’s scope of practice. It is envisioned that CAMRT would need to publish an advanced MRT scope of professional practice to provide role developers with an understanding of the practice boundaries for advanced practice roles. The issue of title protection is, therefore, pivotal to the advanced medical radiation technologist practice initiative. With the current debate on advanced practice and emerging practice roles being developed and haphazardly designated advanced practice status, the need to control role development designation is urgent. Formulating advanced practice models, roles, and practices takes time as emerging practice roles continue to evolve. Title protection is also important as advanced practitioners contrast to entry-level practitioners as they are equipped with an assemblage of higher-order cognitive skills (e.g., decision-making, critical thinking, problem-solving, etc.), in addition to advanced clinical skills and attributes.

Autonomy Evolves

Steven McDavitt, cited in Zeigler (2009), presented the argument that autonomous practice evolves and clinical practice autonomy resides in the practitioner's contractual space and not in the individual practitioner. The APCs interviewed for this research shared their desires for increased practice autonomy. However, they are not cognisant of Steven McDavitt's position regarding the evolution of practice autonomy. This is a position the nurse practitioners interviewed for this research knew very well. Both nurses described how their autonomous practice has changed over time. Although the nurse practitioner's practice and abilities were aligned with the scopes of practice as provided by the College of Nursing, they were required to demonstrate their competence to physicians. This confirms the understanding that whilst a profession's scope of practice may permit a high degree of practice autonomy, the employer or consignee of the practice can dictate the level of practice autonomy to be enjoyed by advanced practitioners. The nurse practitioners' experiences should be a signal for the radiographic profession in Canada. It has been nearly 50 years since advanced practice nursing was adopted in Canada, and nurse practitioners are today still aspiring to be autonomous clinical practitioners.

Similarly, the registered radiologist assistant in the United States continues to aspire for practice autonomy equivalent to their local nurse practitioners. Nurse practitioners in the United States are permitted to perform primary care physician services similar to family physicians and to bill Medicare and Medicaid for reimbursement, similar to physicians (Petree, 2015). Conversely, the advanced practice radiologic technologist cannot perform procedures without the presence of a registered radiologist in the environs of the medical practice. Radiologist assistants also cannot bill Medicare and Medicaid for reimbursement. Instead, such reimbursements are billed by the lead practitioner or most responsible practitioner, the radiologist. This underscores the understanding that advanced practice initiatives take a considerable amount of time, effort, courage and motivation.

The Possible Association Between the Self-Determination Theory and the Improvement of Patient Outcomes

There is a widespread belief that advanced practice guarantees improved patient outcomes (Aiken et al., 2008; CAMRT, 2015; Land & Friese, 2006; Weston, 2010). However, this argument lays not solely or primarily with proving or disproving this belief but more so on examining what explains the association between advanced practice and improved patient outcomes. The present study attributes that possible association to SDT, which examines life goals and aspirations of individuals and the differential relationships between intrinsic and extrinsic life goals and performance. The self-determination theory also links the type and quality of a person's motivations to the predicted outcomes such as performance, problem-solving ability, and conceptual learning, all skills needed for advanced practice.

Skar (2009) argued that nurses' intrinsic desires and ability to make independent patient care decisions with patients and their families, having full control of patient care, and the ability to make an independent clinical judgement are indicators of autonomous clinical practice. Further, Schmalenberg (2008) presented that physicians rated nurses autonomous clinical practice as the most significant indicator of their competence. However, this competence is driven by the nurses' desires to make independent and interdependent clinical decisions that would result in improved patient outcomes. Nurses and other healthcare advanced practitioners value improved patient outcomes and link it to their objective of providing patient care services. This results in practitioners having a wholistic approach to the care of their patients, which possibly contributes to the desired improved patient outcomes.

This argument supports the increasing popularity of a team-based approach to patient care as the approach of choice for healthcare providers. Additionally, it has been established that the combined efforts of medical and non-medical practitioners can result in positive patient care experiences beyond that provided by a singular medical professional (Grumbach & Bodenheimer, 2004). Cost containment could also be realised

as a result of the lower pay rates of non-medical practitioners along with improved practitioner job satisfaction, and improved practitioner retention rates.

Role extension also improves patient outcomes

Emerging practices often evolve as a result of local needs. However, whether it is role extension, expanded practice, enhanced practice, extended practice, or advanced practice, the objectives are the same, to improve patient outcomes. Nonetheless, because of the current propagation of advanced practices in professions allied to medicine that aspire to situate and brand their practice as an advanced practice, a perception has been formulated that advanced practice is the best approach to guaranteed improved patient outcomes. The findings of this research, while limited, indicated that roles situated in the role extension approach can also contribute to improved patient outcomes. Further, the findings also indicate that emerging practice roles evolving from real patient needs can also provide tangible patient benefits.

There are varying presentations of improved patient outcomes, from increased access to patient services to reduced patient wait times and improved patient satisfaction. However, these primary patient care benefits have led to secondary benefits in patient cost containment, improved job satisfaction for professionals, and increased need for a multidisciplinary approach to the delivery of patient care services. This study recorded improved patient outcomes in the form of reduced procedure times, improved patient education, and improved patient satisfaction.

Advanced Practice Does Not Define Tasks Associated with a Role

The fact that advanced practice can improve patient care in a variety of ways speaks to the proliferation of advanced practice initiatives in all facets of healthcare. Beyond the realms of patient care, advanced practice also contributes to improvements in system efficiency, facilitating time efficiency for other team members and improving practitioners' satisfaction and retention rates. Another advanced practice benefit to the

healthcare system is the delivery of comparable care at a lower cost. With all of this considered, it can be seen how the advanced practice approach goes beyond the defining of tasks associated with specific roles. Instead, it is engineered to foster the ability to provide comprehensive improvements in the delivery of patient care services. Therefore, it can be stated that advanced practice is more complex than a specific task associated with a role. According to the CAMRT (2015), advanced practice describes the practitioner's day-to-day activities and responsibilities unlike role extension or extended role that describes a singular activity. Therefore, advanced practice means that all practitioners under that umbrella practice are equally competent at performing those activities and responsibilities. The advanced practitioner brings advanced clinical, technical and professional competencies to the existing healthcare team and performs specific duties in an autonomous way, making more advanced clinical decisions in their area of specialisation. These valuable skills and attributes are developed on an in-depth, advanced knowledge of the theoretical principles of the advanced practitioner's discipline. Therefore, the singular activity of the APCs adapting the coding responsibilities of the radiologist is questionable at qualifying as an advanced practice role. Instead, it infers a sense of the development of a role in response to local pressure, role extension.

Role extension does not represent a wholesome transition to a higher level of functioning and practice. Instead, role extension frequently occurs in response to local need in a particular area. As a result, a well experienced or senior practitioner may be asked to move outside of his or her usual scope of practice in a practical and skills-based way. The resultant added responsibilities usually involve the acquisition and application of narrowly defined knowledge and skills that eventually become part of the required entry-level education and competencies. For instance, research participants described inconsistencies by some APCs in the execution of some of their responsibilities. Two CT technologists described these inconsistencies as the lack of knowledge and competence to perform certain tasks that APCs who are CT technologists are capable of performing. One such task is performing intravenous cannulation. This is now an entry-level competency that must be demonstrated by all technologist. This inconsistency in practice is accurately captured in Harnett's et al (2018, p. 86) argument that the "term

AP [advanced practice] is used inconsistently" and applied to roles that do not qualify as advanced practice roles.

Emerging Practice Frameworks

Emerging practices are developed to improve the delivery of patient care services. The approach best suited for anyone situation depends on several variables, including local issues, regulations, the professional scope of practice, and support from within and outside of the profession, to name just a few. However, the application of the correct practice designation to emerging practice roles cannot be overstated, as the use of the correct terminology is important for concretely and consistently explaining the practitioners' role to consumers, healthcare policymakers, and other healthcare professionals.

Now that the CAMRT (2015) has established and published a definition along with the principles of advanced practice for the medical radiation technologist, it is time for the profession to begin identifying practice areas that can be developed to advanced practice status. However, the approach to emerging practices in medical imaging should not be undertaken in a haphazard format. Instead, an organised and structured approach should be fostered. Nonetheless, the framework on advanced practice in medical radiation technology presented by the CAMRT (2015) failed to consider several issues, including local issues. The inclusion of local issues and others strengthens the advanced practice initiative and are presented in the proposed advanced practice framework presented later in this chapter.

This research examined one emerging practice in medical imaging, the APC role, from a Canadian perspective to ascertain whether it is a professional practice designation, role extension, or advanced practice. One of the objectives of this study was also to explore the development and suggestion of possible frameworks that could inform the successful development and introduction of emerging practices within medical imaging.

This research, therefore, presents two possible emerging practice frameworks, a collaborative learning approach for role extension and a framework for advanced radiographic practice.

A Collaborative Framework for Role Extension in Medical Radiation Technology

One of the questions asked of the interviewees was related to the preliminary discussion on the possible development of the APC practice to a formal program to be offered at the postgraduate level. A number of the interviewees did not think the current APC program/practice had enough learning material or was challenging enough to deserve a master's degree award. Another concern expressed was the financial viability and sustainability of such a program from the perspective of an institution of higher education. Further, some interviewees felt that by developing the APC practice to a course of study, a specialised sub-modality would be created and would result in the recruitment of non-technologist practitioners who do not possess the required imaging experience. However, the complaints about non-technologist practitioners performing the APC role are baseless. Should the APC role be developed to advanced practice status and offered at a postgraduate level, the CAMRT or the CAMRTO would regulate this practice. It would require practitioner registration in medical radiation technology as their primary practice stream and advanced practice as the secondary stream. This would be similar to the nursing profession's approach, where nurse practitioners are also required to first be registered nurses.

However, the findings of this research and the debate presented in the literature confirm that both advanced practice and role extension evolved as a perceived need to address local issues in the delivery of healthcare services. Interestingly, there continues to be a growing trend of higher education addressing the needs of employers (Foskett, 2005; Saunders & Machell, 2000; Tett el al., 2003). There are also increasing calls for a change to how healthcare professionals are educated and the need to foster a patient-centred practice approach to the delivery of everyday healthcare services (Gilbert,

2005; Herbert, 2005). This call for change requires new educational models to facilitate learning in the clinical environment to develop not only knowledge but also skills or competencies that reflect best practices and that are grounded in evidence. One such approach, as described by Eddy (2010), is a collaborative partnership.

The collaborative partnership as presented by Eddy (2010) is the design, delivery, and evaluation of a program by one institution and the awarding of credits by another institution. In this case, the imaging department designs, delivers, and assesses the course of study, and the credits are awarded by a higher education institution after a process of validation to ensure academic standards are established and maintained. However, Trim (2001) posits that for such partnerships to succeed, value systems should be aligned. A successful collaborative partnership, therefore, requires elements such as the clear outlining of common purpose and complementary skills.

In exploring a collaborative partnership designed to integrate education, practice and research initiatives in nursing practice, Downie et al. (2001) presented a synopsis of several collaborative models that have been used and published in the nursing literature between the period of 1989 and 1997. Irrespective of the adapted model, the most frequently cited benefits included an improved knowledge base, job satisfaction, and increased self-confidence (Downie et al., 2001). These are benefits that would be beneficial to the APC practice and the radiographic profession as well. However, common barriers, such as employee burnout, role conflict, role overload, and role ambiguity, were also cited.

From an APC perspective, the didactic and related clinical competencies would be designed, delivered, and assessed by the host hospital. The credits associated with the APC practice could be awarded by higher education institutions such as the Michener Institute of Applied Sciences or McMaster University. This award can be at the level of a postgraduate certificate or diploma. Further, a collaborative partnership can also be fostered with the CAMRT for the offering of the APC program as a professional

development course. This would ensure practitioners are recognised for their learning and expertise in areas of practice beyond the level of initial professional registration.

For decades, training of radiographers had been situated within hospitals. The hospital-based nature of the training of radiographers slowly moved to institutions of higher education in the mid-1960s with the graduation of the then radiography occupation to that of radiography profession. A great example of a collaborative partnership is the one between the Union County College and JFK Muhlenberg Harold B. and Dorothy A. Snyder School of Radiography, located in the state of New Jersey in the United States.

The JFK Muhlenberg School of Radiography was established in 1964 as a hospital-based program to meet the local demands for graduate radiographers (Hackensack Meridian Health JFK Center, 2018). In 1982, the JFK Muhlenberg School of Radiography established a collaborative agreement with Union County College whereby the professional radiographic courses are developed and administered by the JFK Muhlenberg School, and the degree of Associate of Science is awarded by Union County College (Hackensack Meridian Health JFK Center, 2018; Union County College, 2018). However, graduates are eligible to transfer their 80 credits towards further studies for an award of a Bachelor of Sciences degree at any institution within the United States.

Another example of a collaborative partnership between the employer and higher education was illuminated by Foskett (2005) in her study of workforce development via the collaborative partnership route. Foskett studied the collaborative interaction between a charitable organisation and a higher education institution aimed at developing the charitable organisation's apprenticeship in-house guide dog mobility instructor (GDMI) training program into a diploma award (2005). This provided an opportunity for the charity’s staff to study at the higher education level for the award of diploma and therefore ensured their training and experiences would be transferable.

Higher education institutions can benefit from collaborative partnerships in many ways including providing lifelong learning opportunities, enhancing their accreditation work-based learning abilities, and helping employers address the needs of the communities in which they are located (Foskett, 2005). Further, though concerns are merited, the two examples (Foskett, 2005; Union County College/JFK Muhlenberg Schools, 2018) of a collaborative partnership between industry and higher education did not initially meet the criteria to be designated a higher education course or program. However, owing to the recognition of shared values and understandings, successful collaborative partnerships were fostered. Therefore, reflecting on the original objectives of the APC practice according to the stakeholders (reducing wait times by expediting requests for imaging procedures at this hospital), a collaborative partnership may be a good fit for this program and its practitioners.

A Framework for the Development and Implementation of Advanced Practice in Medical Radiation Technology

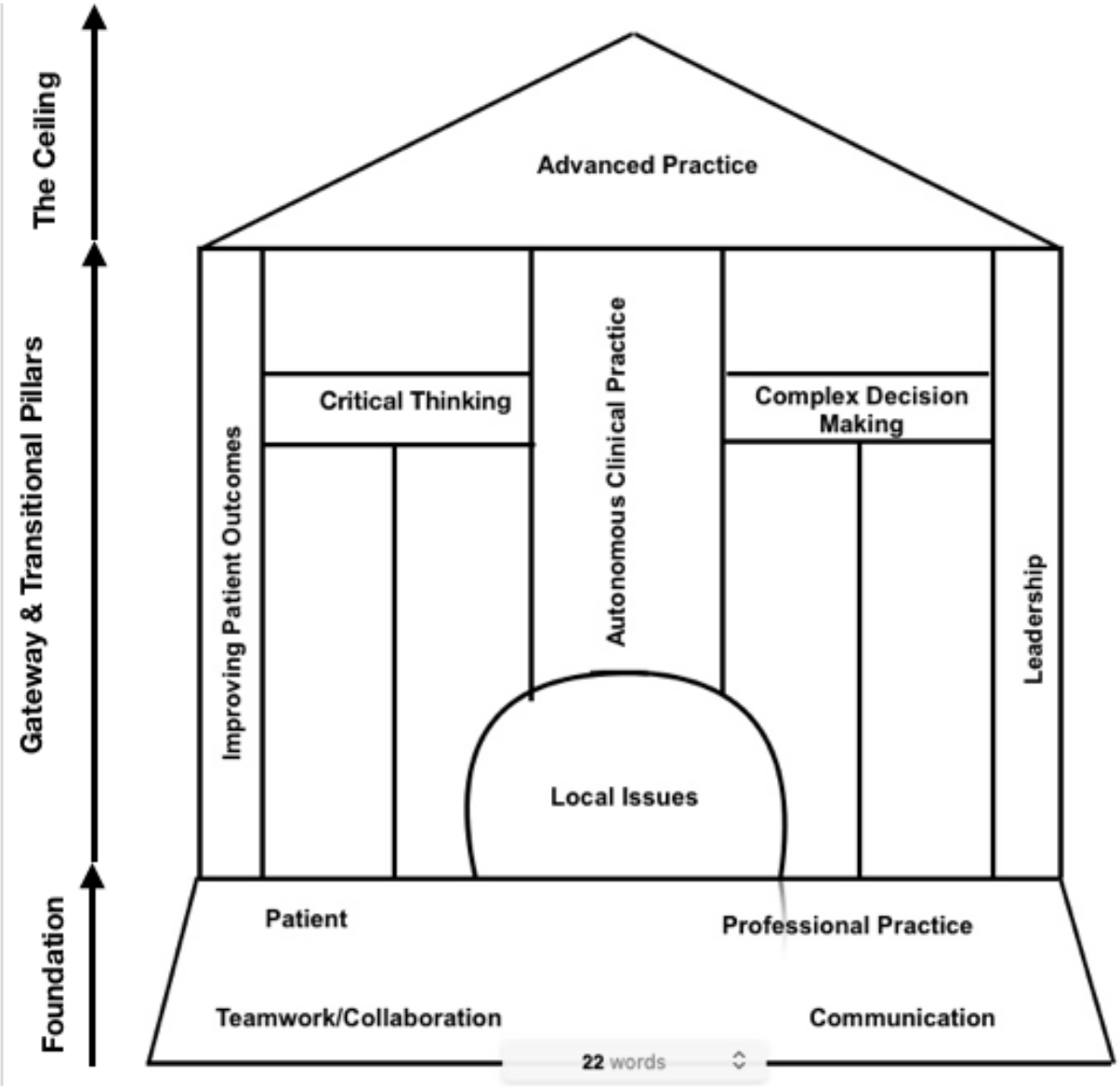
The advanced practice framework presented in figure 5 forms a concept that can inform the development and introduction of advanced practice in medical imaging. The design of the framework was adapted from a conceptual model of characteristics of advanced practice in the medical radiation professions as proposed by Smith et al. (2015). The base and pillars design that leads to advanced practice was adopted as it presented the understanding of the need for a strong practice base and several pillars upon which advanced practice stands. However, added to the concept by this author are gateway requirements. Gateway requirements or local issues are those that are endemic to a certain locale, state, or province. Local issues vary from location to location and from state to state as practice standards and regulations may dictate. The gateway requirements are presented as an arched doorway that provides access to the pillars of advanced practice. Once gateway requirements are actualised, the development of advanced practice becomes possible.

Smith et al.’s (2015) conceptual model, was developed by the Advanced Practitioner Advisory Panel of the Australia Institute of Radiography. The concept draws

strong references from the CanMEDS framework (Frank and Danoff, 2007; Smith et al., 2015), which was developed by the Societal Needs Working Group of the Royal College of Physicians and Surgeons of Canada. The CanMEDS framework was developed to inform the educational curricula of specialist medical practitioners. It is competency-based and therefore can be easily adapted to match most healthcare professions' competency based curricula and training (Smith et al., 2015).

The framework as presented here outlines the conditions that should exist or be worked on to facilitate the introduction of an advanced practice. This is divided into core or foundation (base) requirements, gateway requirements (local issues), and transition requirements (transitional pillars) that all lead to an advanced practice (ceiling; see in Figure 5).

Figure 5. A framework for the development and implementation of an advanced practice in medical imaging (adopted from Smith et al., 2015).



Core or Foundation Requirements

The base or core is especially thick as it represents the pre and early post-professional registration stages of a practitioner's professional life. The core requirements are those competencies stipulated at the time of professional registration in that all practitioners entering the profession of medical imaging should be competent providers of

patient-centred care. They should also demonstrate professional practice, effective communication, and foster a great teamwork approach. Typically, two years post qualification/registration is required for upward and lateral movement within the profession. This assumes that within those two years, practitioners would be able to demonstrate a patient care practise specific to the medical imaging profession. Further, they should have acquired the skills and abilities that would set them apart from the beginning practitioner.

Patient Care

Providing patient-centred care forms the core requirements of all healthcare professions. It includes the provision of compassionate and empathetic care that is provided in the best interest of the patient's well-being. Patient care is centred on attending to the medical, physical, and emotional needs of the patient and his or her family, within the profession's scope of practice. Without the need to provide patient care, there would be no need for patient care providers.

Professional Practice

A professional practice is very important for ensuring public trust in practitioners that provide patient care services. Professional practice speaks to the way practitioners treat themselves, their patients, colleagues, and the general public. For the medical imaging profession, professional practice may cover practices such as appropriate radiation protection for self, patients, and peers and practising correct universal precautions. Also included are accepting responsibility for one's actions, representing the profession in positive ways, and inculcating an attitude of lifelong learning. These and other responsibilities are presented in the profession's codes of professional conduct and tenets of the profession's bill of professional ethics.

Collaboration/Teamwork

With medical imaging professionals working in a multidisciplinary healthcare environment comes the need for collaboration and teamwork in the provision of patient care. Each practitioner, therefore, depends on the other to ensure the effective management of patients' medical, physical, and emotional well-being. High-level collaboration skills are also needed for the provision of educational information to groups outside of the medical imaging profession and to the public at large.

Communication

Communicating (oral and written) is an essential task of all healthcare practitioners. However, effective communication is very important for medical imaging practitioners as the provision of examination information greatly assist in securing patient cooperation and the successful performance of the radiological examination. Communication skills are required for the effective transmission of pre- and post-care instructions to patients, obtaining informed consents, and attending to patients' request and needs in a humane and empathetic way. Communication skills are also needed to collaborate with other healthcare practitioners in the interprofessional work environment.

Gateway Requirements: Local Issues

Gateway requirements are those requirements that act as enablers or barriers to the attainment of advanced practice. If gateway requirements are successfully addressed, access to the transitional stage for advanced practice becomes possible. If they are not addressed, transitioning to advanced practice can be hampered. Gateway requirements are presented as local issues in the proposed framework (Figure 5). Local issues represent the factors such as local needs, labour, radiologist and institutional support, technologist enthusiasm, financial compensation, advanced practice employment opportunities, and availability of training that have been identified by the literature as barriers to advanced practice. Local issues are unique to a practice's country, state, and institution, and therefore may vary between countries, states, and institutions.

Local Needs

Local needs should always be taken into account when considering the introduction of an advanced practice. The local needs for additional medical and non-medical healthcare workers form a good indication of the environment conducive to the introduction of an advanced practice. Local needs may indicate the need for additional clinical skills beyond those of the standard registered medical imaging professional or the need for an increase in the number of practitioners providing that service. The APC practice as presented in this research was enacted out of local needs to improve patient access to the DI department services. Evaluating the local needs would consider the labour laws that govern those practitioners along with their scope of practice.

Local Labour

Local labour plays a very important role in the transition of allied health professions from traditional practice to advanced practice. The industrial labour unions are instrumental in ensuring workers' rights are not violated along with seeking the best interest for their members. Some professional organisations, such as the UK Society and College of Radiographers, perform this role. They negotiate on behalf of employees and establish practice and employment standards, policies, and conditions (Smith et al., 2015). This situation was described in the Central General Hospital's case, where their local labour agreement prevented that institution from developing and implementing new job titles and positions without the prior approval of the union.

Institutional Support

The implementation of advanced practice in medical imaging is designed to assist in the increase of patient care, workflow, creating efficiencies, and decreasing wait times. It is designed to aid the medical imaging department in functioning more efficiently and providing more effective patient-centred care. Institutional support ranges from the allocation of study time to the recognition of the role and the responsibilities associated with the role. This is similar to that of radiologist support for the role. Without such support, the implementation of advanced practice would be a significant challenge.

The APC practitioners continue to receive tremendous institutional support for their patient care role.

Radiologist Support

The blessings of radiologists for medical imaging practitioners assuming some of their responsibilities is very important in the quest to see practitioners practising at an advanced level. After all, it is the radiologists who are relinquishing facets of their practice that guarantees not only employment but also an avenue for other trainee radiologists to enter the profession. Yielder et al. (2014) conducted a survey that found 63% of respondents perceived a lack of support from the radiologist as a barrier to the implementation of advanced practice. This lack of support was recorded as the largest perceived barrier. According to Forsyth and Robertson (2007), 64% of Scottish radiologists surveyed believed that radiographer role development would provide a better use of human resources (technologist and radiologist). This is interesting as the literature (Field & Snaith, 2013; Thom, 2018; Yielder et al., 2014) has also presented clinical resistance from radiologist and physicians as a concern for the advanced radiographic practice initiative.

Nonetheless, this research has demonstrated overwhelming radiologists support for the APC role. One radiologist recognised the abilities of the technologist team and motivated for the institution of the APC role. With a combined effort, the APC role was able to assist radiologists with workloads and contribute to improved patient outcomes. The changing dynamics of the provision of healthcare services coupled with the increasing shortage of healthcare professionals, especially radiologists, will continue to drive the reform of healthcare delivery (Smith et al., 2015), similar to the cases presented in my research.

MRT Enthusiasm/Lifelong Learner

MRT enthusiasm and the espousal of a lifelong learner philosophy are important to the advanced practice initiative. No one can force a practitioner to pursue advanced

practice. That practitioner has to see the advanced practice as part of his or her future self. Yielder et al. (2014) recorded MRT enthusiasm as a strength in the implementation of advanced practice. My research has documented the varied levels of enthusiasm that motivated the interviewed MRTs to apply for the APC role. They cited the opportunity to practice at an advanced level, the opportunity to try something new, and the financial rewards as motivating factors in their decision to become advanced practice coordinators.

Practitioners' motivations (intrinsic or extrinsic) are very important in the transition from entry-level practitioners to advanced practitioners. This position is supported by my belief that the self-determination theory explains the association between advanced practice practitioners' intrinsic motivations for wanting to actualise improved patient outcomes. According to the self-determination theory, human beings are naturally inclined to grow and the three innate psychological needs of competence, autonomy, and relatedness are satisfied, humans are naturally motivated to grow individually and professionally (Ryan & Deci, 2000; Deci & Ryan, 2008). It is, therefore, my suspicion that that advanced practitioners' intrinsic motivations are aligned with the medical profession's philosophy of doing good for all patient. Advanced practitioners have therefore adapted the medical profession's value system and made it theirs to benefit patients.

Financial Compensation

Yielder et al. (2014) in their presentation of establishing an advanced practice for medical imaging in New Zealand found that 20% of medical radiation technologist surveyed perceived financial compensation as a barrier to the implementation of advanced practice in New Zealand. Financial compensation was the second largest barrier to advanced practice in their survey. However, this research has identified financial rewards as a motivating factor for MRTs wanting to practice as APCs. The interviewed APCs indicated they receive a higher hourly rate than the average technologist. The difference in hourly pay rates between technologists and MRTs is attributed to the increased responsibilities of the APC role according to the previous chair of radiology at WGH.

Advanced Practitioner Tier/Employment Opportunity

The availability of an advanced practitioner tier or employment opportunities for this category of practitioners is tantamount to that of institutional support and financial compensation. If an advanced practitioner tier is established without the establishment of the requisite financial reward, practitioners may see the role as an exploitation of their professional worth. Of course, the financial reward for this role comes via institutional support but may also be stipulated by the agreement negotiated by the labour unions and professional bargaining body. The findings of this research and the literature (CAMRT, 2015; Paul, 2009) have indicated the need for an advanced MRT practitioner's tier in Canada.

The Availability of Training Programs

The availability of training programs is aligned with certification and professional registration. Yielder et al. (2014) found supporting education/training deficiencies to be a perceived limitation that is impacting advanced practice roles in New Zealand. In my study, APCs felt that the advanced practice coordinator role should be developed to a postgraduate level so they could be academically recognised for their practice. However, as the APC training was designed and administered in-house, formal certification remains a problem. Formal certification of the APC role would require the establishment of a partnership between the two health institutions and an institution of higher learning.

Educational institutions should be prepared to support the advanced practice movement. The nursing profession has available several postgraduate programs to assist their practitioners in accessing the specialised knowledge and skills needed to transition from general nurse practitioner to advanced nursing practitioner. The same needs to be made available for medical imaging and other allied health professions. This is important as without the provision of advanced courses, certification, and postgraduate registration, the advanced practice initiative would most likely fail. Additionally, to have the advanced practitioner title and job description protected, there needs to be established certification and registration policies (White & McKay, 2002). Policies are neces-

sary as there are a plethora of titles and job descriptions that are being used in the medical imaging profession worldwide that continue to be counterproductive to the quest for professional identity (Furlong & Smith, 2005).

Transition Requirements (Pillars)

Transition requirements, or pillars, are conditions needed for the introduction of an advanced practice. These are the requirements that could see the registered practitioner transitioning to advanced practitioner status and therefore represent the five principles of advanced clinical practice. Five transitional pillars are required to fulfil the requirements of advanced clinical practice. Of the proposed five pillars, three are major pillars, and the other two are supporting pillars. The major pillars are autonomous clinical practice, improving patient outcomes, and leadership, whereas the supporting pillars are complex decision-making and critical thinking. Complex decision-making and critical thinking were designated supporting pillars as their developments are fostered through the development of an autonomous clinical practice, leadership, and improved patient outcomes. The three major pillars connect the base to the ceiling. The support pillars also rise from the base but connect with the major pillars to strengthen their support of the ceiling (advanced practice). Descriptions of the three major pillars are presented first, followed by the two supporting pillars. However, all principles of advanced practice are interrelated and complementary. Further, according to the CAMRT (2015, p.3) “within an advanced practice role, all principles would be woven into the scope of and expectations of practice and employed in day-to-day practice activities to elevate scope and influence.”

Autonomous Clinical Practice

Independent practice is the hallmark of all real professions (Fleming, 1998). Independent clinical practice is defined as the capacity to make clinical practice judgements and decisions freely and independently and without hindrance, in the best interest of the patient (Parland et al., 2000). Practice independence is also the desire of advanced practitioners (Brown, 1998; Department of Health, 2010; HEE, 2018; Kelly et al., 2008;

Martino & Odle, 2007) as autonomous clinical practice is the coveted requisite for professional status (Ballou, 1998). However, the ability to be independent in one's realm of practice is dependent on one's ability to demonstrate sound professional judgement and decision-making, and being accountable and responsible for patient care (Hardy & Snaith, 2006; Kelly et al., 2008; Smith et al., 2015). The ability to practice independently can be developed with advanced professional knowledge and experience. However, this ability should be exercised within existing professional, regulatory, and organisational parameters (Weston, 2008). Further, independent practice must first be present in the profession's scope of practice and within the practice environment. Therefore, the realisation of autonomous clinical practice takes time.

The findings of my research indicate a lack of autonomous clinical practice. Interviewed APCs have indicated their desire for increased practice autonomy consistent with advanced practice; however, this may not be realistic as interviewed nurse practitioners spoke to their experiences of the curtailing of nurse practitioners' independent practice at WGH and WCGH. Further, the possible influence of the self-determination theory (Ryan & Deci, 2000; Deci & Ryan, 2008; Ryan et al., 2008) on autonomous clinical practice to effect improved patient outcomes should also be considered in the advanced practice initiative discussion.

Improving Patient Outcomes

Improving patient outcome is central to the development and implementation of advanced practice (Brown, 1998; CAMRT, 2015; Kelly et al., 2008; Martino & Odle, 2007). Improving patient care can entail increased access to care, improved quality of care, and improved patient satisfaction. The present study has demonstrated that the APC role has contributed to improved patient outcomes in the form of reduced wait times, improved patient satisfaction, and better patient education.

It is argued that the combined efforts of medical and non-medical practitioners can improve patient outcomes (Grumbach & Bodenheimer, 2004). Such combined ef-

forts are confirmed by the understanding that non-physician professionals can contribute to cost containment as they are lower paid and possess some caregiving skills not possessed by physicians (Grumbach & Bodenheimer, 2004). These premises should be cited as motivations for the development and institution of advanced practice for professions allied to medicine. However, improving patient outcomes is inextricably linked to the concept of practice autonomy (Cherow, 1994; Weston, 2010).

Leadership

The CAMRT (2015) posits that leadership is a central attribute of advanced practice as it presents the profession's role to other professionals in the multidisciplinary practice environment. Snaith and Hardy (2006, p.145) cited leadership as the "ability to motivate and inspire others . . . to maximise their potential and optimise service delivery.” Hence, advanced practitioners are seen as leaders in their profession and amongst the interdisciplinary team as they are tasked with increasing workflow, creating efficiencies, and decreasing waiting times (Yielder et al., 2014).

Advanced practice, therefore, includes leadership in areas such as research, mentoring, education, and patient advocacy (HEE, 2018; Nightingale & Hogg, 2003). Leadership may also include both teaching and curriculum development for higher education programs, local and international conference speaking and mentoring of undergraduate and postgraduate students, among other things.

Complex Decision-Making

The healthcare environment is sophisticated, and the multidisciplinary approach to patient care increases this complexity. Advance practice, therefore, requires practitioners to embrace a multiperspective approach to problem-solving and decision making (HEE, 2018; Kelly et al., 2008; Martino & Odle, 2007). Analysing, synthesising and integrating information from a variety of sources and maintaining objectivity in their approach to decision-making aids practitioners in improving their complex decision-making abilities, thereby increasing their level of responsibilities and practice autonomy (CAMRT, 2015; Department of Health, 2010; Hardy & Snaith, 2006).

Every day, radiographic practitioners are required to exercise critical decision-making skills, be it on the quality of their images, whether to irradiate the patient a second or third time, performing supplemental views to demonstrate pathological conditions accurately, or knowing their limitations and practising within (Snaith & Hardy, 2006) them. Nonetheless, those practising at an advanced level are required to make life-altering decisions that can affect patient care outcomes and are therefore required to be objective in their evaluation of up-to-date practice knowledge and reliable research evidence (Smith et al., 2015). Advanced practitioners are, therefore, required to possess sound knowledge of research principles and adeptness in the interpretation of research findings that can inform judgements relative to patient care. They are thus required to think critically in the provision of the patient care services.

Critical Thinking

Critical thinking is a core element of professional practice, as it is essential to the evidence-based practice paradigm (SCoR, n.d.; Smith et al., 2015; Snaith, 2013). Complicating matters further is the fact that practice knowledge is expanding at an unprecedented rate. New discoveries and new technologies are creating many alternative healthcare choices for everyone. Critical thinking, therefore, requires advanced practitioners to interpret, analyse, synthesise, evaluate, infer, and reflect on evidence to inform their professional practice and complex decision-making (Hardy et al., 2008; Cirocco, 2007; DoH, 2010). In the complex decision-making process, advanced practitioners are often unconsciously reflective on their practice. The concepts of critical thinking and reflective practice overlap (Swanwick et al., 2014). Critical thinking requires practitioners to move outwards and explore multiple lines of enquiry, whilst reflective practice is inwardly directed to investigate experience and practice (Cirocco, 2007).

Reflective practice is widely accepted not only as a learning tool but also an evaluation tool designed to improve a practice by continually evaluating the practice introspectively (Sim & Radloff, 2009). Practitioners who are reflective before, during, and af-

ter practice are better able to critically examine their practice to improve and better address patient needs (DoH, 2010). Sim and Radloff (2009) argued that reflective practitioners assume ownership for their learning, are open to new ideas, strive for practice improvements, and are holistic in their approach to problem-solving. Reflective practice is recognised as an enhancement to nurses' problem-solving abilities. Hence, the College of Nurses Ontario has mandated reflective practice as a requirement for continued licensure (Cirocco, 2007). Cirocco (2007) therefore applied a critical thinking tool developed by the CNO to determine whether nurses engaged in reflective practice and whether they perceived it enhances their critical thinking ability. Cirocco found that all of the surveyed nurses have engaged in reflective practice and 71% reported improvements in their nursing practice as a result of engagement in reflective practice (2007).

The Ceiling: Advanced Practice

Once the base requirements are attained, local issues are addressed, and the principles of advanced practice are enshrined in the practice role, the role will have attained advanced practice status. The ceiling is the desired outcome of the transition process from a general practitioner to advanced practitioner. This is akin to clinical leadership as presented by Smith et al. (2015), where the advanced practitioner is seen as someone who possesses expert knowledge and is an outstanding clinical practitioner. He or she is also able to influence and manage change and serves as an expert liaison between the medical imaging profession and other neighbouring medical and allied health professions. The advanced practitioner would be empowered to use his or her autonomous clinical practice to improve patient outcomes and the provision of patient care services.

Contributions to New Knowledge

The objectives of this research were to examine the APC role and thereby gather a comprehensive understanding of the role, to determine if the role meets the criteria for role extension or advanced practice designation and whether the role influenced patient

care. The findings of this research confirm the belief that local needs are the driving force behind emerging practices in radiography/medical radiation technology. Further, the findings also confirm that roles grounded in attributes of role extension can contribute to improving patient outcomes. The APC role presented in this study has successfully demonstrated its usefulness in improving patient access to DI at the studied institutions. Also presented is the self-determination theory as a possible explanation for the association between advanced clinical practice and the realisation of improved patient outcomes.

The findings also demonstrate that local issues such as labour regulations play a significant role in the success of emerging practices. Local issues should, therefore, be confronted and addressed at the inception of the role development process, especially with advanced practice roles. More importantly, it must be understood that practice autonomy of the developed role is not automatically inherited owing to the scope of practice of the profession. Instead, an autonomous practice is dependent on the practice environment or institution.

Nonetheless, roles continue to be developed and incorrectly branded as advanced practice without incorporating the principles of advanced practice into such roles. As a result, there continues to be confusions in the presentation of practitioners' patient attributes to the public and other members of the multidisciplinary team. I, therefore, searched for possible frameworks that could inform the development and implementation of emerging practices in radiography. As a result, this research presented two realistic approaches to the development of role extension and advanced practice roles in medical radiation technology. The proposed frameworks consider several mitigating factors and provide workable opportunities for the achievement of such practice roles. The collaborative approach to role extension ensures that practitioners are recognised for their learnings, and their skills are transferable to other organisations and locations. Also presented is a realistic framework that considered all of the significant mitigating

factors that can inform the successful development and introduction of advanced practice in medical radiation technology. The findings and proposed frameworks can also inform medical radiation technology and healthcare management curricula.

Final Conclusions

The emerging practice of the advanced practice coordinator role was developed out of the need for better utilisation of technologist skill sets and the offering of diagnostic imaging services for extended hours. The APC role was therefore designed to improve patient access to DI services—a patient flow management role. These two catalysts positioned the APC role to positively contribute to improved patient care in the forms of reduced wait times and improved patient education and satisfaction. However, the APC role as successfully practised at Western General and West Central General Hospitals failed at Central General Hospital owing to labour laws and the physical layout of the previous diagnostic imaging department. Nonetheless, Central General Hospital morphed the APC role into an inpatient flow technologist role that also has contributed to reductions in inpatient wait times. This role differs from the APC role in that it is dedicated to inpatient flow management.

After the application of the measures of the attributes of role extension and the principles of advanced practice to the APC role, it can be concluded that the APC role possessed attributes of both role extension and principles of advanced practice. However, the advanced practice principles were demonstrated to low degrees except for improving patient outcomes and critical thinking. Complex decision-making and leadership principles were exhibited to moderate degrees. Nonetheless, the principle of autonomy of the role that guides advanced practice did not exist despite some interviewed APCs feeling that they were autonomous in their practice. It can, therefore, be concluded that the advanced practice role as presented in this study did not meet the criteria for advanced practice role designation. Instead, the practice as studied at Western General and West Central General Hospitals is more consistent with role extension.

Implications for the Medical Radiation Technology Profession in Canada

Practices continue to emerge to meet the demands for patient care services. However, the emergence of practices has far-reaching consequences for the profession, practitioners, and patients. The determination by this research that the advanced practice coordinator role did not attain the criteria for advanced practice designation has implications for the medical radiation technology profession in Canada. It raises the issue of emerging practice roles being developed and assigned role designations without the rigour of role analyses.

This research, therefore, urges the meticulous role analysis to be considered whenever radiographic role development is engaged. The correct application of role description is important for the radiographic profession to concretely and consistently articulate practitioners' role to consumers, healthcare policymakers, and other healthcare professionals. It is also important in the positionality of the profession within the multidisciplinary team approach to the delivery of patient care services. More importantly, the correct application of role designation would inform the development of curricula focused on emerging practice, and shape role descriptions and related practice agreements.

The findings from this research also assist in shaping the research landscape and improving the evidence-based practise approach of the radiographic profession (Harris, 2010; McGuffin, 2015). Research is important in growing the profession's body of knowledge and illuminating the profession's practice that is based on empirical evidence. Further, empirical evidence should be used to inform the advanced practice initiative internationally, thereby creating a singular emerging practice journey path for medical imaging. This can be similar to the International Council of Nurses Nurse Practitioner/Advanced Practice Nursing (ICNNP/APN) network. The world governing body for radiographers, the International Society for Radiographers and Radiologic Technologists (ISRRT) can, therefore, establish an advanced practice committee to inform the

development of advanced radiographic practice internationally. Further, the establishment of such a network can also inform the development of advanced radiographic practice curricula. The development of advanced radiographic practice curricula that compliments clinical practice would provide form and structure to the advanced practice initiative within the profession.

Recommendations for Future Research

Recommendations for future research include:

- The possible association between the self-determination theory and autonomous clinical practice.

- The reality of autonomous clinical practice for medical radiation technologists. There are numerous examples of advanced radiographic practice roles such as the registered radiologist assistant in the United States, the advanced practitioner and consultant practitioner in the UK, and the advanced radiotherapy role in Canada, but what level of practice autonomy is enjoyed by these roles? Therefore, advanced radiographic practice should be examined to determine the levels or degrees of autonomy to practice of these roles.

- Does the introduction of the advanced practice coordinator role reduce the frequency of medical errors?

- Would a forum similar to the International Nurses Council Advanced Nurse Practice be beneficial to the development and implementation of an advanced radiographic practice internationally?

- The testing of emerging practice frameworks that could guide the development and institution of emerging roles.

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Appendices.

Appendix A: Sample of Interview Questions

Title of Study: Advanced Practice Coordinator. Role Extension or Advanced Practice? A Canadian Multi-Case Study.

Possible interview questions.

1. **Program director/manager**

A. Please explain the APC practice/program/role?
B. What is the origin of the APC role, and why was it necessary?
C. Describe the APC practice in detail.
D. In what way/s is the APC practice innovative, compared to other approaches to changing radiological practise locally and internationally?

E. How supportive are other healthcare professions practitioners to the practice and its practitioners?
F. Considering the following definitions:
   A. *Role extension implies supplementary skills and responsibilities that extend beyond the statutory responsibilities and competencies at the point of professional registration, and*
   B. Advanced practice implies the development of a role and the application of knowledge to benefit and modernize the clinical practice
   C. Would you classify the APC practice as role extension or advanced practice?
G. How do you see the APC practice influencing patient care?
H. How do you measure the success of the role and their performance as APCs?
I. What is in the future for the APC role?

2. **Radiologists**

A. Please explain the APC practice/program/role?

B. What is/are your opinion/s of the APC practice?
C. How does the APC role affect your workflow?
D. Does this practice influence patient care? If yes, how?
E. In what direction/s do you see or would like to see this practice go?

3. APCs

A. Please describe the APC practice in detail?
B. What motivated you to apply for this role?
C. According to your experience, what are the highlights and pitfalls of this role?
D. Considering the following definitions:
    A. *Role extension implies supplementary skills and responsibilities that extend beyond the statutory responsibilities and competencies at the point of professional registration, and*
    B. Advanced practice implies the development of a role and the application of knowledge to benefit and modernize the clinical practice
    C. Would you classify the APC practice as role extension or advanced practice?
E. How do you see your APC practice influencing patient care?
F. How do you measure the success of your role and your performance as an APCs?
G. Where would you like to see this practice in the future?

4. Technologists

A. Please describe the APC practice/role?
B. Describe your interactions with the APC practice?
C. According to your interactions and knowledge of the APC practice, what would you say are the positives and negatives of this role?
D. According to your knowledge of the APC practice, would you say the practice influences patient care and if so, how?
E. Considering the following definitions:
    A. *Role extension implies supplementary skills and responsibilities that extend beyond the statutory responsibilities and competencies at the point of professional registration, and*

B. Advanced practice implies the development of a role and the application of knowledge to benefit and modernize the clinical practice

C. Would you classify the APC practice as role extension or advanced practice?

F. What improvements/changes would you like to see with the APC practice?

5. Clericals

A. Please describe the APC practice/role?

B. Describe your interactions with the APC practice?

C. According to your interactions and knowledge of the APC practice, what would you say are the positives and negatives of this role?

D. According to your knowledge of the APC practice, would you say the practice influences patient care and if so, how?

6. Advanced Nurse Practitioners

A. Describe the advanced nurse practitioner role.

B. What attracted you to this role?

C. What special qualifications or experiences needed for this role?

D. How has the medical profession supported your role?

E. How is your nurse practitioner role as perceived by other allied health practitioners?

F. Where would you like to see the ANP role in the future?

Appendix B: APC Survey

Welcome to the Advanced Practice Coordinator program/practice Survey.

Thank you for agreeing to take part in this vital survey aimed at gaining information on the Advanced Practice Coordinator program. Today we will be gaining your thoughts and opinions on this practice to understand the practice of this program better. This survey should only take 8-12 minutes to complete. Be assured that all answers you provide will be kept in the strictest confidentiality. We do not collect identifying information such as name, email address or IP address.

All data would be stored in a password protected electronic format. To help protect your confidentiality, this survey will not contain information that would identify you. Further, in the interest of preserving confidentiality and privacy, you have the option of returning the completed survey via e-mail to sean.richardson@online.liverpool.ac.uk or returning a hard copy via hospital internal mail to Sean Richardson c/o Diagnostic Imaging Department (CT/Angiography), Western General Hospital. You may complete this survey at your pleasure and place of choice. The results of this survey will be used for scholarly purposes only.

Should you have concerns about the research study, please contact me Sean Richardson at 647-970-2640 or sean.richardson@online.liverpool.ac.uk, and I will address your concerns immediately. Should you remain unhappy or have a complaint which you feel you cannot come to me with then, you should contact my primary research supervisor Dr Kalman Winston at kalman.winston@online.liverpool.ac.uk or the university's Research Participant Advocate at (USA number 001-612-312-1210) or email address liverpoolethics@online.liverpool.ac.uk. When contacting the Research Participant Advocate, please provide details of the nature or description of the study, the researcher(s) involved, and the details of the complaint you wish to make. This research

has been reviewed and approved by the University of Liverpool's Virtual Programme Research Ethics Committee and your organisation's ethics in research board. Completion of this anonymous survey constitutes your informed consent to participate in this survey.

Please indicate your response by selecting a response from the following: **Accurate, Neutral, Not Accurate;** as described your APC practice.

1. The APC practice/program requires post registration skills, responsibilities and competencies:

☐ Accurate ☐ Neutral ☐ Not Accurate

2. The APC practice/program entails practice previously reserved for another profession/extended practice:

☐ Accurate ☐ Neutral ☐ Not Accurate

3. The APC practice/program requires postgraduate training, qualifications and credentialing:

☐ Accurate ☐ Neutral ☐ Not Accurate

4. The APC practice/program is task-oriented; provides role specialisation, and is site-limited:

☐ Accurate ☐ Neutral ☐ Not Accurate

5. The APC practice/program does not restrict me to clinical practice:

☐ Accurate ☐ Neutral ☐ Not Accurate

6. The APC practice/program is designed to optimise delivery and satisfy local needs:

☐ Accurate ☐ Neutral ☐ Not Accurate

7. The APC practice/program was developed/is designed to benefit the Medical Imaging profession, and patients, and requires the application of Medical Imaging knowledge:

☐ Accurate ☐ Neutral ☐ Not Accurate

8. The APC practice/program is limited to clinical practice:

☐ Accurate ☐ Neutral ☐ Not Accurate

9. The APC practice/program requires me to function at an advanced level, and requires greater responsibility and accountability:

☐ Accurate ☐ Neutral ☐ Not Accurate

10. The APC practice/program does not require formal knowledge; knowledge and skills are gained via experiential learning/education, and learning is locally initiated:

☐ Accurate ☐ Neutral ☐ Not Accurate

11. The APC practice/program provides autonomous, self-regulated and self-directed practice:

☐ Accurate ☐ Neutral ☐ Not Accurate

12. The APC practice/program develops judgement, decision-making, teaching and leadership skills:

☐ Accurate ☐ Neutral ☐ Not Accurate

13. How would you define or describe the APC practice/program?

_____

_____

_____

_____

_____

_____

_____

13. Which of the partial definitions provided below best describes the original intentions of the APC?

14. Which of the partial definitions provided below best describes the current practice?

Definition 1: **. . . implies supplementary skills and responsibilities that extend beyond the statutory responsibilities and competencies at the point of professional registration.**

Definition 2: **. . . implies the development of a role and the application of knowledge to benefit and modernize the clinical practice.**

Appendix C: Online interview questions for West Central General Hospital staff.

Title of Study: Advanced Practice Coordinator. Role Extension or Advanced Practice? A Canadian Multi-Case Study.

APC interview questions.

A. Please describe the APC practice/role?

B. What motivated you to apply for this role?

C. According to your experience, what are the highlights and pitfalls of this role?

D. How do you see your APC practice influencing patient care?

E. How do you measure the success of your role and your performance as an APC?

E. Considering the following partial definitions:

A. *. . . implies supplementary skills and responsibilities that extend beyond the statutory responsibilities and competencies at the point of professional registration, and*

B. *. . . implies the development of a role and the application of knowledge to benefit and modernize the clinical practice*

F. Which of the above partial definitions best describes the original intentions behind the establishment of the APC practice?

G. Which of the above partial definitions best describes the current APC practice?

H. Where would you like to see this practice in the future?

Appendix D: Ethics approval from the Virtual Programme Research Ethics Committee of the University of Liverpool

Dear Sean Richardson	
I am pleased to inform you that the EdD. Virtual Programme Research Ethics Committee (VPREC) has approved your application for ethical approval for your study. Details and conditions of the approval can be found below.	
Sub-Committee:	EdD. Virtual Programme Research Ethics Committee (VPREC)
Review type:	Expedited
PI:	
School:	Lifelong Learning
Title:	Working Title of Proposal or summary of study scope: Advanced Practice Co-ordinator. Role Extension or Advanced Practice? A Canadian Multi-Case Study.
First Reviewer:	Dr Lucilla Crosta

Second Reviewer:		Dr Morag Gray		
Other members of the Committee		Dr Martin Gough, Dr Rita Kop, Dr Ruolan Wang, Dr Greg Hickman, Dr Marco Ferreira, Dr Kathleen Kelm, Dr Josè Resi Jorge		
Date of Approval:		10/03/2017		
The application was APPROVED subject to the following conditions:				
Conditions				
1	Mandatory	M: All serious adverse events must be reported to the VPREC within 24 hours of their occurrence, via the EdD Thesis Primary Supervisor.		

This approval applies for the duration of the research. If it is proposed to extend the duration of the study as specified in the application form, the Sub-Committee should be notified. If it is proposed to amend the research, you should notify the Sub-Committee by following the Notice of Amendment procedure outlined at http://www.liv.ac.uk/media/livacuk/researchethics/notice%20of%20amendment.doc.

Where your research includes elements that are not conducted in the UK, approval to proceed is further conditional upon a thorough risk assessment of the site and local permission to carry out the research, including, where such a body exists, local research ethics committee approval. No documentation of local permission is required (a) if the researcher will be asking organizations to distribute research invitations on the researcher's behalf, or (b) if the researcher is using only public means to identify/contact participants. When medical, educational, or business records are analysed or used to identify potential research participants, the site needs to explicitly approve access to data for research purposes (even if the researcher normally has access to that data to perform his or her job).

Please note that the approval to proceed also depends on research proposal approval.

Kind regards,

Lucilla Crosta

Chair, EdD. VPREC