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An Analysis of Technical Leadership in Radiology Technology

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AN ANALYSIS OF TECHNICAL LEADERSHIP IN RADIOLOGY TECHNOLOGY

A Dissertation Presented to
The Faculty of the Educational Leadership Doctoral Program
Western Kentucky University
Bowling Green, Kentucky

In Partial Fulfillment
Of the Requirements for the Degree
Doctor of Education

By
Andrew Stephen Kester

May 2017

AN ANALYSIS OF TECHNICAL LEADERSHIP IN RADIOLOGY TECHNOLOGY

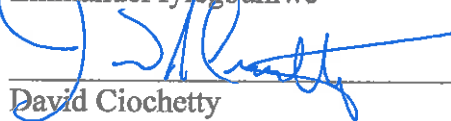
Date Recommended March 7, 2017



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Date

I dedicate this work to my family who has supported me throughout my educational endeavors. Debbie, without your unquestionable support I would not be where I am today. Throughout our 25 years of marriage, you have been by my side during my military career, the transition to life after the Army, and this doctoral degree. Your quiet support of packing a lunch for weekend classes, taking the kids out when I was working on assignments, and proofreading many papers did not go unnoticed. I can never thank you enough for the sacrifices you have made for me. Kyle, you inspire me to be a better father and role model to you at all times. I am proud of the young man you are and the man you will become. Jenna, you will always be my little girl, no matter your age. Thank you for your understanding that education and learning is a never-ending process. Always remember, an educated person does not know all the answers, but knows where to find them. Mom, thank you for instilling in me the qualities of perseverance and determination that have served me well along this journey.

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AN ANALYSIS OF TECHNICAL LEADERSHIP IN RADIOLOGY TECHNOLOGY

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Directed by: Randall Capps, Emmanuel Iyiegbuniwe, and David Ciochetty

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Western Kentucky University

The purpose of this study is to determine whether administrators and supervisors in the field of radiology technology receive leadership training as part of their job and whether there is a significant difference for those who do not receive training. If no training is received, does promotion to a leadership position based on technical proficiency or longevity relate to successful leadership characteristics? Currently, no leadership courses are offered in undergraduate or graduate degrees focused on Radiology Technology. Radiologic technologists are required to choose between advanced degrees in imaging to become more technically proficient or advanced degrees in management or business not specific to radiology in order to gain leadership education.

The study also focuses on the demographics of radiological managers who recognize their need for leadership training and perceived barriers to leadership development within the radiology technology field. Leaders who are not prepared to lead result in increased employee attrition, which directly affects patient care. Four primary research questions guide this quantitative study, which seeks to establish the need for formal and continued education in leadership development at the collegiate level as well as the organizational level.

The results of this study reveal significant differences in leadership characteristics of administrators and supervisors who received formal education and those who did not. The research also showed no relationship with organizations that offer leadership

development and voluntary resignations. Demographic characteristics were seen that were significant to radiologic technologists who exhibit high need for leadership development.

Implications of this research could include introducing leadership courses within the graduate level degrees specific for radiology technology. A recommendation would be to target the organizations and to offer leadership development training, which was indicated from demographics of the participants who responded with high need for leadership characteristic development.

CHAPTER I: INTRODUCTION

Introduction

Smart organizations are becoming flat organizations operating with fewer levels of management. In order for a flat organization to be successful, leadership is important. In the allied healthcare field, radiologic technologists are being selected for management positions based on their technical expertise and years of experience. These technical managers are required to perform duties as technologists as well as manage and provide leadership to their sections. The healthcare industry has the third highest voluntary turnover rate in the nation (Bureau of Labor Statistics, U.S. Department of Labor, 2015). The leading two are the hospitality industry and retail. Radiology departments consist of diagnostic radiology, computed tomography (CT), magnetic resonance imaging (MRI), mammography, ultrasonography, nuclear medicine, radiation therapy, interventional radiography, and bone densitometry. Each has a senior technologist who acts as the assistant to the director of radiology for purposes of staffing, budgeting, patient care, and section management. Educational degrees specific to radiology technology do not offer leadership courses within the curriculum due to the premise that leadership is a non-technical skill. There has been a concentrated effort to increase the leadership capacity for nursing staff (Koteyko & Carter, 2008). This study examines many aspects including the following: (1) Does a need exist for formal leadership training in the radiology course curriculum?; (2) Does technical expertise and experience translate to leadership?; (3) Are there barriers to change in the radiology technology career field?; and (4) Does lack of leadership cause voluntary turnover in radiology technologists.

Background

Assuming leadership is a choice, leaders often make it more complicated than it should be. To have a healthy organization, the leader must build a cohesive leadership team, create clarity, reinforce clarity, and over communicate clarity (Lencioni, 2012). Leading involves a series of skills that are not natural to most people. Skills can be taught, learned, and developed. The root word for leadership is lead, which is an action. Leaders must use action in leading. Kouzes and Posner (2012) reinforced that theory when describing the five principles of leadership: model the way, inspire a shared vision, challenge the process, enable others to act, and encourage the heart.

Many managers within organizations know how to run a department. If not, they would not have achieved their position. The problem arises when managers try to run an organization on strategy, marketing, finances, and technology. None of these practices focus on the internal structure of teamwork or resources of the employees from within the organization (Taplin, Foster, & Shortell, 2013). Managers oversee the day-to-day operations of a department. Leaders develop individuals and build teams. Managers are not always leaders, and leaders are not always managers. Individuals who want to offer organizational change are motivated by opportunities for a challenge and satisfaction while at work. Understanding an individual's position on the hierarchy of needs and giving him/her the opportunity to utilize more potential and move toward self-actualization serve as excellent tools for motivation for leaders (Maslow, 1987). When leaders give employees more control over offering ideas for change, this affords the individual the chance to actualize him/herself and move toward self-actualization and better job satisfaction. Job enrichment is an attempt to motivate employees by giving

them the opportunity to use the full range of their abilities. It can be contrasted to job enlargement, which simply increases the number of tasks without changing the challenge. Enrichment has been described as vertical loading of a job, while enlargement is horizontal loading. With job independence, new ideas and suggestions for organizational change are encouraged from the lowest levels. People, not products, are the real competitive difference between companies, as they will support that which they help to create.

A healthcare leader is held to a higher standard than other professionals due to the service he/she provides. Not only does the leadership affect the employees of the organization, but their decisions affect those seeking medical treatment at their facilities in time of need. The most respected healthcare leaders in the allied health organization can be considered what Robert Greenleaf described as servant leaders (Wren, 1995). These leaders view themselves and act as they are serving others while leading. Many of the technical leaders have grown into that position by first being an effective servant. Having a servant leadership style and being able to successfully address changes within a department will lead to a prosperous healthcare organization.

It is important that a leader adapt his/her leadership style to conform to the environment to promote a healthy organization and to lead change. Leaders are not born but are developed (Argyris, 1957); they are made, which includes being taught. Leadership styles are based upon the organizational setting, education, experience, and mentors and healthcare leaders are no exception. They must be offered a chance to receive the knowledge required to choose a leadership style that works best in their situation. If more healthcare organizations offered leadership development through

seminars, classes, or coaches, fewer leaders would be in culture shock when they are promoted to a leadership position possessing only their technical knowledge and experience. Radiological technologists promoted to a leadership position often have a difficult time adapting to the new role because it is a natural defense response to situations they are not prepared to handle due to lack of experience, training, or mentoring.

The model used in the military, which is the same for many radiologic technologists, is completed through time, training, and track. Leadership in the military is taught based on competency, confidence, and agility (Department of the Army, 2006). It is taught regardless of a soldier's job. All are war fighters first, and their Military Occupational Specialty (MOS) is second. The foundation of military leadership is BE, KNOW, and DO. BE represents the Army Values (LDRSHIP) of Loyalty, Duty, Respect, Selfless Service, Honor, Integrity, and Personal Courage. KNOW refers to their job and the ability to be tactically and technically proficient. DO means acting as a leader in the absence of leadership (Department of the Army, 2006).

The U.S. military has an effective promotion and leadership system. All members are promoted based on leadership potential rather than time in grade. Once promoted to a leadership position, they attend a related leadership school for the level of responsibility assigned with the new promotion (Department of the Army, 2014a). Enlisted soldiers begin their career by learning a technical skill with which they will become proficient over the first four to six years. As they progress through the learning of their job and working within their team, they are afforded the opportunity to compete for leadership positions. Enlisted soldiers who are promoted to non-commissioned officers (NCO)

attend the Warrior Leader Course (WLC), which is intended for entry-level leaders who will be responsible for and lead six to 10 individuals. WLC teaches the foundation that all subsequent leadership courses will build upon. WLC classes are not segregated by job specialties; a combination of all MOSs attend the course together. This policy ensures that the foundation is taught to all enlisted leaders regardless of their job. When an NCO is promoted to a mid-level leadership position, he/she must attend the Advanced Leaders Course (ALC), which builds upon the leadership skills taught at the WLC level and adds job-related skills necessary for that specific MOS. Mid-level leaders are those responsible for 12-25 people. ALC is taught at the branch level segregating the MOSs to enhance their leadership abilities in their job. When the NCO is promoted to a senior leader, he/she is responsible for 30-50 people and attends the Senior Leaders Course (SLC). This course is taught at the branch level similar to ALC with more focus on administrative skills. The pinnacle for a military NCO is to be promoted and to attend the First Sergeants Course and Sergeants Major Course. At this level, the leader is responsible for 70-200 people and is equivalent to a chief operating officer (COO) in a civilian organization (Department of the Army, 2010).

The leadership education system for military officers follows a similar structure as the enlisted leaders (Department of the Army, 2014b). Military officers enlist with little or no military experience. They possess a college degree in their job specialty but may not have leadership experience or experience using such skills. The Basic Officer Leader Course (BOLC) is for entry-level officers who will manage 25-50 people. All military officers attend this course regardless of their position. This is the level at which all officers learn military leadership skills (Department of the Army, 2006). Officers

promoted to company commanders who will manage and lead 70-100 people will attend the Captain Career Course (CCC). Those who are promoted to administrative positions and who will manage 100-150 people attend the Intermediate Level Education (ILE). This position is equivalent to a chief executive officer (CEO) in a civilian organization. Military officers who are promoted to administrative positions to manage and to lead 200-500 people attend Senior Service College (SSC). Leadership and leadership training is an important and crucial part of the military services, and this leadership training design can be incorporated into the healthcare system for leadership development.

Topic

The topic of study for this research is intended to identify the extent of education of radiologic technologists in leadership, either through formal college coursework, institutional programs provided by the healthcare employer, or self-study programs. A quantitative research method design provides a definitive study on the topic of technical leadership among radiological technologists. One open-ended question leads to a qualitative coding design. An explanatory design is employed for this study, in which one open-ended question is supplemented by use of qualitative data to expand the understanding of the quantitative data.

Purpose

The purpose of this study is to determine whether significant differences exist in the leadership characteristics of radiologic technologists with formal leadership education and those without this education. Thus, the Central Research Question for this study is as follows: Does leadership education make a difference in the leadership characteristics exhibited by radiologic technologists?

Research Questions

The broad research questions that are the center of the study are based upon the understanding of leadership. This is not only related to programs of study, but also to the opportunity of career advancement and leadership mentoring. Four primary research questions form the foundation for this research study:

1. Is there a significant difference in the knowledge of leadership characteristics and the developmental need of leadership characteristics exhibited by:
 - a. Administrators with formal leadership education and administrators without formal education?
 - b. Supervisors with formal leadership education and supervisors without formal education?
2. Is there a significant difference in the voluntary turnover rate between organizations that offer leadership development and organizations that do not offer leadership development?
3. What are the perceived barriers to organizational change in leadership development for radiologic technologists?
4. What are the demographic characteristics of radiologic technologists who exhibit:
 - a. High knowledge and high need of leadership skills?
 - b. High knowledge and low need of leadership skills?
 - c. Low knowledge and low need of leadership skills?
 - d. Low knowledge and high need of leadership skills?

Practice Implications

Healthcare leaders are expected to set examples for others as well as to provide leadership guidance. They must be able to understand human nature and be able to motivate those who work for them and encourage them to meet their full potential. Leaders must assume the responsibility to recognize the needs and requirements for their followers as well as for their organization. McFarland, Senn, and Childress (1993) anticipated that a shift to a participative leadership style would need to occur in order for 21st century leaders to be successful. This style is important in healthcare teams, as many healthcare leaders are unfamiliar with leadership styles and the reason this understanding is important unless they have been trained in this area. The desired results for this study are to encourage the implementation of leadership courses throughout the radiologic technology degree course curriculum, to support the importance for leadership development within healthcare organizations, and to support continuous learning for the individual leaders. This process would better prepare radiologic technologists for leadership positions as they lead technical teams. Another envisioned outcome is to encourage radiologic technologists to compete for executive positions in healthcare organizations.

Summary

Organizational change occurs for many reasons. Leaders and their leadership styles determine the acceptance and effect of changes. Change can be a result of necessity for organizational survival or from an innovation to become more productive and profitable. Regardless of the reason, as many different types of organizations exist, there is no all-encompassing template for managing a successful change. However, a system is

available that includes key ingredients: a shared vision, communication, clarity, and having the correct people. Change cannot be completely managed; however, through anticipation and preparation, change can benefit an organization. When a strategy is put in place in the right environment, change will happen naturally.

CHAPTER II: REVIEW OF THE LITERATURE

Introduction

Annual healthcare spending in the US is expected to increase from 17% to 20% by 2024 (McCarthy, 2015). Healthcare organizations require effective leadership at each department level to manage people, property, budgets, and development of technology. The research topic was chosen based upon leadership needs in the allied healthcare field of radiology, with an interest in providing leadership development to mid-level radiology managers to enable them to lead effectively and to compete for executive administrative positions. Positive indicators relating to formal leadership education would benefit the organization through a reduction in absenteeism and voluntary turnover. Many of these technologists are promoted to supervisory or management roles based on that technical experience and not on leadership qualities or potential (Akroyd, Jackowski, & Legg, 2007). These technical leaders are both members and leaders in their healthcare team. Radiology technology undergraduate programs do not include leadership study courses. The organization must take responsibility to promote on not only technical proficiency, but also on leadership potential. Hackman (2002) suggested leaders must have knowledge of some things (within their field), know how to do some things, have emotional maturity, and have personal courage. Technical schools teach radiologic technologists only the first two. The organization must be able to provide the necessary leadership development for new and mid-level leaders in order to be effective in their work. They also must be able to grow and to compete for upper-level positions. McAlearney (2006) defines leadership development as the educational processes designed to improve the leadership capabilities of individuals.

No empirical research has been published on technical leadership of this specific population of medical professionals. This literature review covers research of similar or related constructs that can be used to develop a survey for the intended topic and population. The focus of this study is to analyze the leadership abilities of radiology technical leaders and to justify the need for leadership development in this population. A quantitative research method design that utilizes a self-administered survey may yield questions that could be used for follow-up qualitative face-to-face interviews for a mixed-method research. This is discussed in Chapter IV.

Electronic databases were searched using the following key words: technical leadership, radiology leadership, leadership in allied health, and leadership in healthcare. The term, clinical leadership, is a common example that correlates with the overall research topic and also establishes criteria of the literature review. Databases include the following: EBSCOhost, Google Scholar, ProQuest, RAND Abstracts, Sage Journals, TopScholar, Wiley Online Library, WKU Online Library, and WorldCat. Another resource is the American Society of Radiologic Technologists (ASRT) dissertation directory, which provides research related to the radiologic sciences. The ASRT database included 225 dissertations dating from 1969 to the present. Among these, seven contain leadership within the titles. Of these, three examined leadership behaviors and four researched leadership styles. Only one examined leadership behaviors within a radiology department. The remaining dissertations report on leadership qualities and traits of deans and program directors of educational radiology programs. A broader search of the ASRT database revealed 10 dissertations that contain continuing education in their titles. No empirical research was found that compared radiology managers who have received

formal leadership education or development to those who had such formal training was found.

Leadership Behaviors

The first research review focused on the topic of leadership behaviors and their impact on job satisfaction of medical imaging professionals (Watson, 2007). The researcher concluded that clinical expertise and credibility are the foundations needed by clinical leaders to overcome and are barriers for leadership development. Watson used a quantitative, cross-sectional, correlational research model to complete the study. This topic involves very little previous research data with which to compare and contrast findings. Watson pointed out the necessity to pursue this topic in more detail to promote further interest.

The introduction to Watson's (2007) research pointed out several background factors that lead to poor leadership styles. She indicated that, in the healthcare field, especially technical fields, promotion to a supervisory position is based on technical or clinical proficiency rather than on leadership potential (Garman, Butler, & Brinkmeyer, 2006). In all published healthcare literature from 1970 to 1999, only 3.3% contain research on leadership in allied healthcare fields, with 50% related to the field of nursing (Vance & Larson, 2002). The focus of Watson's research was on both extrinsic and intrinsic motivators. The extrinsic factors were physiologic, safety, and love needs based on Maslow's (1987) hierarchy of needs; the intrinsic factors were self-esteem and self-actualization. Using the model of Full Range Leadership, three styles were assessed and defined (Bass, 1990): transformational, transactional, and passive.

Watson (2007) reported that direct supervisors influence job satisfaction and retention of imaging professionals through open communication, management encouragement of input, professional behavior of coworkers, and professional development. When leaders fail to support these important job-related issues, imaging professionals tend to seek employment elsewhere. In high employee turnover healthcare services, the patient suffers the effect of longer backlogs for procedures, longer wait times, and rescheduling of exams. Watson's goal was to promote the need for medical imaging educators, organizations, and associations to customize leadership and mentorship programs. Currently, most leadership programs are focused on developing management using models from the business sector rather than the skills needed for medical professionals (Cook, 2004).

Only three previous limited scope surveys were found on the related topic, all completed by the American Society of Radiologic Technologists. Without direct comparison studies, Watson (2007) used broad-based literature and related studies to the nursing field to construct similar hypotheses and to structure the survey. The leadership styles chosen were further defined as passive laissez-faire as the avoidance of leadership with little interaction between the leader and followers (Avolio, 1999). This style lowers retention rates, increases stress within the working environment, and decreases job satisfaction because most employees need some level of support from their leader. A transactional leadership style is an exchange of something of value between the leader and the employee that will satisfy independent goals for both (Burns, 1978). Transformational leadership style is a method of developing relationships with followers to inspire, encourage organizational change, and instill self-motivation.

In the review of Watson's (2007) research, leadership styles were further examined and defined. Maslow's (1987) hierarchy of needs and Herzberg's (1974) motivation-hygiene were two theories that were used as a comparison for human motivation. In the hierarchy of needs theory, Maslow indicated that lower-level needs must be fulfilled before higher-level needs become motivators. The lower-level needs associated with this research include physiologic, safety, and love; the higher-level needs include self-esteem and self-actualization. Using these motivators, job satisfaction was assessed. Self-esteem by both leaders and followers is a primary factor relating to job performance. Motivation-hygiene theory introduced by Herberg used the motivator's recognition for work, ability to complete work successfully, the responsibility to accomplish work, the opportunity for advancement, the opportunity for growth, and the work itself. The hygienic factors are organizational policy and procedures, supervision, pay, the work environment, interpersonal relationships, and security (Herberg, 1974). These factors are intrinsic to job satisfaction in that they assist the individual to achieve self-esteem and self-actualization needs. Pay can be a motivator when an individual views it as a reward or acknowledgment of achievement.

Watson's (2007) research involved a single research question: Does a relationship exist between the perceived leadership style of the supervisors of frontline medical imaging professionals and the satisfaction with extrinsic intrinsic motivation factors of frontline medical imaging professionals' jobs? From her research question, eight hypotheses were formed based upon the relationship between the leadership styles of the supervisors and the intrinsic and extrinsic motivating factors of the employees. Within the hypotheses, there was either a positive relationship or no relationship between the

factors. The leadership styles for the hypotheses were transformational, transactional contingent reward, transactional management-by-exception active, and laissez-faire. The intrinsic motivators were self-esteem and self-actualization, while the extrinsic factors were physiologic, safety, and love needs.

Watson's (2007) research incorporated a quantitative, cross-sectional design using correlational statistical analysis. A cross-sectional survey was appropriate for this research for the purpose of investigating issues in a diverse population to discover attitudes, beliefs, opinions, or practices within specific groups. The cross-sectional research consisted of a three-part survey. The first part examined the leadership styles of transformational, transactional, and passive. The second part examined frontline medical imaging professionals' job satisfaction in relation to intrinsic and extrinsic motivating factors. The third part of the survey gathered demographic data that included gender, age, and work status. The purpose of the survey was to test the theories of leadership and job satisfaction, to compare the relationship between leadership styles and motivators, and to examine these issues in the diverse population of medical imaging professionals in a short period.

The potential population of medical imaging professionals within the US was approximately 260,000 at the time the study was conducted (American Registry of Radiologic Technologists, 2006). The criteria for inclusion were to be a registered radiologic technologist, to be employed in an acute care facility in the US, and to be employed as a staff medical imaging technologist. Two pilot tests were conducted prior to the final survey. The first pilot survey was mailed to 90 random imaging professionals inquiring about interest in participation in the final survey. Of the initial test survey, only

13 returned a response to be included. A second pilot test survey was electronically mailed to 90 random imaging professionals. Of those invited through electronically mailed surveys, only six responses were received accepting the invitation. With the two test pilot surveys completed, a 10% response rate was seen.

The intent of the initial sample was 3,000 invitations but was increased to 6,000 due to the response rate. A random sample of 6,000 medical imaging professionals was invited to participate. In the survey, nine levels of leadership behaviors and five levels of motivators were assessed. Using 14 variables, the appropriate sample was determined to be 420 (University of Phoenix, 2004). Within the literature review, the researcher found reference that a sample size of 350 to 400 is adequate to achieve a confidence level of 95% for a quantitative survey sample of a population over 1000 (Creswell, 2005). A total of 359 completed responses were returned that qualified for the survey. The results of the electronically mailed survey were collected through a secure website and downloaded in an Excel spreadsheet. Surveys received through the U.S. Postal Service were manually entered into the Excel spreadsheet for analysis. These data were imported into SPSS 15.0 to perform descriptive and inferential statistical analyses.

Parametric tests were used to perform correlational analysis, and the confidence level was established at 95% with results considered significant at $p < .05$. Descriptive analyses were conducted to determine the central tendency and variability of the sample data. Central tendency outcome was in terms of the mean, median, and mode and variance in terms of standard deviation for each of the nine leadership measures, the five job satisfaction factors, satisfaction with the work environment, satisfaction with the job,

satisfaction with supervision, and commitment to employer. A Likert-type scale was employed using a 0 to 4 point rating scale.

The results of the survey concluded that the overall responses for perception of exhibition of transformational and transactional leadership behaviors by supervisors fell between the rating for once in a while (1) and fairly often (3). Overall responses for perception of exhibition of passive leadership behaviors by supervisors fell between the ratings for not at all (0) and sometimes (2). Responses for satisfaction with extrinsic and intrinsic motivators were between the rating for neither dissatisfied nor satisfied (2) and somewhat satisfied (3) for the medical imaging leadership and job satisfaction. Final responses for satisfaction with job, supervision, and work environment were between the rating for neither dissatisfied nor satisfied (2) and somewhat satisfied (3). Responses for commitment to employer fell between the rating for neither dissatisfied nor satisfied (2) and very satisfied (4) on the Likert-type scale used for the medical imaging leadership and job satisfaction survey.

Using Pearson's correlation coefficient, an inferential analysis was conducted with the results of the medical imaging leadership and job satisfaction survey to test the eight hypotheses. Six of the eight null hypotheses were rejected, resulting in the alternate hypothesis being accepted for having relationships between certain leadership styles and motivating factors. Two null hypotheses were accepted with results $p > .05$.

In the discussion area, the researcher identified the possible bias of respondents of the U.S. Postal Service and electronically mailed surveys. The response rate for this study was 6.6%. Lack of response to the survey posed the potential for sample bias and statistical errors due to the exclusion of potential data from the individuals who chose not

to participate. Also, surveying only frontline staff working in acute care healthcare facilities limited the generalizability of the study to this specific group of medical imaging professionals. Another limitation was the use of self-reporting mechanisms, as the potential for false reporting must be acknowledged and potential false reporting must be considered for the validity of the study. Within the survey, the assessment of job satisfaction also was limited to intrinsic and extrinsic motivators specifically designed to measure satisfaction with the job and the work environment for medical imaging professionals and interpreted by individual respondents.

Watson (2007) recommended the study be repeated using a larger sample due to the low response rate. Verification of the model developed through the current research study may provide healthcare organizations and medical imaging leaders with justification for developing work redesign and leadership development programs based on this model. This research topic was broad in concept and specific in nature. The perception of leadership style affecting employee motivation levels is an issue that is seen and dealt with through a case-by-case situation. No all-encompassing leadership style can work in every leader to follower venue. With the past research of the same topic limited to three studies, this shows either a need to research more or no demand for this type of study. The research has merit and shows results demonstrating the need for more specific leadership programs in allied healthcare. As stated in the research, most leadership programs and classes focus more on management than on leadership. This suggestion for future study supports the intended research.

Leadership Development in Healthcare

Currently, an emphasis on leadership development exists in all levels of healthcare. The American Medical Association (AMA, n.d.) has made physician leadership a top initiative. Any change in an organization must first obtain buy-in at the top to show the support for the rest of the organizational levels to follow. The struggle is to overcome the culture set by the healthcare industry. McAlearney (2006) conducted a study on the need for leadership in healthcare organizations. One of the main issues for leadership development programs in a healthcare organization is that leadership and business skills are not taught in medical school programs. Physicians, by position, are leaders of medical teams upon graduation. This introduces a gap in educational and developmental priorities within the organization. Specific hierarchically structure challenges between clinical and administrative sides impede organizational learning. These challenges only reinforce the need for leadership development at all levels in the healthcare organization.

Aaron's (2005) research included 284 self-evaluated radiologic technology program directors on leadership styles. One of the outcomes showed that 69% of the program directors report their preferred method of learning leadership skills is through workshops and lectures. Learning through actual experience was preferred by 31% of the program directors, along with the same percentage preferring network and learning through mentors. Reading articles for improving leadership skills was preferred by 23% of the research group. King's (2002) research on the deterrents to web-based continuing professional education concluded that survey respondents prefer printed materials over electronic materials. This outcome may be contradicted if repeated due to the increase in

availability of electronic media since the initial study in 2005.

The study design for McAlearney's (2006) research included 35 expert informant interviews and a study of 55 organizations reported to provide healthcare leadership development. The qualitative method consisted of open-ended questions to provide a framework and to allow for probing for additional information. The expert informants were selected based on their reputation in the healthcare industry, using a snowball sampling technique. These experts were from healthcare associations, universities, consulting organizations, and provider organizations. The interviews consisted of questions relating to their leadership development experiences. The organizations that were selected for the study were those that self-reported to have provided a leadership development program. One hundred twenty-five interviews were conducted with these organizations; the respondents included executives, directors, managers, and program participants. This survey consisted of questions regarding the structure and format of the leadership development programs offered by the organizations. There were no non-responses to this survey method with either the experts or the organizational case studies. The interviews were on average one hour each for the key informants and 45 minutes for each organizational case study.

Interviews were audiotaped and transcribed for review. The outcome provided over 1,000 pages for analysis. McAlearney (2006) employed the constant comparative method of qualitative data analysis utilizing common techniques to code the data and a grounded theory approach for interpretation. Results of the coded variables revealed six common themes, the first theme was industry lag. Healthcare industry has fallen behind in leadership development compared to other industries. Some respondents estimated that

the industry is as much as 15 years behind. The second theme was representativeness; healthcare organizations should be representative of the community and those it serves. The third theme was professional conflicts. As noted earlier, the challenges between administration and clinical departments make any changes difficult. The fourth theme was time constraints. Healthcare staffing does not facilitate time from the clinical setting for individuals to attend leadership development programs. The fifth theme was technical hurdles. Many healthcare organizations do not have technical equipment such as computers, video conferencing, classrooms, or technical staff to support a leadership program. The final theme in this study was financial constraints. Many healthcare organizations do not have a budget or department for leadership development.

McAlearney (2006) concluded that any changes in healthcare leadership development would involve the effect of strategy, culture, and structure. Organizational leaders who believe in the value of learning support and sustain a leadership development program. Evidence of such support comes from healthcare organizations that provide a position for a Chief Learning Officer on the executive staff. The limitation of this study was the snowball sampling, which limited the selection of experts who are reputable in the industry, as well as organizations that already had a leadership development program.

Doh (2003) conducted a study to determine whether leadership can be taught and, if so, can it be learned. Doh's qualitative research design centered around five questions: Can leadership be learned? Can leadership be taught? How can leadership be taught? To whom can leadership be taught? By whom can leadership be taught? His panel consisted of six experts in the field of leadership and education who are well recognized by their writings, consulting, and executive coaching. Three of the interviews were conducted

face-to-face and three were conducted through email. The face-to-face interviews were recorded and transcribed. Common themes developed as a result of the interviews. All panel participants indicated they believe leadership, in general, could be learned. Each panel member had stipulations for their comments that included the following: focus is needed to learned leadership capacities, not everyone can master leadership but anyone can improve on his/her leadership, and some people are more prone to be leaders based on their personalities.

Doh's (2003) panel of experts agreed that leadership can be taught. A caveat was added, depending upon the student and the teacher. The panel concluded that leadership is an action; in order to teach an action, both thinking and doing are required. Being taught and reading books about leadership is only part of leadership development. In most leadership courses, common practices are taught; however, for a particular learner those practices may not be effective in their situation. The learner must implement that which he/she was taught and learned from both successes and failures.

Federal healthcare organizations consist of the Department of Defense, the Department of Veteran Affairs, and the Department of Health and Human Services. These organizations were the subject of a research study to identify skills required for future leaders regardless of environment. The research focused on 47 senior federal healthcare leaders during a two-day leadership summit. These participants were randomly divided into six focus groups with a facilitator to document the discussions. Twelve skills were identified that included historical and emergent for future leaders (Hudak, Fung, & Rosemkrans, 2015). These skills include the following abilities: build partnerships, develop trust, thrive in complex and ambiguous environments, listen actively, think with

agility, create conditions for success, assert aspirational future-based leadership, develop present moment awareness, create an inter-agency learning network, develop network leadership, develop network goal setting, and maintain resilience. These skills lead to a successful evolution to interagency leadership. Today's healthcare leaders must use a combination of technology and personal relationships in order to build trust and credibility.

Clinical Leadership

An additional study centered on the topic of clinical leadership and was conducted out of the growing demand for leadership development among physicians and nurses. One such study researched the barriers to clinical leadership development in nurses (Fealy et al., 2011) and argued that leadership competencies revolve around four levels in which a clinical leader operates: the individual, the team, the department, and the organization. On the individual level, a leader faces criticism; on the team level, the leader acts as a resource for others. On the department level, the leader is required to work with organizational administration and with other departments and, on the organizational level, the leader reviews processes that align other levels with the organization's vision. Certain barriers can be introduced at each level of operation for the clinical leader.

The Fealy et al. (2011) study design used a mixed-methods approach to identify leadership development needs for nurses, which involved a quantitative survey instrument that was mailed to a simple random sample of nurses. The study also included 22 focus group qualitative interviews. One third of the respondents reported that they had attended in-service leadership training, while the remaining two thirds reported receiving

no leadership development. The survey was conducted in Ireland in 2009 using the Clinical Leadership Analysis of Need Questionnaire (CLAN-Q) developed for the study. The instrument was a self-administered, self-reported questionnaire designed to measure the need for clinical development and to define barriers to clinical leadership development. The CLAN-Q instrument was developed using a five-point Likert-type scale ranging from no need to very high need.

In order to reduce sampling error, a simple random sample of 3000 nurses and midwives was generated by the Registry of Nurses. This number was used for a 95% confidence interval and to account for non-responses. SPSS software was utilized to interpret the quantitative data; factor analysis established validity. Cronbach's alpha was performed to assess internal consistency and reliability of data. The results revealed four perceived barriers to leadership development: quality of care factors, interdisciplinary relationships, recognition, and influence. One limitation to this study was found in the low alpha coefficient for three of the barriers, which would indicate further development of the instrument. Another limitation noted was the unusable response rate of 30.92%, which could introduce non-response bias into the results. The author of this research instrument was contacted for review of the complete instrument. It was then determined that this instrument, with modifications to reflect radiologic technologists, would capture the intent for the current study. The lead author granted permission to modify and to use the instrument for researching technical leadership in radiology. A copy of the permission is listed in Appendix A.

Organizational Change

Collins and Hansen (2011) suggested that leaders in great companies always prepare for and anticipate change within the company they lead. Great leaders are not born great with extraordinary talent and luck; change requires work and some paranoia to become great. Drucker and Senge (2001) pointed out that a leader cannot manage change but should anticipate and stay ahead of it. Organizations need to abandon mindsets and models that are ingrained in their history if they desire to innovate and to improve. Processes and products should be reviewed on a consistent schedule to stay ahead of change. Identifying change agents and innovators is important to allow their energy to diffuse to others. Individual bias blocks change (Rogers, 2003). Johnson (1998) used metaphors in a simple way to describe four types of people in a time of change; these individuals react different to changes during life or business.

Organizational change not only requires a behavior modification, but also a change in individual attitude. Anyone can be forced to change the way in which he/she accomplishes a task or process, but a successful implementation alters the attitude of the person (Lawson & Price, 2003). Three levels of change can influence the behaviors of people and their attitudes; the first level does not affect the way in which one works. This is a change of doing business outside an organization that does not result in an internal change. The next level is an adjustment in the current process; the change modifies a work habit for efficiency or better results, but the inherent process is not unlearned. The third level of change is to completely alter an individual's thoughts about a process and is the most difficult due to the time required to unlearn and to accept that a better way exists to accomplish a task (Lawson & Price, 2003).

In order to manage this change process, Lawson and Price (2003) pointed out four conditions for changing employee mindset. They change their minds only if they can see the point of the change. This aligns with references from other researchers for employee buy-in. If employees do not understand the purpose or the benefit, they are reluctant and resistant to change. Avoiding employee resistance involves an empirical rational approach (Hweitt-Taylor, 2013), which is accomplished by presenting the innovation and its benefit to the organization and to the employees. The next condition is that the organizational culture be in line with the change. The third and fourth conditions follow one another in that those being asked to change possess the required skills to do so and see their leaders making changes.

Leaders must be able to recognize individuals in their organization and their reaction to change. Edmonds' (2011) research introduced four categories of employees within an organization when reacting to change: blockers, sleepers, preachers, and champions. Blockers are those who try to prevent change and their power to influence others to be reduced. Sleepers are not in a position of power or bothered by change; they need to be engaged and given power to desire buy-in and to support the change. Preachers are in a position of power but do not think change is a priority. Champions are advocates for change and the change agents within the workforce. These individuals need to be encouraged and given time and resources to influence others. When change is necessary, a personal buy-in is needed at all levels of the organization in order to make the change a priority (Bleser et al., 2014). Leaders who foster a supportive organizational culture allow for a shared vision that is essential during a time of change.

Change agents and leaders are an important part of an organization. With technology, virtual teams, and international business models, organizational change cannot be avoided. Successful organizations are either planning for change or managing the transition associated with it. An effective leader recognizes the need for change, the time to make the change, and those required to support the change. Employees must be a part of the organization and must believe in the vision and share in the belief that they are making a difference in the community and the lives and future followers for whom they are providing services (Blanchard & Stoner, 2004).

Organizational Learning

Organizational learning is a result of employees being able and encouraged to seek higher education and continuous learning. Leaders are required to possess higher educational degrees based on the greater responsibilities placed on the position. They must be able to recognize the needs and requirements for their followers as well as the facility as a whole. Many aspects are involved in planning and accomplishing the goals and objectives of an organization, and leaders must be able to identify them. A proper balance of understanding financial practices, a functional management system, and being able to address the changes in the healthcare continuum lead to a prosperous healthcare organization. Leaders have unique requirements inherent to the position they hold; they must be able to plan, organize, staff, direct, and control at their level of management.

Summary

Leadership behaviors and styles are an integral part of successful organizations. The question that arises is from where they acquired this knowledge. Are they receiving formal training offered by their employing organizations, through mentors, or through

self-improving continuing education? Based on the findings in the literature that was reviewed, recommendations and conclusions have been made that leadership training is essential in the allied healthcare field of radiology technology. Leaders are developed through experience, opportunities, training, and mentoring. The desired outcome of this research is to determine the extent of training in leadership that radiology professionals receive through their organizations and whether specific demographic criteria are relevant in determining the area of highest need for leadership development.

CHAPTER III: METHODOLOGY

Introduction

The primary focus of this research was to determine whether significant differences exist in the leadership characteristics of radiologic technologists with formal leadership education and those without formal education.

Research Questions

Four primary questions formed the foundation for this research:

1. Is there a significant difference in the knowledge of leadership characteristics and the developmental need of leadership characteristics exhibited by:
 - a. Administrators with formal leadership education and administrators without formal education?
 - b. Supervisors with formal leadership education and supervisors without formal education?
2. Is there a significant difference in the voluntary turnover rate between organizations that offer leadership development and organizations that do not offer leadership development?
3. What are the perceived barriers to organizational change in leadership development for radiologic technologists?
4. What are the demographic characteristics of radiologic technologists who exhibit:
 - a. High knowledge and high need of leadership skills?
 - b. High knowledge and low need of leadership skills?

- c. Low knowledge and low need of leadership skills?
- d. Low knowledge and high need of leadership skills?

Research Design

A quantitative methodology was employed to gather data from a random sample of the population of radiologic technologists provided through the American Registry of Radiologic Technologists. An approved modification of the CLAN-Q instrument was used as the instrument for this research. Appendix A includes the letter for modification and use. The original instrument was designed to identify barriers to leadership development in nurses in Ireland (Fealy et al., 2011) and included seven sections with 107 questions. For the modified version for radiologic technologists, only four sections were used with 43 questions. Section one was modified and the terms nursing and nursing departments were changed to radiologic technologist and radiology departments. Ten questions were finalized for section one relative to demographics. Age and gender were maintained in the demographics to note additional findings but did not directly impact the research questions. Question one of section one asked whether the participant was currently working in the radiology technology field and did not correspond with any of the research questions. If the participants responded that they were not currently working, their responses were omitted from in analysis.

Section two of the modified instrument consisted of 20 questions relating to the respondent's history of leadership development, his/her knowledge of leadership characteristics, and his/her need for leadership development. The 10 questions in section two that inquired about the participant's knowledge and need were rated using a Likert-type format from 1 to 5, with 1 being low and 5 being high. The questions corresponded

to seven leadership characteristics that were selected by the researcher as necessary for leaders in the radiology technology field. These characteristics included communication, motivation, integrity, stamina, respect for others, flexibility, and self-control and were narrowed down from lists of leadership characteristics from many sources (Curtis, De Vries, & Sheerin, 2011; Department of the Army, 2006; Laureani & Antony, 2015).

Table 1 summarizes the characteristics and the associated survey questions.

Table 1

Leadership Characteristics

Leadership Characteristics	Instrument Question (s)
Communication	2.11.4 and 2.11.6
Motivation	2.11.1 and 2.11.9
Integrity	2.11.3
Stamina	2.11.10
Respect for others	2.11.2 and 2.11.7
Flexibility	2.11.8
Self-control	2.11.5

Section three contained two questions inquiring whether the participant had ever voluntarily resigned from a job in radiology technology. The second question asked about the reason for leaving. A pre-determined list of common reasons for resigning was included and an option for “Other” with a free text field if the participant opted to input a reason not listed in the selections. Section four consisted of 10 questions relating barriers

to leadership development in their organizations. This section used a Likert-type format with five options from strongly disagree, disagree, neither agree nor disagree, agree, and strongly agree with the statements. The final question in section four contained an open-ended question allowing the participant to input any other potential barriers to leadership development for radiologic technologists. The responses for this question were coded for similarity and added to the analysis. The survey instrument is located in Appendix B of this research. The following five hypotheses provided the foundation for the research questions:

H₀1a: No significant differences will exist in the knowledge of leadership characteristics exhibited between administrators with formal leadership and administrators without formal education.

H_a1a: A significant difference will exist in the knowledge of leadership characteristics exhibited between administrators with formal leadership and administrators without formal education.

H₀1b: No significant differences will exist in the developmental need of leadership characteristics exhibited between administrators with formal leadership and administrators without formal education.

H_a1b: A significant difference will exist in the developmental need of leadership characteristics exhibited between administrators with formal leadership and administrators without formal education.

H₀2a: No significant differences will exist in the knowledge of leadership characteristics exhibited between supervisors with formal leadership education and supervisors without formal education.

H_{a2a}: A significant difference will exist in the knowledge of leadership characteristics exhibited between supervisors with formal leadership education and supervisors without formal education.

H_{02b}: No significant differences will exist in the developmental need of leadership characteristics exhibited between supervisors with formal leadership education and supervisors without formal education.

H_{a2b}: A significant difference will exist in the developmental need of leadership characteristics exhibited between supervisors with formal leadership education and supervisors without formal education.

H₀₃: No relationship will exist in the voluntary turnover rate between organizations that offer leadership development and organizations that do not offer leadership development.

H_{a3}: A positive relationship will exist in the voluntary turnover rate between organizations that offer leadership development and organizations that do not offer leadership development.

Population

The population for this study was radiologic technologists in the US who have self-reported their position to be one of two selections on the American Registry of Radiologic Technologists (ARRT) annual application renewal form: supervisor or assistant chief technologist and administrator or manager. A letter of cooperation was obtained from the ARRT to support this research (see Appendix C). The number of radiology technologists who reported to be in the positions are as follows: 11,948 supervisors or assistant chief technologists and 13,944 administrators or managers. An

oversampling request for 900 random individuals' contact information was made from the ARRT for each of the two positions. The total sample size was 1,800 individuals as a representative sample with a + or – 5% for error rate. This was included in order to offset the non-respondents. A monetary participation drawing incentive offered to reduce non-respondents, providing a chance to receive one of 10 \$50 gift cards. Each respondent who completed the survey had the option to enter his/her name into the drawing. A total of 101 respondents submitted their email addresses; those who entered the drawing were imported into an Excel spreadsheet in order of response. A random number generator was used to choose 10 numbers, and those individuals were emailed for contact information. The gift cards were mailed with tracking numbers and receipts, and postal tracking numbers were saved for recordkeeping.

Data Collection

The modified CLAN-Q instrument for radiologic technologists was uploaded into Qualtrics and emailed to the random sample provided by the ARRT. Qualtrics was used as an online survey tool that allowed the researcher to build, distribute, and analyze survey results (Qualtrics, 2014). The survey letter accompanying the instrument is located in Appendix D. The research instrument was uploaded into Qualtrics, and a library was built and was named “Research Instrument”. The library was developed by uploading the Excel spreadsheet of the 1,800 random sample names, email address, and job position held. Only the names and email addresses were uploaded in the Qualtrics library. The survey letter was uploaded into Qualtrics and the research instrument link was attached and emailed to the sample. A wku.edu email address of the researcher was used as the sending address to give credibility to the research instrument and to encourage

participants to open, read, and respond. The last question of the instrument was a link for those who desired to be entered into a drawing for the gift cards in order to follow the link to another Qualtrics survey in which they would input their email address and then select finish. This process stored their response and closed the gift card drawing link, returning them to the research instrument and closing the link. After the first week, more gift card surveys were completed than the research instrument. It was concluded that some participants, after completing the research survey and directed to the gift card link, finished only the gift card survey. When returned to the research survey, they closed it before clicking on the finish tab. Qualtrics reported the number of surveys that were started, but did not show the response until the survey was finished. This proved problematic and data were lost. Subsequent weekly reminders cautioned the participants to be sure to click on the finish tab to complete and to record responses.

Due to the large population and subsequent sample size, email delivery of the research instrument was used. This step may have introduced bias from the sample size (Porter, 2004). The ARRT provided the 1,800-random sample from members who indicated on the annual renewal that the ARRT could release their email addresses for approved research. The ARRT would have provided a random sample postal mailing address with address labels from the entire 25,892 population, although this opportunity was not chosen. Of the 25,892 population in the two job positions requested, only 2,000 selected to release their email addresses for research. The random sample of 1,800 was chosen from the data base of 2,000. Bias could have been introduced from participants who are selected routinely for research.

Reminders were sent out every Monday for three weeks. The research instrument link was open for 30 days for participants to complete at any time during that period. Subsequent findings indicated that the highest responses were seen on the day reminders were sent. During week one, 103 surveys were completed; 101 surveys during week two; and 80 during week three. Weeks four and five showed that 70 and 32 respectively were completed. Qualtrics did not show the email addresses of those who had responded and did not send a reminder email to an email address of an individual who completed the survey. Once the survey was completed, the data were downloaded from Qualtrics and imported to SAS (Statistical Analysis System), a data analytics software program for interpretation (SAS Institute, 2016).

Analysis Plan

Results from the quantitative study may contain non-reflective results of a self-evaluation for the radiologic technologist. Therefore, a quantitative study was more feasible due to the nature and size of the population. Following an interview schedule for a qualitative study would have been difficult with radiologic technologists while on the jobsite. A quantitative survey was emailed to a randomly selected number of this population to be completed at their leisure and returned for analysis. This method provided a larger number of responses to be used in the data base for interpretation and not limited to an area within driving distance of the researcher.

Description of Variables

Independent Variables

The independent variables included type of healthcare facility, years of employment, highest educational degree obtained, and primary discipline of registry.

These variables were collected from questions 1.4, 1.5, 1.6, and 1.9 of the demographic section of the research instrument.

Dependent Variables

The dependent variables included formal leadership training, institutional leadership development, and voluntary turnover rate. These variables were collected from questions 2.1, 2.2, 2.8, 2.9, and 3.1 of the research instrument.

Reliability and Validity

A content validity index (CVI) was conducted for content relevancy (Polit, Beck, & Owen, 2007). The content validity survey was used to validate the 31 questions relating to leadership in the research instrument. Demographic questions were removed for the content validity survey. The survey asked the panel of experts to rate each question for content only. The scale used to rate each was as follows: 1 = not relevant, 2 = somewhat relevant, 3 = quite relevant and 4 = highly relevant (Davis, 1992). The survey was divided into four sections. Section one contained questions 2.1 through 2.10 from the research instrument. The panel of experts was asked to rate each question on the content for gauging the leadership training individuals may have experienced. Section two consisted of the 10 items in question 2.11 separated into two parts of knowledge and need. The panel experts were asked to rate each on the content for gauging leadership knowledge and needs that an individual may report. Section three contained the questions 3.1 and 3.2 of the research instrument relating to voluntary turnover rates. The panel experts were asked to rate each on the content for gauging voluntary turnover. Section four included the 10 items in question 4.1 pertaining to perceived barriers. The panel experts were asked to rate each on the content to gauge perceived barriers to

organizational change.

According to Lynn (1986), when using five or less experts to conduct a CVI, all must be in agreement that an item is content valid. With a CVI using more than five experts, some disagreement can occur and still have content validity. The CVI survey was emailed to 11 experts with a goal of receiving more than six for analysis using a convenience sample of the researcher's acquaintances who possessed terminal degrees. This type of sampling may have introduced subject bias from the participants, as they knew the researcher and the intent of the study. This bias was foreseen, reported, and accepted for this dissertation research. Eight content surveys were completed and used in the analysis for CVI. Table 2 shows the outcome of the Item-Content Validity Index (I-CVI). To be considered excellent content validity, an I-CVI of 0.78 or higher is required and a Scale-CVI (S-CVI) requirement of 0.90 or higher (Polit et al., 2007). The S-CVI for this instrument was 0.94. The eight experts used in the CVI survey consisted of an Ed.D. in Professional Practice, a Ph.D. in Educational Leadership, a Ph.D. in Educational Psychology and Research, an Athletic Administrator, an Ed.S. Principal, a Psy.D. Clinical Psychologist, and a Ph.D. in Education. Table 2 summarizes the I-CVI.

Table 2

Individual – Content Validity Index

Question Number	Number of Experts Giving a rating of 3 or 4	I-CVI	Evaluation
1.1	8	1.00	Excellent
1.2	6	0.75	Good
1.3	6	0.75	Good
1.4	8	1.00	Excellent
1.5	7	0.88	Excellent
1.6	6	0.75	Good
1.7	8	1.00	Excellent
1.8	8	1.00	Excellent
1.9	7	0.88	Excellent
1.10	8	1.00	Excellent
2.1	8	1.00	Excellent
2.2	8	1.00	Excellent
2.3	8	1.00	Excellent
2.4	8	1.00	Excellent
2.5	8	1.00	Excellent
2.6	8	1.00	Excellent
2.7	8	1.00	Excellent
2.8	8	1.00	Excellent
2.9	8	1.00	Excellent
2.10	8	1.00	Excellent
3.1	7	0.88	Excellent
3.2	7	0.88	Excellent
3.3	7	0.88	Excellent
3.4	8	1.00	Excellent
3.5	8	1.00	Excellent
3.6	8	1.00	Excellent
3.7	7	0.88	Excellent
3.8	7	0.88	Excellent
3.9	8	1.00	Excellent
3.10	7	0.88	Excellent
4.1	7	0.88	Excellent
4.2	6	0.75	Good
5.1	8	1.00	Excellent

Table 2

Individual – Content Validity Index (continued)

Question Number	Number of Experts Giving a rating of 3 or 4	I-CVI	Evaluation
5.2	7	0.88	Excellent
5.3	8	1.00	Excellent
5.4	8	1.00	Excellent
5.5	8	1.00	Excellent
5.6	8	1.00	Excellent
5.7	8	1.00	Excellent
5.8	8	1.00	Excellent
5.9	8	1.00	Excellent
5.10	8	1.00	Excellent

The CVI survey is located in Appendix E. The results of the CVI showed all questions to be good to excellent and no changes were made to the instrument. At this point, an application for Institutional Review Board for research approval was submitted, which consisted of the research instrument, letter of cooperation from the ARRT, and letter of consent (Appendix G). IRB approval was awarded with “Exempt from Full Board Review” (Appendix H), after which instrument reliability through test-retest was conducted. The pilot survey was emailed to 48 radiology technologists who self-reported as managers or supervisors. In order to increase the number of participants for the pilot survey, a discussion board was posted in the Education and Management communities on the ASRT webpage describing the research along with a request for pilot survey participants. Twenty-five additional participants volunteered to be part of the pilot study, and an email letter of intent was sent to the pilot group (Appendix F). To reduce test

taking bias and the Hawthorne effect (McCambridge, Witton, & Elbourne, 2014), the term test-retest was not mentioned in the letter. Qualtrics was used as an online survey tool that allowed the researcher to build, distribute, and analyze survey results (Qualtrics, 2014). The pilot survey was uploaded into Qualtrics and the link was sent out to the pilot group. After one week, a reminder email was sent to the pilot group; after two weeks, 37 participants completed the test survey. The first pilot survey was closed in Qualtrics, and the pilot survey was uploaded into a second link in Qualtrics. This was emailed to the same 48 members in the pilot group. No changes were made between the first and second survey questions. After one week of the second survey being emailed, a reminder was sent to the pilot group. After two weeks, 28 participants completed the retest survey. The Qualtrics link was closed, and both the test survey and retest survey results were analyzed. In order to maintain anonymity and to enable comparison, a coding system was established asking participants to input a seven-digit code using two-digit month of birth, two-digit date of birth, last two digits of cell phone number, and first digit of street address. This was used in both the test and retest pilot surveys to analyze responses from the same participant on both. Of the 37 test survey responses and 28 retest responses, 25 participants responded to both surveys and data could be analyzed for test-retest reliability. Due to the low response number, a full survey test-retest could not be performed to estimate reliability. Cronbach's alpha coefficients were calculated on each of the survey questions using the returned survey results ($N = 25$). If the participation rate in the pilot study had been greater, survey items with poor coefficients could have been improved or removed. The results were accepted as a limitation and no survey questions were removed or modified.

Data Analysis

Descriptive statistics were used to analyze the data from a survey that was developed to understand the perceptions of radiologic technologists on leadership development. Stating the null and alternative hypotheses was made prior to data analysis. An independent samples *t*-test was used when comparing the variables. Chi-square for independence also was used as inferential statistics to compare the means and variances within survey results.

Generalizability

The generalizability of this study would use the results of the research method to apply it to the larger population from which the sample was taken. The results could impact the radiology technology community. This research could be duplicated within the allied healthcare field and results compared for similarities. These fields include laboratory, surgical, emergency medicine, dental, pharmacy, ophthalmology, and biomedical maintenance. The traditional extent of validity is more thorough on quantitative research methods due to the larger data base of participants. This method also allows for random sampling giving the results more strength.

Feasibility

A study in the formal education of leadership development offered to technical leaders in radiology technology could produce resistance in participation. Narrowing the study to the knowledge and understanding of leadership provided results that were more accurate, lowering the participants' defensives.

Summary

Change is needed in both the educational and the medical communities.

Leadership can be measured through a quantitative process of cost savings within a department, low turnover rate, and increased revenue. These characteristics do not come naturally or are self-taught. They are learned through formal training, mentoring, and coaching.

CHAPTER IV: RESULTS

Introduction

This study focused on determining whether significant differences exist in the leadership characteristics of radiologic technologists with formal leadership education and those without formal education. The outcome of is to determine whether there is a need for leadership development for radiologic technologists. If a need is established, what are the demographics of the personnel for which the need is essential?

Population

The population of this research study was gained from a letter of agreement from the ARRT that is included in Appendix C. There are 325,000 registered radiologic technologists throughout the US. Of the eight self-reported job categories in this population, two were used to conduct this research: Supervisor or Assistant Chief Technologist and Administrator or Manager. For the purpose of this study, the category of Supervisor or Assistant Chief was termed Supervisor and that of Administrator or Manger was termed Administrator. At the time of this research, 13,944 members self-reported as Administrators or Managers and 11,948 as Supervisors or Assistant Chief Technologists. A random sample of 900 from each group, with a total of 1,800, was selected and email addresses were requested to reflect the population and to account for non-responses. Participants from the instrument validity test retest were cross-referenced to ensure that none of those in the pilot test were within the random sample provided by the ARRT for the research instrument. None of the names or email addresses listed in the random sample were among the participants used in the pilot survey. A plan was in place to exclude any individual who took part in the pilot survey, although it was unnecessary

to exercise. Based on the random 1,800 surveys sent, 386 surveys were completed, achieving a 21% response rate.

Descriptive Statistics

As shown in Table 3, the primary research question revolved around radiologic technologists who self-reported on an annual registry renewal. Among the 386 participants, 204 (52.9%) indicated their job title was administrator or manager, 170 (44.0%) indicated their job title was supervisor or assistant chief technologist, and 12 (3.1%) provided no response. Results regarding the gender of the participants are included in Table 4. Among the 386 participants, 225 (58.3%) were female, 159 (41.2%) were male, and 2 (0.5%) provided no response.

Table 3

Descriptive Statistics of Participants – Job Position

Job Position	<i>N</i>	Percent
Administrator	204	52.9
Supervisor	170	44.0
No response	12	3.1
Total	386	100.0

Table 4

Descriptive Statistics of Participants - Gender

Gender	<i>N</i>	Percent
Female	225	58.3
Male	159	41.2
No response	2	0.5
Total	386	100.0

Table 5 provides information regarding the distribution of participants by primary discipline of registry. Of the 15 available national registry types offered by the ARRT, 12 were represented in this research. Among the 386 participants, 5 (1.3%) reported they were registered in Cardiac – Interventional Radiography, 10 (2.6%) in Cardiovascular – Interventional, 69 (17.9%) in Computed Tomography, 49 (12.7%) were registered in Magnetic Resonance Imaging, 35 (9.1%) in Mammography, 27 (6.9%) in Nuclear Medicine Technology, 5 (1.3%) in Quality Management, 20 (5.2%) in Radiation Therapy, 141 (36.5%) reported being registered in Radiography, 1 (0.3%) as a Radiologist Assistant, 11 (2.8%) in Sonography, 10 (2.6%) in Vascular – Interventional Radiography, and 3 (0.8%) provided no response. The three registry types not represented in this research were from the disciplines of Bone Densitometry, Vascular Sonography, and Breast Sonography. The impact from the lack of representation of these sections is discussed in Chapter V.

Table 5

Descriptive Statistics of Participants – Primary Discipline of Registry

Primary Discipline of Registry	<i>N</i>	Percent
Cardiac-Interventional Radiography	5	1.3
Cardiovascular – Interventional	10	2.6
Computed Tomography	69	17.9
Magnetic Resonance Imaging	49	12.7
Mammography	35	9.1
Nuclear Medicine Technology	27	6.9
Quality Management	5	1.3
Radiation Therapy	20	5.2
Radiology	141	36.5
Radiologist Assistant	1	0.3
Sonography	11	2.8
Vascular – Interventional Radiography	10	2.6
No response	3	0.8
Total	386	100.0

The healthcare facility type is included in Table 6. Among the 386 participants, 39 (10.1%) indicated they worked in an educational facility/university hospital, 129 (33.4%) a for-profit medical facility, 24 (6.2%) in a government-owned facility to include

military and VA, 189 (49.0%) in a not-for-profit medical facility, and 5 (1.3%) provided no response.

Table 6

Descriptive Statistics of Participants – Healthcare Facility Type

Healthcare Facility Type	<i>N</i>	Percent
Educational facility/university hospital	39	10.1
For-profit medical facility	129	33.4
Government-owned facility to include Military and VA	24	6.2
Not-for-profit medical facility	189	49.0
No response	5	1.3
Total	386	100.0

Tables 7 and 8 include the survey participants' highest formal education and the concentration of that education. As shown in Table 7, among the 386 participants, 19 (4.9%) indicated they completed high school plus radiologic technologist registry, 40 (10.4%) completed a certificate program, 121 (31.4%) completed an associate's degree, 119 (30.8%) completed a bachelor's degree, 71 (18.4%) a master's degree, 5 (1.3%) a doctoral degree, and 11 (2.8%) did not provide a response to the question. As shown in Table 8, among the 386 participants, 19 (4.9%) indicated their education concentration was business general, 4 (1.0%) education general, 9 (2.3%) education health, 80 (20.7%) healthcare administration, 6 (1.6%) informatics/IT, 218 (56.5%) medical imaging, 15

(3.9%) organizational leadership, 9 (2.3%) other, 8 (2.1%) other non-technical, 5 (1.3%) other technical, and 13 (3.4%) did not provide a response.

Table 7

Descriptive Statistics of Participants – Highest Formal Education

Highest Formal Education	<i>N</i>	Percent
High school diploma + RT	19	4.9
Certificate program	40	10.4
Associate’s degree	121	31.4
Bachelor’s degree	119	30.8
Master’s degree	71	18.4
Doctoral degree	5	1.3
No response	11	2.8
Total	386	100.0

Table 8

Descriptive Statistics of Participants – Concentration of Highest Formal Education

Concentration of Highest Formal Education	<i>N</i>	Percent
Business general	19	4.9
Education general	4	1.0
Education health	9	2.3
Healthcare administration	80	20.7
Informatics/IT	6	1.6
Medical imaging	218	56.5
Organizational leadership	15	3.9
Other	9	2.3
Other non-technical	8	2.1
Other technical	5	1.3
No response	13	3.4
Total	386	100.0

Analysis of Data

The purpose of this study was to determine whether leadership education makes a difference in the leadership characteristics exhibited by radiologic technologists. The prevailing interest that guided this study led to four research questions with five associated hypotheses.

1. Is there a significant difference in the knowledge of leadership characteristics and the developmental need of leadership characteristics exhibited by:
 - a. Administrators with formal leadership education and administrators without formal education?
 - (1) H_{01a} : No significant differences will exist in the knowledge of leadership characteristics exhibited between administrators with formal leadership and administrators without formal education.
 - (2) H_{01b} : No significant differences will exist in the developmental need of leadership characteristics exhibited between administrators with formal leadership and administrators without formal education.
 - b. Supervisors with formal leadership education and supervisors without formal education?
 - (1) H_{02a} : No significant differences will exist in the knowledge of leadership characteristics exhibited between supervisors with formal leadership education and supervisors without formal education.
 - (2) H_{02b} : No significant differences will exist in the developmental need of leadership characteristics exhibited between supervisors with formal leadership education and supervisors without formal education.
2. Is there a significant difference in the voluntary turnover rate between organizations that offer leadership development and organizations that do not offer leadership development? With the associated H_{03} : No relationship will

exist in the voluntary turnover rate between organizations that offer leadership development and organizations that do not offer leadership development.

3. What are the perceived barriers to organizational change in leadership development for radiologic technologists?
4. What are the demographic characteristics of radiologic technologists who exhibit:
 - a. High knowledge and high need of leadership skills?
 - b. High knowledge and low need of leadership skills?
 - c. Low knowledge and low need of leadership skills?
 - d. Low knowledge and high need of leadership skills?

Analysis of Research Question 1: *Is there a significant difference in the knowledge of leadership characteristics and the developmental need of leadership characteristics exhibited by Administrators and Supervisors with formal leadership education and Administrators and Supervisors without formal education.*

Methodology for Research Question 1a. Participants were classified into two groups based on their response to survey question 1.7, What is your current job position as reported to the ARRT? These two groups included Administrators and Supervisors. Only respondents who self-identified as Administrators were used to address Research Question 1a.

Section 2.11 included 10 questions with two parts asking the respondents to rate their knowledge of leadership characteristics (knowledge) and their developmental need (need) of the same characteristics. The respondents' answers were in a Likert-type scale from 1 to 5, with 1 being low and 5 being high for both the knowledge and need

questions (Appendix B). In order to measure leadership characteristics, responses to the survey on knowledge and need questions were summed to obtain overall knowledge and need scores. Scores had a range of 10 to 50, with the higher values indicating higher knowledge and need. To investigate the differences between the knowledge and need scores for administrators with and without formal leadership training, an independent samples *t*-test was utilized.

Results for Research Question 1a. The independent samples *t*-test indicated a significant difference between administrators who had received formal leadership training and those without training for the “knowledge score,” $t(169) = -2.37, p = 0.0190$. No significant differences were found for the “need score,” $t(165) = 1.12, p = 0.2655$. Based on the findings, H_{01a} was rejected. A significant difference was seen in the knowledge of leadership characteristics between administrators with formal leadership education and those without. H_{01b} was accepted, as no significant differences were found for the need scores. Table 9 summarizes these findings.

Table 9

Administrator Formal Leadership Education Compared with Leadership Knowledge and Need for Leadership Development Mean Scores

Formal Leadership Education	Knowledge of Leadership Characteristics			Developmental Need of Leadership Characteristics		
	<i>N</i>	\bar{X}	<i>SD</i>	<i>N</i>	\bar{X}	<i>SD</i>
Yes	93	44.6	4.4	92	24.3	11.1
No	78	42.9	4.9	75	26.1	9.6

Methodology for Research Question 1b. Participants were classified into two groups based on their response to survey question 1.7, What is your current job position as reported to the ARRT? These groups included Administrators and Supervisors. Only respondents who identified themselves as Supervisors were used to address Research Question 1b.

Section 2.11 had 10 questions with two parts asking the respondents to rate their knowledge of leadership characteristics (knowledge) and their developmental need (need) of the same leadership characteristics. The respondents' answers were in a Likert-type scale from 1 to 5, with 1 being low and 5 being high for both the knowledge and need questions (Appendix B). In order to measure the leadership characteristics, responses to the survey on knowledge and need questions were summed to obtain overall knowledge and need scores. Scores had a range of 10 to 50, with the higher values indicating higher knowledge and need. To investigate the differences between the knowledge and need scores for supervisors with and without formal leadership training, an independent samples *t*-test was utilized.

Results for Research Question 1b. The independent samples *t*-test indicated no significant differences between supervisors who received formal leadership training and those without formal training for the "knowledge score," $t(136) = -1.69, p = 0.0936$. No significant difference was found for the "need score," $t(133) = 0.05, p = 0.9571$. Based on this finding, H_02a was accepted, as no significant difference was found in knowledge scores, and H_02b was accepted, as no significant difference was found in need scores. Table 10 summarizes these findings.

Table 10

Supervisor Formal Leadership Education Compared with Leadership Knowledge and the Need for Leadership Development Mean Scores

Formal Leadership Education	Knowledge of Leadership Characteristics			Developmental Need of Leadership Characteristics		
	<i>N</i>	\bar{X}	<i>SD</i>	<i>N</i>	\bar{X}	<i>SD</i>
Yes	87	43.1	4.9	85	28.3	12.0
No	20	42.3	4.7	49	29.1	10.1

Analysis of Research Question 2: *Is there a significant difference in the voluntary turnover rate between organizations that offer leadership development and organizations that do not offer leadership development?*

Methodology for Research Question 2. Responses were collected from question 2.1, In the last year, have you participated in any in-service education or training in leadership offered by your employer? and question 3.1, Have you ever voluntarily resigned from a job in Radiology Technology? These questions were used to test for independence. A Chi-square test of independence was calculated using the frequency of voluntary resignation of radiologic technologists who had participated in leadership development courses offered by their employers.

Results for Research Question 2. The analysis revealed no significant differences between the dependent variable of voluntary turnover rate in organizations that offer leadership development and those that do not offer leadership development, using Chi-square test of independence, $\chi^2(1, N = 338) = 0.8790, p < 0.3485$. Based on the

findings as presented, H_03 was accepted. The survey data do not indicate a substantial correlation in radiologic technologists who participated in employer offered leadership development programs and those who did not participate relative to voluntary resignation from a position in the radiographic technology field. When comparing the independence between the two variables, data were missing from non-responses or incomplete responses for both questions. This missing data could not be used for analysis. The summaries of these results are displayed in Tables 11, 12, and 13.

Table 11

Participation in Employer Offered Leadership Training

Participation in Leadership Training	<i>N</i>	Percent
Yes	244	63.2
No	127	32.9
No response	15	3.9
Total	386	100.0

Table 12

Voluntarily Resignation

Resignation	<i>N</i>	Percent
Yes	202	52.3
No	138	35.8
No response	46	11.9
Total	386	100.0

Table 13

Participation in Employer Offered Leadership Training and Voluntary Resignation

		Participation					
		No	%	Yes	%	Total	%
Resignation	No	43	31.4	73	36.3	116	34.3
	Yes	94	68.6	128	63.7	222	65.7
	Total	137	100.0	201	100.0	338	100.0

Analysis of Research Question 3: *What are the perceived barriers to organizational change in leadership development for radiology technologists?*

Methodology for Research Question 3. Responses were collected from questions in section 4.1 pertaining to barriers to leadership development and were ranked accordingly by means. This section used a Likert-type format with five options from

strongly disagree receiving a ranking of 1, disagree receiving a ranking of 2, neither agree nor disagree with a ranking of 3, agree with a ranking of 4, and strongly agree receiving a ranking of 5. Question 4.2 of the survey instrument was an open-ended question for any additional perceived barriers.

Results for Research Question 3. The 10 questions were ranked by means, the highest (5) being considered the strongest perceived barrier and the lowest (1) considered the weakest perceived barrier for radiologic technologists. The survey data indicate perceived barriers for organizational change in leadership development for radiographic technologists. The barrier ranks and sample means are displayed in Table 14. Results from the opened-end question are discussed in the section on additional findings in Chapter V.

Table 14

Rank Order of Perceived Barriers

Rank Order	Perceived Barrier	<i>N</i>	Rank Mean
1	RT interest not represented in the organization	336	3.54
2	Few opportunities for RT career progression	336	3.27
3	Professional tensions within interdisciplinary team	336	3.26
4	Little support for RT professional development	337	3.20
5	Radiology managers lack authority within organization	334	3.19
6	Effective collaboration between clinical and education	335	3.05
7	RT shortages	335	2.91
8	RT expertise valued by other healthcare professionals	336	2.85
9	RT viewed as equals	336	2.74
10	High regard for status of RT	333	2.62

Analysis of Research Question 4: *What are the demographic characteristics of radiologic technologists who exhibit high need of leadership development.*

Methodology for Research Question 4. Responses were collected from demographic question 1.4, What is your primary discipline of registry?; question 1.5, What type of healthcare facility are you currently employed?; and question 1.9, What is the highest formal education you have attained? These questions were cross referenced with those relating to knowledge and need of leadership qualities in section 2.11 of the survey instrument.

Results for Research Question 4. Summarized in Table 15, 62 (16.1%) of the respondents were categorized as having high knowledge of leadership characteristics and high need of leadership development, 108 (28%) were categorized as having high knowledge of leadership characteristics and low need of leadership development, while 91 (24.3%) were categorized as having low knowledge of leadership characteristics and high need of leadership development. Additionally, 122 (31.6%) were categorized as having low knowledge of leadership characteristics and low need of leadership development.

In relation to the demographics of the respondents in the categories for high knowledge of leadership characteristics and high need of leadership development and low knowledge of leadership characteristics and high need of leadership development, the two highest categories were recorded in each of the subsets of primary discipline of registry, types of healthcare facility of current employment, and highest formal education attained. Summarized in Table 16, the highest two demographics for primary discipline of registry were 51 from Radiography (13.8%) and 29 from Computed Tomography (7.8%). The highest two demographics for healthcare facility currently employed included 75 from not-for-profit facilities (20.2%) and 61 from for-profit facilities (16.4%). The highest two demographics for highest formal education attained were from respondents with bachelor's degrees (58, or 15.6%) and associate's degrees (55, or 14.8%). The survey data show demographic characteristics of radiologic technologists who exhibit high need for leadership skills.

Table 15

Extent of Knowledge of Leadership Characteristics with the Extent of Developmental Need of Leadership Characteristics

Leadership Group	<i>N</i>	Percent
High knowledge high need	62	16.1
High knowledge low need	108	28.0
Low knowledge high need	94	24.3
Low knowledge low need	122	31.6
Total	386	100.0

Table 16

Demographics for High Need of Leadership Development

Demographics	High Knowledge High Need		Low Knowledge High Need	
	<i>N</i>	Percent	<i>N</i>	Percent
Radiography	19	5.12	32	8.63
Computed Tomography	12	3.23	17	4.58
Not-for-profit facility	30	8.09	45	12.13
For-profit facility	25	6.74	36	9.70
Bachelor's degree	18	4.85	40	10.78
Associate's degree	23	6.20	32	8.63

Summary

A comprehensive literature review was completed for empirical research conducted to measure leadership needs of radiographic technologists. No specific research has been done on this topic; however, studies have been conducted in the field of nursing that provide correlation. The purpose of this study was to determine if significant difference exist in the leadership characteristics of radiologic technologists with formal leadership education and those without formal education. The study focused on radiologic technologists registered with the ARRT and self-reported as in one of the two groups of administrators or supervisors. Based on the 25,892 population of these subsets, 1,800 surveys were sent to a random sample; 386 surveys were completed, achieving a 21% response rate. The results of the study were presented in this chapter. Chapter V discusses the additional research findings, study limitations, and suggestions for future research.

CHAPTER V: DISCUSSION AND CONCLUSIONS

Introduction

Leadership is a trait that is learned, developed, and is a continuous process. It is essential to every organization; healthcare is no exception. Leadership does not only affect the organization, but it also affects the community that it supports. Ineffective leadership causes increased turnover in employees, which results in a shortage of staff at two levels. First, when employees leave a position in healthcare, other staff members must absorb additional job responsibilities until a new individual can be hired. During such time patient care is greatly affected. With fewer personnel, the number of patients seen each day is reduced, increasing wait times for patients to be scheduled. Second, when a new employee is hired, a training period occurs in which a staff member must spend time with the new person while he/she learns the responsibilities of the job.

The intended population of study for this research was radiologic technologists in leadership positions. The purpose of this study was to determine whether leaders in radiology technology are receiving formal education in leadership that pertains to their job. Another focus of this research was to determine whether longevity in the field of radiology technology relates to leadership skills without receiving formal leadership training, as well as whether ineffective leadership is a cause of followers' voluntary resignations. Finally, the research was intended to reveal any barriers that hinder leadership development for radiologic technologists and the organizational change that must occur to overcome these barriers.

Discussion of Research Findings

Findings for the specific research questions with additional findings and observations related to the research study are included in this section.

Discussion of Research Question 1: *Is there a significant difference in the knowledge of leadership characteristics and the developmental need of leadership characteristics exhibited by Administrators and Supervisors with formal leadership education and Administrators and Supervisors without formal leadership education?.*

For Research Question 1, participants were asked if they had attended any leadership courses as part of their formal education, which was defined as degree or certificated awarding programs. Of the 386 participants, 188 (50%) responded that they had attended and 182 (49%) indicated they had not. Those who reported receiving formal leadership courses acquired those instructions at the following educational levels: 51 (29.5%) in a certificate program, 8 (4.6%) in an associate's degree, 59 (34.1%) in a bachelor's degree, 53 (30.6%) in a master's degree and 2 (1.2%) in a doctoral degree, with 15 participants not responding to the question. This revealed that only half of the radiologic technologists in a leadership position have had any formal leadership training and leads to the question, Are radiologic technologists in the positions of administrators and supervisors managers or leaders? Kotter (1990) defined managers' tasks as planning and budgeting, organizing and staffing, as well as controlling and problem solving. Kotter also defined leaders' tasks as establishing direction, aligning people, and motivating and inspiring. By job title, radiologic technologists are in a technical field, managing and teaching skills that are inherent with the position. This study did not reveal the position of administrators or supervisors hired by the organization to be a manager or

a leader. This lack of information is discussed later in this chapter as a suggestion for future research.

Participants who had formal leadership education were asked at what level of education they received leadership training; however, the survey failed to include a question related to whether the formal leadership education was specific to radiologic technologists. Doh's (2003) research findings showed that leadership programs should be customized for the circumstances of the students. This limitation is discussed later in this chapter. An additional finding showed a very weak correlation, $p = 0.0095$, between the two variables of years working and need of leadership development. The conclusion can be drawn that, as a radiologic technologist gains more experience, he/she realizes the need for leadership development.

Two main organizations that support radiologic technologists are the ARRT and the ASRT. The ARRT is the credentialing body that administers the certification and registration exams for qualified individuals. The ARRT's (2017) mission statement is as follows: "Our mission is to promote high standards of patient care by recognizing qualified individuals in medical imaging, interventional procedures, and radiation therapy." ARRT credentialing exams include four parts: patient care, radiation safety, image production, and imaging procedures. ASRT is a professional association that promotes education, advocacy, research, and innovation for radiologic technologists. The ASRT's (2017) mission statement is as follows: "The mission of the American Society of Radiologic Technologists is to advance and elevate the medical imaging and radiation therapy profession and to enhance the quality and safety of patient care." The main

focuses of these two organizations involves patient care and safety. Leadership training and continuous learning is secondary.

The significant difference that was found ($p = 0.0190$) in the knowledge of leadership characteristics between administrators with formal leadership education and those without indicates formal education increases knowledge of leadership characteristics. In the associated findings, no significant differences were noted in the developmental needs of leadership characteristics of administrators with formal leadership education and those without formal education; however, it shows some important findings. Administrators with formal leadership education have knowledge of leadership characteristics but do not have the need to develop them further because of their formal education; administrators without formal education do not have the knowledge of those characteristics. Therefore, they did not report a need to develop that of which they have no knowledge.

Administrators and supervisors possess longevity in the career field. If an administrator or supervisor reports low knowledge of leadership characteristics and low need for leadership development, a conclusion may be made that they are unaware of the meaning of leadership. Not all radiologic technologists share the aspiration to be a leader or a manager in this career field or possess the talent for leadership. This talent is not a characteristic that someone is born with; leadership is gained by education, experience, and practice. Talent is developed over time by determination, drive, and passion (Colvin, 2010). Highly motivated radiologic technologists in organizations should be challenged to maintain their interest. Professional development for those employees should be available.

Discussion of Research Question 2: *Is there a significant difference in the voluntary turnover rate between organizations that offer leadership development and organizations that do not offer leadership development?*

For Research Question 2, participants were first asked if they had voluntarily resigned from a position in radiology technology; that answer was then compared to the question asking if they had received any in-service leadership training from their employer. Question 3.2 asked the participants for the primary reason they had voluntarily resigned for the singular purpose of determining if poor leadership was a reason for leaving. Individuals were given six common reasons for resigning from employment. One of the six was ineffective leadership of supervisor, as well as a choice of “Other.” From the results listed in Table 17, 10% responded that they had resigned from a position in the radiology technology career field due to ineffective leadership of their supervisor.

The Chi-square test of independence, $p = 0.3485$, showed no significant differences between voluntary resignation and leadership training offered by employers. The respondents who were offered leadership training (251, or 67.7%) were asked whether attendance was mandatory or voluntary. Of these, 139 (55.2%) indicated the training was mandatory, and 113 (44.8%) stated the training was voluntary. Mandated training may cause bias to reception, implantation, and compliance of the training material.

Some radiologic technologists have higher educational degrees than their supervisors. Subordinates can influence their superiors (Useem, 2001); trust is the basis of this relationship. The subordinate must respect the position and keep the superior informed consistently and thoroughly. If the foundation of trust is absent, no other course

of action exists other than the subordinate resigning and seeking better working conditions and opportunities for advancement elsewhere.

Table 17

Reasons for Resignation

Reason	<i>N</i>	Percent
Better career opportunity within the career field	130	64.7
Relocation	27	13.4
Ineffective leadership of supervisor	21	10.0
Other	12	6.0
Change in career	6	3.0
Seeking higher education	3	1.5
Financial incentive	2	1.4
Total	201	100.0

Discussion of Research Question 3: *What are the perceived barriers to organizational change in leadership development for radiology technologists?*

Survey question 4.1 asked participants to rate 10 working conditions in their current employment setting. These conditions relative to barriers for leadership development were modified from the Clinical Leadership Assessment of Need Barrier Scale (CLAN-QB); (Fealy et al., 2011). The Approval Letter for Use and Modification of Research Instrument is included in Appendix A. The three barriers that received the highest means, with 5 being the greatest were as follows: Radiologic Technologists’

interest not represented in the organization with a mean of 3.54, few opportunities for radiologic technologist career progression with a mean of 3.27, and professional tensions within interdisciplinary team with a mean of 3.26. These barriers revealed the need for organizational change within the healthcare professional fields. Survey question 4.2 was an inquiry open-ended question asking to list any other barriers to leadership development, which yielded 107 candid responses. These barriers were coded into four categories: organizational, departmental, personal, and professional. The summary for these findings is displayed in Table 18. These responses point out possible further implications on perceptions and interdepartmental relationships between the nursing field and ancillary services.

Education, support, and buy-in from organizational leaders are needed for a change to be supported and to occur. Opinion leaders and change agents cause change to be accepted or rejected, as well as the time needed to diffuse (Rogers, 2003). Radiologic technologists interact with nursing staff in emergency departments, intensive care units, surgical departments, and in-patient care departments. Nurses have specialties, as do radiologic technologists. Radiologic technologists operate stationary and mobile x-ray equipment, as well as stationary and mobile fluoroscopy equipment; they must be proficient in both the Hospital Information System (HIS) and in the Radiology Information System (RIS). Using the leadership model of Southwest Airlines in employee development, similar programs may be beneficial (Southwest Airlines, n.d.).

Southwest Airlines (n.d.) understands the importance of employee development. University for People is a learning facility in Texas that offers a variety of professional and personal development for its employees. The ASRT could create a Learning

University to offer leadership courses specific for radiologic technologists. Southwest offers a program called Days in the Field, in which an employee can spend time in another person's position to learn about the job. In order to reduce some of the professional tensions within interdisciplinary teams, healthcare organizations could allow nurses to spend a day working with a radiologic technologist and a day in which radiologic technologists could work with a nurse to understand that which one another's job entails. This would be a beginning for understanding of the details and demands of the positions.

Table 18

Other Barriers to Change

Barrier	<i>N</i>	Percent
Organizational	49	45.8
Departmental	24	22.4
Personal	19	17.8
Professional	15	14.0
Total	107	100.0

Discussion Research Question 4: *What are the demographic characteristics of radiologic technologists who exhibit high need of leadership development.*

For Research Question 4, the intent was to determine whether certain demographic characteristics are displayed by radiologic technologists who exhibit a high knowledge of leadership characterizes, along with a high need for leadership

development. This would indicate that they are aware of leadership traits and in need of leadership training. The highest two demographics for primary discipline of registry were respondents from Radiography (51, or 13.8%) and Computed Tomography (29, or 7.8%) who were employed by not-for-profit facilities (75, or 20.2%) and for-profit facilities (61, or 16.4%) and possessed bachelor's degrees (58, or 15.6%) and associate's degrees (55, or 14.8%). Using this demographic analysis, leadership programs could be designed and marketed to organizations that meet these criteria. Universities that offer associate's degrees and bachelor's degrees in medical imaging could offer leadership courses in the curriculum. Additional findings indicate an age range of 25 to 68 years, with a mean age of 48; years of experience ranged from 1 to 47 years, with a mean of 22; and respondents of this survey managed 0-280 people, with a mean of 28.

Study Limitations

A limitation in the pilot testing was the convenience that sample consisted of this researcher's colleagues from past employment and current employment, as well as acquaintances in the radiology field. This may have introduced bias in the pilot study from some pilot study participants familiar with the intended research. A larger sample size would have yielded a more thorough reliability test.

The selection of job descriptions for this research also resulted in a limitation. Four job descriptions were included in the two categories selected for the study. Administrator or Manager positions were combined under one job description, and Supervisor or Assistant Chief Technologist were combined under another job description. The ARRT categorizes supervisor or assistant chief technologist under one job description. The position of supervisor indicates supervision of other technologists,

whereas duties of an assistant chief technologist may not include having followers. This may account for 10 responses of none and 26 non-responses to question 1.8 on the number of individuals managed.

Within the survey responses, a lack of representation was noted from the three registry types: Bone Densitometry, Vascular Sonography, and Breast Sonography. This limitation represents the small specialized career fields and few leadership positions associated with that field. Typically, these specialized fields have only one or two radiologic technologists per organization and they fall under the supervision of another imaging director.

An initial limitation of the study was that from the 25,892 population in the two job positions requested, only 2,000 selected to release their email addresses for research. The random sample of 1,800 was selected from the 2,000 name data base. Bias may have been introduced from participants who are selected routinely for research. Due to the large sample size, the most efficient distribution method was through email with a digital survey. This limited the population to only those with an email address. Some potential participants in the random sample supplied a military or government email address to the ARRT as a point of contact. These types of federal supplied email addresses block any external links, reducing the participation from employees from those types of facilities. Only 6% of the respondents were employed by a government-owned facility. This would have been accomplished by the recipient of the survey forwarding it to a non-federal email and completing the survey outside his/her employment facility. When asked about leadership courses received in formal education, a supportive question should have been added relative to whether the courses were specific for leadership in radiology

technology. The same should have been added when asking about employers providing leadership training. A contributing factor to the non-completion rate may have involved survey length. Even with 43 questions, the survey duration ranged from 7 minutes or less to over 22 minutes. The duration summary is included in Table 19. This is discussed further in suggestions for future research.

Table 19

Survey Duration

Time	<i>N</i>	Percent
7 minutes or less	199	51.6
8 - 14 minutes	142	36.8
15 - 21 minutes	23	6.0
Over 22 minutes	22	5.6
Total	386	100.0

Suggestions for Future Research

The research instrument could be used with other populations within the allied healthcare field to include Laboratory Technicians, Surgical Technicians, Pharmacy Technicians, Dental Technicians, Emergency Medical Technicians, and Biomedical Maintenance Technicians in order to compare findings and whether the leadership knowledge and developmental need is similar. Further research could be conducted on job descriptions and expectations from healthcare organizations that employ radiologic technologists as administrators and supervisors. The research could determine whether

they require these positions to be managers for planning and budgeting, organizing and staffing, and controlling and problem solving. It also could determine whether organizations want these administrators and supervisors to possess leadership skills for establishing direction, aligning people, and motivating and inspiring employees.

If this research was reproduced with the same population, a recommendation is to remove the perceived barriers aspect of the study and to do two separate studies. This suggestion arises from two factors found in the results of data analysis. The first involves survey duration time, as the goal was that the survey take less than 10 minutes to complete. More than half of the respondents required 15 minutes, with some outliers taking over 22 minutes to complete. The duration may have contributed to incomplete data. Another factor relative to separating the leadership analysis and barrier perceptions is related to the large responses to the open-ended question 4.2 asking for any other issues believed to be barriers to leadership development for radiologic technologists. The 107 candid responses alone could support future research on this one topic.

The findings of this study may support a qualitative methodology from the same population. A smaller sample could be used for telephonic or face-to-face interviews, expanding on the responses to questions of the modified CLAN-Q instrument. As the interview process begins and other questions arise, those questions can be added to future interviews as the research progresses. This may also be accomplished at the annual Radiology Society of North America conference.

Conclusion

Both personal sacrifice and determination are needed by new leaders in the field of radiology technology. If an employer does not offer leadership training, radiologic

technologists must take online courses, seek out a leadership mentor either within the organization or from another organization, or leave the career field to receive these skills. In order to build a healthy organization, the leader must assemble a cohesive leadership team. Radiologic technologists have a need for leadership development to prepare them not only for leadership positions within their department, but also to compete for interdisciplinary positions throughout the organization. This goal could be accomplished through leadership modules developed with specific leadership challenges pertinent to radiology technology. Such modules may include staff development, as well as interactions with physicians and nursing staff. Organizations with an educational department could integrate leadership development during annual training. A leadership school for new managers could be offered for all newly promoted first-time supervisors, which may occur at the organization or contracted to a partnering stakeholder that specializes in leadership training. Buy-in from the organization is needed before a change can occur. Leadership requires authenticity from the leader through communication, and they must have their own point of view to be able to lead. They must know who they are and what they want. Emotional intelligence is a trait that successful leaders learn in order to develop and to use for their benefit to connect with those they lead (Pearce, 2003). Implications from this study also could include specific training in professional writing, effective communication, listening, and emotional intelligence that would assist radiologic technologists in leadership positions.

Continuous learning is the foundation for change in an individual as well as in an organization. A simple gaining of new knowledge is an insufficient condition for learning to have occurred; therefore, a resulting change means that learning has occurred.

Organizational learning is the bridge that brings together transformational leadership and organizational change. The approaches are not specific to a certain type of organization or business; they are intended to be implemented in any setting in which there is a leader and subordinates. Organizational learning and individual learning can be compared with similar attributes. Organizational leaders with a learning attitude are those with a deep sense of self-discipline and ethical behavior. When an organization as a whole is viewed as a learning organization, the individual employee also continually seeks self-improvement and ongoing learning. Companies understand the need for leaders who value and realize their purpose for learning. This demand for effective leadership and continuous leadership development is required regardless of the organizational setting.

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APPENDIX A: Approval Letter for Use and Modification of Research Instrument

Re: CLAN-Q Survey Instrument

Page 1 of 3

Re: CLAN-Q Survey Instrument

Gerard Fealy [gerard.fealy@ucd.ie]

Sent: Monday, April 20, 2015 12:47 PM

To: Kester, Andrew

Cc: Capps, H. Randall; Martin McNamara [Martin.Mcnamara@ucd.ie]; Mary Casey [Mary.Casey@ucd.ie]

Attachments: GF_AK_april2015.pdf (178 KB)

Dear Andrew,

Please find attached herewith the letter of permission, as requested. I trust this is sufficient to meet the needs of your committee.

Kind regards,

Gerard

Gerard M. Fealy | Professor of Nursing |

Associate Dean for Research, Innovation and Impact |

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| Belfield Dublin 4.

| T: +353 1 7166461 |

<http://www.ucd.ie/nmhs/staffstructure/academicstaff/gerardfealy/>

<http://www.ucd.ie/nmhs/>

On 20 April 2015 at 18:11, Kester, Andrew <andrew.kester@wku.edu> wrote:

Dr. Fealy,

Thank you very much. I will credit your instrument in my dissertation and use APA in-text citations when referencing's the instrument. I will forward you a copy of my final dissertation when my research is complete towards the end of the year.

Andrew

From: Gerard Fealy [gerard.fealy@ucd.ie]

Sent: Monday, April 20, 2015 12:05 PM

To: Kester, Andrew

Cc: Capps, H. Randall; Martin McNamara; Mary Casey

Subject: Re: CLAN-Q Survey Instrument

Dear Andrew,

Thank you.

Yes, I am happy for you to modify the instrument in order to enable it to be administered to radiology technicians.

I will prepare a formal letter and send it in the next day or so.

Kind regards,

Gerard

Gerard M. Fealy | Professor of Nursing |

Associate Dean for Research, Innovation and Impact |

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NURSING, MIDWIFERY AND HEALTH SYSTEMS RESEARCH UNIT

20 April 2015

Mr Andrew Kester
Doctoral candidate
Western Kentucky University, USA

Re: Clinical Leadership Assessment of Need Questionnaire (CLAN-Q)

Dear Andrew,

I hereby grant you permission to use and adapt, as appropriate, the Clinical Leadership Assessment of Need Questionnaire (CLAN-Q) and its associated Clinical Leadership Assessment of Need Barriers Scale (CLAN-QB) for the purpose of your dissertation research on technical leadership development for radiology technologists. Permission is granted on the basis that you will acknowledge the original authorship of the instrument in your dissertation and will cite authorship, as appropriate, in subsequent publications.

I take this opportunity to wish you every success with your research.

Yours sincerely,

Gerard Fealy
Professor of Nursing/Associate Dean for Research, Innovation and Impact
E-mail: gerard.fealy@ucd.ie
Tel. 353 1 7166461

APPENDIX B: Survey Instrument

Technical Leadership in Radiology Technology

1.1 Are you currently employed in the Radiology technology career field?

- Yes
- No

1.2 Gender

- Male
- Female

1.3 What is your current age?

1.4 What is your primary discipline of registry: (select one)

- Radiography
- Radiation Therapy
- Mammography
- Magnetic Resonance Imaging
- Sonography
- Bone Densitometry
- Vascular - Interventional Radiography
- Radiologist Assistant
- Nuclear Medicine Technology
- Cardiovascular - Interventional
- Computed Tomography
- Quality Management
- Vascular Sonography
- Cardiac - Interventional Radiography
- Breast Sonography

1.5 What type of healthcare facility are you currently employed?

- Not for profit medical facility
- For profit medical facility
- Educational facility
- Government owned facility to include Military and VA

1.6 Total number of years working in primary registered discipline

1.7 What is your current job position as reported to the ARRT? (Select one)

- Supervisor or Assistant Chief Technologist
- Administrator or Manager

1.8 How many people do you manage?

1.9 Highest formal educational attained

- High School Diploma + RT
- Certificate program
- Associates degree
- Bachelors degree
- Masters degree
- Doctoral degree

1.10 In your formal educational training, which best describes your concentration?

- Medical imaging
- Health care administration
- Business general
- Education general
- Education health
- Informatics / IT
- Organizational Leadership
- Other technical
- Other non-technical
- Other

2.1 In the last year, have you participated in any in-service education and training in leadership offered by your employer?

- Yes
- No

2.2 If Yes, was it?

- Mandatory
- Voluntary

2.3 If Yes, how many training sessions have you attended in the last year?

2.4 In the past two years have you participated in any in-service education and training in leadership offered by your employer?

- Yes
- No

2.5 If Yes, was it?

- Mandatory
- Voluntary

2.6 If Yes, how many have you attended in the past two years?

2.7 Thinking back over the past two years of leadership training offered by your employer:

	Not useful	Somewhat useful	No opinion	Useful	Very useful
How useful was the training in meeting your leadership development needs?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2.8 Have you received any leadership courses as part of your formal educational program?

- Yes
- No

2.9 If yes, at which formal educational level?

- Certificate program
- Associates degree
- Bachelors degree
- Masters degree
- Doctoral degree

2.10 Thinking back on the leadership courses in your formal educational program:

	Not useful	Somewhat useful	No opinion	Useful	Very useful
In general, how useful were the courses in meeting your clinical leadership development needs?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2.11 Instructions: Please read each item on the list. Using Part 1, please indicate your knowledge for each skill or capability. For Part 2 indicate your development needs for each leadership skill or capability. Please answer the following questions with 1 being low and 5 being high

	Part 1: My Knowledge					Part 2: My Development Need				
	1	2	3	4	5	1	2	3	4	5
1. Identifying priorities for service improvement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Treating others with compassion, tact and sensitivity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Creating a culture of trust and ethical behavior	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Providing clear and concise instructions to others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Considering social and cultural backgrounds	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

when interacting with others										
6. Stating priorities with an appropriate sense of urgency and importance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. Respecting colleagues' needs and feelings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. Demonstrates commitment to lifelong learning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. Participates in continuing professional development	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. Recognizes my strengths and weakness	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

3.1 Have you ever voluntarily resigned from a job in Radiology Technology?

- Yes
- No

3.2 What was the primary reason for voluntarily leaving?

- Better career opportunity within the Radiology Career Field at another facility
- Change in career
- Ineffective Leadership of my supervisor
- Financial incentive
- Seeking higher education
- Relocation
- Other _____

4.1 Instructions: With reference to your experiences of conditions affecting your development as a radiological leader, please indicate the extent to which you agree or disagree with each statement on the list in your current employment facility.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
1. There is little support for Radiologic Technologists continuing professional development	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. There is effective collaboration between clinical and academic settings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. There is high regard for the status of Radiologic Technologists	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

<p>4. There are few opportunities for Radiologic Technologists to progress along clinical career pathways</p>	○	○	○	○	○
<p>5. Radiologic Technologists are viewed as equal members of the interdisciplinary team</p>	○	○	○	○	○
<p>6. There are professional tensions among members of the interdisciplinary team</p>	○	○	○	○	○
<p>7. Radiologic Technologists interests are not well represented at the organizational level</p>	○	○	○	○	○
<p>8. Radiologic Technologist managers lack authority at the</p>	○	○	○	○	○

organizational level					
9. Shortages of Radiologic Technologists compromise the provision of optimum care in my work place	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. The expertise of Radiologic Technologists is recognized and valued by other health professionals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4.2 List any other barriers to leadership development for Radiologic Technologist?

Thank you for participating in this survey.

APPENDIX C: Letter of Cooperation



THE AMERICAN REGISTRY OF RADIOLOGIC TECHNOLOGISTS®

August 4, 2016

Western Kentucky University Institutional
Review Board
1906 College Heights Blvd. #11026
Bowling Green, Kentucky 42101

To Whom it May Concern:

Doctoral candidate, Andrew Kester, has requested that the American Registry of Radiologic Technologists provide contact information for a random sample of its certificants to conduct a survey for his dissertation research entitled *An Analysis of Technical Leadership in Radiology Technology*.

ARRT has reviewed his proposal and agreed to provide the contact information for the sample having the characteristics specified in his proposal under ARRT's policies and procedures for cooperating in such research.

Sincerely,

A handwritten signature in black ink, appearing to read 'J. Reid'.

Jerry B. Reid, Ph.D.
Executive Director

JBR/dak

GOLD STANDARD
PATIENT CARE



1255 NORTHLAND DRIVE, ST. PAUL, MN 55120
651.687.0048 MAIN PHONE | WWW.ARRT.ORG

APPENDIX D: Survey Letter

Dear Radiology Colleague,

Do you believe leadership is important in the Radiology Technology field? How do we learn and teach leadership in our field? You selected to share your email for research in your ARRT renewal. My name is Andrew Kester, I am a Radiologic Technologist from Clarksville, TN completing an Educational Doctoral Degree at Western Kentucky University. As part of my degree, I am conducting a research study entitled: An Analysis of Technical Leadership in Radiology Technology. The purpose of this study is to assess the relationship between technical experience and leadership abilities. One of the primary goals is to test how Radiologic Technologists acquire leadership skills. Because of your management position I would like to invite you to participate in a survey for my research study.

If you would kindly agree to assist in this study, participation will involve responding to a 43-question online survey, which will take approximately 10 minutes to complete. Participation in this study is voluntary; however, those who complete the survey will be entered in a drawing to for a chance to win one of ten \$50 gift cards. You may refuse to participate or withdraw at any time during the survey. The results of the research study may be published; however, names will not be disclosed and results will be strictly confidential. Your assistance in this survey is greatly appreciated. Please follow the link below which will direct you to the survey. Upon completion of my research I would gladly share my results and / or speak at functions at your request.

In this research, there are minimal foreseeable risks to you, which include potential loss of privacy. To minimize this risk, all returned surveys will be coded to

maintain individual respondent confidentiality. Although there may be no direct benefits to you, the possible benefit of your participation is increase awareness for formal leadership development in our career field. If you decide to participate in the project, your informed consent will be implied by completing the electronic survey. Thank you for assisting me in this endeavour.

Genuinely,

Andrew Kester RT (R, CT)
Doctoral Candidate, Ed D.
Western Kentucky University
andrew.kester@wku.edu
931-494-7732

APPENDIX E: Content Validity Index Survey

The questions below are being reviewed for their contribution in the assessment of leadership training and development in both formal and informal settings. Read each question then indicate the extent YOU believe the item is a valid and relevant measure for gauging the leadership training individuals may have experienced.

1. In the last year, have you participated in any in-service education or training in leadership offered by your employer?

2. How many training sessions have you attended in the last year?

3. Was this in-service or training in leadership by your employer

Mandatory

Voluntary

4. In the past two years have you participated in any in-service education or training in leadership offered by your employer?

5. How many training sessions have you attended in the last two years?

6. Was this in-service or training in leadership offered by your employer

Mandatory

Voluntary

Thinking back over the past two years of leadership training offered by your employer:

7. How useful was the training in meeting your leadership development needs?

8. Have you received any courses designed as a "Leadership Course" as part of your formal educational program?

9. At which formal educational level was this course offered?

Certificate program

Bachelors degree

Masters degree

Doctoral degree

Thinking back on the leadership courses in your formal educational program:

10. In general, how useful were the courses in meeting your clinical leadership development needs?

The next set of questions are being reviewed for their contribution in the understanding of knowledge and need of leadership skills. Read each question then indicate the extent YOU believe the item is a valid and relevant measure for gauging leadership knowledge and needs that individuals may report .

Instructions: Please read each item below and indicate your current **knowledge** for each skill or capability.

1. Identifying priorities for service improvement
2. Treating others with compassion, tact and sensitivity
3. Creating a culture of trust and ethical behavior
4. Providing clear and concise instructions to others
5. Considering social and cultural backgrounds when interacting with others
6. Stating priorities with an appropriate sense of urgency and importance
7. Respecting colleagues' needs and feelings
8. Demonstrates commitment to lifelong learning
9. Participates in continuing professional development
10. Recognizes my strengths and weakness

Instructions: Please read each item and indicate your current **development needs** for each skill or capability.

1. Identifying priorities for service improvement
2. Treating others with compassion, tact and sensitivity
3. Creating a culture of trust and ethical behavior
4. Providing clear and concise instructions to others
5. Considering social and cultural backgrounds when interacting with others
6. Stating priorities with an appropriate sense of urgency and importance
7. Respecting colleagues needs and feelings
8. Demonstrates commitment to lifelong learning
9. Participates in continuing professional development
10. Recognizes my strengths and weakness

The next set of questions are being reviewed for their contribution in the understanding of employment retention rates. Read each question then indicate the extent YOU believe the item is a valid and relevant measure for gauging voluntary turnover.

1. Have you ever voluntarily resigned from a job in Radiology Technology?

2. What was the primary reason for your resignation?

Better career opportunity within the Radiology Career Field at another facility
Change in career

Ineffective Leadership of my supervisor

Financial incentive

Seeking higher education

Relocation

Other _____

The next set of questions are being reviewed for their contribution in the understanding of perceived barriers to organizational change. Read each question then indicate the extent YOU believe the item is a valid and relevant measure for gauging perceived barriers to organizational change individuals may have experienced.

Instructions: With reference to your experiences of conditions affecting your development as a radiological leader please indicate the extent to which you agree or disagree with each statement on the list in your current employment facility.

1. There is little support for Radiologic Technologists continuing professional development
2. There is effective collaboration between clinical and academic settings
3. There is high regard for the status of Radiologic Technologists
4. There are few opportunities for Radiologic Technologists to progress along clinical career pathways
5. Radiologic Technologists are viewed as equal members of the interdisciplinary team
6. There are professional tensions among members of the interdisciplinary team
7. Radiologic Technologists interests are not well represented at the organizational level
8. Radiologic Technologist managers lack authority at the organizational level
9. Shortages of Radiologic Technologists compromise the provision of optimum care in my work place
10. The expertise of Radiologic Technologists is recognized and valued by other health professionals

11. Are there any other issues you believe that are potential barriers to leadership development for Radiologic Technologists?

Thank you for taking the time to rate the content of this research instrument. If you consent, please provide me with the following general personal information to be added in the methodology section of my dissertation for this CVI. Names and employment organizations will not be published.

1: Your Highest Educational Degree and concentration (i.e. PhD Education)

2: Your job title

APPENDIX F: Pilot Survey Letter

Dear Radiology Colleague,

I am a Radiologic Technologist that is completing an Educational Doctoral Degree at Western Kentucky University. I am conducting a research study entitled An Analysis of Technical Leadership in Radiology Technology. The purpose of this study is to assess the relationship between technical experience and leadership abilities. One of the primary goals is to test how Radiologic Technologists acquires leadership skills. You have been chosen to participate in a pilot study of the survey instrument for my research study. Your participation will help me refine the survey for use in the final research sample of Radiologic Technologists across the United States.

If you consent to assist in this pilot study, your participation will involve responding to a 39-question survey, which takes approximately 10 minutes to complete. You will be asked to complete this survey two different times within a two-week time frame to evaluate how reliable the survey is in soliciting similar answers from the same individuals at different times. Your participation in this study is voluntary. You may choose not to respond to individual question(s) in the survey, not to participate in the study, or to withdraw from the study at any time. The results of the research study may be published but your name will not be used and your results will be maintained in confidence.

In this research, there are minimal foreseeable risks to you, which include potential loss of privacy. To minimize this risk, all returned surveys will be coded to maintain individual respondent confidentiality. Although there may be no direct benefits to you, the possible benefit of your participation is increase awareness for formal leadership development in our career field. Thank you for assisting me in this endeavor.

Genuinely,
Andrew Kester RT (R, CT)
Doctoral Candidate, Ed D.
Western Kentucky University
931-494-7732

APPENDIX G: Informed Consent Document

INFORMED CONSENT DOCUMENT

Project Title: An Analysis of Technical Leadership in Radiology Technology
Investigator: Andrew Stephen Kester, Department of Educational Leadership,
(931)494-7732, andrew.kester@wku.edu



You are being asked to participate in a project conducted through Western Kentucky University. The University requires that you give your signed agreement to participate in this project.

You must be 18 years old or older to participate in this research study.

The investigator will explain to you in detail the purpose of the project, the procedures to be used, and the potential benefits and possible risks of participation. You may ask any questions you have to help you understand the project. A basic explanation of the project is written below. Please read this explanation and discuss with the researcher any questions you may have. You should be keep a copy of this form for your records.

1. **Nature and Purpose of the Project:** The purpose of this study is to determine if significant difference exist in the leadership characteristics of radiologic technologists with formal leadership education and those without formal leadership education. The desired results for this study would be to implement leadership courses throughout radiologic technology degree course curriculum, support the importance for leadership development within healthcare organizations and continuous learning for the individual leaders. This would better prepare radiologic technologists for leadership positions in leading technical teams.
2. **Explanation of Procedures:** Data will be collected through an electronically administered survey. Participation will involve responding to a 43 question survey, which takes approximately 15 minutes to complete.
3. **Discomfort and Risks:** There are no known foreseeable risks or discomforts associated with this project. None of the interview questions deal with sensitive or overly personal information.
4. **Benefits:** Participant will receive no direct benefit from participation.
5. **Confidentiality:** Only the primary researcher of this project will have access to the research data and it will only be reported in a summary format.
6. **Refusal/Withdrawal:** Refusal to participate in this study will have no effect on any future services you may be entitled to from the University. Anyone who agrees to participate in this study is free to withdraw from the study at any time with no penalty.

You understand also that it is not possible to identify all potential risks in an experimental procedure, and you believe that reasonable safeguards have been taken to minimize both the known and potential but unknown risks.

Your continued cooperation with the following research implies your consent.

THIS PROJECT HAS BEEN REVIEWED AND APPROVED BY
THE WESTERN KENTUCKY UNIVERSITY INSTITUTIONAL REVIEW BOARD
Paul Mooney, Human Protections Administrator
TELEPHONE: (270) 745-2129

APPENDIX H: Western Kentucky University IRB Approval



INSTITUTIONAL REVIEW BOARD
OFFICE OF RESEARCH INTEGRITY

DATE: August 5, 2016
TO: Andrew Kester
FROM: Western Kentucky University (WKU) IRB
PROJECT TITLE: [942978-1] Kester Ed.D Dissertation
REFERENCE #: IRB 17-024
SUBMISSION TYPE: New Project
ACTION: APPROVED
APPROVAL DATE: August 5, 2016
REVIEW TYPE: Exempt from Full Board Review

Thank you for your submission of New Project materials for this project. The Western Kentucky University (WKU) IRB has APPROVED your submission. This approval is based on an appropriate risk/benefit ratio and a project design wherein the risks have been minimized. All research must be conducted in accordance with this approved submission.

This submission has received Exempt from Full Board Review based on the applicable federal regulation.

Please remember that informed consent is a process beginning with a description of the project and insurance of participant understanding followed by an *implied* consent form. Informed consent must continue throughout the project via a dialogue between the researcher and research participant. Federal regulations require each participant receive a copy of the consent document.

Please note that any revision to previously approved materials must be approved by this office prior to initiation. Please use the appropriate revision forms for this procedure.

All UNANTICIPATED PROBLEMS involving risks to subjects or others and SERIOUS and UNEXPECTED adverse events must be reported promptly to this office. Please use the appropriate reporting forms for this procedure. All FDA and sponsor reporting requirements should also be followed.

All NON-COMPLIANCE issues or COMPLAINTS regarding this project must be reported promptly to this office.

This project has been determined to be a Minimal Risk project.

Please note that all research records must be retained for a minimum of three years after the completion of the project.

If you have any questions, please contact Paul Mooney at (270) 745-2129 or irb@wku.edu. Please include your project title and reference number in all correspondence with this committee.