DEVELOPING CONFIDENCE AND KNOWLEDGE IN NURSES MANAGING POST-CATHETERIZATION PATIENTS

by

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ABSTRACT

WHITNEY MILLER PATTERSON. Developing confidence and knowledge in nurses managing post-catheterization patients. (Under the direction of DR. DAVID LANGFORD)

Increase in volume and acuity of patients following Chest Pain Center Percutaneous Intervention (PCI) accreditation at a hospital in the foothills of North Carolina, led to various needs identified. One identified need was standard care training for nurses taking care of post-catheterization patients. An evidence-based program was developed to provide education aimed at increasing nursing knowledge and to positively impact their attitudes about confidence and competence in caring for post-catheterization patients. Thirteen 2-hour face-to-face education sessions were offered over three months to 141 nurses identified by nursing directors as nurses working on units that accept post-catheterization patients. A sample of 17 participants participated in the scholarly project with all completing a test of knowledge and most completing a survey about beliefs pre- and post-education. A statistically significant difference was measured in total score between pre-test (M=18.76, SD=2.04, SE=.50) and post-test (M=23.35, SD= 1.84, SE= .44); t(16)=-9.037, p=.000. Questions regarding management of complications provided some of the lowest initial scores and largest increase in scores on the post-test of knowledge. No statistically significant change in attitudes about nursing competence and confidence was measured. Results suggest that while nurses gained knowledge about post-catheterization patients by attending the education sessions, experience may be more important to recognize and manage complications. As a result of time and practical constraints, hands-on experience was not possible during this study. This underscores the

need for future education sessions offered concurrently with clinical hands-on experience managing vascular access sites and complications in a controlled setting.

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Developing Confidence and Knowledge in Nurses Managing Post-Catheterization Patients

Thousands of cardiac catheterizations are performed daily worldwide. Patients who undergo heart catheterization are at risk for vascular access site complications (VASCs) such as bleeding, hematomas, and occlusions. Early recognition and effective management of complications are essential components of nursing care focused on patient safety and positive outcomes. Comprehensive training programs using evidence-based practice provide nurses with the proper skills to manage this specialized set of patients. Heart catheterization lab technicians undergo rigorous training in accordance with the Society of Invasive Cardiovascular Professionals educational guidelines (SCAI & SICP, 2015). However, nurses providing post-catheterization care are lacking similar national guidelines. Currently, there are no training programs, materials or follow-up education in place for the nurses that manage post-catheterization patients at Catawba Valley Medical Center (CVMC). A comprehensive and specific training program lays the foundation for nurses to provide the best standard of care. The aim of this scholarly project was to increase the knowledge of nurses caring for post-catheterization patients through development and implementation of an evidence-based training program. Training was designed to increase nursing knowledge thus positively impact nurses' attitudes about confidence and competence in caring for post-catheterization patients.

Background and Purpose

Competent nursing care of post-cardiac catheterization patients directly impacts patient outcomes such as reducing complications, recovery time and cost. Medicare patients who experienced a VASC after radial artery catheterization demonstrated an average increased cost of $4278 (Schueler et al, 2013). Early recognition of complications and effective management is vital in reducing cost to the patient.

The culture at CVMC is rooted in reliance on nurses calling the catheterization lab staff when complications occur. Staff of the catheterization lab are currently contacted by nurses to handle complications including any medical or vascular access issues that arise overnight. Members of the catheterization lab staff undergo rigorous training to care for cardiac catheterization patients. This is not currently or historically the case for nurses who manage the patient after the procedure within this facility. Post--catheterization complications have the potential to become major safety issues for patients if the closest on-call technician or cardiologist takes the full thirty minutes allotted to arrive at the hospital per emergency protocols.

A need was identified to provide a training program focused on nursing care of post-catheterization patients. Currently there is no structured training, materials or follow up for nurses caring for post-catheterization patients at CVMC. In 2014 CVMC earned the designation of a Chest Pain Percutaneous Intervention (PCI) Center. Since then the catheterization lab was made available twenty-four hours per day to handle patients having acute heart attacks. This directly increased the volume and acuity of patients requiring nursing care. Total catheterizations increased from 43 to 64 per month in the two years after certification. This includes the addition of the higher acuity ST elevation

Myocardial Infarction (STEMI) patients from zero to nine per month (McGinnis, 2017). Also, current justification for a second cath lab is underway due to increasing patient volume with the potential to bring more revenue to the hospital. Faster cath lab turnover has the potential to translate into more procedures in a day; however, this requires development of nursing expertise in managing sheaths and vascular complications so that sheaths can be removed outside of the catheterization lab. Capasso et al. (2006) note that catheterization lab throughput can be maximized when expert nursing staff remove sheaths and effectively manage vascular access sites on consolidated, specialized units. Management of vascular access site complications (VASCs) is a vital role of post-catheterization nursing and has short and long term patient outcome implications. Proper nursing management of VASC's can reduce patient stays, costs, pain, morbidity and mortality (Merriweather &Sulzbach-Hoke, 2012). Naidu et.al (2016) recommended as best practice, vascular site checks and vital sign monitoring every fifteen minutes for two-hours post-catheterization. With an increase in monitoring, procedures and follow up tasks, nurses need the skills to effectively monitor and recognize complications in multiple patients. The extra demands on time previously listed also require administration to consider increasing staff to meet patient needs safely.

Literature Review

A comprehensive literature review was conducted using Cochrane, CINAHL, PubMed, Academic Search Complete and Science Direct. For nurses to effectively manage post-catheterization patients they must have a knowledge base that includes anatomy, procedures, pharmacology and risk factors of VASC's. They must be timely in recognition of complications and effective in complication management to minimize adverse effects on the patient. This review addresses the best practices for development of a training program within the context of the specific needs of post-catheterization patients.

Incidence of Complications

VASC rates vary depending on type of access and procedure. Total complication rates for all cardiac catheterizations vary between 0.7- 9% (Samal & White, 2002). VASC rates of PCI range from 5-20% (Merriweather & Sulzbach-Hoke, 2012). Trans-radial access is gaining popularity and has a complication rate of 2-23% (Schueler et al, 2013). Bleeding is the most frequent complication following femoral artery access and may present in a multitude of ways including hematoma, pseudo-aneurysm, and retroperitoneal hemorrhage. Multiple factors increase the risk of vascular access site complications including the technique of the cardiologist, anatomical placement of the access, drugs administered and method of closure (Lee et al., 2014). Nurses managing this patient population should have knowledge of risk factors, complications, patient anatomy and manual compression techniques. They need to possess a thorough understanding of vascular access issues and promptly recognize complications to minimize morbidity, mortality, and hospital costs associated with them, which can be

substantial (Merriweather & Sulzbach-Hoke, 2012). Anti-platelet medications administered during the catheterization have been shown to increase the risk of VASC's and nurses must be knowledgeable about these. They should also be knowledgeable about other risk factors including advanced age, longer sheath time, larger sheath size and stent placement (Mandak et al., 1998).

Nursing

Removing femoral sheaths and managing related complications after catheterization are predominantly the responsibilities of nurses in many hospitals and requires frequent assessments and monitoring of vital signs, puncture site, extremities and pulse checks (Merriweather &Sulzbach-Hoke, 2012). Stegemann et al. (2015) demonstrated a statistically significant reduction in VASCs when sheath management and removal was performed by well trained personnel ($p = 0.03$). Another study performed by Liew et al. (2007) collected data about VASC rates after implementation of a nurse lead protocol for femoral sheath removal. When experienced nurses implemented a specific training protocol that involved a mix of education, observation and hands on experience, sheath removal and patient management by nursing following cardiac catheterization was safe and effective. They also found that hypertension was a statistically significant risk factor for bleeding and hematoma formation. Frequent monitoring and blood pressure measurement by nursing allows for close observation and management of this risk factor.

Training

The importance of well trained nurses was explored by Stayt et al. (2015) who found that a combination of simulation (hands-on training) and classroom learning was more effective than classroom training alone. Scores on post-tests of knowledge in

recognizing a deteriorating patient were significantly higher in the combination learning group. Nursing competence discussed by Vernon, Chiarella and Papps (2011) involves skills, knowledge and abilities which are garnered through structured, standardized and clear training that promotes initial and continuing competence.

Literature Gap

There is a major gap in literature regarding the standardization of training and knowledge regarding vascular site access management. Several authors mentioned the need for further study about nursing intervention and that a standard of practice should be developed for care of post-catheterization patients (Rolley et al., 2009; Sulzbach-Hoke et al., 2010; Tagney & Lackey, 2005). Tagney and Lackey (2005) note that, despite expansion of cardiac practice, procedures and centers, very little has been done to explore the effect of nursing intervention in VASC management, a trend that has continued since their analysis. Rolley et. al (2009) note limited data about nursing care of post-catheterization patients despite increases in procedures. They further mention that the impact of nursing care pre- and post-catheterization as well as development of standards of nursing care has remained unexplored. Sulzbach-Hoke et al. (2010) note a lack of universally accepted evidence-based guidelines for nursing care of post-catheterization patients and ongoing issues with vascular complications despite advancements in technology. There remains very little literature investigating the type and amount of nursing training and knowledge necessary to demonstrate true proficiency in sheath pulling and VASC management. In contrast, common requirements for training of catheterization lab personnel include knowledge of anatomy and physiology,

medications, procedures, laboratory and EKG interpretation, risk factors, patient assessment, vital sign assessment and complication management (SCAI/SICP, 2015).

Theoretical Framework

The theoretical framework for this project is the Evidence Based Practice Paradigm (Leach,2006). First identified in 1970, the framework allows for program development and care delivery based on the best and most current research instead of anecdotal beliefs and historical methods. The model involves the five steps as displayed in Figure 1.

This model provides for clear, concise and transparent application of vetted evidence to a situation in which a need has been assessed (Leach, 2006). Application of the paradigm to the scholarly project is detailed in Figure 2.

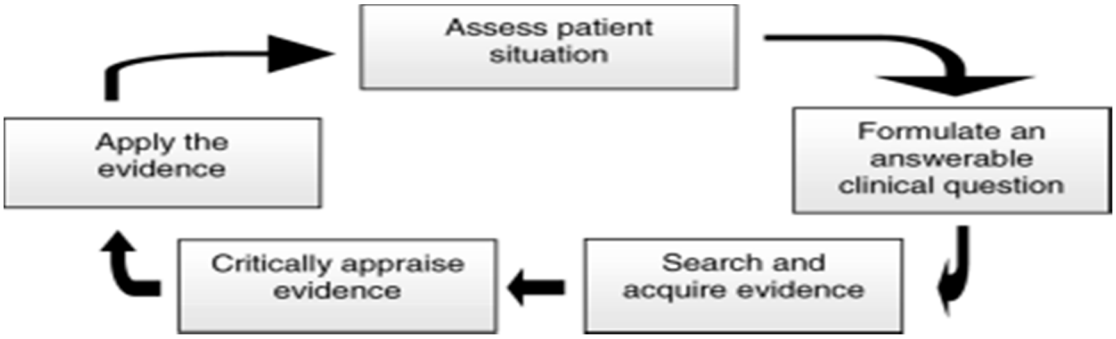

Figure 1. Evidence Based Practice Paradigm. From Evidence-based practice: A framework for clinical practice and research design. Leach, M. J. (2006). *International Journal of Nursing Practice, 12* (5) 248-251.

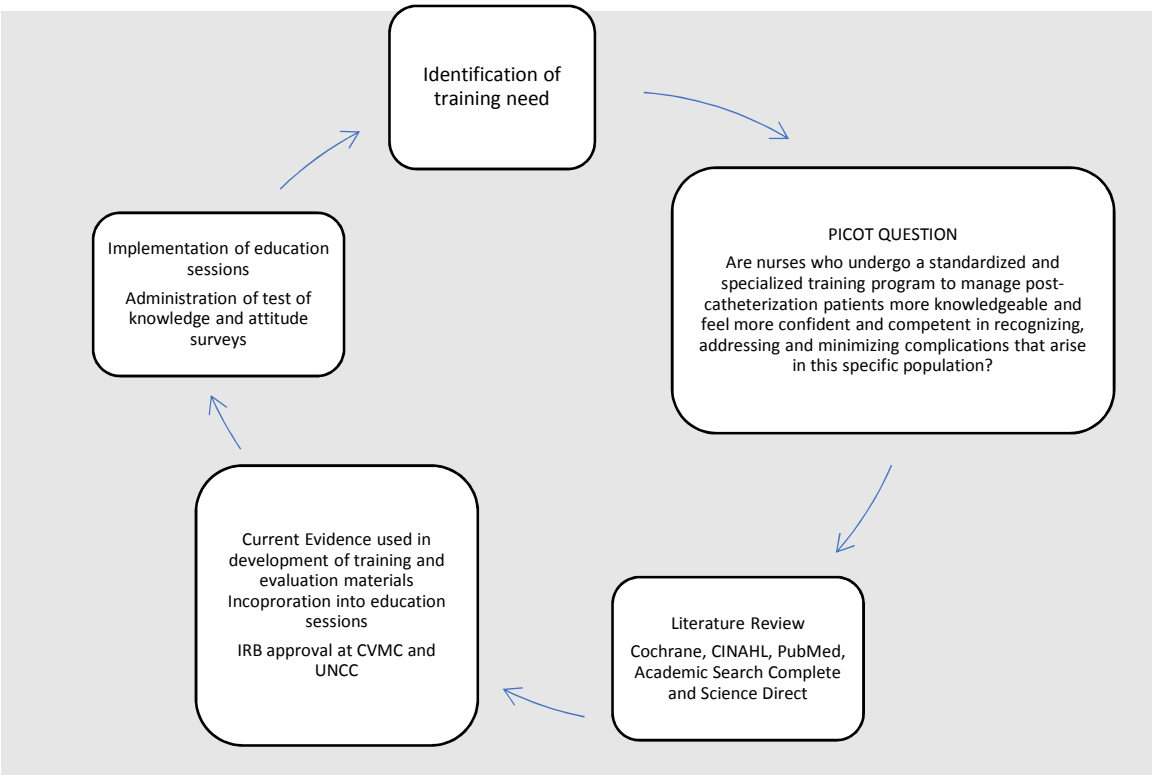

Figure 2. Application of Theoretical Framework to Scholarly Project

Design

Development of the project began with investigation of complications, current guidelines and best practices for post-catheterization management and training programs at other facilities. Evidence-based materials and classes were developed through a comprehensive literature review. Thirteen 2-hour education sessions were offered over three months. Education sessions and the nearly thirty-page training manual were developed by the DNP project coordinator. Sessions were performed face-to-face by the project coordinator with the only variance due to questions posed by participants. The main outcome measure for this program was the comparison of means on a pre- and post-training test of knowledge. This was to measure the effectiveness of the training program in increasing general nursing knowledge of post-catheterization patients. Baseline data was also collected to measure nursing attitudes of confidence and competence they feel when caring for post-catheterization patients immediately prior to training and 4-6 weeks after. A combination of education, observation and clinical experience is the cornerstone of all the nurse training programs for vascular access management reviewed for this study (Barwon Health, 2008; BMC2, 2014; Capitol Health, 2011). Unfortunately ensuring all study participants the equal opportunity to observe and have hands on experience with patients was not possible in the limited time frame of the study. Approximately 70 participants would have needed to provide consent for participants to observe and actively manage their vascular access sites. For this reason, development of the education component was the focus of the program design with the process as detailed in Figure 3.

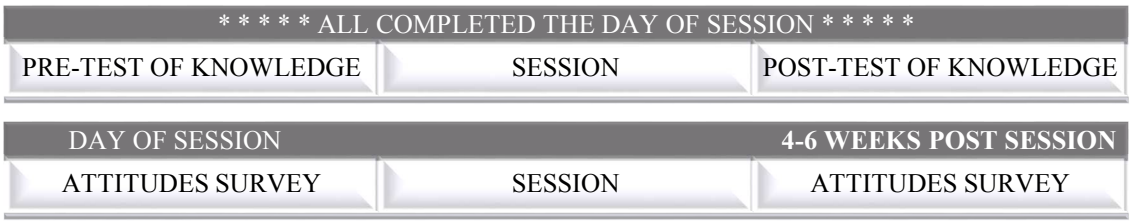

Figure 3. Schedule of Testing and Survey Administration

Methods

Seventeen nurses participated in a pre-post design program design focused on increasing general knowledge about, recognition of complications in and management of post-catheterization patients. Nurses were recruited from all departments currently treating post-catheterization patients. An email invitation was extended by the DNP program coordinator to all 141 nurses over three months and included any nurse capable of caring for post-catheterization patients that wished to participate. Recruitment flyers were placed in multiple areas on each eligible unit in high traffic areas such as the main desk, breakroom and hallways. 17 nurses responded and attended one two-hour education session. Informed consent was completed prior to participation. See Appendix C for a copy of the Informed consent. Enrolled participants completed pre/post testing to measure their general knowledge before and after the education session. A survey about nursing attitudes was administered just prior to the class and 4-6 weeks after to assess potential changes in beliefs when caring for post-catheterization patients. Participants had the opportunity to leave anonymous feedback about the education program. IRB approval was obtained from boards at CVMC and The University of North Carolina at Charlotte (UNCC) prior to any recruitment efforts. Refer to Appendix D for copies of the IRB approval letters.

The project setting was Catawba Valley Medical Center (CVMC) and education, testing and survey administration all occurred in this setting. The participants consisted of any CVMC nurse who currently provides care for post-catheterization patients and voluntarily expressed an interest in education about caring for these patients. Participation in the training was voluntary and included new hires and new graduates

from departments who care for post-catheterization patients. The number of nurses potentially caring for post-cath patients was provided by nursing managers. An alpha level was set at .05, effect size of 0.5 and power of 80% the sample size needed to conduct the analysis was 26.

Measurement

Identical printed materials, tests and surveys were provided to all participants. Training materials consisted of a 25-page manual covering nursing pertinent concepts adapted from the SCAI/SCIP guidelines for catheterization lab staff, guidelines from other facilities and recommendations from current literature. There were no current protocols or guidelines for training to draw from at CVMC. The thirteen training sessions were identical except for individual questions posed by participants. Sessions were conducted in hospital education rooms, face-to-face with the study coordinator. Per policy at CVMC, nurses were provided education pay for the two-hour sessions. All sessions were offered at different days throughout each week at five pm.

Measurement of general medical knowledge about catheterization patients pre- and post-education was collected using a written test. The test consisted of twenty-five multiple choice questions tailored to nursing care. Themes were drawn from an exhaustive review of current literature including the SICP educational guidelines for invasive cardiovascular technology personnel. Major themes included general knowledge and recognition and management of complications post-catheterization.

Nursing attitudes about perceived competence and confidence in taking care of post-catheterization patients was measured with a written survey immediately prior to and one month post education. The survey was developed by the project coordinator and

consisted of a Likert scale of one to five from strongly agree (1) to strongly disagree (5). Literal definitions of competence and confidence were provided for consistency, to minimize variability of individual ideas about meaning and question concepts mirrored the major themes of the tests.

Pre- and post-testing of knowledge was administered immediately before and after the session. This was to measure the effect of the education session on general knowledge about post-catheterization patients.. Participants were also instructed to not share their materials or discuss to course until all sessions were complete to minimize the possibility of skewed results of future participants.

Data Collection Tools

Pre-test/Post-tests of Knowledge. The pre- and post-test evaluation tools were designed to test the level of knowledge of participants at baseline and after training. Developed by the primary investigator, the questions were based on common evidence-based themes identified in the current literature. Questions were drawn directly from literature to ensure that what was asked was measured in the response. These themes and information were included within the training program. There are no national guidelines or standardized curriculum about nursing care for post-catheterization patients (Rolley et al, 2009). Education for this program was based on SCAI/SCIP guidelines for catheterization lab staff, other hospital protocols and current literature.. Results were entered into SPSS and analyzed using the paired t-test of interval level data within the same group. The tests were identical and administered just prior to and after education was completed. Refer to Appendix A for a copy of the pre/post-test.

Attitudes Survey. A survey regarding nursing attitudes and beliefs about competence and confidence was developed by the primary investigator and was administered just prior to education and again 4-6 weeks after. The survey was developed with the intention of obtaining baseline data about perceptions of the nursing staff at CVMC. A Likert scale was developed to measure participants' attitudes about their confidence and competence. Refer to Appendix B for a copy of the attitude survey. The 4-6 week gap in survey administration was intended to allow the participants to utilize the knowledge they gained while caring for post-catheterization patients thus measuring their attitudes about confidence and competence after applying what they had learned. Results were entered into SPSS by the primary investigator and each question was analyzed individually using the Wilcoxon signed-rank test for ordinal level data.

Intervention

Currently there are no policies, procedures or guidelines for nurse training and care of post-catheterization patients at CVMC. Training is anecdotal and the only instructions for nursing care exist on post-catheterization orders. Those instructions can be modified by the cardiologist to determine the amount of time a patient must remain flat in bed post-catheterization and frequency of vital signs (CVMC, 2015). No further instruction is provided to nurses including about recognition and management of complications. This lack of training and guidelines has created a culture of reliance on the catheterization staff. This program was created to develop and provide education, working toward empowerment of nursing staff to care for post-catheterization patients independently. A total of thirteen education sessions lasting two hours were offered over three months. Each participant attended only one two-hour session. Printed materials

developed by the primary investigator were provided to participants and utilized during training. Materials were designed to be kept by the participants for ongoing reference. Informed consent was obtained prior to administration of survey, pre-test and education The follow up survey was administered 4-6 weeks post-training which took a minute or two to complete.

Results

The aim of this scholarly project was to increase the knowledge of nurses caring for post-catheterization patients through development and implementation of an evidence-based training program.

Test of knowledge

A total of 17 (n=17) nurses participated in the study. Three participants did not provide demographic information which is listed in Table 1.

Table 1. Demographic Data (based on 14 of 17 respondents)

Experience (years)	<1 7.1% (1)	1-5 50% (7)	5-10 28.6% (4)	10+ 14.3% (2)	
Frequency of Care	Never 7.1% (1)	Rarely 21.4% (3)	Monthly 21.4% (3)	Weekly 42.9% (6)	Daily 7.1% (1)
Education level	ADN/DIPLOMA 14.3% (2)	BSN 78.6% (11)	MSN 7.1% (1)		
ACLS	100% (14)				

Their responses were included in the results analysis. The majority had 1-5 years nursing experience and at least weekly contact with catheterization patients. Sixty-five percent were BSN educated nurses and all were ACLS certified. A paired samples t-test was conducted to compare the pre- and post-test total scores and for each question. The total score was a measure of overall general knowledge about post-catheterization patients. Individual questions were separated into three categories: knowledge, recognition and management. A statistically significant difference was measured in total score between pre-test (M=18.76, SD=2.04, SE=.50) and post-test (M=23.35, SD= 1.84, SE= .44); t(16)=-9.037, p=.000. These results suggest that the nurses did gain knowledge about catheterization patients by attending the education sessions. Statistically significant differences for total score and individual questions can be found in Table 2.

Table 2. Test results – Differences between Pre- and Post-test Mean Scores (n=17)

Question #	Type	Mean	SD	SE	t*	P
5	Management	.47	.52	.12	3.77	.002
6	Recognition	.41	.51	.12	3.35	.004
8	Management	.59	.51	.12	4.78	.000
11	Knowledge	.24	.44	.11	2.22	.041
12	Management	.64	.49	.12	5.42	.000
15	Knowledge	.35	.49	.12	2.95	.009
17	Knowledge	.35	.61	.15	2.40	.029
18	Management	.53	.52	.13	4.24	.001
Total Score	Overall	4.59	2.09	.51	9.037	.000

Survey

Fourteen of the seventeen participants completed follow up surveys. A Wilcoxon signed-rank test showed that a single two-hour education session did not elicit a statistically significant change in attitudes about confidence and competence among the nursing staff. Connors, Good and Gollery (2017) observed similar results with classroom only learning sessions. They go on to note that introduction of simulation elicited significant increases in perceived confidence and competence in providing care. Survey analysis by question is summarized in Table 3. Answers did vary but on average most felt that they were moderately confident and competent when providing care for catheterization patients both before and after the workshop. Nearly all indicated that they always call the catheterization lab staff for help with complications and that they believed that more education is needed to provide the best care to catheterization patients. Four participants strongly disagreed that ongoing education is necessary. One did not change their answer after the education session and did not provide demographic data demonstrating how often they care for post-catheterization patients. Two others changed to strongly agree and somewhat agree. The fourth did not complete the follow up survey.

Two did not provide demographic information and two indicated they care for catheterization patients on a weekly basis. The survey findings, although not statistically significant, were consistent with some small, positive changes in their feelings about receiving adequate education and managing vascular complications without help from the catheterization lab staff after receiving specialized training.

Table 3. Wilcoxon Sign Rank Data

Pre-education survey	N	Mean	Std. Deviation	Post-education survey	Mean	Std. Deviation
QUESTION 1	14	2.2857	.82542	QUESTION 1	2.2857	1.68379
QUESTION 2	14	2.3571	.74495	QUESTION 2	2.4286	1.74154
QUESTION 3	14	2.2143	.89258	QUESTION 3	2.4286	1.65084
QUESTION 4	14	2.3571	.92878	QUESTION 4	2.5000	1.74312
QUESTION 5	14	2.7143	.72627	QUESTION 5	2.4286	1.78516
QUESTION 6	14	1.7857	1.42389	QUESTION 6	2.2857	1.81568
QUESTION 7	14	2.3571	1.00821	QUESTION 7	2.4286	1.45255
QUESTION 8	14	2.3571	.63332	QUESTION 8	2.3571	1.33631
QUESTION 9	14	2.3571	.63332	QUESTION 9	2.2857	1.38278
QUESTION 10	14	2.8571	.86444	QUESTION 10	2.6429	1.21574
QUESTION 11	14	3.0714	1.07161	QUESTION 11	3.0714	1.26881

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11
Z	-.155[b]	-.161[b]	-.499[c]	-.360[c]	-.319[b]	-.850[c]	-.212[c]	-.122[c]	-.123[b]	-.499[b]	-.245[c]
Asymp. Sig. (2-tailed)	.877	.872	.618	.719	.750	.395	.832	.903	.902	.618	.807

Five general knowledge and one management question were answered correctly by all participants. Topics ranged from anatomy to medications. Analysis using Pearson's correlation coefficient demonstrated no statistically significant relationship between frequency of care, years of experience or education level with pre- and post-test scores as summarized in Table 4.

Table 4. Pearson Correlation Coefficients

		PRETOTAL	POSTTOTAL
Years Exp.	**Pearson Correlation**	**-.160**	**-.324**
	Sig. (2-tailed)	**.585**	**.259**
	N	**14**	**14**
Freq. of Care	**Pearson Correlation**	**-.139**	**.035**
	Sig. (2-tailed)	**.634**	**.905**
	N	**14**	**14**
Ed. Level	**Pearson Correlation**	**.278**	**-.028**
	Sig. (2-tailed)	**.336**	**.925**
	N	**14**	**14**

Discussion

Results of the one-sample t-test based on differences demonstrate a statistically significant difference in the overall scores of participants between the pre- and post-test. Total score demonstrated an increase in mean of 4.6 points from M=18 to M=23. The lowest pre-test scores pertained to management of patients and complications. The most frequently missed question pertained to management of bleeding which only three participants answered correctly before training. More problematic is that despite a heavy focus on the content of the question in the education sessions, 35% (6) of respondents still answered incorrectly. Removal of the bandage to assess the puncture site is a basic concept that must be understood and followed to properly manage bleeding. Dressings mask the location of the puncture site and two-finger directed pressure 1-2 cm above the site is standard practice for achieving hemostasis. Without confirmation of the puncture site visually, pressure may be applied incorrectly leading to further complications. Knowledge about anatomy of the puncture site is imperative in sheath removal and subsequent vascular site and complication management (Smith & Labriola, 2001). This underscores the need for further training and experience in caring for post-catheterization patients. An expert staff dedicated to sheath pulling and post-catheterization patient management who has met competency requirements is considered the best organizational design to minimize vascular complications (BMC2, 2014). Consolidation of post-catheterization patients on a single unit with a dedicated and expert staff would be ideal at CVMC. This will not be possible without an extensive training program and coordination with nurse management and hospital administration. .

Clinical experience observing, then pulling sheaths and managing vascular access would increase the expertise of nurses at CVMC and reduce their reliance on catheterization lab staff. This was made clear by Liew et al. (2007) who noted that nursing led sheath removal protocols are a safe and effective way to manage vascular access sites.. Other programs train nurses in this manner with vascular management ranging from 3-10 sheath pulls after education sessions and observation (BMC2, 2014; Capital Health, 2011). The absence of this type of training for nurses at CVMC has prevented them from learning to expertly and independently manage post-catheterization patients without help from the catheterization lab staff.

The nurses did demonstrate good basic knowledge about terms, tests and procedures related to post-catheterization patients. Complication management posed the greatest challenge for participants reinforcing the need for a comprehensive training program.. Lack of understanding about steps to take and interventions to use can pose a safety problem as well as perpetuate the need for expensive on-call catheterization staff. Post-training scores demonstrate statistically significant improvement in scores in both management and knowledge

Congruent with the culture to date at CVMC of reliance on catheterization lab staff to remove sheaths and manage complications, approximately half of respondents did not realize that it is common in most hospitals for nurses to remove and mange sheath sites post-catheterization. This is not surprising considering all sheaths are removed in the catheterization lab and nursing dependence on catheterization lab staff to manage complications. Only one-third of respondents were aware that manual pressure is a well-established technique and has historically been considered the “golden standard” of

sheath removal (Hsu et. al, 2012; Patel et al., 2015). Reluctance to change current practice as evidenced by answers to question five indicates that changing attitudes about complication management will require further education as detailed previously. In the future consolidation of post-catheterization patients onto a single unit with expertly trained staff would be ideal for patient care and consistent with programs located at other facilities. Capasso et. al (2006) demonstrated successful transfer of care of post-catheterization patients from the catheterization lab to a dedicated vascular management unit as evidenced by low rates of complications. This was achieved with a mix of didactic learning and monitored clinical experience. This shift in policy, procedure and logistics would require collaboration with hospital administration, management, nursing and educators to reorganize how patients are assigned. Guidelines for optimal care should draw from most current evidence and practices of successful programs at other hospitals. Nursing development needs to include classroom learning and clinical experience managing catheterization patients with supervision until proficient. Moving forward, provision of hands-on experience may help facilitate necessary changes.

There is potential to directly impact nursing practice when caring for catheterization patients. Possession of a strong foundation of evidence-based knowledge about these patients allows nurses to provide the highest quality care and feel competent and confident in their practice. As a four-time Magnet designated facility the empowerment of nursing is a cornerstone of CVMC philosophy. Potential also exists to decrease reliance on catheterization lab staff to handle complications. From a fiscal standpoint, that reduces utilization of on-call staff that earn time-and-a-half when called in off hours. Furthermore, when combined with hands-on sheath training, the opportunity

to reduce room turnover time and increase catheterization lab output could be significant. Expansion is not possible without extensive training for nursing to increase their level of expertise managing catheterization patients.

Overall the results of the surveys are useful for a baseline snapshot about nursing beliefs at CVMC. The nurses on average either somewhat agreed or felt neutral about their training, ability to care for catheterization patients and recognition and management of complications. All but two respondents indicated that further education is needed to provide the best standard of care to catheterization patients. This underscores the need for a comprehensive, standardized and specialized training program to improve the expertise of and change the nursing culture regarding catheterization patients at CVMC.

Limitations

There were several important limitations to this project. First, sample size (n=17) was inadequate to reach a power of 80% and effect size of .5 limiting generalization. Fourteen respondents completed follow up surveys limiting the generalizability of the results including any assumptions about baseline findings to the larger population of nurses caring for post-catheterization patients at CVMC. In addition, the sample was self-selected and half of the nurses that provided demographic data cared for post-catheterization patients daily or weekly. They may have been more motivated to pursue education regarding these patients.

Classes were offered over the course of three months so there is no way to know if participants in later session discussed or reviewed material with previous participants potentially skewing results. Materials were created by the primary investigator and tailored specifically to the unique practice environment of the hospital and catheterization patient population and existing policy and procedures at the hospital..

Finally, due to time and logistical constraints a clinical “hands on” component managing vascular access sites was not included as part of this project. It was not possible to guarantee that all participants would be able to observe vascular access site management and subsequently perform sheath removal with manual compression; therefore, this component was not included in the scholarly project.

Recommendations

As noted in literature, further study is necessary to develop guidelines for training of nurses caring for post-catheterization patients. Findings of this project are promising regarding the potential of nursing at CVMC while highlighting areas for improvement. The following recommendations are made.

- Standardized, comprehensive and specialized program comprised of education sessions and hands-on experience.
- Leaders should be identified on both day and night shift to ensure that experts in catheterization patient management are present in the hospital at all times.
- All post-catheterization patients should be consolidated to one unit and managed by a dedicated and expert staff.
- An investment in training hours and materials will be needed from administration and require stakeholder identification and mobilization.
- Regular evaluation of the program to address learning needs, opportunities and to update material should occur on at least a yearly basis.
- Further research into nursing care of post-catheterization patients is needed to close gaps in knowledge and facilitate development of standards of care for nursing.
- Collaboration with other health systems to create regional standards of care moving towards national standards.

Conclusion

The aim of the study was to increase the knowledge of nurses caring for catheterization patients through development and implementation of an evidence-based training program created using the most current literature. Due to the absence of a training program currently, obtaining baseline data from nurses about knowledge level and beliefs about their confidence and competence was as important as assessing their response to training. Development of a properly trained and empowered staff to care for catheterization patients has the potential to impact patient outcomes, costs and catheterization lab productivity. The single training session based on SCAI/SICP guidelines for catheterization lab staff and literature demonstrated a statistically significant increase in nursing knowledge but also demonstrated areas for improvement. While the surveys did not return statistically significant results, the data did underscore nursing desire for further education and their reliance on catheterization lab staff for support. Changes to this current culture of nursing including reliance on catheterization lab staff will require further education and hands-on experience. Future training should incorporate classroom learning and clinical experience as this has been proven to provide greater benefit than didactic content alone (Connors, Good & Collery, 2017; Liew et.al, 2007). This may include a combination of initial training sessions, computer based modules, observation of procedures and experience pulling sheaths and achieving hemostasis with targeted manual pressure. Development of national standards may start with local health system collaboration to develop regional standards of care while monitoring outcomes.

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APPENDIX A: PRE/POST TEST

PRE-TEST/ POST-TEST

1. When performing a heart catheterization access to the heart is gained through a(n):
    a. Vein
    b. Artery

2. Coronary angiography is a test to:
    a. Assess tolerance of cardiac medications
    b. Visualize the valves of and blood flow through the heart
    c. Visualize and assess the arteries that supply blood to the heart

3. The most common complication of catheterization is:
    a. Bleeding/oozing
    b. Hematoma
    c. Pseudo-aneurysm

4. What does VCD stand for?
    a. Vascular Complication Database
    b. Venous Cap Deployment
    c. Vascular Closure Device

5. The FIRST step in managing a bleeding/oozing sheath site is:
    a. Manual pressure
    b. Alerting on-call Cath Lab staff
    c. Removal of the bandage

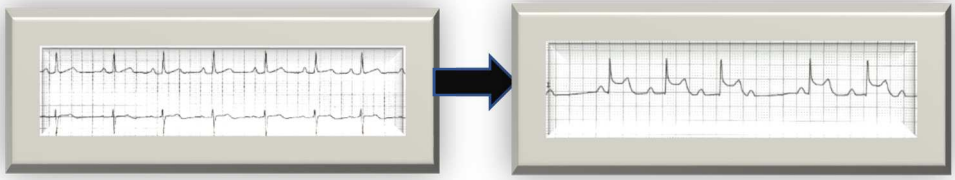
6. Sudden, symptomatic Bradycardia and Hypotension in a post-Cath patient typically indicates:
    a. Blood loss
    b. Vaso-vagal reaction
    c. Allergic reaction to IVP dye

7. Standard treatment for the above is:
    a. Fluid bolus, Trendelenburg positioning, Atropine
    b. Heparin and sheath site pressure
    c. EKG and call MD

8. Which is considered the “gold standard” of sheath removal?
    a. Femo-stop
    b. Manual Pressure
    c. C-Clamp
    d. VCD

9. Every patient that undergoes Percutaneous Coronary Intervention (PCI) or "stenting" with a drug eluding stent is expected to take an anti-platelet drug and aspirin for a minimum of one year.
    a. True
    b. False

10. A post-Cath patient complains of chest pain and shortness of breath with this telemetry change:



What steps do you take?
    a. Monitor – this is not a concerning change
    b. Fluid bolus and obtain 12 lead EKG
    c. Call MD and obtain 12 lead EKG

11. Unless otherwise specified it is assumed that sheath insertion occurs:
    a. Antegrade
    b. Retrograde

12. Typical manual pressure "hold" time in the absence of complication is:
    a. 10 minutes
    b. 20 minutes
    c. 40 minutes

13. Three main components of a cardiac waveform are:
    a. P, QRS and T waves
    b. Alpha, Beta and Sigma
    c. Small wave, spike, recovery

14. All acute myocardial infarctions present with ST-elevation:
    a. True
    b. False

15. The Allen's test is performed to assess:
    a. Femoral artery patency
    b. BP differences between upper and lower extremities
    c. Adequate blood flow to the hand via the ulnar artery

16. When holding manual pressure on an <u>antegrade</u> oozing/bleeding Cath site pressure should be applied:
    a. 1-2 cm ABOVE the puncture
    b. 1-2 cm BELOW the puncture

17. The most common complication of radial catheterization is:
    a. Radial artery spasm
    b. Bleeding
    c. Artery occlusion

18. Once a TR or Vas band has been removed it is okay to put back on for oozing/bleeding at site:
    a. True
    b. False

19. Ischemia means:
    a. Tissue death
    b. Decreased blood supply
    c. Reperfusion

20. Major risk factors for VASC (Vascular Access Site Complications) as evidenced in current literature include:
    a. Female gender, Age, Anti-coagulation use, Hypertension, Large sheath size
    b. Male Gender, High cholesterol, Small sheath size
    c. Dehydration, Diabetes, and recent illness

21. Patients that undergo catheterization via the femoral artery:
    a. Require overnight monitoring whether or not intervention is performed
    b. Typically require more anti-coagulation/anti-platelets than radial patients
    c. Must lay flat for several hours post-Cath with head raised no more than 30^{o}

22. It is common in most hospitals for nursing staff to remove and manage sheath sites post-Cath:
    a. True
    b. False

23. Brilinta, Effient and Plavix are all considered:
    a. Statin drugs
    b. Beta-Blocker drugs
    c. Anti-platelet drugs

24. EF stands for:
    a. Excitation field
    b. Extra femoral
    c. Ejection fraction

25. Infarct means:
    a. Tissue death
    b. Decreased blood supply
    c. Reperfusion

APPENDIX B: SURVEY

Instructions: This survey is composed of statements geared toward measuring your personal attitudes about your confidence and competence in the care you provide to post-catheterization patients. There is no right or wrong answer and your answers are **ANONYMOUS**. Using the standard definitions of confidence and competence and the scale below, please indicate your feelings about the statements in the survey.

Confidence: The feeling or belief that one can rely on someone or something; firm trust and feeling of self-assurance arising from one's appreciation of one's own abilities or qualities.[1]

Competence: the ability to do something successfully or efficiently.[1]

1- STRONGLY AGREE
2- SOMEWHAT AGREE
3- NEUTRAL
4- SOMEWHAT DISAGREE
5- STRONGLY DISAGREE

1. I feel confident in the care I provide to post-catheterization patients:
   1 2 3 4 5

2. I feel competent in the care I provide to post-catheterization patients:
   1 2 3 4 5

3. I feel as confident providing care for post-catheterization patients as I do for other patients on the unit:
   1 2 3 4 5

4. I feel as competent providing care for post-catheterization patients as I do for other patients on the unit:
   1 2 3 4 5

5. I believe I have received adequate training to provide the best care to post-catheterization patients:
   1 2 3 4 5

6. I believe that continuing education in needed to provide the best care to post-catheterization patients:
   1 2 3 4 5

7. I feel competent in recognizing complications in post-catheterization patients:
   1 2 3 4 5

8. I feel competent in managing complications in post-catheterization patients:
   1 2 3 4 5

9. I feel confident that I can manage complications in post-catheterization patients:
   1 2 3 4 5

10. I feel I can manage complications of post-catheterization patients without help from the cath lab staff:
    1 2 3 4 5

11. I routinely call the cath lab staff for help with complications of post-catheterization patients:
    1 2 3 4 5

12. Please leave any feedback (positive and/or negative), suggestions or questions you may have on the back. Your responses are completely **ANONYMOUS** and will only be seen by the DNP project coordinator and no one else. Thank You!

APPENDIX C: INFORMED CONSENT

Informed Consent form for nurses providing care to catheterization patients at Catawba Valley Medical Center participating in the following project:

Specialized Nurse Management of Catheterization Patients:
Development of Confidence with Knowledge

Principal Investigator – Whitney Patterson
Organizations – Catawba Valley Medical Center and the University of North Carolina at Charlotte
Project - Specialized Nurse Management of Catheterization Patients: Development of Confidence with Knowledge
This Informed Consent Form has two parts:

- **Information Sheet (to share information about the research project)**
- **Certificate of Consent (signatures if you agree to take part)**

You will be given a copy of the signed Informed Consent Form
PART I: Information Sheet
Introduction
My name is Whitney Patterson and I am the primary investigator for the project - Specialized Nurse Management of Catheterization Patients: Development of Confidence with Knowledge. I am studying the effect of specialized training for nurses on their knowledge level and feelings of confidence and competence when providing care for catheterization patients. This project will be implemented in cooperation with Catawba Valley Medical Center and the University of Charlotte at North Carolina.

Purpose of the research
The study aims to increase knowledge and improve personal perceptions of confidence and competence when providing care to catheterization patients through evidence based practice. The data collected during this project will be used to shape future training.

Type of Research Intervention
A onetime training session will be offered with materials provided during the sessions produced as reference materials for you to keep. Pre/post tests of knowledge will be administered the day of the training. A survey will be administered to determine change in your attitudes about confidence and competence prior to the class on the day of the training as well as a month afterward.

Participant selection
As a nurse who has the potential to provide care to catheterization patients, you are eligible to participate in this research study.

Voluntary Participation
Your participation is entirely voluntary. It is your choice whether to participate or not. You may change your mind later and stop participating even if you agreed to participate at an earlier time. You may stop participating at any point during the project. Participation in the project will in no way affect your employability with CVMC.

Duration
Each participant will be expected to attend one 2-3 hour class. 20-30 minutes will be devoted to pre/post tests of knowledge before and after class. 5-10 minutes will be allotted at the beginning of the course to complete the initial survey. Time dedicated to tests and the initial survey are considered part of the 2-3 hour time frame. A follow up survey will be administered one month later which should take no more than 5-10 minutes to complete. No further time commitment necessary.

Risks
There are no foreseeable risks to participate in this project. All information collected will be anonymous, confidential and used for the purposes of this project only.

Benefits
The benefit of participating is increasing your knowledge in caring for catheterization patients.

Reimbursements
As per discussions with senior administration in the past, any CVMC-provided education- required or elective- for which employees take advantage is done "on the clock" per legal counsel's recommendation based on Labor laws. Education pay will be provided to all participants.

Confidentiality
The anonymous information collected from this project will be kept confidential with printed responses kept in a locked file cabinet and digital information password protected. No one will access the printed data except for the principal investigator. The anonymous and coded digital data will be used for analysis and reported by the principal investigator in the final report. Responses will not be linked to personal information in any way. This consent form will be stored separately from your test and survey responses.

Sharing the Results
The knowledge garnered from this project will be summarized in a written article and presented at UNCC upon completion of the DNP program for which this project was implemented.

Right to Refuse or Withdraw

You do not have to take part in this research if you do not wish to. There is no penalty for refusing or withdrawing at a later time.

Who to Contact
If you have any questions you may ask them now or later, even after the project has started. If you wish to ask questions later, you may contact me at any of the following:

Whitney Patterson FNP-C
Catawba Valley Cardiology 828-326-2354
whitney.patterson@catawbavalleymc.org
wmpatter@uncc.edu

This proposal has been reviewed and approved by the IRB at CVMC which is a committee whose task it is to make sure that project participants are protected from harm. If you wish to find about more about the IRB, contact Dr. Rebecca Tart PhD.

A copy of this informed consent form has been provided to the participant.

PART II: Certificate of Consent
I have read the foregoing information. I have had the opportunity to ask questions and any questions that I have asked have been answered to my satisfaction. I consent voluntarily to participate in this project.

Printed Name of Participant_____

Signature of Participant _____

Date _____
Day/month/year

Statement by the researcher/person taking consent
I have to the best of my ability ensured the participant understands the research project and the following components:
1. One time training course
2. Pre/Post tests and survey day of class
3. Post training survey one month post-class
I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

Printed Name of researcher/person taking the consent

_____

Signature of researcher /person taking the consent

_____

Date _____
Day/month/year

APPENDIX D: IRB APPROVAL

Catawba Valley Medical Center Institutional Review Board
Catawba Valley Medical Center
810 Fairgrove Church Road, SE
Hickory, North Carolina 28602
Office 828-326-2490 • **FAX** 828-326-3641 • http://irb.catawbavalleymedical.org
Chair: Ann Moore, MSN, RN-BC,
CEN Co-Chair: Rebecca Creech
Tart, PhD

To: Whitney Patterson, NP

From: IRB

Date: October 14, 2016

RE: Notice of IRB Exemption
Exemption Categories: 45 CFR 46.101(b)(1) and 45 CFR 46.101(b)(2)
Study Title: Specialized Nurse Management of Catheterization Patients: Development of Confidence with Knowledge Study ID: 2016.06
Application Received: October 10, 2016

PLEASE READ THIS LETTER CAREFULLY IN ITS ENTIRETY. IT CONTAINS IMPORTANT INFORMATION ABOUT YOUR SUBMISSION AND YOUR RESPONSIBILITIES AS AN INVESTIGATOR.

This submission has been reviewed and was determined to be exempt from IRB monitoring on October 14, 2016 according to Health and Human Services exemption categories cited as 45 CFR 46.101(b)(1), educational settings, and 45 CFR 46.101(b)(2), surveys, in the Code of Federal Regulations. If this study protocol is altered, it is your responsibility as the primary investigator to submit a study amendment form to the IRB and await a written response prior to implementing any changes.

The IRB applies 45 CFR 46, Subparts A-D to all research it reviews regardless of funding source. 21 CFR 50 and 21 CFR 56 are applied to all research studies under the Food and Drug Administration regulation.

cc:

Rebecca Tart, PhD

Dr. David Langford
OFFICE OF RESEARCH COMPLIANCE
9201 University City Boulevard
319 Cameron Hall
Charlotte NC 28223-0001
(704)-687-1871
Web site: http://research.uncc.edu/
Federalwide Assurance (FWA) #00000649

To: Whitney Patterson
From: Office of Research Compliance
Date: 11/03/2016
RE: Notice of Approval of Exemption
Exemption Category: 1. Educational setting,2. Survey, interview,
public observation **Study #:** 16-0933
Study Title: Specialized Nurse Management of Catheterization Patients: Development of Confidence with Knowledge
This submission has been reviewed by the IRB and was determined to meet the Exempt category cited above under 45
CFR 46.101(b).
This determination will expire one year from the date of this letter. It is the Principal Investigator's responsibility to submit for renewal of this determination.

Study Description:

Catawba Valley Medical Center (CVMC) obtained Chest pain with PCI accreditation in 2014. Staff of the catheterization lab currently handle all complications and undergo rigorous training to care for catheterization patients. A need was identified to provide a similar training program focused on nursing care of catheterization patients. National Guidelines do not exist for the nursing care of catheterization patients. An exhaustive search of current research has been performed by the principal investigator to determine the best practices when caring for catheterization patients. Development of the project began with investigation of complications, current guidelines and best practices for catheterization patient management and nursing training programs at other facilities. Findings of the literature review were compiled into a training program to increase the knowledge of any nurse in a position to care for catheterization patients. The pre- and post-test evaluation tools are designed to test the level of knowledge of participants at baseline and after training. Developed by the primary investigator, the questions are based on common evidence-based themes identified in current literature. Measurement of nursing attitudes about their confidence and competence in caring for catheterization patients is included to determine baseline beliefs as well as how nurses feel about the care they provide after they receive training. The aim of the study is to increase the knowledge of nurses caring for catheterization patients through development and implementation of an evidence-based training program created using the most current literature.

Investigator's Responsibilities:

It is the investigator's responsibility to promptly inform the committee of any changes in the proposed research, and of any adverse events or unanticipated risks to participants or others. You are required to obtain IRB approval for any changes to any aspect of this study before they can be implemented.

If applicable, your approved consent forms and other documents are available online at http://uncc.myresearchonline.org/irb/index.cfm?event=home.dashboard.irbStudyManagement&irb_id=16-0933.

Data security procedures must follow procedures as approved in the protocol and in accordance with ITS Guidelines for Data Handling and the End User Checklist.

Please be aware that approval may still be required from other relevant authorities or "gatekeepers" (e.g., school principals, facility directors, custodians of records).

CC:

David Langford, School of Nursing

Charlene Whitaker-Brown, School of Nursing