

INPATIENT INTRAVENOUS CHEMOTHERAPY ADMINISTRATION:
NURSING COMPETENCE AND CONFIDENCE

by

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DEDICATION

This paper is dedicated to my family. Thank you all for your understanding, patience, and encouragement. I could not have completed this process without your support.

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ABSTRACT

An estimated 40% of people in the United States will receive a cancer diagnosis in their lifetime. This illness may be managed with intravenous (IV) chemotherapy, which requires specialized training and expertise for staff nurses. A microsystem assessment was completed on an inpatient medical, surgical, oncology unit at a northwest Montana hospital. Nurses in the microsystem expressed the inability to maintain competency standards and expertise with infrequent IV chemotherapy administration. A review of the literature was conducted to identify best practices in competence and confidence in nursing IV chemotherapy administration. A root cause analysis was conducted to discover factors contributing to low levels of competency and confidence in IV chemotherapy administration. Comparisons were made between the standards, guidelines, and policies, and themes were analyzed. Solutions were identified and prioritized. A protocol utilizing just-in-time training was developed along with an implementation plan and an evaluation plan. Just-in-time training utilizes checklists, demonstration, peer review feedback, and self-assessment as a measure of competence and confidence assessment. Feedback about the protocol, implementation plan, and evaluation plan was solicited from a key administrator and stakeholders. The Clinical Nurse Leader (CNL) is well suited to implement this protocol due to their ability to integrate care with an interdisciplinary team to identify, develop, implement, and evaluate care practices.

CHAPTER ONE

INTRODUCTION

According to the National Cancer Institute, an estimated 40% of people in the United States will receive a cancer diagnosis in their lifetime (2012). The benefit of antineoplastic agents, or chemotherapy medications, is potentially life-saving for people with malignancies. Chemotherapy is defined as “all antineoplastic agents used to treat cancer...” (Neuss et al., 2013, p. 226) and includes all classes and actions of chemotherapy medications. Chemotherapeutic agents act by targeting cancer and non-cancer rapidly dividing cells, which contributes to the potential toxicity of normal cells and increased risk of side effects (Lehne, 2016). While a cancer diagnosis can be emotionally and physically devastating to patients, oncology treatment options such as chemotherapy may be necessary for effective disease management.

The complex nature of chemotherapy medications and schedules requires expert nursing care with initial and ongoing training and education of nurses. Serious hypersensitivity and adverse reactions are more common with chemotherapy treatments and require prompt recognition and management by nurses (Viale, 2009). Possible risks related to improper administration are associated with potential short and long-term effects for both nurses and patients such as increased incidence of cancer as well as reproductive concerns (Centers for Disease Control and Prevention, 2014). These consequences are especially true for intravenous (IV) chemotherapy agents because administration of these medications is associated with a higher risk of short and long-

term toxic effects if not administered correctly. The safe handling of chemotherapy medications including potential spills requires additional training. Also, many of the chemotherapy medications are vesicants, which can cause severe damage to skin and tissues (Payne & Savarese, 2015). IV chemotherapy administration involves multiple steps and numerous medications. The side effect profile of these medications is quite high for both patients and exposed providers. Side effects vary based on the type of chemotherapeutic agent given, dose, and frequency (National Cancer Institute, 2012). Effective management requires specialized training and expertise.

There are considerations for the psychosocial aspects associated with chemotherapy, not only for the patient, but also for the nurse administering the medications. There is an increase in the emotional distress in individuals with cancer that may include worries and fears involving their diagnosis (Institute of Medicine, 2008). It is important to complete psychosocial screening and assessment of the cancer patient prior to and during therapy to assess for anxiety and depression (National Cancer Institute, 2015). In addition, nurses may experience worry related to potential exposure to chemotherapy as well as an increase in reactions and knowledge deficits (Verity, Wiseman, Ream, Teasdale, & Richardson, 2008). Ongoing education and competency assessment may increase safety and knowledge issues.

Safe and effective administration of IV chemotherapy requires specific knowledge and training followed by methods that ensure continuing competency maintenance. There are multiple definitions, explanations, and interpretations for competence in nursing (Blazun, Kokol, & Vosner, 2015). According to the American

Nurses Association (ANA), competency is defined as “an expected level of performance that integrates knowledge, skills, abilities, and judgment” (2013, p. 3). Competence also affects a person’s sense of confidence, which is the belief that one is able to accomplish something. Confidence relates to having “feelings of pride or belief in one’s ability to successfully accomplish something” (Smith, 2012, p. 172). Smith asserts that improving nursing competence can enhance one’s feelings of confidence as well. In other words, developing and maintaining nursing competence in IV chemotherapy administration can also result in increased confidence for inpatient staff nurses. Additionally, self-reflection may be utilized in nursing competency evaluation “as an initial, ongoing and integral step to assuring competence” (Schroeter, 2008, p. 8). This self-reflection may increase awareness of strengths and areas of improvement for nursing competency.

There are significant barriers that can contribute to decreased opportunities for inpatient staff nurses from maintaining proficiency of IV administration. First, inpatient nurses see fewer patients because outpatient infusion and management of side effects has become safer and more common. Second, a shift from IV to oral chemotherapy medications with advances in chemotherapeutic agents and increased convenience reduces the opportunity for nurses to practice IV chemotherapy administration (Neuss et al., 2013). Finally, the recent change to an only online methodology of validation and subsequent reevaluation does not allow for observation of ongoing competency (Carreon, Sugarman, Beener, & Agan, 2015).

Background

Microsystem Assessment

As a basic concept, a microsystem is the interaction of the patient with the healthcare system (Donaldson & Mohr, 2000). According to Nelson, Batalden, & Godfrey, a “health care clinical microsystem is a small group of people who work together in a defined setting on a regular basis to create care for discrete subpopulations of patients” (2007, p. 3). In order to function, business and clinical goals must have linked processes including a sharing of information with measurable outcomes (Nelson et al., 2007). Further, the clinical microsystem is dynamic and may be part of a larger system, called a macrosystem. The microsystem assessment, the first step of quality improvement, allows for a deeper understanding of the function of the microsystem. High functioning clinical microsystems have the 5 following elements included in the assessment: Purpose, Patients, Professionals, Processes, and Patterns, otherwise known as the 5 P Assessment (Nelson et al., 2007).

The microsystem assessment was applied to a combined inpatient medical, surgical, oncology unit by the Clinical Nurse Leader (CNL) student. Data were collected and clarified during interviews with staff and members of leadership. Additionally, the following surveys were completed: Magnet Inpatient Unit Staff Satisfaction Survey, Core and Supporting Processes, and Patient Satisfaction Survey. A detailed description of the surveys will be addressed later.

Purpose. The microsystem assessment was completed on an inpatient 23-bed combined medical, surgical, oncology unit for a rural northwest hospital, which is part of a larger hospital system. This non-profit organization is governed by a community board of trustees and has been in existence for more than 105 years. In addition to primary medical/surgical care, 22 associated clinics that cover 11 different specialties are included in the hospital system. The service line also includes a home care agency, skilled nursing facility, and home care services. The hospital system has received awards for obstetrics, low readmission rates, and oncology care and is rated in the top 100 community hospitals by Thompson Reuters. In addition the hospital system is working towards Magnet status.

There is no formal mission statement for the microsystem but the motto for the floor is guided by the following viewpoint: “providing excellence along the journey: compassionate care, hope, education, quality & safety” (Nurse A, personal communication, September 16, 2015). Persons 18 years of age and older with medical conditions requiring 24/7 skilled nursing care are admitted to this unit with admission orders from a physician with admitting privileges. Although this unit is not exclusively for oncology patients, this is the only unit that administers inpatient intravenous chemotherapy. The microsystem does not accept patients with invasive monitoring needs (e.g., ventilators, vasopressors). Patients requiring invasive monitoring are moved to the Intensive Care Unit.

Patients. As the following data was not currently being tracked for the microsystem, data were analyzed for a 7 day period. There were approximately 30 patient visits in the week with the percentage of male patients at 63% ($n = 19$) and the percentage of female patients at 37% ($n = 11$). The living conditions for patients and mortality rate for the microsystem is not known. The mortality rate for the hospital is the same as the national benchmark for COPD, heart attack, heart failure, pneumonia, stroke, and surgical procedures. (Center for Medicare and Medicaid Services, 2015). The average length of stay (LOS) for all patient types in the 7 day period analyzed is 2.8 days. Data was not available for the LOS for various patient types.

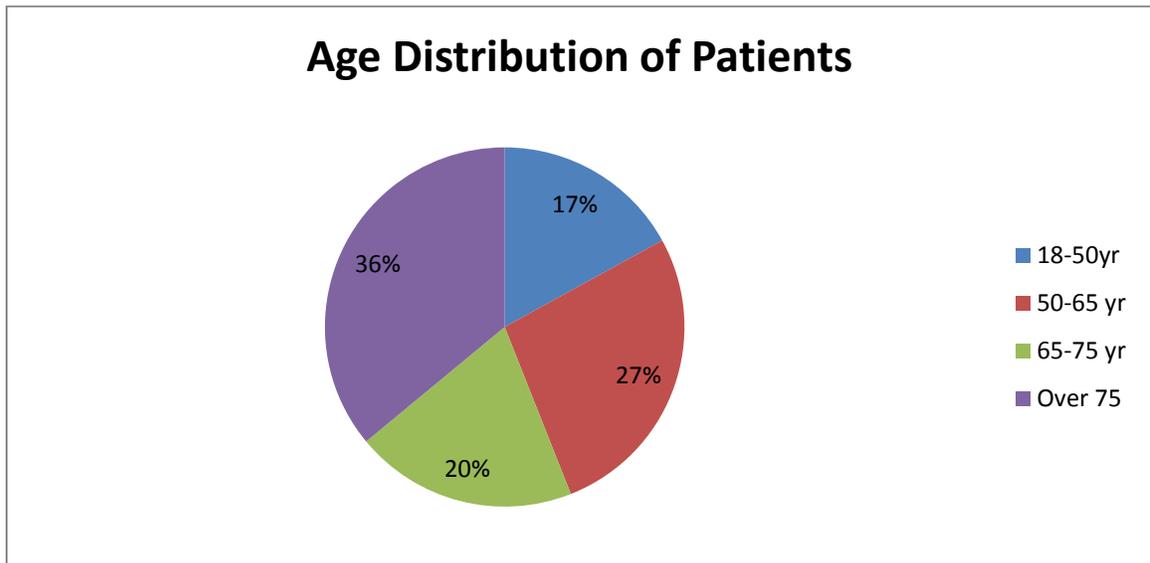


Figure 1. Age Distribution of Patients (N = 30)

The age distribution of patients is depicted in Figure 1 with 36% of patients over 75 ($N = 11$), 20% of patient between 65-75 ($N = 6$), 27% of patients between 50-65 ($N =$

8) and 17 % of patients between 18-50 ($N = 5$). The microsystem does not admit pediatric or newborn patients.

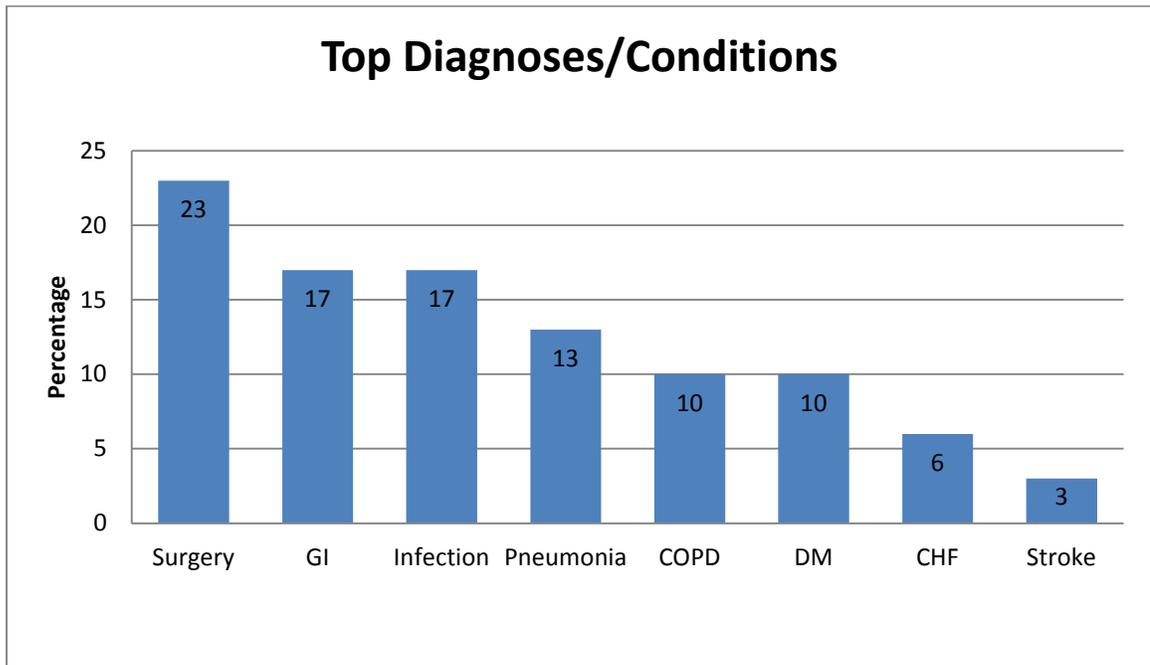


Figure 2. Top Diagnoses/Conditions

Surgery, gastrointestinal (GI), infection, pneumonia, chronic obstructive pulmonary disease (COPD), diabetes mellitus, congestive heart failure (CHF), and stroke are among the top diagnoses and conditions in Figure 2 with surgery, GI and infection in the top three for a one-week assessment of the microsystem. Approximately 75% of patients had a primary or secondary diagnosis code of oncology related conditions.

Patients are admitted from the ER, unit transfers, and direct admissions. Data were not available for admission frequencies from these areas. The 30-day readmission rate for the microsystem is not known. The hospital 30-day readmission rate is reported

as better than the national average of 15.2% for rate of unplanned readmissions after discharge from the hospital (CMS, 2015).

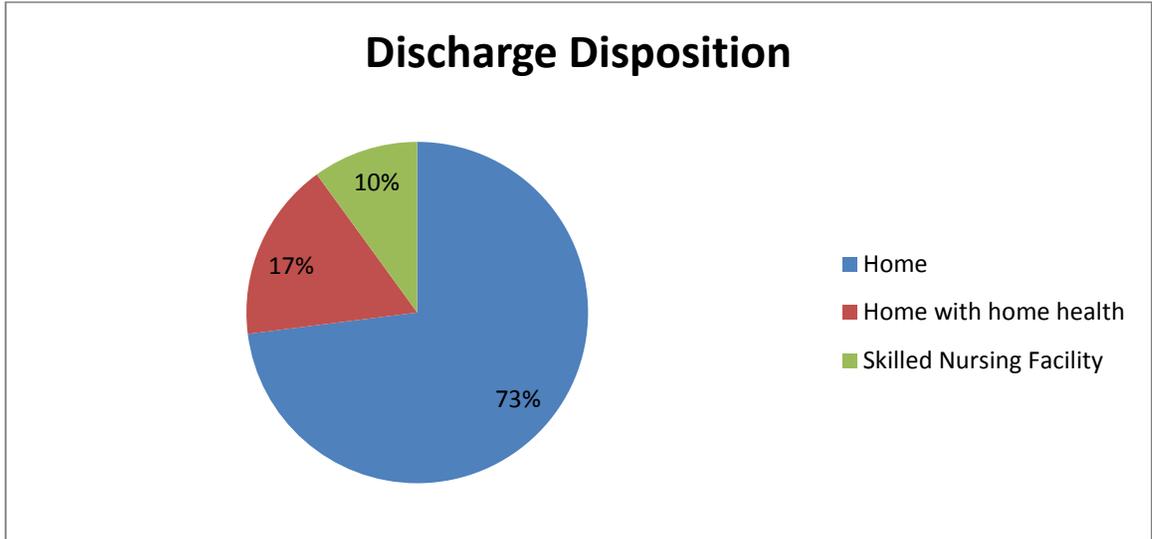


Figure 3. Discharge Disposition

Patients are discharged to the following: home, home with home health, and to skilled nursing facilities (Figure 3). The majority of patients are discharged home.

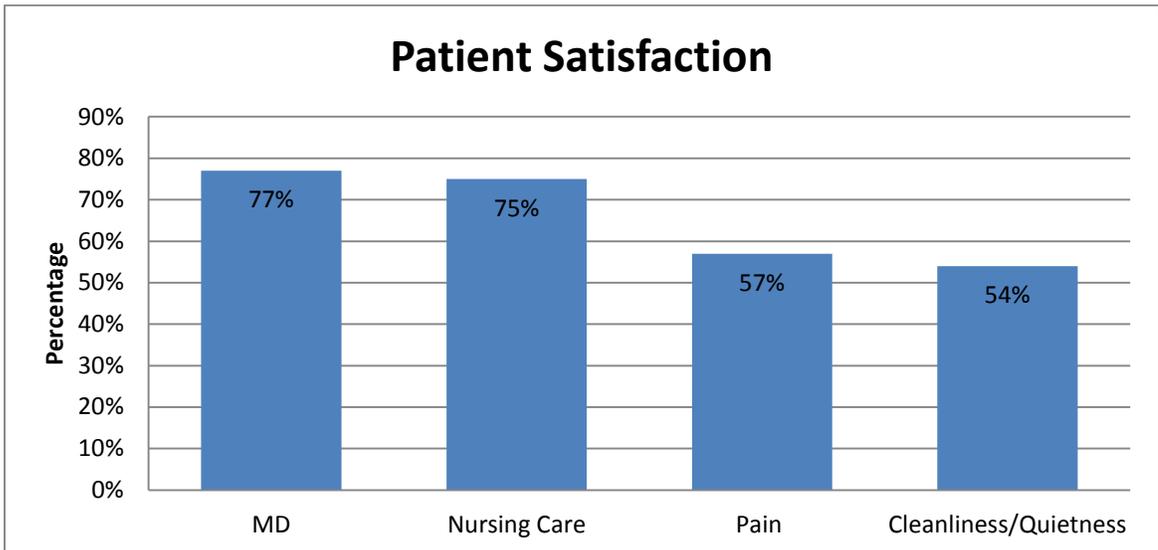
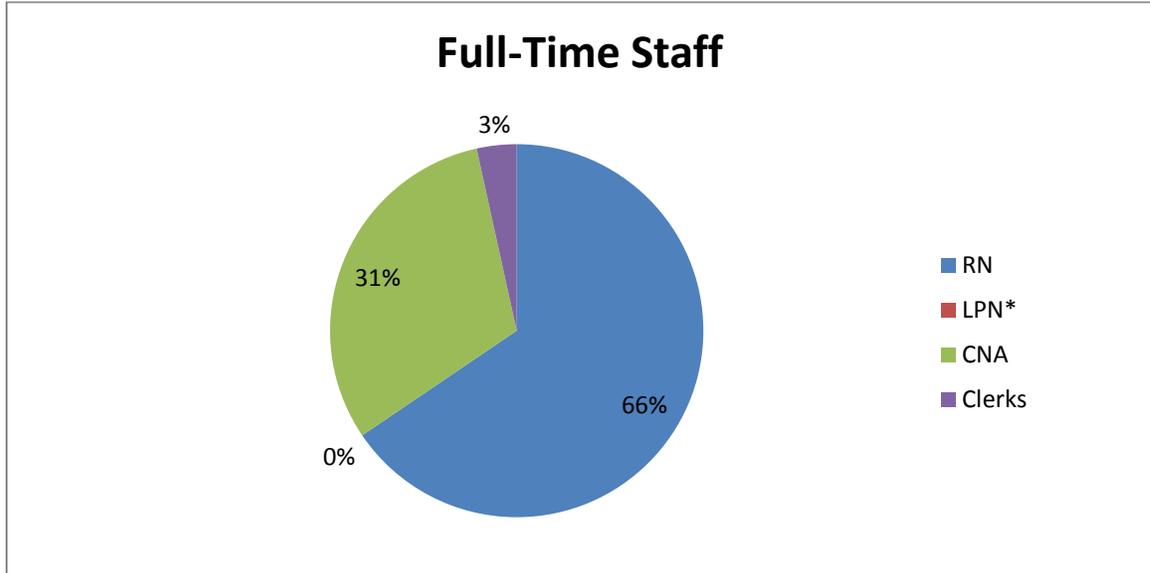


Figure 4. Patient Satisfaction

The Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) Patient Satisfaction Surveys are depicted in Figure 4 with an overall patient satisfaction rate of 72%. Patients report they are more satisfied with MD care (77%) and nursing care (75%) and less satisfied with pain management (57%) and cleanliness/quietness (54%).

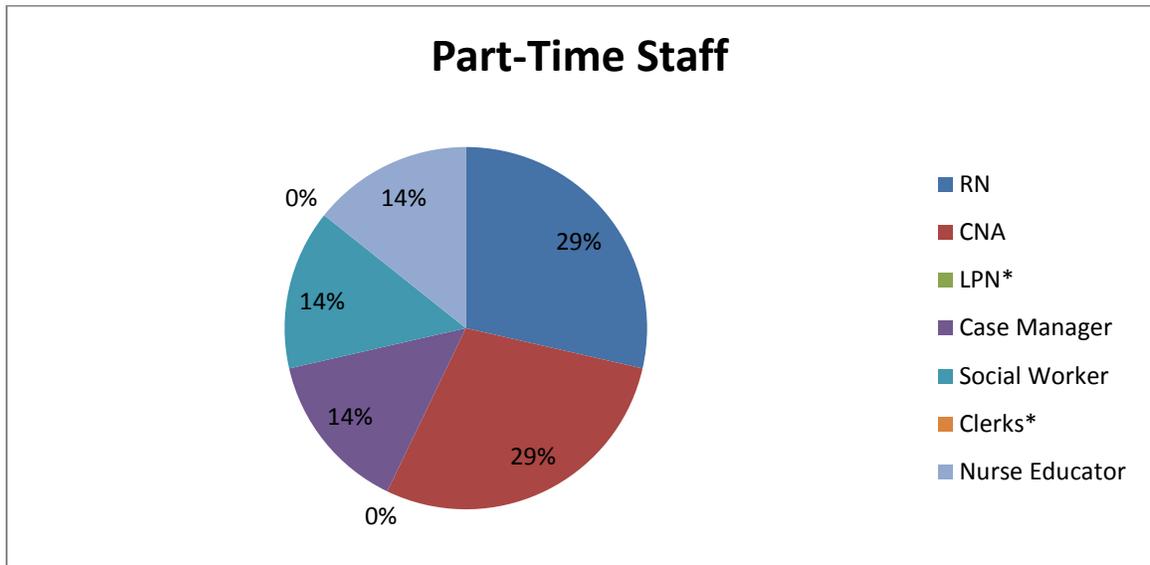
Professionals. The number of physicians that admit patients is approximately 300 and includes the following professionals: hospitalists, family practice providers, surgeons, oncologists, pediatricians, pulmonologists, and urologists (Nurse B, personal communication, September 16, 2015). The Acute Care Clinical Educator shares responsibilities with first floor staff as well as general medical, surgical, and skilled nursing facility staff. The Acute Care Educator position is currently not filled at this time. There are no travelers in the microsystem as well as no on-call staff. Float pool staff are rarely utilized. There was a recent change in management with a new manager beginning in July of 2015.

The current staff mix is depicted in Figure 5 for full time staff and Figure 6 for part time staff. The majority of full time and part time staff is comprised of RNs ($N = 32$). LPNs are not employed in this microsystem.



* There are no LPNs among the full-time staff.

Figure 5. Full-Time Staff (N = 58)



* There are no LPNs or clerks among the part-time staff.

Figure 6. Part-Time Staff (N = 7)

Regarding the skill level and education of the staff, 74% of nurses have a BSN and 26% of nurses have an ADN. In addition, 40% of nurses have received their

Medical/Surgical or Oncology Certification, which are the approved certifications for the unit. The supporting departments include respiratory, cardiology, lab, pulmonology, radiology, physical therapy, speech therapy, occupational therapy, palliative care, pharmacy, mental health specialists, and oncology.

All of the nurses in this unit are required to complete an intensive initial online Oncology Nursing Society (ONS) chemotherapy and biotherapy course with subsequent biannual abbreviated online renewals. After completion of the initial ONS course, observation of two chemotherapy administration sessions is required, usually occurring in the outpatient Infusion Center. For effective staffing for the microsystem, the unit manager recommends all RN staff be prepared to administer IV chemotherapy (Nurse A, personal communication, September 16, 2015). In addition to the ONS courses, nurses are required to complete varying general organizational education three times per year determined by administration. In an informal verbal survey of eight nurses in the microsystem, nurses were asked their preferences for education. The nurses stated that they do not prefer to attend live courses for educational activities in the classroom. The preferences of the microsystem nursing staff for education are easily accessible resources and possibly brief educational sessions at the point of care. Despite validation and continuing education, oral and written narratives revealed feelings of insecurity, incompetence, and decreased confidence with infrequent administration of IV chemotherapy. In addition nurses commented on insufficient preparation time that is necessary for policy, process, and medication review prior to administration of IV chemotherapy (Nurse B, Nurse C, personal communication, September 16, 2015).

Regarding staffing, at the charge nurse's discretion, the microsystem nurse patient ratio may be decreased when chemotherapy is administered (Nurse A, personal communication, September 16, 2015).

Table 1. Magnet Nurse Satisfaction Survey

Item	2014		2015	
	Mean	Standard Deviation	Mean	Standard Deviation
Enjoy their job	3.66	0.48	4.19	0.58
Treated with dignity and respect	3.75	0.24	4.28	0.33
Recognized and thanked for what they do in their job	3.35	0.33	3.76	0.42
Fairly well satisfied with their jobs on the unit	3.85	0.59	4.56	0.69
Work contributes to a sense of personal achievement	4.40	0.43	4.68	0.48
Good teamwork among the RNs on the unit	5.75	0.48	5.56	0.46
Can count on each other to pitch in and help when things get busy	5.80	0.49	5.48	0.42
Recommend their unit as a good place to work	3.80	0.31	4.80	0.75

Magnet Nursing Job Satisfaction Surveys were completed in 2014 (20 responses) and 2015 (25 responses). The surveys, based on a 1-6 Likert Scale, revealed the following mean and standard deviation (SD) information in Table 1. The majority of nurses rated improvements in most categories. In addition, the majority of nurses reported that they enjoyed their jobs, they are treated with dignity and respect, they are fairly well satisfied, work contributes to a sense of personal achievement, there is good teamwork and they can count on each other to pitch in and help, and recommend their unit as a good place to work. There was an increase in all of the components of the satisfaction survey

with the exception of a small decrease in teamwork and counting on each other to pitch in and help.

Processes. The inpatient unit hours are 24 hours per day, 7 days per week. Day shift (7am-11pm) has one charge nurse, six medical/oncology nurses, and three CNAs. For night shift (11pm-7am), there is one charge nurse, four RNs, and two CNAs. The patient-staff assignment ratio is four patients for every nurse with three patients per nurse if chemotherapy is administered. All of the 23 total beds are general medical, surgical, and oncology beds. Report is given at the beginning of day shift and night shift. Meals are served for patients at 8:30 am for breakfast, 11:30 am for lunch, and 5:30 pm for dinner. Patients call in their food orders to dietary with staff assistance, if needed. Rounding of patients is conducted on an hourly basis during day hours and every 2 hours at night.

Figure 7 depicts the results of a survey in which staff were asked to rate specific processes in the microsystem that work well or are problematic. Eighteen of 36 surveys were received and compiled, which is a 50% response rate. None of the processes were identified by staff as 'totally broken' and none of the core processes were cited as a source of a patient complaint. Staff reported that they were working on the processes of bedside reporting, fall prevention, and answering patient lights.

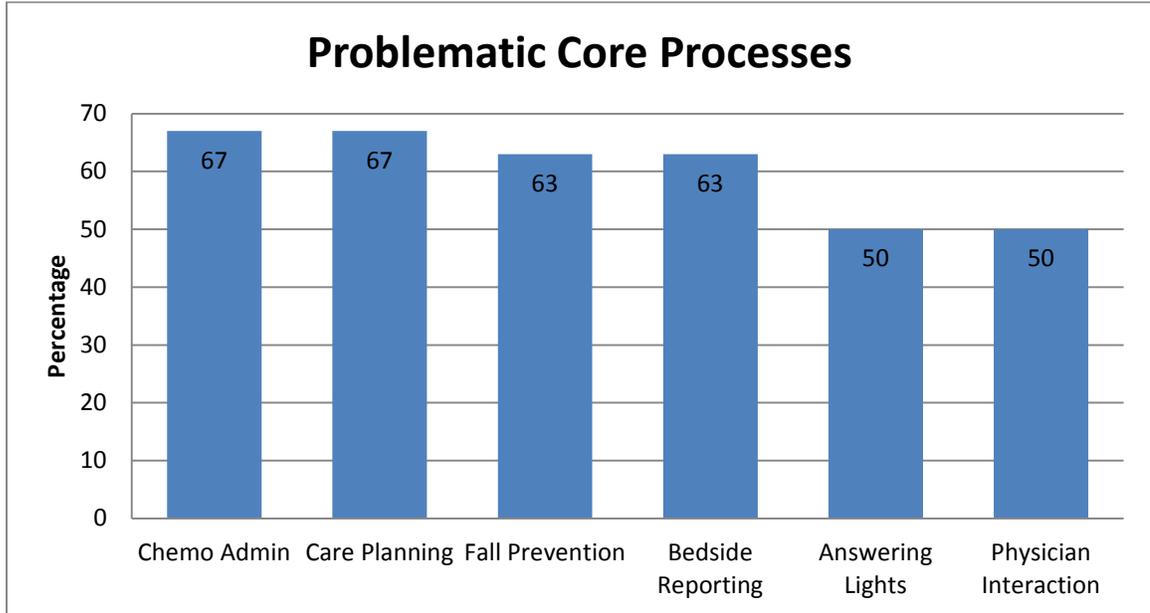


Figure 7. Problematic Core Processes (N = 18)

For problematic processes, chemotherapy administration, care planning, fall prevention, and bedside reporting topped the list. Answering lights and physician interaction were also identified as problematic. Narrative comments in the survey report low frequency of IV chemotherapy administration and insecurity. In addition, verbal comments from nurses included statements of decreased confidence in administration (Nurse C, Nurse D, Nurse E, personal communication, September 16, 2015).

The flowchart in Figure 8 depicts the *Policy N300 Chemotherapeutic and Biotherapeutic Drug Administration* analysis of the ideal steps for IV chemotherapy administration for a patient admitted to the microsystem. This analysis is also based on professional experience of IV chemotherapy administration. Due to the low frequency, there was not an opportunity to observe an actual administration.

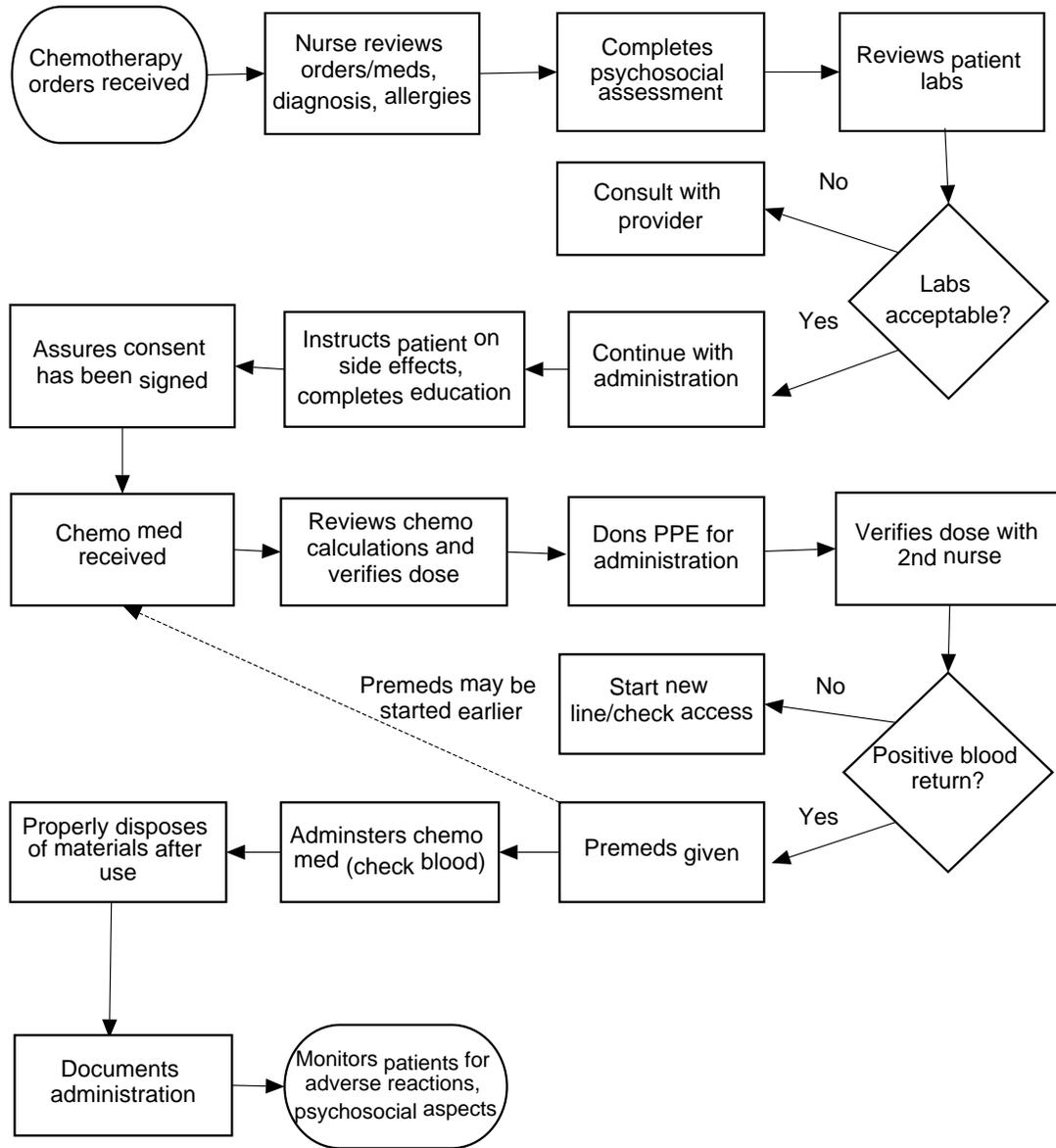


Figure 8. IV Chemotherapy Administration Flow Chart

The chemotherapy orders are received from the provider and are sent electronically to the pharmacy and nurses. The nurse reviews the order and medications as well as verifies the diagnosis and allergies. A psychosocial assessment of the patient is completed. The nurse then reviews the patient labs and determines if the labs are

acceptable for treatment. Labs are dependent on the chemotherapy drug to be given. At a minimum, a complete blood count (CBC) is necessary to review red blood cells (RBC) and white blood cell (WBC) counts. If there is a question about lab results, the nurse consults with the provider. If labs are acceptable, the nurse continues with the steps of administration and instructs patient on the side effects of the medication and completes education. The nurse also verifies that the consent form has been signed. After the chemotherapy medication is received, the nurse verifies the chemotherapy calculation and dose. Pre-medications such as IV hydration, antiemetics, steroids, and antihistamines may begin when the chemotherapy is received or later in the flowchart after blood return is checked. Premedication types and amounts vary depending on the type of chemotherapeutic medication to be administered. Personal protective equipment (PPE) is donned and the dose is verified with a second nurse. At this point a blood return is checked. If a positive blood return is not received, the nurse must start a new line or assess the patency of a central line if utilized. If a positive blood return is noted, pre-medications are given if not previously administered. The IV chemotherapy is administered with frequent blood checks for IV push chemotherapy vesicants. After administration is complete, the nurse properly disposes of the IV tubing and documents the administration. The nurse then monitors the patient for adverse reactions, which may be expected side effects related to the medication or may be as a result of hypersensitivity. These reactions vary depending on the patient, type, and frequency of chemotherapy medication given and may range from mild to severe (National Cancer Institute, 2012). Reviewing chemotherapy medications including side effects and adverse

reactions is an essential component of administration. Several nurses verbally stated that there is often insufficient time to complete all of the steps in the flow chart including policy and procedure review. In addition, recalling all of the steps is difficult for nurses administering IV chemotherapy due to the low frequency.

Several additional problem processes were identified in the survey including nursing care planning, fall prevention and bedside reporting. Also, it was reported that communication with providers was an issue. This was due to variances in provider preferences for relaying patient information. In addition, nurses reported that providers were not communicating relevant patient and family information.

Patterns. According to Nelson et al. (2011), microsystem assessment patterns include measures such as the financial position of the unit, patient outcomes, and achievements which elicit a sense of pride for the staff. The most significant successful pattern is that staffing has stabilized with increased retention and minimal use of staff from the float pool (Nurse A, personal communication, September 16, 2015). The microsystem staff is most proud of the cohesiveness of team relationships. The microsystem is breaking even from a financial standpoint with a report of steady productivity. Core measure data is near the national benchmark with stroke measures and rate clostridium difficile infections better than the national benchmark. The rate of catheter associated UTI, central line-associated bloodstream infections, and surgical site infections are reported as the same as the national benchmark. The compliance on all stroke measures is 100% for the microsystem. This is notable as the unit does not typically have a large number of stroke patients.

Patterns that have opportunities for improvement include pressure ulcer prevention, patient falls, and IV chemotherapy administration. There was one pressure ulcer reported in the past year for the microsystem. The patient fall rate for the unit was reported as above the national benchmark. Specific data related to patient falls was not available for the microsystem. Restraints are rarely utilized in this microsystem (Nurse A, personal communication, September 16, 2015). The fall rate continues to be a concern.

The incidence of IV chemotherapy administration was fairly infrequent on this unit. In the past year, the majority of the 56 chemotherapy medications were administered orally. Forty-six percent, or 26 chemotherapy medications, were administered intravenously during the 12 month period (Pharmacist A, personal communication, October 1, 2015). No sentinel events were associated with chemotherapy administration during the 12 month time period.

Problem and Significance

Nurses in the microsystem expressed the inability to maintain competency standards and expertise with infrequent IV chemotherapy administration as their number one problematic process equal to care planning. The lack of frequency coupled with increasing complexity of administering these medications contributes to feelings of insecurity and decreased confidence. High-risk, low-volume therapies, such as chemotherapy administration, occur infrequently and “carry an increased risk to patients because of their complexity” (Helman, Lisanti, Adams, Field, & Davis, 2015, p. 1). Competency validation and maintenance does not occur at only one point in time but it is

rather an ongoing process. Although there have been no adverse reactions associated with IV chemotherapy administration in the past year in the microsystem, the potential for having a reaction is increased (Viale, 2009). It is also anticipated that the number of patients receiving IV and peritoneal chemotherapy will increase with additional oncology providers and techniques.

The higher levels of stress experienced by oncology nurses may be attributed to the challenges associated with knowledge and skill maintenance (Raingruber & Wolf, 2015). In addition, there may also be a correlation between oncology nurses' stress and burnout along with nurse retention (Toh, Ang, & Devi, 2012). In other words, minimizing stress associated with competency maintenance may contribute to retention of oncology nurses.

In addition, nursing professionalism and competency are associated with a positive work environment and patient outcomes while a lack of clinical competency may be associated with poor patient outcomes (Schroeter, 2008). High nurse satisfaction can be related to increased quality and safety of care (Aiken et al., 2012). By increasing competency, nursing satisfaction and patient outcomes may be improved.

Purpose and Objectives

The purpose of this clinical project was to improve competence and confidence in the IV chemotherapy administration process for nurses within one rural Montana hospital microsystem. The process begins with the initial chemotherapy order and ends when the administration is done and the nurse is monitoring the patient. It is important to work on

this process now because administering IV chemotherapy is a high risk, low volume therapy that requires ongoing nursing competence and confidence.

The specific aim of this project was to develop an evidence based chemotherapeutic protocol to increase nursing competence to achieve a minimum of 10 out of 14 points on an administration checklist (see Appendix A) and increase confidence in IV chemotherapy administration by 2 points on a 5 point Likert scale by 6 months after implementation (see Appendix B).

CHAPTER TWO

REVIEW OF LITERATURE

The theoretical framework was derived from the Synergy Model which was developed in the 1990s led by Dr. March Curley (1998). The Synergy Model incorporates identification of eight patient characteristics and eight nurse competencies that exist along a continuum for safe patient care (Curley, 1998). In this model, patient needs and characteristics influence nurse competencies. Synergy occurs “when the needs and characteristics of a patient, clinical unit, or system are matched with a nurse’s competencies” (Kaplow & Reed, 2008, p. 17). This model has been utilized in a variety of clinical settings to guide care of acute and critically ill patients. Intravenous chemotherapy administration requires nursing competency in order for synergistic care to occur.

A literature review was conducted to determine best practice in IV chemotherapy administration and factors that can affect the development and maintenance of IV chemotherapy competence. The PubMed®, CINAHL®, The Cochrane Library, and Google Scholar databases were utilized for the literature search. The following search term combinations were included: intravenous, chemotherapy, administration, standards, guidelines, best practice, nurse, competence, confidence, high risk, low volume, validation and measurement. The search strategy originally consisted of search terms related to “chemotherapy administration” and/or “competence” combined with additional terms listed above. One or two search combinations were the basis of the literature search

initially. Based on the search results, another term was added or deleted. In addition truncation symbols were utilized such as nurs*and competenc*. The reference lists from articles were also reviewed for further relevant material. Literature was chosen based on relevance to the concepts of chemotherapy administration, competence, confidence, and measurement or validation.

Standards, Guidelines, and Policies for Chemotherapy Administration

Five evidence-based standards and guidelines were reviewed to determine best practice for IV chemotherapy administration with expert consensus and include the following:

- *2013 Updated American Society of Clinical Oncology(ASCO)/Oncology Nursing Society(ONS) Chemotherapy Administration Safety Standards Including Standards for the Safe Administration and Management of Oral Chemotherapy* (Neuss et al., 2013)
- *American Society of Health-System Pharmacists (ASHP) Guidelines on Preventing Medication Errors with Chemotherapy and Biotherapy* (Goldspiel et al., 2015)
- *Safe administration of systemic cancer therapy. Part 1: Safety during chemotherapy ordering, transcribing, dispensing, and patient identification* (Agency for Healthcare Research and Quality [AHRQ], 2012)

- *Safe administration of systemic cancer therapy. Part 2: Administration of Chemotherapy and Management of Preventable Adverse Events Guideline* (AHRQ, 2014)
- *Standards and Competencies for Cancer Chemotherapy Nursing Practice* (Canadian Association of Nurses in Oncology [CANO], 2011)

The standards and guidelines were identified from online searches with the following search term combinations: intravenous, chemotherapy, administration, standards, guidelines, best practice, nurse, and safety. All standards and guidelines were based on expert consensus and best available evidence. Few studies conducted with higher levels of evidence including randomized controlled trials were found. This may in part be due to the ethical nature of research involved with IV chemotherapy administration.

The *2013 Updated ASCO/ONS Chemotherapy Administration Safety Standards* are widely utilized in the United States as a reference for oncology nurses. The ASCO/ONS standards were developed by a panel of multidisciplinary professions beginning in 2008 based on evidence to promote patient safety with periodic ongoing revisions (ASCO, 2015). The purpose of the ASHP guidelines is to “define best practices for the safe use of chemotherapy . . . and to assist practitioners in improving their medication-use systems to prevent medication errors and patient harm from these agents” (Goldspiel et al., 2015, p. 223). The *ASHP Guidelines on Preventing Medication Errors with Chemotherapy and Biotherapy* is included as it was recently updated and recognizes the importance of the nursing role in administration of IV chemotherapy. The mission of

the AHRQ is to “produce evidence to make health care safer, higher quality, more accessible, equitable, and affordable, and to work within the U.S. Department of Health and Human Services and with other partners to make sure that the evidence is understood and used” (AHRQ, 2015, para. 3). Parts 1 and 2 of the *Safe administration of systemic cancer therapy guidelines* utilized for the synthesis for best practice from the AHRQ refer to the Cancer Care Ontario website as the bibliographic source for the guidelines. In addition, the *Standards of Competencies for Cancer Chemotherapy Nursing Practice* are included as the standards detailed nursing-specific administration information is included for the Canadian Association of Nurses in Oncology.

Three organizational nursing policies from the hospital of interest were identified for comparison with best practice guidelines and standards:

- *Policy N1515 Cancer/Oncology Patient, Symptom Management formerly Symptom Management of the Oncology Patient* (Revised January, 2015)
 - Reference as cited in the policy:
 - *Chemotherapy and Biotherapy Guidelines and Recommendation for Practice*, 3rd Ed; Martha Polovich, MN, RN, AOCN, Julie M. Whitford, RN, BSN, OCN, Mikaela Olsen, RN, MS, OCN. Oncology Nursing Society (ONS).
- *Policy N300 Chemotherapeutic and Biotherapeutic Drug Administration* (Revised February, 2015)
 - References as cited in the policy:

- Cancer: Principles & Practice of Oncology, 4th Ed; Vincent T. DeVita Jr., Samuel Hellman, Steven A. Rosenberg, Chapter 67, page 2571 – 2572, 2579.
- Journal Intravenous Nurs 1995 Jan-Feb 18 (1): 16-22, Fe San Angel, Current Controversies in Chemotherapy Administration.
- Chemotherapy and Biotherapy Guidelines and Recommendation for Practice, 4th Ed; Martha Polovich, MN, RN, AOCN, Kristine B. LeFebvre, MSN, RN, AOCN; Mikaela Olsen, RN, MS, OCN. Oncology Nursing Society (ONS).
- *Policy N310 Chemotherapeutic Drugs (Extravasation of Vesicant Drug)*
(Revised January 2012)
 - Reference as cited in the policy:
 - Chemotherapy and Biotherapy Guidelines and Recommendation for Practice, 3rd Ed; Martha Polovich, MN, RN, AOCN, Julie M. Whitford, RN, BSN, OCN, Mikaela Olsen, RN, MS, OCN. Pages 105 – 115. Oncology Nursing Society (ONS), 2009.

Synthesis

Only aspects that specifically related to the nursing role of chemotherapy administration were included in the synthesis of recommendations for the five guidelines and standards. There were several similarities between the standards and guidelines with key common concepts related to nursing administration of IV chemotherapy for best practice. All of the standards and guidelines frequently referred to institutional policies

and procedures for specific requirements for administration and documentation. In addition, standardization of administration was recommended to be included in the policies and procedures.

None of the standards or guidelines gave specific recommendations for safe handling of hazardous materials regarding personal protective equipment (PPE). Each standard referred to institutional policies and procedures for additional information in this area. In addition, the ASCO/ONS and the CANO standards referred to additional organizations that specifically address safe-handling of chemotherapeutic agents such as the Occupational Safety and Health Administration for the ASCO/ONS standards (Neuss et al., 2013). The institutional policy N300 contains detailed information on nursing PPE, safe handling, and disposal of hazardous materials and chemotherapeutic waste. In addition, post chemotherapeutic precautions regarding bodily fluids are outlined.

All standards and guidelines include nursing associated concepts including the following areas: nursing staff, chemotherapy planning, patient education/consent, administering chemotherapy, and monitoring.

Nursing Staff. Nursing staff education is a commonality to all of the standards and guidelines and included a number of recommendations. All recommend initial comprehensive education prior to administration of IV chemotherapy followed by renewals and all suggested that nurses complete competency maintenance annually or more often if needed. The CANO standard includes additional recommendations for self-directed learning for competency maintenance. In addition, the importance of adequate staffing was included in both part 1 and 2 of AHRQ and ASHP guidelines. The ONS

website refers to ANA principles for adequate staffing. Additionally, the importance of having a distraction free work environment was emphasized in part 1 of the AHRQ guidelines and CANO standards.

The current institutional policy N300 recommends completion of validation training with no further recommendations for competency maintenance. Nurses who administer chemotherapy are also recommended to follow-up with Occupational Health and Wellness Services yearly. The policy also states that nurses complete an initial comprehensive ONS validation followed by renewals every 2 years.

Chemotherapy Planning. Nursing recommendations related to chemotherapy planning for the five standards and guidelines include patient assessment with confirmation of the diagnosis and allergies along with a complete medical history and assessment. Central line and IV access information was also included in the standards and guidelines except for part 1 of the AHRQ guidelines with references to institutional policies. In addition, recommendations for patient comprehension confirmation and psychosocial concerns are also incorporated in the AHRQ guidelines.

The institutional policy N300 contains specific information regarding the pretreatment phase with assessment and lab verification. Detailed information of IV site selection and central line maintenance is also included. Policy N1515 discusses initial and ongoing patient psychosocial evaluation and comprehension confirmation of patient education.

Patient Education/Consent. Patient education was a commonality to all of the standards and guidelines. Education of the patient occurs at many steps of the administration process and includes confirmation of a signed consent form. Recommendations were also included regarding patient education and adverse reactions and symptom management. Educational considerations such as literacy were also included in the standards and guidelines.

The organizational policy N300 includes information on verification of informed consent. Patient education is detailed in Policy N1515 including patient education before and throughout treatment including educational considerations.

Administering Chemotherapy. Because of the complexity and increased risks associated with chemotherapy administration, all of the guidelines and standards recommended independent, two-person checks of the patient, drug, dose, and infusion rate. In addition, all recommended procedures for extravasation and antidote management. The use of checklists was recommended in parts 1 and 2 of the AHRQ and ASHP guidelines.

The institutional policy N300 contains detailed information regarding chemotherapy administration including monitoring vascular sites and verification of blood return throughout the treatment. IV push, piggy-back, and continuous infusions are also detailed. Although a checklist is completed as part of initial competency validation, a checklist is not required for subsequent chemotherapy infusions. Policy N310, last revised in 2012, discusses extravasation recognition and initial treatment with antidote management.

Monitoring. Adverse reaction and toxicity monitoring was a commonality to all of the standards and guidelines. The ASCO/ONS and CANO standards referred to ongoing monitoring of the patient's physical and psychosocial status with possible referrals to various specialties such as dietitians, physical therapists, social workers, financial specialists, chaplains, massage therapy, mental health specialists, among other professionals. All standards and guidelines recommended institutional tracking cumulative doses of chemotherapy medications. It is not stated who maintains responsibility for cumulative dose tracking. Ongoing monitoring to treatment response was also included in all standards and guidelines.

Institutional policies N300 and N310 include information on ongoing patient physical and psychosocial monitoring and treatment response. In addition policy N1515 outlines possible side effects to be included in patient education with monitoring treatment response.

Table 2 compares the best practice guidelines and standards to the existing hospital policies. The table identifies the previous nursing associated concepts related to chemotherapy administration. While the hospital policies address many areas of the same areas as the guidelines and standards, several components of the three hospital policies are absent.

Table 2. Comparison of Guidelines, Standards, and Hospital A Policies

	ASCO/ONS Standards	AHRQ Guidelines (Parts 1 & 2)	CANO Standards	ASHP Guidelines	Policy N300	Policy N1515	Policy N310
Nursing staff							
-Education							
Initial	X	X	X	X	X		
comprehensive education							
-Competency maintenance	X	X	X	X	X		
-Adequate staffing	X	X		X			
-Environment-distracted free		X	X				
Chemotherapy planning	X	X	X	X	X	X	X
Patient education & consent	X	X	X	X	X	X	X
Administering chemotherapy	X	X	X	X	X		X
Monitoring	X	X	X	X	X	X	X

Competency

For competency, the following search term combinations were included: intravenous, chemotherapy, administration, best practice, nurse, competence, confidence, high risk, low volume, validation and measurement. Few articles specifically related to chemotherapy administration were available for competency assessment review.

Definition

According to the Merriam-Webster Dictionary Online, competency is defined as an ability or skill (Merriam-Webster's online dictionary, n.d.). As previously stated, the ANA defines competence as "an expected level of performance that integrates

knowledge, skills, abilities, and judgment” (2013, p. 3). Although there is not a consistent interpretation for competence in nursing, definitions usually include holistic standards (Blazun et al., 2015) which are also incorporated in the ANA definition. Additionally, competence and competency may be used interchangeably or differentiated with competence focusing more on the potential of performing a task while competency focusing on the actual performance (Laibhen-Parks, 2014). Moreover, the responsibility of obtaining and maintaining competency may be shared between with the nurse, organization, and regulatory bodies. Being competent is not the only determinant of good performance (Levine & Jonson, 2014). The concept of competence is a complex construct that is difficult to define in the practice setting.

Measurement and Validation

Because there is no universally accepted definition for competence or competency in nursing, measuring competency is also not consistent. The frequency of competency and validation or measurement methods varies according to the goals of the competency (Levine et al., 2014). In addition, research of valid and reliable tools needs to be further developed (Wilkinson, 2013). Initial competency validation differs from continued competency validation often with abbreviated education and measurement. Competency can be measured and validated in a number of different ways depending on the purpose of the evaluation and may consist of external methods, examination of internal documents, observation, professional activities, system enhancements, and internal strategies (Levine et al., 2014). Although not an exhaustive list, specific methods for

competency validation may include observation, case study analysis, peer review, self-reflection, testing, and checklists (EdCaN, 2008; Levine et al., 2014; Schroeter, 2008).

Observation of daily work may be utilized as a competency validation. In addition, observation may include simulation, which involves performing a skill in a practice setting under realistic circumstances. Simulation may include a variety of techniques that range from role-playing to high fidelity simulation. Debriefing may also be a part of simulation and involves clarification and consolidation of insights from the simulation (Aebersold & Tschannen, 2013). Although simulation has been utilized for student nurses with effective results (Shin, Park, & Kim, 2015), less research is available for practicing nurses. Simulation has been demonstrated for practicing nurses for improving competency as an evaluation method (Aebersold et al., 2013). However, the effectiveness of high fidelity simulation related to improved patient outcomes and safer care in the practice setting has received mixed results (Hallenbeck, 2012).

Case study analysis includes incorporating previous knowledge to a problem-based scenario to develop solutions (Sprang, 2010). Peer review involves evaluation of care by a nurse colleague to ensure quality and safety (Haag-Heitman, & George, 2011). Self-reflection “is an initial, ongoing, and integral step to assuring competence” (Schroeter, 2008, p. 8) and may be completed before and after competency education and validation. Testing can include a pre and post exam to evaluate knowledge acquisition (EdCaN, 2008). Checklists are another method of competency validation utilized to verify demonstration of skill completion. Incorporation of multiple competency

validation techniques may be utilized to assess different aspects of proficiency including knowledge, skill, judgment, and attitude (Levine et al., 2014).

There is minimal literature available in assessing IV chemotherapy administration competency validation methods in nursing practice. Methods utilized from the literature specific to IV chemotherapy administration include simulation with electronic learning vignettes, observed simulation, case study analysis, and checklists (Carreon et al, 2015; White et al., 2010; Crannell, 2012; Muehlbauer, Parr, & Perkins, 2013; Vioral, 2014; Yu, H., Yu, S., Chen, Wang, Tang, 2013). An editorial recommended training and competency maintenance only for selected staff in administration (Wujcik, 2012).

Although not specific to chemotherapy administration, a training approach for high-risk low volume therapies, like chemotherapy administration, for just-in-time training was evaluated. The authors determined that checklists, reviewed at the beginning of the shift, along with charge nurse peer feedback and checklist completion resulted in effective training (Helman, et al., 2015). Additionally, a nursing survey resulted in increased comfort in caring for patients when just-in-time training was implemented for patients requiring high-risk low-volume therapies (Helman et al., 2015). Feedback, or peer review, was found to be beneficial in staff education (Mantesso, Petrucka, & Bassendowski, 2008; Ross, Bruderle, & Meakim, 2015; Thomassen, Storesund, Softeland, & Brattebo, 2014). Kahn, Ehlers, and Wood found that short, interactive in-services with peer feedback were determined to be a successful method of education for radiologists (2006). Checklists were also found to be valuable in assessing competency (Just, Hubrich, Schmidtke, 2015; Koester et al., 2013; Spector et al., 2012).

Barriers to Competency

There are a number of barriers to competency evaluation in the healthcare environment. Organizational resources of cost and time must be considered in the development of competency assessment programs (Allen, et al., 2008). This includes the costs and resources associated with developing and implementing the competency evaluation tool as well as compensation for staff attending the evaluation. There are also variances in cost with the type of competency validation being utilized. Compliance in completing competencies may be an additional concern with tracking and follow-up. In addition, lack of administrative support may also be a barrier.

Additional Considerations

Learning principles, strategies, and preferences are additional considerations in competency. Adult learning principles need to be incorporated into competency assessment with consideration. Adult learning principles employ the use of interactive techniques utilizing a variety of methods including self-directed learning (Aliakbari, Parvin, Heidari, & Haghani, 2015). The use of multiple strategies, interaction, and repetition may be effective training methods (Bluestone et al., 2013). In addition, the preferences of the nurses completing the competency evaluation must also be included in the selection of evaluation. As noted in the microsystem assessment, nurses did not prefer to attend long educational courses. The preferences of the microsystem nursing staff for learning strategies include checklists, easily accessible resources, and possibly brief educational sessions.

Relation to Confidence

Although nurses may be able to administer chemotherapy, they may not have the confidence to believe that they can deliver the chemotherapy successfully. Among other attributes, holistic nursing care requires confidence (Adamson, King, Moody, & Waugh, 2009). As noted from all of the standards and guidelines above, patient assessment is an integral part of chemotherapy administration. With increasing competence and confidence, the nurse may be better able to focus on the oncology patient instead of focusing on only the task of chemotherapy administration.

Summary of Recommendations for Competency and Confidence Assessment

Summarized below are recommendations based upon the review of the literature for assessing competence and confidence of nurses administering IV chemotherapy and high risk, low volume therapies.

1. Simulation and debriefing (Aebersold et al., 2013; Shin et al., 2015)
2. Case study analysis (Sprang, 2010)
3. Peer review (Mantesso et al., 2008; Ross et al., 2015; Thomassen et al., 2014; Helman et al., 2015)
4. Self-assessment/self-reflection (Carreon et al., 2015; Helman et al., 2015; Schroeter, 2008)
5. Testing (EdCaN 2008)
6. Checklists (Just et al., 2015; Koester et al., 2013; Spector et al., 2012; White et al., 2010)
7. Just-in-time training (Helman, et al., 2015)

CHAPTER THREE

METHODS

Design

The design of the project is based on the plan, do, study, act (PDSA) model, which is a problem-solving model used for process improvement (Nelson et al., 2007). The project focused on the first step of the model (plan) which includes a review of the local problem, development of aims, description of the targeted process, brainstorming and prioritization of solutions using root cause analysis (RCA) and development of implementation and evaluation plans. (Nelson et al., 2007).

Sample/Setting

The setting for the intervention is the first floor Medical, Surgical, Oncology Unit at Hospital X. The target of the PDSA process will be the 36 full-time and part-time nurse staff members.

Procedure

A review of the literature was conducted by the CNL student to identify best practices in competence and confidence in nursing IV chemotherapy administration. In addition, a literature review of competency and confidence in nursing was completed.

Data Analysis

A root cause analysis was conducted by the CNL student to discover factors contributing to low levels of competency and confidence in IV chemotherapy administration. Comparisons were made between the standards, policies, and guidelines, and themes were analyzed. Solutions were identified and prioritized by the CNL student. A protocol was developed by the CNL student to determine root causes identified in the RCA along with an implementation plan and an evaluation plan. Feedback about the protocol, implementation plan, and evaluation plan was solicited from a key stakeholders.

Ethical Issues

This protocol development study was approved as “exempt” by the Montana State University Institutional Review Committee (IRB). The methods used to conduct the microsystem assessment were reviewed by the IRB to ensure confidentiality was protected during the assessment.

CHAPTER FOUR

RESULTS

Root Cause Analysis

For the root cause analysis (RCA), a fishbone diagram was completed. A fishbone diagram is a “tool used to identify and clarify the causes of an effect of interest” (Nelson et al., 2007, p. 316). The fishbone diagram may assist in determining potential causes of a problem or issue.

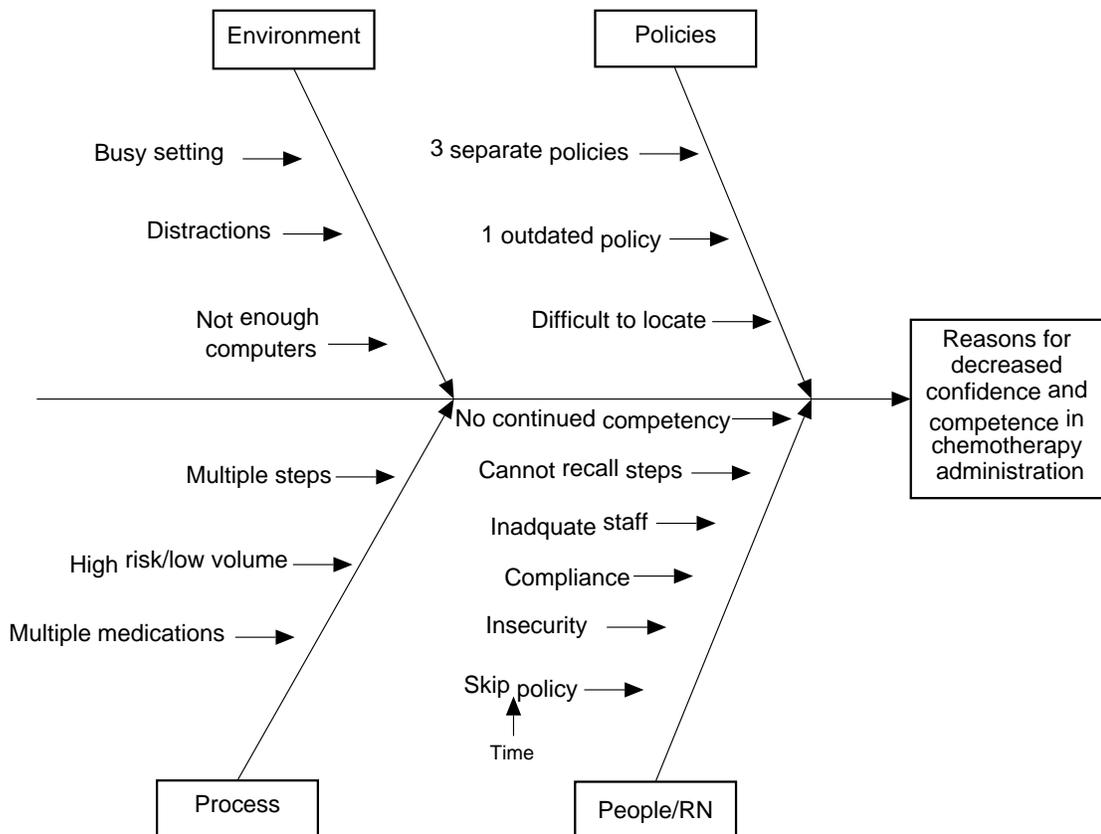


Figure 9. Fishbone Diagram of Causes for Decreased Confidence and Competence

Figure 9 depicts a fishbone diagram of the causes for decreased nursing competence and confidence in IV chemotherapy administration. Environmental factors include the busy setting with distractions and not enough computers for nurses to review information. The policy factors include difficulty locating the multiple policies along with one outdated policy. Process factors include multiple steps and medications involved in chemotherapy administration, which is a high risk, low volume therapy. The factor involving people includes a lack of continued competence, inability to recall steps, inadequate staffing during chemotherapy administration, compliance issues with reviewing policies, insecurity, and nurses skipping policy review due to inadequate time.

There were several gaps identified in the guidelines, standards, and policies (Table 2). In addition, two components of IV chemotherapy administration determined as best practice and included in the RCA were not included in the policies: adequate staffing and a distraction free environment. In addition, having to access three separate policies may also be a deterrent for review.

Although IV chemotherapy administration is a high-risk low-volume therapy, it is not an urgent event. Because of the lack of urgency associated with administration, just-in-time training is proposed. There are minimal valid and reliable tools to measure competence and confidence in chemotherapy administration. Helman et al. proposed a method for just-in-time training with a checklist review, demonstration with checklist completion, peer review feedback, and self-assessment. Related to just-in-time training, there are a number of recommendations for competency validation. Appendix A outlines the chemotherapy administration checklist to be completed by the charge nurse. The aim

is to achieve a minimum of 10 points on an administrative checklist indicated by a 'yes' response for completion. Peer review feedback is included along with the checklist completion. Peer review feedback allows for questions and re-demonstration, if needed. Because there is teamwork and cohesiveness with the staff, feedback will more likely to be perceived in a positive manner (Boehm & Bonnel, 2010). In addition, just-in-time training aligns with the identified preferences of short educational activities at the point of care.

Self-assessment is another method of validation for competence and confidence validation (Carreon et al., 2015; Helman et al., 2015; Schroeter, 2008). Appendix B outlines the proposed Chemotherapy Administration Self-Assessment that will be completed prior to chemotherapy administration and 6 months after implementation. The aim is to increase confidence in all 4 components of IV chemotherapy administration by 2 points on a 5 point Likert scale.

Protocol

The components of the fishbone diagram to be addressed in the protocol include the process and people factors. Modeling after the just-in-time training method proposed by Helman et al. (2015), the proposed chemotherapy administration protocol was developed as follows:

- If IV chemotherapy is to be administered, the charge nurse approaches the staff nurse at the beginning of the shift. The orders, protocol, and checklist are

reviewed by the charge nurse to confirm that the minimum competency is able to be met by the nurse administering chemotherapy.

- The orders, protocol, and checklist are reviewed by the bedside staff nurse at the beginning of the shift who will be administering the chemotherapy.
- The checklist is completed by the charge nurse during administration with checklist scoring ‘yes’ or ‘no’ for each section of the checklist for the nurse completing each section. Feedback and training are provided by the charge nurse at the bedside during administration which allows for reflection and re-demonstration, if needed.
- Additional questions are answered by the charge nurse during administration which allows for peer feedback.

Figure 10 depicts the revised chemotherapy administration flow chart incorporating the just-in-time training method. Highlighted areas indicate a change from the original flow chart. At the beginning of shift, the charge nurse reviews the chemotherapy orders, checklist, and protocol and then approaches the staff nurse to review the same information. The charge nurse verifies the chemotherapy dose with the staff nurse. Steps with an asterisk indicate checklist items to be completed by the charge nurse with peer feedback provided during administration.

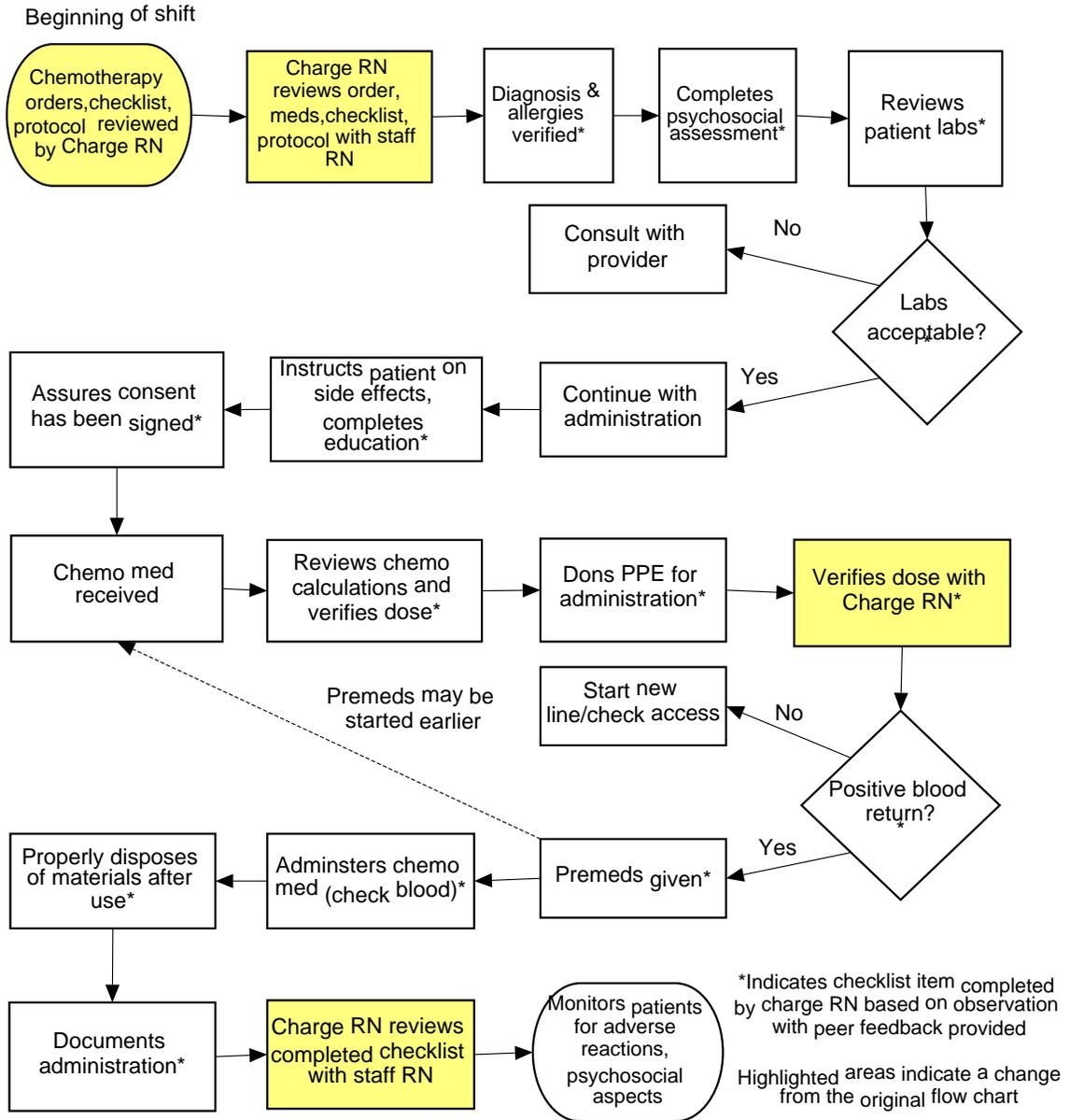


Figure 10. Revised IV Chemotherapy Administration Flow Chart

Implementation Recommendation and Evaluation

The standards and guidelines reviewed from the literature support a minimum of annual chemotherapy administration validation. For the implementation plan, it is proposed that charge nurses will complete a minimum of annual chemotherapy

competency administration. Charge nurses will be educated at their monthly charge nurse meeting and staff nurses will be educated at a monthly staff meeting prior to initiation on the procedure change and tools.

The plan will be evaluated prior to staff education of the protocol and at 6 months. The Chemotherapy Checklist and peer review feedback will be completed by the charge nurse with each chemotherapy administration. The results of the checklists will be reviewed at 6 months. The 4 question, 5 point Likert self-assessment scale will be administered prior to implementation of the new protocol and at the 6 month evaluation with a comparison of the self-assessment scale with a pre/post measurement.

CHAPTER FIVE

DISCUSSION

Proposal Presentation and Feedback

There were a number of comments and suggestions, after presenting the root cause analysis along with the proposed protocol implementation for just-in-time training to a key administrator (Nurse F, personal communication, December 10, 2015) and the Unit Council (Nurse A, B, C, G, H, personal communication, January 7, 2016). The overall response to the proposal was positive and the key administrator and council members determined that implementation of the just-in-time training was feasible. One consideration from the key administrator is the education of all microsystem staff nurses to ensure understanding of responsibilities of charge nurses and staff nurses regarding IV chemotherapy administration. Another consideration is maintaining records for the checklists and self-assessments to determine improvements. The Unit Council members expressed interest in adopting the checklist with possible incorporation in the electronic medical record (EMR). In addition the self-assessment was another potential interest for the council in assessing confidence.

Over one million people are diagnosed with cancer each year in the United States (American Cancer Society, 2015) with many receiving IV chemotherapy. With declining inpatient IV chemotherapy practices, there is a need for competency maintenance to ensure staff and patient safety and increase confidence among nursing staff. With

development of just-in-time training, nurses will have a detailed process for IV chemotherapy administration.

Completing a microsystem analysis, root cause analysis, and protocol development is an ideal role for the Clinical Nurse Leader (CNL). As a leader in healthcare, the focus of the CNL is improving quality in a variety of clinical settings (Williams & Bender, 2015). The CNL integrates care with an interdisciplinary team to identify, develop, implement, and evaluate care practices with a focus on safety and improvement of patient outcomes (American Association of Colleges of Nursing [AACN], 2015). In an inpatient setting, the CNL is well suited to utilize evidence based practice to improve patient care with innovative methods.

Recommendations for Future Work

Recommendations for further work include implementation of the proposed protocol for the microsystem nursing staff. In addition, further work regarding competence and confidence in inpatient IV chemotherapy administration may be beneficial in developing valid and reliable tools for evaluation. In addition, the proposed just-in-time training protocol for non-urgent high-risk low-volume may be applicable to other competencies and patient care areas.

Conclusion

As IV chemotherapy administration transitions away from the bedside, there are less opportunities to maintain competence among inpatient nurses. Just-in-time training is

a method that may improve competence and confidence in IV chemotherapy administration utilizing checklists, demonstration, peer review feedback, and self-assessment. Quality care can be maintained with a focus on safety to nurses and patients.

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APPENDICES

APPENDIX A

CHECKLIST FOR INPATIENT IV CHEMOTHERAPY ADMINISTRATION

Checklist for Inpatient IV Chemotherapy Administration

Skill	Charge Nurse Evaluation Yes/No
Reviews order, meds, protocol, checklist	
Diagnosis and allergies verified	
Completes psychosocial assessment	
Reviews and interprets labs	
Instructs patient on side effects, completes education	
Assures consent has been signed	
Reviews chemo calculations and independently verifies dose	
Dons PPE	
Verifies drug dose with Charge Nurse	
Checks for blood return	
Administers premeds (may be started earlier)	
Administers chemotherapy (verifies blood return)	
Properly disposes of materials	
Documents administration	

Charge nurse signature: _____

Date _____

Staff nurse signature: _____

Date _____

APPENDIX B

CHEMOTHERAPY ADMINISTRATION SELF-ASSESSMENT

CHEMOTHERAPY ADMINISTRATION SELF-ASSESSMENT

Date: _____

Please indicate the degree to which you agree with each of the following statements regarding IV chemotherapy and write in any comment that you may have.

The results will be anonymous. Thank you!

	Strongly Disagree	Disagree	Neither agree or disagree	Agree	Strongly Agree
I am confident in checking/verifying chemotherapy.	1	2	3	4	5
I am confident in the safe handling of chemotherapy.	1	2	3	4	5
I am confident in the administration of chemotherapy.	1	2	3	4	5
I am confident in vesicant extravasation management for chemotherapy.	1	2	3	4	5

Additional comments: