EFFECT OF IMPLEMENTING CHEMOTHERAPY ADMINISTRATION SOPS ON NURSE'S KNOWLEDGE AND ATTITUDE AT UGANDA CANCER INSTITUTE

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A Centre of Excellence in the Heart of Africa

Effect of Implementing Chemotherapy Administration SOPs on Nurse's Knowledge and Attitude at Uganda Cancer Institute

BY

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A Dissertation

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Declaration

I declare that I personally did this work presented in this dissertation and has not been presented to any other institution or university for any award before. Where another individuals work is referred to, has been cited and /or acknowledge clearly.

Author:

Kemigisha Misk Signed 

Date May, 2nd 2024

This dissertation has been submitted with the approval of the following supervisors:

Dr. Grace Nakate

Signature:  Date: 5/5/2024

Dedication

This piece of work is dedicated to my beloved parents, my mum Ms. Mbabazi Angelica, and my Dad Mr. Joseph Karatunga thank you for providing for me shelter when I could not. My daughter Marina Grace Karabo, Mr. Matovu Eddie and my nieces Wanyana Anita and NAkalanzi Joan thank you for being patient with me while I was away and my teacher Dr Grace Nakate, thank you for supporting me throughout my education

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List of Acronym

USA:	United States of America
SOPs:	Standard operating procedures
CA:	Chemotherapy administration
ACS:	American Cancer society
ONS:	Oncology Nurses Society
ASCO:	American Society of clinical oncology
ANPDs:	Antineoplastic drugs
PPE:	Personal protective equipment
HD:	Hazardous drugs
KAP:	Knowledge, attitude and practice
MSDS:	Material safety datasheet (MSDS)
UCU:	Uganda Christian University
REC:	Research ethical committee
IV:	Independent variable,
DV:	Dependent valuable
KAP:	Knowledge, Attitude and Practice
REDCAP:	Electronic Data Capture
UCI:	Uganda Cancer Institute

Definition of Terms

Chemotherapy is any antineoplastic drug (ANPD) that treat cancer, given through oral or parental routes as specified by standard.

Chemotherapy administration is the process of obtaining clinical information, selection of treatment regimen, planning, obtaining informed consent, ordering, preparation, administration, monitoring, assessment of response and monitoring response and toxicity to ensure safe chemotherapy administration

Implementation, a process of training and monitoring nurses on how to utilize SOPs for safe chemotherapy administration.

Standard operating procedures (SOPs), a set of written instructions derived from standard guidelines for chemotherapy administration modified to suit needs of a given organization.

Abstract

Background/Purpose: The worldwide increase in cancer cases has led to an escalated use of chemotherapy treatment. Administering chemotherapy is a complex and high-risk process that requires a multidisciplinary approach and a high level of competency. At the study unit, nurses lack specialized training in oncology and typically learn on the job, with no structured training or monitoring of the use of standard operating procedures (SOPs) for chemotherapy administration (CA). Therefore, their competency in administering chemotherapy was currently unknown. This study aimed at assessing the impact of implementing chemotherapy administration SOPs on nurses' knowledge and attitude towards safe chemotherapy administration.

Methods: A single group pretest-posttest quasi experimental design was conducted to assess the effectiveness of implementing chemotherapy administration standard operating procedures (SOPs) on nurses' knowledge and attitude. A semi-structured questionnaire containing demographic data and questions about nurse's knowledge and attitude of chemotherapy administration SOPs was used at pre and posttest implementation. Participants were chosen by convenience. Knowledge questions were scored as one for correct answers and zero for incorrect ones, while attitude questions were rated on a 5-point Likert scale.

Results: The results indicated that most participants understood the use of personal protective equipment (PPE) in handling of antineoplastic drugs (ANPDs) (98.6%) and the adverse effects of ANPDs exposure (94.4%). Although 80.6% of participants observed safety precautions, 48.6% did not. Most participants did not engage in conversations with patients before chemotherapy administration to assess their understanding. While reasonable steps were taken to minimize hazardous exposure, 43.1% of participants mentioned work overload. The participants' attitude toward paying attention to precautionary measures did not change significantly after training, with time constraints being cited as a reason for the lack of attitude change.

Recommendation: The study recommended that the Uganda Cancer Institute and the Ministry of Health should develop institutionalized chemotherapy administration guidelines and support the implementation of educational training programs for nurses. It also suggested the establishment of an orientation program for newly employed nurses and in-service refresher courses for staff in chemotherapy administration safety. Additionally, the study recommended further research to assess nurses' chemotherapy administration practices.

Chapter One: Introduction

Cancer is a collection of diseases characterized by uncontrolled growth and spread of abnormal cells. Cancer cases are on rise and if not managed properly, it can lead to death (American Cancer Society (ACS), 2018). Rise in cases has led to increased use of chemotherapy (Kingham et.al, 2014). Most cancer patients require chemotherapy drugs during their treatment (Jarach, 2019). Chemotherapy administration (CA), a cornerstone of cancer treatment, involves a complex and high-risk administration process. The process involves clinical information, treatment selection, planning, consent, ordering, preparation, transportation, administration, monitoring, and assessment of response, waste management and toxicity to ensure safe administration (Garzon, Pinacho, Bustos, Gustavo, Bustamante, 2019). It involves complex process with numerous risk factors and high error index (Graeve, McGovern, Arnold & Polovich, 2017). Its exposure results into short and long-term effects like vomiting, fevers, mucositis, bone marrow suppression, teratogenic effects, and increased risk of cancer. Its administration requires highly trained and competent nurses.

In the United States, cancer ranks the second most common cause of death after heart diseases (Garzon, Pinacho, Bustos, Gustavo, Bustamante, 2019; ACS, 2018), making its treatment with chemotherapy a critical component. However, errors in the administration of chemotherapy have been frequently observed, including technique, timing, dosage, and omission errors, often associated with interruptions, administration routes, and workload (Assuncao-Costa, de Sousa, Silva, et al., 2022). These errors are attributed to various factors such as workload, interruptions, time deficits, stress, lack of training, and lack of guidelines (Dagne, Muluken & Molla 2023; Neuss et al. 2016 & Fatuma et al., 2014).

Common errors include incorrect drug orders, under or overdosing, administering the wrong medication, administration route errors, and omission of medication or hydration (Ulas, 2015).

Several studies have reported chemotherapy administration errors in different countries, with varying levels of error rates (Ashokkumar et al., 2018; Dagne, Muluken & Molla 2023; Neuss et al. 2016 & Fatuma et al., 2014). To address these challenges and ensure safe and effective treatment, guidelines and protocols have been developed to institutionalize safe practices in chemotherapy administration (Polovich & Martin, 2011). However, the success of implementing these guidelines has been mixed, with factors such as low adherence to antiemetic prescription and lack of physician buy-in impacting the efficacy of these initiatives (Asefa, et al., 2021).

Nurses, who are responsible for chemotherapy administration, often lack the necessary knowledge and skills in oncology nursing care, particularly in developing countries like Pakistan, Nigeria, and Uganda (Khan, Khowala, Ali, 2012; Nwozichi, Ojewole & Oluwtosin, 2017; Lew & Tibenderana, 2019). This lack of expertise and training can lead to challenges in the pre-administration phase, including inadequate assessment of allergies, calculation of body surface area, and dose verification (Khan, Khowala, Ali, 2012). Additionally, the absence of specialized education and training in oncology nursing in these countries further exacerbates these challenges (Asefa, Dinegde & Demie, 2021; Lew & Tibenderana, 2019).

At UCI Chemotherapy administration has the highest frequency of CA in the world as explained by several challenges like uncertainties in cancer staging, absence of

prognostic biomarkers which lead to error ide of aggressive treatment (Low et al. (2017)

Additionally, it was found out that patients receiving chemotherapy at the study side found it not easy as most patients reported severe side effects and negative impact chemo caused on their bodies. The researcher advices development of interventions that would manage discomfort due to CA (Peter, Eriksson, Namala, Babirye, Wettergren, 2016).

Researchers have suggested various interventions to improve nurses' knowledge and skills in chemotherapy administration, such as the use of flow maps to monitor system performance and creating an environment that encourages open communication about errors and safety concerns (Chera et al., 2015; Campbell, 2014). Comprehensive education and training of health workers, interdisciplinary collaboration, and the implementation of national chemotherapy safety standards have shown promise in enhancing chemotherapy administration practices (Vioral & Kennihan, 2012; Looper et al, 2016; Shemmer, Williams, Merado, Pitts & Polancich, 2019). Moreover, the implementation of standard operating procedures for chemotherapy administration has the potential to positively impact nurses' knowledge and attitudes toward safe chemotherapy administration (Lew & Tibenderana, 2019).

Therefore, the importance of specialized training and mentorship in oncology nursing cannot be overstated, particularly in regions where such resources are scarce. Developing and implementing tailored interventions and guidelines that prioritize safety and competency in chemotherapy administration is crucial for ensuring the well-being of both patients and healthcare workers

Chemotherapy administration guidelines are available however, nurses lack knowledge about their availability and utilization (Gwen & Nickle, 2017; Dejoy et al., 2017; Orajlu, Habibzadel, Sakhuidi &Hajaghazadeh, 2012 & Ramanand et al., 2012).

Background

The researcher implemented chemotherapy administration SOPs to equip nurses with appropriate knowledge on chemotherapy drug administration, attain expert knowledge and achieve competencies of its administering (Hatatet & Oakley, 2019). Findings informed management about the level of performance of nurses in chemotherapy administration; knowledge of staff, strength and weakness to aid in decision making while allocating scares resources for training needs identified or areas that require support and maintenance.

Statement of the Problem

According to UCI (Cancer burden report, 2020 & 2022), there is a steady increase in cancer cases. In 2020 there were 34,008,22 new cases, 992 deaths and 62,545 leaving with cancer in five years. In 2022, there were 34,008,22 new cases, 992 deaths and 62,545 people leaving with cancer per year. Cancer burden has led to increased use of chemotherapy drugs, which can have potential adverse effects due to their complexity, narrow therapeutic index, and toxicity even at therapeutic dosage (Smith et al., 2020). According to quarterly clinical reports in one of outpatient Chemotherapy infusion unit at UCI, on average,1551 patients receive chemotherapy per month (Clinical report, 2023). There are five nurses on unit with at least three on duty every day and one on weekend coverage. Each nurse administers chemotherapy to thirty patients daily on top of their other nursing routines like blood transfusion, wound dressing and other duties. Nurses,

patients, and caretakers may be exposed to these drugs through inhalation, ingestion, dermal absorption, and contact with mucous membranes in the eyes (Jones & Brown, 2018). Although chemotherapy administration guidelines exist, there is a need for their institutionalization in oncology units to prevent unnecessary cytotoxic exposure and to enhance patient and nurse safety (

At UCI, chemotherapy administration standard operating procedures (SOPs) exist, but they are only prescriptive and lack specific training or monitoring. Nurses at UCI have no specialized training in oncology care and acquire knowledge on the job. As a result, the competence of nurses in chemotherapy administration is unknown, making it difficult to ascertain patient and nurses' safety, conduct quality checks, and address training needs (Garcia & Martinez, 2017). The implementation of these SOPs is essential in evaluating nurses' knowledge and attitude toward chemotherapy administration to enable process improvement, quality checks, and enhanced patient and nurse safety.

Purpose: This study aimed at evaluating the effectiveness of implementing chemotherapy administration SOPs on nurses' knowledge and attitude of safe chemotherapy administration at UCI.

Specific Objectives

1. Assess nurses' knowledge of chemotherapy administration SOPs before and after training.
2. Assess nurses' attitudes toward the use of chemotherapy administration SOPs before and after training.
3. Evaluate the effectiveness of implementing chemotherapy administration SOPs on nurses’ knowledge e and attitude.

Significance of the Study to Nursing: This study holds significant implications for nursing. The findings informed management about the performance level of nurses in chemotherapy administration, highlighting areas for improvement and aiding in decision-making for resource allocation and support (Adams & White, 2016). Increased competence in chemotherapy administration among nurses will build confidence among patients and administrators, leading to improved efficiency and proper resource utilization. Additionally, the expanded knowledge base of nurses will contribute to developing training materials, reviewing curricula, and advocating for specialized training in oncology care (Brown, 2020). The results have guided further research and the development of policies to enhance oncology care and environmental conservation.

Theoretical Frame work/Model

The protection motivation theory by Roger (1983) guides the study, highlighting two cognitive appraisal pathways: threat appraisal and coping appraisal (Maddux & Rogers, 1983). Threat appraisal involves severity and vulnerability, while coping appraisal involves response efficacy, self-efficacy, and response cost. The theory posits that individuals' adaptive behavior results from their perception of the severity and vulnerability of a threat, their belief in the effectiveness of recommended coping responses, and the perceived cost of acting.

Theoretical model of protection motivation theory

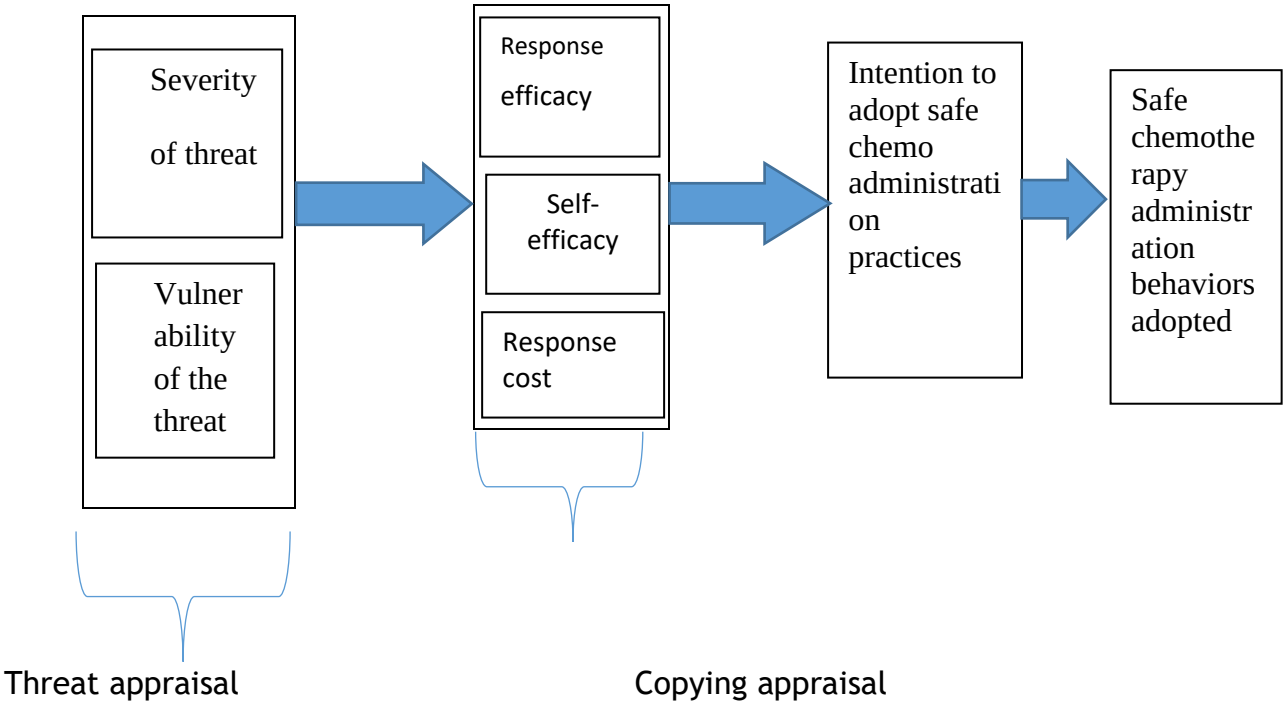


Fig 1: Adapted from Roger, 1983

According to the theory, when individuals perceive a health communication message, it triggers their assessment of severity, vulnerability, response efficacy, response costs, and self-efficacy, leading to protection motivation and acceptance of recommended health-related changes. Higher perceptions of severity and vulnerability increase the intention to engage in adaptive behaviors, fostering understanding of how people adopt protective behaviors in response to threats.

The theory's constructs are applicable to the study as follows: severity of the threat influences nurses' intention to acquire knowledge and skills in safe chemotherapy administration. Perceived vulnerability positively influences nurses' intention to adopt protective measures. Self-efficacy positively influences nurses' intention to adopt knowledge and skills, while response efficacy positively influences nurses' intention to adopt safe chemotherapy administration practices.

Response cost may hinder the adoption of standard operating procedures (SOPs) for safe chemotherapy administration.

Furthermore, previous research, such as that by Win, Stanaland, and Chan (2010), Plotnikoff and Higginbotham (2002), and Oakley et al. (2020), supports the effectiveness of the protection motivation theory in predicting behavior change and compliance with protective measures.

Operational Definition

In this section, the researcher operationalized independent and dependent variables and discussed their measurement.

The Independent variable is the implementation of chemotherapy administration SOPs and the dependent variables are knowledge, attitude in chemotherapy administration.

Implementation is a process of training nurses on application of SOPs for safe chemotherapy administration.

Standard operating procedures (SOPs), a set of written instructions derived from standard guidelines for chemotherapy administration modified to suit the needs of a given organization.

Knowledge is the information and understanding a nurse has about principles and practices of chemotherapy administration.

Attitude is a set of emotions; feelings, beliefs, or behaviors nurses have towards utilization of chemotherapy administration SOPs.

Summary

Chapter one discussed the introduction to the research study, background and problem statement, purpose, significance, research question, specific

objectives, theoretical background, and theoretical model and operational terms defined. In chapter two, the researcher reviewed literature related to prevalence and statistics of cancer, training during the implementation of chemotherapy administration SOPs and Nurses, knowledge, attitude, and practice of chemotherapy administration, and a summary of the review and gaps Identified. Chapter 3 will discuss the research design of the study.

Chapter Two: Literature Review

In this study, the researcher evaluated the effect of implementing SOPs for Chemotherapy Administration on nurses' knowledge and attitude of safe chemotherapy administration at an oncology Unit. The literature reviewed the prevalence and statistics of cancer, training on the use of SOPS for chemotherapy administration to nurses, and nurses' knowledge and attitude of chemotherapy administration.

Prevalence and Statistics of Cancer

Cancer is a group of diseases characterized by uncontrolled growth and spread of abnormal cells. The number of cancer cases is increasing worldwide, leading to a rise in the use of cytotoxic drugs like chemotherapy (17.2 million cases worldwide, 1.7 million newly diagnosed cases, 43.8 million people living with cancer for five years and 8.9 million deaths (ACS, 2018). In Africa, 24 million people will be diagnosed with cancer by 2050 (Kingham et.al, 2014; Global burden of disease collaboration, 2016). Population based Statics of cancer cases in Uganda are very scanty due to cancer registry issues. Cancer treatment involves use of chemotherapy, radiotherapy and surgery.

In summary, raising cancer cases have led to increase in use of cytotoxic drugs like chemotherapy that has adverse effects to patient, caregivers and nurses who are most exposed.

Nurses and pharmacists are the most exposed health workers to chemotherapy, and exposure can result in both short-term and long-term effects.

Training on SOPs for Chemotherapy Administration

Exposure to chemotherapy drugs during the administration process can cause harm to both patients and nurses. Exposure maybe during preparation,

administration or handling patient excretes. Nurses and pharmacists are more exposed health workers with nurses being the most exposed. Exposure may result into long-term or short-term effects like adverse reproductive outcome and increased risk of cancer (Graeve, McGovern, Arnold & Polovich, 2017). Chemotherapy competency that includes product storage, preparation, transportation, administration, spill management, documentation and monitoring is an essential element of oncology nursing practice to ensure safe, effective treatment and minimize risks to health workers, patients and caretakers. At the oncology unit, nurses perform these roles mentioned above with exception of preparation, which is done by the pharmacist. Research studies about chemotherapy administration have not been done in Uganda, if done they are not yet published.

To minimize this risk, the American Society of Health-System Pharmacists (ASHP) and the National Institute for Occupational Safety and Health (NIOSH) developed chemotherapy administration guidelines.

Studies have shown that nurses lack adequate knowledge about chemotherapy drugs and their administration safety measures. Additionally, their attitudes toward chemotherapy safety are influenced by their level of knowledge and practice in handling chemotherapy, which is still inadequate.

In order to minimize health workers' exposure to cytotoxic drugs, the American society of health-system pharmacist (ASPTA) and the National institute for occupational safety and health (NIOSH) came up with chemotherapy administration guidelines to guide health workers on how to administer

chemotherapy and how to eliminate exposure to cytotoxic drugs. Unfortunately, many nurses are unaware of the existence of these guidelines.

Nurses have reported unavailability of safe handling guidelines in their work places (Asefa, Dinegde & Demie, 2022). These findings are similar to the study oncology unit where CA guidelines exist and institutionalized however not implemented in all oncology units. Researchers recommend provision of guidelines in chemotherapy units and training of at-risk personnel as administrative control. Chemotherapy administration guidelines should be accessible to all health care team. Similarly, there is need to ensure accessibility to CA guideline in all units to guide the nurses and those involved. Without guidelines, errors are most likely to occur.

A study conducted by Ulas (2015) in Turkey showed one or more errors during chemotherapy preparation and administration. This call for argent need to find feasible interventions that enhance nurses' knowledge, attitude and practice in order to ensure adherence to safe chemotherapy administration precaution and training is one of the interventions.

Health care workers involved in handling and administration of cytotoxic drugs should have comprehensive education and training in chemotherapy-related knowledge. This safety culture involves collective attitude, belief, and behavior for everyone (Gwen & Nickle, 2017). The findings and recommendations are similar to those of Shemmer, Williams, Merado, Pitts and Polancich, (2019) who recommended all members to get involved in a drive to implement safe handling programs to ensure adherence to current guidelines. There is need to cultivate a safe healthcare environment by promoting safe practices, nurturing a just culture and improving process that detect, mitigate or prevent harm.

Many researchers recommend standardized process for nurses who administer chemotherapy, education and training in use of guidelines be encouraged. This requires a multidisciplinary involvement of all team players. In addition, there is need for assessment of patient safety culture, application of safe science principals and methods. There is need for identification and reporting patient safety risks and events. Consistence in chemotherapy administration through identification of best chemotherapy administration practices, setting up a multidisciplinary team of nurse leaders, pharmacist, educators and all-important team players to develop and evaluate current process and develop best practices (Carreon et al. 2012; Beener and Agan, 2015; Carreon, Sugar man, Beener and Agan, 2015 and Looper et al. 2016). There should be a standardized process for nurses who administer chemotherapy whereby for one to administer chemotherapy he/she must have completed ONS chemotherapy program, three-chemotherapy administration observation and chemotherapy provider card renewed every two years. These measures are not in place at the oncology unit. Studies have shown that nurses lack adequate knowledge about chemotherapy drugs and their administration safety measures. Additionally, their attitudes toward chemotherapy safety are influenced by their level of knowledge and practice in handling chemotherapy, which is still inadequate.

According to response efficacy construct, if nurses believe that taking an adaptive response will work they will appreciate the use of SOPs in ensuring safety chemotherapy administration and will adapt them. Although chemotherapy administration guidelines are in place, nurses are unaware of their availability despite of them being the most exposed group of health workers. There is need to educate and train them on standard processes for chemotherapy administration.

Chemotherapy Administration

Nurses involved in administration of cytotoxic drugs should have comprehensive education and training. A safety culture to improve outcome involves collective attitude, belief and behavior for everyone involved (Gwen & Nickle, 2017). All members must get involved in a drive to implement safe handling program to ensure adherence to current guidelines. These recommendations are similar to one of Ann, Vioral, heather and Kennihan, 2012, Meade 2014 and Looper et al., 2016, who encourage institutions to set up multidisciplinary team comprising of nurse leaders, pharmacist, educators and all-important team players to develop and evaluate current best Practices. Shemmer, Williams, Merado, Pitts & Polancich (2019) recommended application of healthcare quality competency framework that cultivates a safe healthcare environment by promoting safe practices, nurturing a just culture and improving processes that detect, mitigate or prevent harm. Assessment of patient safety culture, application of safe science principals and methods and identification and reporting patient safety risks and events are encouraged.

Safe handling guidelines are unavailable at work places, there should be provision of guidelines in all chemotherapy units (Asefa et al., 2021). Furthermore, there should be training of at-risk personnel as administrative control. Through implementation of chemotherapy administration SOPs guidelines, the above stated measures will be instituted. Every oncology unit required to avail guidelines in chemotherapy units.

Nurses' competence in oncology care should be accessed through self-learning, return demonstration, observation on job and skill marathon with nurses moving from station to station in groups (Crannell, 2012). A practice that aims at

enhancing mastering of skills. The researcher also recommends training nurses using simulation methodology suitable for nurse as it gives them room to learn without being crowded of patient's interaction. They are able to express themselves openly and gain competence before acting on a patient.

Summery; every oncology unit should have guidelines accessible by all staff and develop a collective safety culture all staff involved through training.

Mentoring Nurses in Chemotherapy Administration

Mentorship facilitates retention of organizational values and for one to succeed as a mentor must be available in clinical area, good communicator, and give report to management on behalf of other mentors (Sewell, 2012). The researcher intends to mentor nurses in clinical area to assist in mastery of skill in chemotherapy administration.

Nurses Knowledge of Chemotherapy Administration

Nurses (63%) who administer parental chemotherapy have knowledge gap errors in chemotherapy administration and not fully exposed to utilization of chemotherapy administration guidelines (Neuss et al., 2016). Over 140 errors occur in medication error like under dosing, over dosing schedule, time errors, omission of drugs or hydration, improper preparation of drugs and chemotherapy administration to wrong patients. Other causes identified include stress, understaffing, lack of experience and unclear orders as factors believed to contribute to occurrence of errors. They expressed a need for periodic review of guidelines since technology in medicines and treatment modalities keep shifting hence need for cancer nurses to keep advancing in knowledge and skill. When nurses lack this knowledge, they will not take protective measures. They need to

understand principals, practice and safe handling protocols of chemotherapeutic agents.

To minimize this risk, the American Society of Health-System Pharmacists (ASHP) and the National Institute for Occupational Safety and Health (NIOSH) developed chemotherapy administration guidelines. However, many nurses are unaware of the existence of these guidelines, and there is a reported lack of safe handling guidelines in their workplaces.

Studies have shown that nurses lack adequate knowledge about chemotherapy drugs and their administration safety measures. Additionally, their attitudes toward chemotherapy safety are influenced by their level of knowledge and practice in handling chemotherapy, which is still inadequate. Nurses are unaware of availability of CA guidelines (Carreon, Sugarcane, Beener &Agan, 2015).

The nurses in the study conducted by Ramanand, Basant, Kumar, and Karn (2012) exhibit unsatisfactory levels of knowledge on chemotherapy drugs (CDs) issues. Nurses who handle CDs lack knowledge of preventive measures, leading to increased unsafe behaviors among health workers.

Training of all staff involved in any aspect of handling of hazardous drug is one of the essential elements described in occupational safety and administration guidelines. One of the crucial elements outlined in occupational safety and administration guidelines is the training of all staff engaged in any aspect of handling hazardous drugs. If unaware of the guidelines, they are likely not adopting precaution while handling chemotherapy. There is an expressed need for training in chemotherapy handling (Simon &Toland (2017; Ramanand, Basant, Kumar & Karn, 2012; Turk et al. 2004). In contrast, one study conducted

by Borges, Silvino and Santos (2015) to assess knowledge, attitude and practice of health professionals working in chemotherapy treatment units, health professions were aware of the drug exposure. They consider themselves vulnerable to chemical risks. The institution suggests periodic exams for staff members handling antineoplastic drugs to improve adherence to preventive measures like using PPE and enhancing safety infrastructure. Nurses can reduce chemical exposure by following best practice guidelines. Health professionals are aware of their vulnerability to chemical risks from drug exposure. It is recommended to involve all staff in training programs for safely handling hazardous substances and to increase adherence to preventive measures, such as using PPE and following best practice guidelines to minimize chemical exposure.

Alehashem and Baniasadi (2018), highlighted that nurses who handle cytotoxic drugs have insufficient ongoing education. They emphasized the necessity for experts to conduct continuous training to keep nurses' knowledge current. The authors suggested that oncology nurses should seek formal training from reliable sources to ensure they possess the necessary and practical knowledge for safe handling of cytotoxic drugs.

Nurses Attitude of Chemotherapy Administration

In his article on the role of a verifying chemotherapy nurse, Becze (2016) recommends that if errors occur, the nurse should follow up with the prescriber to make corrections and report the error as a near miss in the institution database. However, some nurses believe double-checking chemotherapy does not prevent errors instead interrupts work flow, time consuming and one may not be accountable for the error (Schwappach, Taxis & Peiffer, 2018; Koulounti, roupa,

Charalambous & Noula, 2019). They still have inadequate knowledge and practice in handling chemotherapy, which positively influences their attitude towards chemotherapy safety. Training in safety and continuous health education on protective measures in their rightful order was recommended. Also, employers should employ nurses of high education level, long experience and high performance. Similarly, Zayed, Saled, El-Sallany and Shehata (2019) recommend conduction of pre-employment and ongoing refreshing training programs. Literature shows that through conducting continuous health education on protective measures in their rightful order and employing highly qualified nurses enhances safe chemotherapy administration practices. From the above findings, nurses still have knowledge gap for handling cytotoxic drugs and there is poor ongoing education for nurses.

Nurses Practices of Chemotherapy Administration

Health care workers in oncology units are exposed to cytotoxic drug as reported by Ndaw and Remy (2023) following their research finding after conducting surface contamination and urine collection from staff which showed exposure to chemotherapy drugs (CD). Similarly, a study by Simon and Toland (2017), health care workers experiencing adverse effects of chemotherapy drugs either during preparation or during administration. These findings indicate that nurses not trained in chemotherapy administration are more exposed to cytotoxic agent than those who had. Majority of nurses administering chemotherapy did not use adequate PPE, a practice that exposed them to droplets to chemotherapy.

A study done by Graeve, McGovern, Arnold and Polovich (2016) showed that Personal protective equipment (PPE) use was lower than recommended. They found chemical residue in several areas. Nurses in ambulating health centers

exhibited lower use of PPE, possibly due to employers having less formalized safety programs and limited direct supervision over staff. This trend mirrors the practice observed at the study site, where some nurses either handle chemotherapy without appropriate protection or rely on single gloves. Implementing comprehensive precautionary measures, rather than just supplying spill kits, emerged as a crucial protective factor. Such actions signify a proactive approach by management in addressing the issue of antineoplastic drug exposure, highlighting their commitment to prioritizing the health and safety of their employees (Dejoy et al., 2017).

Nurses administering chemotherapy have reported experiencing adverse side effects of chemotherapy during preparation or administration, (Ndaw & Remy 2023; Toland & Simon, 2017). They advised that closed system devises along use of PPE reduce exposure of health care workers. However, this equipment is not used in every health setting. Meade (2014), in her document on how to avoid accidental exposure to intravenous cytotoxic drugs, acknowledged health care workers as having up-to-date comprehensive education and training. He advises involvement of all members of the multidisciplinary team in a drive to implement safe handling program to ensure adherence. Through implementation of safety measures, it portrays an image of how serious the problem of antineoplastic drug exposure sis and value is and safety of employees (Dejoy et al., 2017).

In 2015, Chera et al. implemented a strategy to enhance patient safety by advocating for understanding the system's behavior through the use of flow maps to comprehend the flow of information between each step. To develop systems with a high degree of flexibility to handle unexpected events and ensure staff maintain safety awareness, they established an environment and infrastructure.

This environment facilitates all staff and patients in developing an awareness of safety and feeling empowered to discuss errors and inefficient systems. Leaders are motivated to openly address safety concerns, as well as to encourage, acknowledge, reward, and publicly celebrate individuals engaging in improvement initiatives. Additionally, they conducted safety rounds; where they spoke with frontline worker at site, discussed safety and quality concerns. Process improvement was noted (reduced waiting time, reduce interruption, reduced number of patients requiring re-planning). Campbell (2014) recommends the adoption of a closed intravenous cytotoxic administration system to minimize the risks associated with cytotoxic exposure. Findings indicate that with appropriate risk assessment and stakeholder consultation, nurses at bedside can implement safety improvement. From literature, we see nurses working in resource-limited setting unlikely to adhere to use of protective gears due to work overload. They may perceive use of PPE as time consuming. If a nurse has to invest a significant amount of time, effort, or money in adopting standard operating procedures (SOPs), they may feel hesitant to implement them or if they face opposition from influential individuals, they might feel awkward to carry it out.

Intravenous Administration

Nurses lack skill in assessment of chemotherapy induced peripheral neuropathic pains among patients receiving cytotoxic chemotherapy (Al-Atiyyat & Banifawaz, 2018). Since nurses rarely perform this procedure, they wait on clinician to perform the neurologic assessment. Implementation of SOPs will guide nurses understand what is expected of them other than handpicking what to do or not to do. Many nurses start working in oncology units without prior training, a

thing that causes them to be stressed due to lack of knowledge on safe chemotherapy administration (Kapucu at el., 2015).

In their developed model of cancer patient participation in intravenous chemotherapy safety, Na et al. (2017) recommend that staff assist patients in deciding between self-care and supervised care during chemotherapy infusion. They recommended that management design an organizational system and safety culture to ensure the smooth progress of activities in which cancer patients can participate. At the study unit, such systems are none existence, patients rely on information given to them by nurses or doctors. Majority do not know the medication they are receiving. Nurses monitor and assess drug side effects. There are no clear guidelines to guide vascular access used in administration of chemotherapy. Different vascular access has different advantages and disadvantages. Infection rate for peripheral inserted central catheters (PICs) and planted vascular access devices (pots) remain high though may improve patients' quality of life. However, the type of venous access used may vary depending on perception about risks involved (Lavasseur et al. 2018). Most health workers do not use PPEs yet safe handling programs should be for all health workers, there should be system behavior through use of flow maps to understand information.

Drug Monitoring

Physicians and oncology nurses overestimate how often nausea and vomiting occur and underestimate how much these symptoms affect the daily quality of life of patients. There is perceptual gap between health profession who prescribe anti-emetic and patients who receive them. Over 38% of patients surveyed in this study reported not adhering to antiemetic prescribed attributed to the burden of medication already on. The researchers recommend on minimizing and eliminating

requirement to swallow medication of which are also perceived as triggering vomiting (Vidall et al., 2015).

Waste Management

Management should always select a lead person to follow up and evaluate implemented waste management equipment post safe equipment for cytotoxic waste management (Gemma & Wadwy, 20217). The lead person identifies those likely to resist change, involve them at the beginning of training, and let them come up with other innovative ways of proper waste management. At the study unit waste management is left to the cleaners who collect and dispose of waste with exception of pharmacy department where biohazard team collect and dispose of used up chemotherapy vials. Waste is not segregated at all, used up chemotherapy bottles are mixed together with food leftovers, a practice that puts those handling waste to danger and endangering our community. Daylo, Alemayelu and Baraki (2018) stressed a concern of not segregating waste among developing countries a practice that cause serious environmental hazards. They recommended training of health care workers in waste management. In their findings, 47.7% of surveyed healthcare workers showed knowledge of hospital waste management, while 42.3% demonstrated its proper practice. Almost half of the health care workers have poor knowledge and practice of waste management yet they are the one handling hazardous wastes.

Researchers like Janmaimool, 2017; Lwin, Stanaland & Chan, 2010; Plotnikoff & Higginbotham, 2002, Searle, Vedhara, Norman, Frost and Herrad, 2000,

Health communication campaigns should be packaged and well communicated to determine people's compliance to behavioral changes.

Rise in Cancer cases has led to increased use of chemotherapy drugs; these are toxic with high risk of causing harm to patients and t and nurses during its administration, and waste disposal. Several researches have reported nurse's exposure during administration, employers do not provide adequate supplies of PPE to their staff leading to diminished adherence to safety precautions. Knowledge gaps on safe handling practices and preventive measures have been reported among nurses. In order to limit exposure to cytotoxic effects, chemotherapy administration guidelines have been developed to guide health workers on safe practices. These emphasize a need for training and mentoring staff at risk, and reassessing them periodically to update their knowledge and skills to ensure adherence to correct guidelines, cultivate a safe environment, improving processes that mitigate or prevent harm. Though chemotherapy administration guidelines exist, nurses' knowledge and attitude of utilization of chemotherapy administration guidelines is unknown. There are no chemotherapy administration studies reported in Uganda to inform about patient's safety and nurses. At the study site all nurses administering chemotherapy are not certified oncology nurses, they learn on job. Their knowledge of chemotherapy administration is unknown. Basic concepts of oncology nursing are provided to newly recruited staff however, it's limited in content. No specific training on use of SOPs for chemotherapy administration as adopted from guidelines. There is urgent need to institutionalize chemotherapy administration guidelines, train and mentor nurses in use of SOPS, and conduct refresher training for staff to ensure continuity of safety measures. The researcher will assess nurses' knowledge and attitude regarding chemotherapy administration, train and mentor them in using SOPs for safe chemotherapy administration.

Summary: Raising cancer cases have led to increase in use of cytotoxic drugs like chemotherapy that has adverse effects to patient, caregivers and nurses who are most exposed. Although chemotherapy administration guidelines are in place, nurses are unaware of their availability despite of them being the most exposed group of health workers. Nurses still have knowledge gap for handling cytotoxic drugs and there is poor ongoing education. There is need to educate and train them on standard processes for chemotherapy administration.

Chapter Three: Methodology

In Chapter three, the study outlines the research design employed, describes the study area's population, specifies the sample size and selection process, outlines the sampling technique, explains the data collection method, discusses the data collection instrument's validity and reliability, and clarifies the validity of the data and the data collection procedure. The chapter also elaborates on the data analysis and addresses ethical considerations.

Study Design

The researcher designed pre and post internal study study to evaluate how effectively implementing chemotherapy administration SOPs impacted nurses' knowledge and attitude. According to Reichardt, (2019), this design involves taking a pretest measurement, then implementing interventions, and then taking a posttest measurement to assess the effect of the intervention. The design fitted well in this study in that the researcher measured participants knowledge and attitude at pretest, then conducted an intervention which is training, and thereafter took a posttest measurement once for each group. At the beginning of training, a pre-test assessment comprised of semi-structured questionnaire was given after which training on use of chemotherapy administration SOPS followed. Thereafter, a post test assessment was served to the same group. These contained questions assessing knowledge and attitude based on PMT constructs for each of the behavioral domain. They received a training intervention on risks and protective factors for each step of CA SOPs (preparation, transportation, administration, monitoring side effects, and waste management). This method was similar to the ones used by Roozbzhani, Kaviani & Khosandi (2020); Ying Wu, Stanton, Li, Lwin, Stanaland & Chan (2010); Galbraith & Cole (2005).

Study Setting

Uganda's Ministry of Health owns a specialized oncology unit called the Uganda Cancer Institute, which operates autonomously under the Uganda Cancer Institute Act (2016). The institute is responsible for coordinating and delivering comprehensive cancer care and prevention services, conducting cancer-related research and training, and formulating policies on cancers and related diseases. It is recognized as the leading center of excellence for oncology in East Africa, catering to a population of 170 million across six-member states. The institute is closely linked to Makerere University College of Health Sciences and the Mulago hospital complex. It collaborates with local and international organizations in the areas of training and research. It provides community-based ambulatory and in-patient services to cancer patients. Its structure is composed of clinical directorate (pharmacy, nursing, laboratory, medical, pathology, and medical records) technical services (accounts, human resource, and procurement) and support services (catering, utility facilities, cleaning services. Its work force has a range of qualification ranging from certificates, diplomas, degrees and postgraduate degree and PhDs. Its employees come from various ethnic groups with diverse cultural background male and females. It also has visiting teams from various regions national and international as it collaborates with many organizations. The nursing directorate contributes 70% of the total workforce from which a sample will be obtained given the fact that they are the most exposed group.

According to Majid (2018), description of demographic characteristics of a population are defined including age, ethnicity, social economic status, educational level, marital status and work status. Conceptualization of the

population of interest will help in identification of eligibility criteria, study setting and sample strategies.

Study Population

The correspondents comprised of 72 out of 100 nurses working at UCI, the remaining staff were either on annual leave, study leave or sick leaves or off duty during time of data collection.

Sample selection and sample size.

None probability convenience sampling was used based on accessibility of participants in a population (Mallory& Kim, 2014). Participants were selected by convenience depending on their availability on the pre- determined dates. Seventy-two nurses out of hundred working at the oncology unit as per human resource office at the time of study that meet the inclusion criteria and provided a signed informed consent form participated in the study. A list of all nursing staff at the oncology unit was obtained from the human resource office. Selection of participants depended on staff duty schedules and their availability.

Inclusion criteria

All nurses with or without experience in chemotherapy administration at Uganda cancer institute at the time of study. Staffs who had gained experience at job on its administration and give chemotherapy administration. New recruits only observe their seniors until they fill confident enough to start administering it.

All nurses who had consented to take active participation in the study. This ensured that participants fully understood the study purpose and all risks involved and voluntarily accept to participate. It avoids also legal implications involved with research.

All carders of nurses employed by oncology unit because the population is small (90) and all carders are expected to administer chemotherapy.

Exclusion criteria

Visiting nurses since these are temporally and may not be available during the period of study.

Student nurses allocated at the unit by the time of study as these are temporally.

Data Collection tool

Questions selected were obtained from literature reviews of those who conducted similar studies (Zayed, Saied, El-Sallamy, &Shehata, 2019; Maryam &Shadi, 2018; Graeve, McGovern, Arnold, &Polovich, 2017; Mohsen &Fareed, 2013 Polovich & Martha, 2012 and Ben-Ami, Shaham, Rabin, Melzer. &Ribak, 2001). This tool had been shown to be effective in gathering information about knowledge, practice and attitude of chemotherapy administration. It was a suitable tool because the questions arise from concepts used in PMT which is the theoretical frame work guiding the study.The researchers used a self-administered questionnaire survey as the data collection tool. The questionnaire consisted of three sections: the first section included nine questions about the participants' demographic data, the second section contained 18 questions assessing nurses' knowledge, and the third section described attitudes towards chemotherapy administration, including preparation, transportation, administration, side effects management, and waste management of ANPD. Each correctly answered knowledge question received one mark, while incorrect answers were awarded zero marks, resulting in a highest possible score of 18 and a lowest score of zero on the knowledge section. The attitude section utilized statements on a 5-point Likert scale, where a higher score indicated a more positive attitude.

Sampling procedure

Participants were grouped into three groups depending on their duty rota. However, those who were available at the time of training but not in that particular group for that day, were allowed to train and training lasted for three weeks for all groups with each group taking a week. Group one had 30 participants, group two 25 and group three 17 participants from different units including; general OPD, Private OPD, emergency, radiotherapy unit, pediatrics OPD, adult STC, LTC, PVT ward, pediatric ward, surgical unit, theatre and CCP). A conference room was booked throughout the period of training. Training was conducted on alternate days that is Monday, Wednesday and Friday for each group due to tight work schedules. The researcher explained the research protocol to the participants and thereafter obtained a written informed consent from each participant in a group at the beginning of training. Thereafter, the researcher administered a self-administered questionnaire to each participant at before commencement of training and this took over 30 minutes. Then on completion, the researcher collected the filled-up questionnaires and kept in a locked cardboard accessed by a researcher only to ensure confidentiality. Training in chemotherapy administration SOPs followed up until all the Ca processes (steps) were completed. At the end of training, a posttest was given and questionnaire taken for marking and analysis. This process went on for all other groups of participants. Data was sorted checked for completeness, coded and entered in computer and statistically analyzed.

Validity and reliability: To ensure face validity of the questionnaire survey, we ensured it by selecting questions that were reviewed by experts in literature review of similar studies. For content validity, questions selected corresponded to

the theoretical concepts designed to measure the variables. The questions were developed based on literature review of similar studies (Zayed, Saied, El-Sallamy, & Shehata, 2019; Maryam & Shadi, 2018; Graeve, McGovern, Arnold, & Polovich, 2017; Mohsen & Fareed, 2013 Polovich & Martha, 2012 and Ben-Ami, Shaham, Rabin, Melzer. & Ribak, 2001). These tools have shown to be effective in gathering information about knowledge, practice and attitude of chemotherapy administration. It was a suitable tool because the questions rose from concepts used in PMT which was the theoretical frame work guiding the study.

Data management and analysis

Collected data was sorted, crosschecked for completeness of the questions. Incomplete questionnaires were excluded. Completed data was then coded, tallied and entered into computer using research electronic data capture (Redcap). Researcher exported the entered data to Software for statistics and data science (STATA) version 15 for statistical analysis.

The analysis of demographic data involved presenting it numerically in a frequency table. Knowledge-related data were illustrated using graphs, pie charts, or frequency tables for categorical variables, and descriptive statistics such as mean, median, mode, and standard deviation for continuous variables. Attitudes were analyzed and displayed through frequency tables and bar charts.

Continuous variables were compared using T-test and chi-squire to determine relationship between effectiveness of implementing chemotherapy administration SOPs and the nurses' opinion about the intervention.

Ethical consideration

An introductory letter was obtained from the university (UCU) introducing the researcher to the oncology unit. A researcher wrote a request through the research and training committee at the study unit seeking for permission to conduct the study. After receiving approval from the research and ethics committee (REC), the researcher proceeded to seek further permission from top management including executive director of the institution, clinical head, nurse administrator, hospital administrator to be contacted for their support. Thereafter, training work plan and time schedules with guidance of head nurse depending on participant's work schedules made. In order to ensure research ethics honored the following done:

Autonomy: The researcher sought consent from the study participants at the time of enrollment. Those that accepted to participate in the study signed the consent form. Those that declined to participate in the study were at liberty to do so voluntarily. Those that consented were given a pretest before training session. Pre and post interviews were given to participants to assess level of knowledge and attitude of SOPs for CA at baseline and after training. Feedback from the interview were returned after all participant had completed training to avoid participants from getting clue to the question to avoid getting unrealistic the information.

Confidentiality: The information provided was stored in a locker and accessible to only the investigators when needed. Feedback from the interview returned after all participants had completed training. This avoided contamination of the information. Only the researcher had access to data collected. No person's name was used to ensure confidentiality of the participants.

Beneficence and Non – maleficence: No risks were involved in this research; findings from this study benefited nurses to understand their level of performance and work harder to improve. Management was able to identify strength and weaknesses and devise ways of overcoming them. Nurses gained knowledge in safe chemo administration.

Justice: All nurses who met inclusion criteria were recruited without discrimination, and no penalties to those who declined to participate in the study

Risks involved: There was no risk involved except one's valuable time. The assessment informed us of the needs required by our patients to have proper planning and allocation of resources by management.

Right of refusal to participate and withdrawal: A participant was free to choose to participate or not in the study and would withdraw at any time.
No conflict of interest to participants and researcher. The research not funded by any organization

summary

A descriptive cross-section study design was used to evaluating effectiveness of implementing chemotherapy administration SOPs on nurses' knowledge and attitude at specialized oncology unit. Over 72% of nurses who met inclusion criteria and consented were sampled. A self-administered questionnaire survey was used. Validity and Reliability was ensured by selecting questions reviewed by experts in literature review of similar studies and those that corresponded to the theoretical concepts designed to measure the variables. Completed data was coded, tallied and entered Redcap, exported to STATA version 15 for analysis. An introductory letter was obtained from the university (UCU) introducing the researcher to the oncology unit. Informed consent was sought from all participants and data

collected stored in a locker and accessible to only the investigators when needed. No risks were involved, participant was free to choose to participate or not in the study and would withdraw at any time. No conflict of interests, research was not funded. We shall look at chapter four where results of the study findings are discussed.

Chapter Four: Result

This chapter covers presentation of data, analysis and interpretation of results. It presents findings of the study in four sections: of CA SOPs shown by chi-squire and t-test results in knowledge and attitude table of results. Demographic section will discuss characteristics of participants. Analysis of findings will be presented looking at each participant response following the research objectives: Assess nurses' knowledge of chemotherapy administration SOPs before and after training Social demographic characteristics of the respondents, comparison of knowledge items scored rightly between pre and post evaluations, comparison of attitude items between pre and post evaluations, nurses' rating of the effectiveness of the training of SOPs and Nurse's Opinion of the effectiveness of the training, describe nurses' attitude of use of chemotherapy administration SOPS before and after training, describing the effectiveness of implementing chemotherapy administration SOPs and the nurses' opinion about the intervention. Data obtained from the study was analyzed using research electronic data capture (Redcap). Entered data was exported to Software for statistics and data science (STATA) version 15 for statistical analysis.

Social demographic

The table below shows demographics of participants which comprised of gender, age, marital status, level of education, years of experience in nursing, years of experience as an oncology nurse, number of patients receiving chemotherapy per nurse and number of patients receiving chemotherapy per unit.

Table 1: Social Demographic Characteristics of the respondents

Variable	Frequency (Percent)	Mean (SD)	Median (IQR)	Median (P25-P75)
Sample size n (%)	72(100.0)			
Age in complete years, mean (sd)		36.8 (7.9)		
Age in complete years, median (iqr)			35.0(8.3)	
Age in complete years, median (P25-P75)				35.0 (31.3; 39.5)
Age group in years, n (%)				
25 to 29	9 (12.5)			
30 to 34	24 (33.3)			
35 to 39	21 (29.2)			
40 to 44	6 (8.3)			
45 and Above	12 (16.7)			
Sex, n (%)				
Male	12 (16.7)			
Female	60 (83.3)			
Level of education, n (%)				
Diploma	46 (63.9)			
Bachelor's degree	26 (36.1)			
Marital status, n (%)				
Married	47 (65.3)			
Single	23 (31.9)			
Divorced	1 (1.4)			
Widower/Widow	1 (1.4)			

Years of nursing experience, mean (sd)		12.2 (7.)		
Years of oncology nursing experience, mean (sd)		6.3 (5.)		
Years of chemotherapy handling experience, mean (sd)		6.4 (5.6)		
Number of patients receiving chemotherapy per day at your unit, mean (sd)		24.6 (30.1)		
Number of patients you personally administer chemotherapy to, mean (sd)		21.0 (25.0)		

The table above shows the demographics of the participants starting from level of education, marital status, years of nursing, years of oncology nursing, years of chemotherapy handling, number of patients receiving chemotherapy per day, per nurse:

Most participants were female between ages of 30 to 34 years, diploma holders and married in a reproductive age. Average years of nursing experience was 12.2 with Oncology nursing experience being 6.3years. Few participants had experience in chemotherapy administration and administered chemotherapy to twenty-five patients per day at a unit. One nurse administers chemotherapy to twenty-one patients.

Table 2: Compared knowledge at pre and post training.

	Pre	Post	Chi-sq
Knowledge of antineoplastic drugs (ANPDs) are,	65.3	70.8	17.624
Knowledge of routes of exposure to ANPDs,	73.6	75.0	20.044

Knowledge of all adverse health effects of ANPDs except	54.2	63.9	20.007
Knowledge of the most appropriate guidelines and standards for safe preparation,	44.4	50.0	32.400
Knowledge of role of biological safety cabinet (BSC)	52.8	54.2	29.257
Knowledge of chemotherapy exposure to the body through contact with,	76.4	75	24.667
Knowledge of required PPE in chemotherapy administration	69.4	70.8	9.877
Knowledge of how one protects him/herself from chemotherapy exposure	81.9	86.1	4.540

In table two the researcher compared Knowledge items at pre and post training and evaluated the outcomes.

Evaluations

Total knowledge was scored out of 15 for one who got it right at pre and post, and P value determined to assess for association. The higher the score the more knowledge one had about antineoplastic drug.

Key Observations:

Across various knowledge areas, there was improvement in participants' knowledge from the pretest to the posttest. Notable increases in knowledge were observed in understanding the adverse health effects of ANPDs, use of biological safety cabinets and correct usage of personal protective equipment (PPE). Knowledge regarding safety measures in ANPD administration and the correct way

of using PPE slightly decreased however, the overall trend shows positive improvements in knowledge.

In several areas, such as knowledge of routes of exposure to ANPDs and waste disposal of cytotoxic agents, participants maintained a similar level of knowledge from pretest to posttest.

The highest score was observed in understanding of self-protection from chemotherapy exposure both at the pretest and posttest.
Knowledge on use of BSC was scored lowest at pretest, many did not know what it was and its use. Though knowledge on use of protective gears improved, there correct way of using them and safe waste disposal of cytotoxic agents remained low at posttest. Range at pre-was 0-12 and at post was 0-13.

Table 3: Comparison of Attitude items between Pre and Post Evaluations

Variable	Pre	Post	T-test	Chi-sq	P-Value
Sample size n (%)	72 (100.0)	72 (100.0)	0.58	NA	NA
1. Use of PPE in handling of ANPDs is essential, n (%)	70 (97.2)	71 (98.6)	-0.65	0.029	0.865
2. Adverse health effects of ANPDs exposure are worrying, n (%)	68 (94.4)	66 (91.7)	2.10	9.626	0.002
3. Am given enough information on how to protect myself from chemotherapy exposure, n (%)	40 (55.6)	52 (72.2)	0.36	14.179	0.000
4. I do not feel confident in my competency to handle chemotherapy emergencies, n (%)	21 (29.2)	23 (31.9)	-0.19	12.241	0.000
5. Giving chemotherapy to patients makes me feel guilty, n (%)	53 (73.6)	52 (72.2)	-0.33	7.947	0.005
6. It is easy to inform patients about their treatment but harder to help them e, n (%)	42 (58.3)	40 (55.6)	2.03	5.040	0.025
7. I know that all precautions are taken to ensure that I am not at risk from chemotherapy, n (%)	35 (48.6)	47 (65.3)	0.00	20.549	0.000
8. I pay attention to precautions measurements, n (%)	58 (80.6)	58 (80.6)	-0.19	22.310	0.000
9. I try to avoid patients that are experiencing bad side effects from chemotherapy, n (%)	53 (73.6)	52 (72.2)	-0.17	4.938	0.026

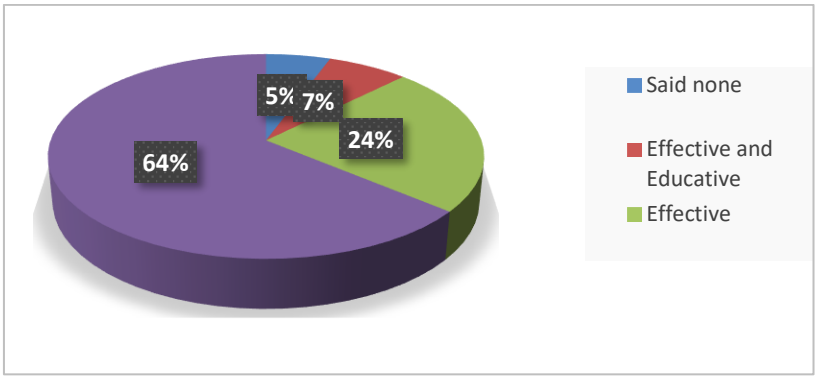
10. Giving chemotherapy impedes communication with patients. n (%)	31 (43.1)	30 (41.7)	1.20	11.694	0.001
11. I always feel that I have supported patients during their chemotherapy treat, n (%)	53 (73.6)	59 (81.9)	0.87	10.090	0.001
12. I know that when I administer chemotherapy patients have understood as much, n (%)	44 (61.1)	49 (68.1)	0.52	9.858	0.002
13. I know enough about chemotherapy to answer patient's questions adequately, n (%)	44 (61.1)	47 (65.3)	0.35	27.236	0.000
14. I feel confident in my competency to handle complications caused by chemotherapy, n (%)	46 (63.9)	48 (66.7)	-0.38	18.813	0.000
15. My job duties do not often interfere with my being able to follow chemotherapy, n (%)	20 (27.8)	18 (25.0)	1.18	23.631	0.000
16. On my unit, all reasonable steps are taken to minimize hazardous job tasks, n (%)	27 (37.5)	34 (47.2)	-0.50	12.498	0.000
17. Compared to my co-workers, my chance of harm from chemotherapy exposure is l, n (%)	34 (47.2)	31 (43.1)	-0.34	4.323	0.038
18. I have enough work in my work place to always follow chemotherapy safe hand, n (%)	31 (43.1)	29 (40.3)	0.58	4.798	0.028

Results

Attitude questions were scored as one if response was positive and 0 if it was negative this aimed at having a sense of outcome in one direction. Although most participants understand how essential it was to use PPE in handling of ANPDs (98.6%) and the adverse health effects of ANPDs exposure (94.4%), many participants have less information on how to protect themselves from chemotherapy exposure. They lack confidence to handle chemotherapy emergencies. They also find it hard to inform patients about their treatment.

Participants at pre and posttest agreed (80.6%) that they pay attention to safety precautions however, there some (48.6%) who don't know precautions to safeguard against risks from chemotherapy exposure. No wonder most of them do not talk to patients prior to chemotherapy administration to find out if a one understood information about chemotherapy. Although reasonable steps are taken to minimize hazardous exposure, most (43.1%) nurses had enough work in their work places to always follow chemotherapy safe handling. Generally, nurses' attitude to paying attention to precautions measurements did not change much after training, this is explained by the fact that attitude changes with time.

Fig 1: Participants Opinion of the Effectiveness of the Training of CA SOPs



Majority of participants rated training of chemotherapy administration SOPs as being effective (88%) and educative.

Effectiveness of the implementation of SOPS on nurse's knowledge and attitude was determined by inferential statistics where t-test, Chi-square and P-value were determined for knowledge and attitude. In table one and two of results there is significant differences in t-test values for knowledge and attitude at pre and posttests evaluation as a result of implementing an intervention which was training. Additionally, the P-value was less than 0.05 an indication that the study was statistically significant.

Summary: This chapter looked at social demographic characteristics of the respondents, comparison of knowledge items scored rightly between pre and post evaluations, comparison of attitude items between pre and post evaluations, nurses' rating of the effectiveness of the training of SOPs and Nurse's Opinion of the effectiveness of the training, describing the effectiveness of implementing chemotherapy administration SOPs and the nurses' opinion about the intervention. The next chapter will discuss the findings, limitations and also generate recommendations for the study.

Chapter Five: Discussion

The fifth chapter of this dissertation involves discussing the study findings, which aimed to assess the effect of implementing Chemotherapy Administration Standard Operating Procedures (SOPs) on nurses' knowledge and attitude at Uganda Cancer Institute. The research objectives were to assess nurses' knowledge of chemotherapy administration SOPs before and after training, describe their attitude toward using these SOPs, and evaluate the effectiveness of their implementation as well as the nurses' opinion about the intervention. The chapter will also include review of literature as well as recommendation and implications. The research results were presented following the research objectives: To assess nurses’ knowledge of chemotherapy administration SOPs before and after training, describe nurses’ attitude of use of chemotherapy administration SOPS before and after training and describing the effectiveness of implementing chemotherapy administration SOPs and the nurses’ opinion about the intervention.

The discussion is guided by the protection motivation theory by Roger and Maddux (1983-1985) that proposes two appraisal pathways, threat appraisal and coping appraisal, as determinants of behavior. that guided in selection of test items in a questionnaire. This theory based on principal that behavior is a function of two appraisal pathway, threat appraisal and copying appraisal. Threat appraisal is comprised of two elements, Severity of a threat and vulnerability of the threat while copying appraisal is comprised of three elements; response efficacy, self-efficacy, and response cost. In this case, perceived severity positively influences nurses’ intention to acquire knowledge and skill in safe chemotherapy administration. Milne and Sheern (2000) believed that the theory variables arouse,

sustain, and direct activity and operationalize in terms of people's intention to perform a recommended precautionary behavior

Social demographics characteristics of respondent

Most nurses (80%) participated in the study giving a good presentation. Nursing staff comprised mostly of female diploma holder nurses in their reproductive age (22-29) with minimal working experience (6.3 years). Nurse workforce is still young in terms of academic progress and skill acquisition. Oncology care is highly specialized and requires a multidisciplinary teamwork nursing inclusive. From finding, nurses need further training academically at least to a graduate level, they can specialize in oncology nursing. In Uganda nursing specialization has not yet taken shape like other countries. The staff are still young and in reproductive age group, making them more vulnerable to effects of cytotoxic exposures hence a priority group to train and empower in chemotherapy handling to avoid adverse effect. This calls for more training of staff in chemotherapy administration to ensure good adherence to guidelines to safeguard from adverse effects of exposure. With high number of patients and few nurses administering the drug, the nurse and patient safety is unknown. Majority of nurses are married (63.9%) and indication of how engaged the team is, and they have to take care of the family and balance up with cancer care. With the mean years of experience being 12.2 and that of oncology nursing experience is lower at a mean of 6.3, this is an indicator that the staff are still inexperienced in area of oncology care and chemotherapy administration many are fresh from school. This explains why more training of chemotherapy administration is required.

Mean of patients receiving chemotherapy per day at each unit was 24.6. Compared to the ratio of nurse to patient on ground, the number of patients

receiving chemotherapy at UCI is high, implying that prevalence of exposure to chemotherapy agents is high. The same nurses administering chemotherapy is expected to give care to other needs of the patients like drug administration, procedures, counselling and other needs. On average, a nurse administers chemotherapy to 21 patients. This is a big number to a nurse given the other duties he/she has to perform. On average, 10 patients receive chemotherapy per day at each unit. In Summary, Majority of the staff at the study site are diploma holders, married and with few of oncology nursing experience. This puts them at a risk of being expose to cytotoxic agents during process of patient care. The patient and caretakers are neither safe nor the environment around.

Nurses Knowledge of chemotherapy administration SOPs

Nurses' knowledge about antineoplastic drugs being cytotoxic increased from 65.3% to 70.8% after training. Findings are similar to those by Hojat, Goudaezi, Hasanv and, Galehdar and Birjandi (2023) whose findings showed improvement in knowledge of chemotherapy safety standards. They expressed a need for using various learning methods such as E- learning to provide learning. At the study site, training in chemotherapy administration is still insufficient. This is attributed among other challenges the workload on nurses given low nurse patient ratio. From the findings 25% of nurses still lack knowledge of routs of chemotherapy administration yet these are the people who administer chemotherapy agent.

Nurses' perception of the perceived severity of exposure to chemotherapy agents is still low as half of the nurses had knowledge (54.2%) of adverse health effects of ANPDs and training had minimal impact on their knowledge (63.9%). Only 50% of staff are well acquitted with appropriate guidelines and standards for safe

preparation. When nurses have low threat appraisal of chemotherapy they may not adapt to behavior of safe chemotherapy administration. There is need to train more nurses to arouse their awareness so that they respond appropriately to SOPS implementation. When nurses get to understand these dangers, he/she will positively respond to the safety measures instituted hence leading to adherence to safety precautions.

Perceived vulnerability: Perceived vulnerability positively influence nurses' intention to acquire knowledge and skill of safe chemotherapy administration. In this study, nurses (83%) are knowledgeable about their vulnerability to exposure of ANPD and are knowledgeable about the use of PPEs correctly (70%). They understand their vulnerability to the adverse effect of chemotherapy exposure, they adhere to protective measures. However most of them do not know the biosafety cabinet BSC (94%). This explains why a few staff knew how to use it (6.9%) and many nurses do not know (93.1%) the types of protective wears to wear while preparing chemotherapy. There is need for more training of use of PPEs. These finding are similar to one by Silver-Rodriguees, Silva, Nunes, Cardos & Nascimento, (2019) who examined nurse's attitude towards administration of antineoplastic as being concerned with extravasation and lack of appropriate devices for drug administration.

Self-efficacy: In this study many nurses do not know most appropriate guidelines and standards for safe preparation (50.0%). Self-efficacy positively influences nurse's intention to adopt knowledge and skills in safe chemotherapy administration. When nurses perceive the use of Sops in chemo administration as easy to follow, the more they will take an active part in adapting it. These finding are similar to ones in literature where many nurses do not know the existence of

guidelines hence likely not to take protective measures while administering the drug

Most nurses had good attitude towards use of PPE as a measure for protection against adverse effects of chemotherapy exposure an indication that they intend to adopt knowledge and skills in safe chemotherapy administration. They perceive the use of Sops in chemo administration as easy to follow and are more willing take an active part in adapting them.

More than two-third (66.7%) of nurses had unsatisfactory knowledge and practice in chemotherapy administration (Mahdy, Rahman, EI and Ahmed, (2018). They recommended designing in service training and educational program to improve nurse's knowledge, practice and attitude regarding chemotherapy administration.

At the study site, nurses are not fully exposed to CA guidelines 50% of the participants did not know availability of CA guidelines. No reports of error or near miss have been documented despite of literature finding indicating reports of errors in chemotherapy administration (Neuss et al, 2016). With knowledge gap nurses will not take up protective measures hence patient safety and their safety are at stake.

Given the ratio of nurses' patient in chemotherapy infusion, the rate of errors in terms of dosing, time errors omission of drug or hydration status is unknown.

Patients receiving chemotherapy have reported severe side effects few days after chemo infusion and some have been reported dead. There is need to monitor

chemo infusion at pre and post treatment. Guidelines are crucial in ensuring proper administration.

Staff knowledge on chemotherapy handling still unsatisfactory as reported from the study where they reported not being confident to handle chemotherapy.

Given the findings that nurses do not know availability of guidelines, this is a clear indication that they will not adopt too their use in daily activity. Simon & Toland (2017) further advises that when nurses are exposed to guidelines, they are likely to adopt to their use on daily activities.

Training at study site have not covered all staff yet there is a need to train every staff at the study site for any chemo handling and adherence to preventive measures. Nonresistance the cleaners who clean infusion area should be trained in waste management of cytotoxic agents. Trainings should be on going as reported by Alehashem and Banlasadi (2018).

Attitude. Most staff understood how essential it is to use of PPE in handling of ANPDs. At least staff now have information on how to protect themselves from chemotherapy exposure. The next drive should be emphasizing on how to use then correctly at all times to help them gain confidence.

From the findings, it's evident that nurses themselves do not trust use of chemotherapy in treatment of cancer. They believe chemotherapy shortens the life of the patients. That is evidenced in their expression of finding it difficult to inform patients about their treatment and also very hard to help them. No wonder they do not sensitize patients about outcome of chemotherapy, they do not believe in the treatment they give to the patients. They are not confident in talking to patient about outcomes of chemotherapy administration. From findings,

it’s evident that nurses administering chemotherapy are impeded in their communication to patients.

Various duties of the nurses interfere with their attention paid to CA process, their attention is divided to other general nursing duties like other nursing care services like wound dressing, drug administration to mention but a few. Minimal measures are in place at UCI to minimize hazardous job tasks however, majority are exposed to chemotherapy agents.

Results revealed that nurses lack competency to handle chemotherapy emergencies and complication, an indication that more training in chemotherapy administration is still required.

Errors have been reported by nurses however, they are never recorded for fears of being blamed by other senior staff. Delivered chemotherapy is never crosschecked by two staff as recommended in guidelines. They do not also cross check with prescription, they administer what has been brought by the pharmacy. This is not in line with Becze (2016) who recommended role of verifying nurse in prevention of CA errors. It implies that mechanism of errors identification and management is still lacking hence magnitude of the CA errors not known.

Nurses have negative attitude towards chemo safety adherence due to knowledge of gap. Literature states that positive attitude is influenced by the level of knowledge and practice of chemotherapy administration though this is still inadequate as reported by Schwappach, Taxis & Peiffer, 2018), Kaulanti, Roupa, Charalumbous & Noula, 2019)

In summary, the discussion highlights the improvement in nurses' knowledge of cytotoxic properties of antineoplastic drugs and the need for various learning

methods, such as e-learning, to provide comprehensive training. It also emphasizes the importance of nurses' awareness of the severity and vulnerability of exposure to antineoplastic drugs, as well as the need for training to ensure their knowledge and skills in safe chemotherapy administration. The lack of knowledge and practice in chemotherapy administration, as well as the inadequate use of protective measures, pose significant risks to both the nurses and the patients. The findings also reveal nurses' unsatisfactory knowledge and practice in chemotherapy administration, as well as their negative attitudes towards chemotherapy safety adherence. The lack of competency to handle chemotherapy emergencies and complications, as well as the underreporting of errors and near misses, highlight the need for comprehensive training and continuous evaluation of nurses' performance.

Analysis of findings, Knowledge score for pre and posttest was out of 15 with range for pretest at 0-12 and posttest at 0-13. Mean and median for pre and posttest were 8.5(3.0) and 9.0 (2.7) respectively. There was no much difference regarding mean, median and ranges at pre and posttest. This is explained by the fact the time between training and practicing what was learnt was short. After training, there is need to allow nurses assimilate and put into practice what was learnt unlike in this study where time interval between training and implementation was short. Similarly difference between attitude at pre and posttest did not change much given the time intervals. Change in attitude requires much more time as one practices it’s a gradual process.

Inferential statistics where t-test, Chi-square and P-value were determined for knowledge and attitude. Findings showed that the training was effective, nurse’s knowledge of chemotherapy administration SOPs improved and attitude changed

positively. The study was statistically significant given that P-value was less than 0.05.

Conclusion: The study concludes that there is insufficient knowledge and adherence to SOPs for chemotherapy administration, and recommends institutionalized guidelines, educational training programs, and continuous evaluation of nurses' performance to enhance safety measures and protect them from exposure to cytotoxic agents. It also points out the need for separating nurses' general duties from those of chemotherapy administration, and emphasizes the importance of further research in assessing nurses' chemotherapy administration practice.

Limitation

Following corvid 19 pandemic restrictions and scaling down of staff and some services, the researcher could not assess CA practices which required close observation and time to have meaningful information. Training could not take effect following restrictions in gatherings by Ministry of health. This would have given us a comprehensive assessment about CA

Recommendations

Nurses should be encouraged to attend scientific meetings and conferences and gain updated knowledge about chemotherapy administration for proper nursing services.

Uganda Cancer Institute together with ministry of health should develop institutionalized chemotherapy administration guidelines and support implementation of educational training program for nurses. Increase nurse’s awareness about policies and guidelines related to chemotherapy administration.

The hospital should have an orientation program to train all newly employed nurses and in-service refresher courses for the staff in chemotherapy administration safety.

Periodically and continuously evaluation of nurse's performance should be done to improve quality of their performance. Further research in assessment of nurses' chemotherapy administration practice is required.

There should be separation of nurses' general duties from those of chemotherapy administration. Nurses in chemotherapy administration should be left to concentrate on chemotherapy administration other than mixing up with other duties like drug administration, wound dressing, booking return dates and other duties.

More training in chemotherapy administration is still required as many areas were not covered in the training given the time.

Dissemination of the Findings

The findings will be disseminated to the School for Research and Post Graduate Studies of Uganda Christian University, nursing research conferences, and the hospital research and ethics committee where the research was conducted, and publication in a relevant journal will be sought

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Appendices

Appendix I: Consent

Title of the study: Effect of Implementing Chemotherapy Administration SOPs on Nurse's Knowledge Attitude and Practice at an Oncology Unit.

Principal investigator: Kemigisha Misk

Institute: Uganda Christian University

Background Information

Uganda Christian University is a training institute that offers undergraduate and postgraduate courses. Am undertaking a master's degree in nursing science. A student undertaking this course is required to conduct a research study in a health-related field. This research proposal is in fulfillment of the above requirement.

Introduction

I am Kemigisha Misk a student at Uganda Christian University under taking a master's degree in nursing sciences. Am undertaking a research in chemotherapy administration. Am glad to interact with you as I gain insight in this study of the effect of implementing chemotherapy administration SOPs on nurse's knowledge, attitude and practice. Since you have administered chemotherapy before, I find you a resourceful person to provide this information. I invite you to take part in this study.

Purpose of the study

As highlighted earlier, the purpose of this study is to gain insight whether implementing chemotherapy administration SOPs will have effect of on nurse's knowledge, attitude and practice

Procedure

The researcher will seek consent from the study participants study at the time of enrollment. Those that accept to participate in the study will sign the consent form. Those that will decline to participate in the study will be at liberty to do so voluntarily.

Risks involved

There is no risk involved except your variable time. The training will enrich you with more knowledge and skills in chemotherapy administration.

Right of refusal to participate and withdrawal

You are free to choose to participate in the study or not. You may also withdraw at any time. Your participation is voluntary. No compensation will be provided for your time and willingness to take part in the study however breakfast and lunch will be provided to all staff involved in training. You have a right not to answer any single question and can completely withdraw from the study at any point.

Confidentiality

The information provided will be stored in a locker and accessible to only the instigator when needed

Available source of information

If you have any questions or clarification to make, you can reach the investigator, Kemigisha on email misk. kemigisha @ yahoo.com/misk. kemigisha @ gmail.com tell; 0782705490

Authorization

I have read and understood this consent form and I volunteer to participate in this research study. I understand that I will receive a copy of this form. I voluntarily choose to participate.

I permit the investigator to record or take photographs that may or may not be used in magazine or any documentary.

I……. do acknowledge that I have red and understood the above information.

I agree to participate in this study.

Participant signature……..

Participant name……

Investigator's signature……..

Signature of the person obtaining consent……..

Appendix II: Questionnaires

Chemotherapy administration Questionnaires

Thank you for accepting to participate in this study of nurses who administer chemotherapy.

Chemotherapy administration refers to preparation, administration, disposal and coming into contact with excreta of a patient that may be contaminated with chemotherapy

Please note the following:

Please read each item carefully

Please, clearly mark your response appropriately from options provided

Respond to each question to the best of your ability describing your personal practice

Regarding chemotherapy administration

Section 1: Demographic

Tick where applicable for No 1&2				
1.Level of education	Certificate	Diploma	Bachelor's degree	Doctoral degree

2. Marital status	Married	Single	Divorced	Widower/Widower

Please, enter the number requested	
3.Your age	
4.Year of nursing experience	
5.Year of oncology nursing experience	

6.Years of chemotherapy handling experience	
7. Number of patients you personally administer chemotherapy to	
8. Number of patients receiving chemotherapy per day at your unit.	

Section 2: Knowledge and attitude of chemotherapy administration (CA)

Select the most appropriate answer for questions 1 to 15 by ticking	**Correct**	**Not correct**
Knowledge assessment		
Select the most appropriate answer for questions 1 to 15 **1.**Antineoplastic drugs (ANPDs) are a). Antineoplastic drugs (ANPDs) are cytotoxic b). Antineoplastic drugs (ANPDs) are cytotoxic c). Antineoplastic drugs (ANPDs) are not toxic d). Antineoplastic drugs (ANPDs) are cytotoxic but not teratogenic		
2. The following are the routes of exposure to ANPDs a). Mouth, skin, tough, eating contaminated food, excrete, sweat. b). Eating contaminated food, skin, nose, infection, wounds c). Inhalation, ingestion, absorption through skin and eyes, injection d). Ingestion, sharing meals, contact, contact with cancer patient		
3. All are adverse health effects of ANPDs except a). Vomiting, fevers, mucositis, bone marrow suppression, b), Fevers, teratogenic effects, increased risk of cancer c). Toothache, fainting, short nails, admission to hospital		

d). Loss of appetite, abdominal pain, Joint pain, loss of hearing		
4. What is the management of adverse health effects of ANPDs a). Take antiemetic's, good hygiene, exercise, good nutrition b). Stay hydrated, take local herbs, stay indoors, take your medication c). Hyper hydrate, radiation, council patient, good hygiene d). Avoid fatty meals, monitor patient, avoid sex		
5. Identify the most appropriate guidelines and standards for safe preparation of ANPDs except: a). Guidelines for ordering, preparation and administration. b). Guidelines for managing pain, oral sores, drug side effect c). Guideline for neutropenia, anemia, bone marrow suppression d). Guideline for managing vomiting, skin irritation and anemia.		
6. What are the safety measure in safe administration of ANPDs a). Clean up spills, use protection, wear disposable gloves b). Boil drinking water, wear, shoes, eat a balanced diet. c). Educate the patient, mange stress, eat plenty of fruits. d). Take a balanced diet, prevent infections, avoid exposure		
7. What is the role of biological safety cabinet (BSC)? a) For preparation of hazardous drugs.		

b). For safety of workers c) For checking for drug contamination d). For helping in putting on PPEs		
8. What is the use of BSC? a). For transporting chemotherapy drugs b). For preparation of chemotherapy drugs c). For protection against spills d) For Safety of the patient.		
9. What are the required PPE in chemotherapy administration? a). Gumboots, plastic cover, priming b) Gowns, face shield, face masks c) Protection against spills		
10. What is the correct way of using PPE? a). Donning two pairs of gloves, wearing disposable gown, use eye glasses b). Wearing a disposable gown or clinical court, wear mask c). Using eye glasses, face covers, shoe covers d) Use Face shield, clean linen, covered shoes		
11. What if the safest way of waste disposal of cytotoxic agents? a) Dispose of All unused drugs, used drug containers, equipment in a leak-proof container well labelled as containing cytotoxic drugs b). Burn cytotoxic wastes in an open pit where there is good aeration. c). Do not sort none cytotoxic waste from the cytotoxic one.		

12. Chemotherapy can enter the body through contact with a) Spills and splashes. b) Contaminated water c)An infected person d) Exposed body					
13. What type of protective wear do you wear while preparing chemotherapy? a). Shoes, lab coat, face mask, gown b) Mask, chemo splashes, gloves c). Cover shoes, helmet, eye glasses d). Gloves, face shield, chemo gown,					
14. How does one protect him/herself from chemotherapy exposure? a) Wearing head capes b). Cleaning the floor well c). Using PPE appropriately d). Avoiding handling chemo gents					
15.How can you protect yourself from chemotherapy aerosols a). Use of face masks b). Use of face shield c). Use of surgical mask					
Section 2: attitude of chemotherapy administration (CA)					
Indicate your level of agreement with these statements about CA SA= Strongly Agree; A= Agree; N= Neutral; D =Disagree; SD Strongly Disagree	**SA**	**A**	**N**	**D**	**SD**
Attitude of chemotherapy administration					
1. Use of PPE in handling of ANPDs is essential					
2.Adverse health effects of ANPDs exposure are worrying					
3.Am given enough information on how to protect myself from chemotherapy exposure					
4.I do not feel confident in my competency to handle chemotherapy emergencies					

5. Giving chemotherapy to patients makes me feel guilty.					
6.It is easy to inform patients about their treatment but harder to help them emotionally					
7. I know that all precautions are taken to ensure that I am not at risk from chemotherapy					
8. I pay attention to precautions measurement's					
9. I try to avoid patients that are experiencing bad side effects from chemotherapy					
10. Giving chemotherapy impedes communication with patients.					
11.I always feel that I have supported patients during their chemotherapy treatment					
12.I know that when I administer chemotherapy patients have understood as much as they wish to know about their treatment					
13.I know enough about chemotherapy to answer patients questions adequately					
14.I feel confident in my competency to handle complications caused by chemotherapy					
15. My job duties do not often interfere with my being able to follow chemotherapy safe handling precautions.					
16.On my unit, all reasonable steps are taken to minimize hazardous job tasks					
17. Compared to my co-workers, my chance of harm from chemotherapy exposure is lower					
18.I have enough work in my work place to always follow chemotherapy safe handling precautions					
Assessing nurse's opinion on use of chemo administration SIOPs					
1.On a scale of 5, how would you rate the effectiveness of training					
2. What is your perception about the training of use of chemotherapy administration SOPS? Specify…….					

Appendix V: Approval Letter

UGANDA CHRISTIAN UNIVERSITY

A Centre of Excellence in the Heart of Africa

01/02/2022

To: Kemigisha Misk

0782705490

Type: Initial Review

Re: UCUREC-2021-250: Effect of Implementing Chemotherapy Administration SOPs on Nurse's Knowledge Attitude and Practice at an Oncology unit, December 28th,2021, 2021-12-28

I am pleased to inform you that the Uganda Christian University REC, through expedited review held on **01/02/2022** approved the above referenced study.
Approval of the research is for the period of **01/02/2022** to **01/02/2023.**

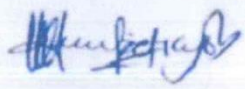
As Principal Investigator of the research, you are responsible for fulfilling the following requirements of approval:

1. All co-investigators must be kept informed of the status of the research.
2. Changes, amendments, and addenda to the protocol or the consent form must be submitted to the REC for re-review and approval **prior** to the activation of the changes.
3. Reports of unanticipated problems involving risks to participants or any new information which could change the risk benefit: ratio must be submitted to the REC.
4. Only approved consent forms are to be used in the enrollment of participants. All consent forms signed by participants and/or witnesses should be retained on file. The REC may conduct audits of all study records, and consent documentation may be part of such audits.
5. Continuing review application must be submitted to the REC **eight weeks** prior to the expiration date of **01/02/2023** in order to continue the study beyond the approved period. Failure to submit a continuing review application in a timely fashion may result in suspension or termination of the study.
6. The REC application number assigned to the research should be cited in any correspondence with the REC of record.
7. You are required to register the research protocol with the Uganda National Council for Science and Technology (UNCST) for final clearance to undertake the study in Uganda.

The following is the list of all documents approved in this application by Uganda Christian University REC:

No.	Document Title	Language	Version Number	Version Date
1	Budget	English	December 28th,2021	2021-12-28
2	Informed Consent forms	English	December 28th,2021	2021-12-28
3	Data collection tools	English	December 28th,2021	2021-12-28
4	Protocol	English	December 28th,2021	2021-12-28

Yours Sincerely



Peter Waiswa
For: Uganda Christian University REC

Uganda Cancer Institute

Upper Mulago Road, P. O. Box 3935, Kampala - Uganda. **Tel:** +256 414 540 410 **Fax:** +256 414 530 729 **Website:** uci.or.ug

22nd February, 2022

Ms. Misk Kemigisha

Uganda Cancer Institute.

RE: Permission to Conduct Research at Uganda Cancer Institute SR-09/22.

Thank you for choosing Uganda Cancer Institute for your study titled "**Effect of implementing chemotherapy administration SOPs on nurses knowledge and attitude and practice at an oncology unit**". The study was reviewed and accepted to be conducted at UCI. This decision was based on the fact that your study had an approval from UCIREC and UNCST.

Please take note of the following as you conduct research at UCI;

i) The conduct and discipline of your study staff will be governed by the rules that govern the conduct and discipline of Public Officers.

ii) Abide by the National Council for Science and Technology (UNCST) regulations for conducting research involving human participants and all relevant regulations. Thus ensure timely renewal of approvals to avoid expiration because we will expect you to avail us proof of renewal to allow you to continue with study conduct after the expiry date.

iii) You are requested to do thorough protocol training for your staff to ensure effective implementation of the study. You should also deliver the updated certificate (s) of human subject's protection for each of your study staff at UCI to the Research and Ethics Review Office before study implementation.

This offer can however be terminated in case your behavior or study staff is contrary to the Institute's values and principles.

By copy of this letter, the UCI Clinical head is informed about your study and strongly urged to take action in case of any malpractices observed as you conduct research at UCI.

Sincerely,

Dr. Nixon Niyonzima

Director Research and Training UCI

C.C. Executive Director, UCI

" The Senior Hospital Administrator, U.C.I.

" UCI Clinical Head, UCI

Appendix VII: Plagiarism report

Turnitin Originality Report

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Effect of Implementing Chemotherapy Administration Sops on Nurse's Knowledge and Attitude at Uganda Cancer Institute. A Dissertation Submitted to the Faculty of Science and Technology of The Uganda Christian University BY Kemigisha Misk In Partial Fulfillment of the Requirements for the Degree of Master of Science in Nursing January, 2024 1 Declaration I declare that I personally did this work presented in this dissertation and has not been presented to any other institution or university for any award before. Where other individuals work is referred to, has been cited and /or acknowledge clearly. Author : Kemigisha Misk Signed ..... Date ..... This dissertation has been submitted with the approval of the following supervisors : Dr. Karen Drake, Bethel University St. Paul, MN, USA Signature..... Date : ..... Dr. Grace Nakate Signature: ..... Date : i

Dedication This piece of work is dedicated my beloved parents , my mum Ms.Mbabazi Angelica, thank you for providing for me shelter when I could not. My daughter Marina Grace Kirabo and my nieces Wanyana Anita and NAkalanzi Joan thank you for being patient with me while I was away and my teacher Dr Grace Nakate, thank you for supporting me throughout my education ii Acknowledgement I acknowledge encouragement and love received from friends and family during study struggles. Without your continued patience, support I could not have completed this program. I wish to convey my sincere gratitude to my supervisors Dr Grace Nakate, Prof Karen and all my faculty who tirelessly and patiently guided me in my thesis by reading every bit, giving feedback and constructive pieces of advice. Many thanks go to my fellow students of MNS 8 for their advice and encouragement during the discussions which has tremendously contributed positively to my completing of this program. To my work colleagues who covered activities of the unit during my absences while pursuing my studies. Lastly to the Almighty God who gave me wisdom and strength. iii Table of Content Declaration .....i Dedication .....ii Acknowledgement ..... iii Table of Content .....iv List of Tables .....vii List of Acronym ..... viii Definition of

Electronic Data Capture Uganda Cancer Institute viii Definition of Terms Chemotherapy is any antineoplastic drug (ANPD) that treat cancer, given through oral or parental routs as specified by standard . Chemotherapy administration is the process of obtaining clinical information, selection of treatment regimen, planning, obtaining informed consent, ordering, preparation, administration, monitoring, assessment of response and monitoring response and toxicity to ensure safe chemotherapy administration. Implementation, a process of training and monitoring nurses on how to utilize SOPs for safe chemotherapy administration. Standard operating procedures (SOPs), a set of written instructions derived from standard guidelines for chemotherapy administration modified to suit needs of a given organization. ix Abstract Background/Purpose: The worldwide increase in cancer cases has led to an escalated use of chemotherapy in treatment. Administering chemotherapy is a complex and high-risk process that requires a multidisciplinary approach and a high level of competency. At the study unit, nurses lack specialized training in oncology and typically learn on the job , with no structured training or monitoring of the use of standard operating procedures (SOPs) for chemotherapy administration (CA). Therefore, their competency in administering chemotherapy is currently unknown . This study aims to assess the impact of implementing chemotherapy administration SOPs on nurses' knowledge , practice, and attitude towards safe chemotherapy administration . Methods: A descriptive multiple cross -section study was conducted to assess the effectiveness of implementing chemotherapy administration standard operating procedures (SOPs) on nurses' knowledge and attitude. A semi-structured questionnaire containing demographic data and questions about nurse's knowledge and attitude of chemotherapy administration SOPs was used at pre and posttest implementation. Participants were chosen by convenience. Knowledge questions were scored as one for correct answers and zero for incorrect ones, while attitude questions were rated on a 5-point likert scale . Results: The results indicated that most participants understood the use of personal protective equipment (PPE) in handling of antineoplastic drugs (ANPDs) (98.6%) and the adverse effects of ANPDs exposure (94.4%). Although 80.6% of participants observed safety precautions, 48.6% did not. Most participants did not engage in conversations with patients before chemotherapy administration to assess their understanding. While reasonable steps were taken to minimize hazardous

exposure, 43.1% of participants mentioned work overload. The participants' attitude toward paying attention to precautionary measures did not change significantly after training, with time constraints being cited as a reason for the lack of attitude change. x Recommendation: The study recommends that the Uganda Cancer Institute and the Ministry of Health should develop institutionalized chemotherapy administration guidelines and support the implementation of educational training programs for nurses. It also suggests the establishment of an orientation program for newly employed nurses and in-service refresher courses for staff in chemotherapy administration safety. Additionally, the study recommends further research to assess nurses' chemotherapy administration practices. xi Chapter One: Introduction Rise in cancer cases has led to increased use of chemotherapy (Kingham et.al, 2014). Most cancer patients require chemotherapy drugs during their treatment (Jarach, 2019). Chemotherapy administration (CA) involves complex process with numerous risk factors and high error index (Graeve, McGovern, Arnold & Polovich, 2017). Its exposure result into short and long-term effects like vomiting, fevers, mucositis, bone marrow suppression, teratogenic effects, and increased risk of cancer. Its administration requires highly trained and competent nurses. Chemotherapy administration guidelines are available however, nurses lack knowledge about their availability and utilization (Gwen & Nickle, 2017; Dejoy et al., 2017; Orajlu, Habibzadel, Sakhuidi &Hajaghazadeh, 2012 & Ramanand et al., 2012). The researcher implemented chemotherapy administration SOPs to equip nurses with appropriate knowledge on chemotherapy drug administration, attain expert knowledge and achieve competencies of its administering (Hatatet & Oakley, 2019). Findings informed management about the level of performance of nurses in chemotherapy administration; knowledge of staff, strength and weakness to aid in decision making while allocating scares resources for training needs identified or areas that require support and maintenance. Background Cancer represents a collection of diseases characterized by the uncontrolled growth and spread of abnormal cells , and if not managed properly, it can lead to death (American Cancer Society (ACS), 2018). Chemotherapy, a cornerstone of cancer treatment, involves a complex and high-risk administration process, as it requires precise clinical information, treatment selection, planning, consent, ordering, preparation, monitoring, and assessment of response and toxicity to ensure safe administration (Garzon, Pinacho, Bustos, Gustavo, Bustamante, 2019). In the United States, cancer ranks as the second most common cause of death after heart diseases (Garzon, Pinacho, Bustos, Gustavo, Bustamante, 2019; ACS, 2018), making its treatment with chemotherapy a critical component. However, errors in the administration of chemotherapy have been frequently observed, including technique, timing, dosage, and omission errors, often associated with interruptions, administration routes, and workload (Assuncao-Costa, de Sousa, Silva, et al., 2022). These errors are attributed to various factors such as workload, interruptions, time deficits, stress, lack of training, and lack of guidelines (Dagne, Muluken & Molla 2023; Neuss et al. 2016 & Fatuma et al., 2014). Common errors include incorrect drug orders, under or overdosing, administering the wrong medication, administration route errors, and omission of medication or hydration (Ulas, 2015). Several studies have reported chemotherapy administration errors in different countries, with varying levels of error rates (Ashokkumar et al., 2018; Dagne, Muluken & Molla 2023; Neuss et al. 2016 & Fatuma et al., 2014). To address these challenges and ensure safe and effective treatment, guidelines and protocols have been developed to institutionalize safe

practices in chemotherapy administration (Polovich & Martin, 2011). However, the success of implementing these guidelines has been mixed, with factors such as low adherence to antiemetic prescription and lack of physician buy-in impacting the efficacy of these initiatives (Asefa, et al., 2021). Nurses, who are responsible for chemotherapy administration, often lack the necessary knowledge and skills in oncology nursing care, particularly in developing countries like Pakistan, Nigeria, and Uganda (Khan, Khowala, Ali, 2012; Nwozichi, Ojewole & Oluwtosin, 2017; Lew & Tibenderana, 2019). This lack of expertise and training can lead to challenges in the pre-administration phase, including inadequate assessment of allergies, calculation of body surface area, and dose verification (Khan, Khowala, Ali, 2012). Additionally, the absence of specialized education and training in oncology nursing in these countries further exacerbates these challenges (Asefa, Dinegde & Demie, 2021; Lew & Tibenderana, 2019). In response to these issues, researchers have suggested various interventions to improve nurses' knowledge and skills in chemotherapy administration, such as the use of flow maps to monitor system performance and creating an environment that encourages open communication about errors and safety concerns (Chera et al., 2015; Campbell, 2014). Comprehensive education and training of health workers, interdisciplinary collaboration, and the implementation of national chemotherapy safety standards have shown promise in enhancing chemotherapy administration practices (Vioral & Kennihan, 2012; Looper et al, 2016; Shemmer, Williams, Merado, Pitts & Polancich, 2019). Moreover, the implementation of standard operating procedures for chemotherapy administration has the potential to positively impact nurses' knowledge and attitudes toward safe chemotherapy administration (Lew & Tibenderana, 2019). Therefore, the importance of specialized training and mentorship in oncology nursing cannot be overstated, particularly in regions where such resources are scarce. Developing and implementing tailored interventions and guidelines that prioritize safety and competency in chemotherapy administration is crucial for ensuring the well-being of both patients and healthcare workers Statement of the Problem The burden of cancer has led to increased use of chemotherapy drugs, which can have potential adverse effects due to their complexity, narrow therapeutic index, and toxicity even at therapeutic dosage (Smith et al., 2020). Nurses, patients, and caretakers may be exposed to these drugs through inhalation, ingestion, dermal absorption, and contact with mucous membranes in the eyes (Jones & Brown, 2018). While chemotherapy administration 3 guidelines exist, there is a need for their institutionalization in oncology units to prevent unnecessary cytotoxic exposure and to enhance patient and nurse safety (Johnson, 2019). At UCI, chemotherapy administration standard operating procedures (SOPs) exist, but they are only prescriptive and lack specific training or monitoring. Nurses at UCI have no specialized training in oncology care and acquire knowledge on the job. As a result, the competence of nurses in chemotherapy administration is unknown, making it difficult to ascertain patient and nurses' safety, conduct quality checks, and address training needs (Garcia & Martinez, 2017). The implementation of these SOPs is essential in evaluating nurses' knowledge and attitude toward chemotherapy administration to enable process improvement, quality checks, and enhanced patient and nurse safety. Purpose: This study aimed to evaluate the effectiveness of implementing chemotherapy administration SOPs on nurses' knowledge and attitude toward safe chemotherapy administration at UCI. Specific Objectives: The specific objectives were to assess nurses' knowledge of chemotherapy administration

SOPs before and after training, describe nurses' attitudes toward the use of chemotherapy administration SOPs before and after training, and evaluate the effectiveness of implementing chemotherapy administration SOPs from the nurses' perspective. Significance of the Study to Nursing: This study holds significant implications for nursing. The findings will inform management about the performance level of nurses in chemotherapy administration, highlighting areas for improvement and aiding in decision-making for resource allocation and support (Adams & White, 2016). Increased competence in chemotherapy administration among nurses will build confidence among patients and administrators, leading to improved efficiency and proper resource utilization. Additionally, 4 the expanded knowledge base of nurses can contribute to developing training materials, reviewing curricula, and advocating for specialized training in oncology care (Brown, 2020). The results can also guide further research and the development of policies to enhance oncology care and environmental conservation. Theoretical Frame work/Model The protection motivation theory by Roger (1983) guides the study, highlighting two cognitive appraisal pathways: threat appraisal and coping appraisal (Maddux & Rogers , 1983). Threat appraisal involves severity and vulnerability , while coping appraisal involves response efficacy, self-efficacy, and response cost. The theory posits that individuals' adaptive behavior results from their perception of the severity and vulnerability of a threat , their belief in the effectiveness of recommended coping responses, and the perceived cost of taking action.

Theoretical model of protection motivation theory Severity of threat Vulner ability of the Response efficacy Self- efficacy Response cost Intention to adopt safe chemo administrati on practices Safe chemothe rapy administr ation behaviors adopted Threat appraisal Copying appraisal Fig 1: Adapted from Roger, 1983 According to the theory, when individuals perceive a health communication message, it triggers their assessment of severity, vulnerability, response efficacy , response costs, and self-efficacy , leading to protection motivation and acceptance of recommended health-related changes. Higher perceptions of severity and vulnerability increase the intention to engage in adaptive behaviors, fostering understanding of how people adopt protective behaviors in response to threats. The theory's constructs are applicable to the study as follows: severity of the threat influences nurses' intention to acquire knowledge and skills in safe chemotherapy administration. Perceived vulnerability positively influences nurses' intention to adopt protective measures. Self-efficacy positively influences nurses' intention to adopt knowledge and skills, while response efficacy positively influences nurses' intention to adopt safe chemotherapy administration practices. Response cost may hinder the adoption of standard

operating procedures (SOPs) for safe chemotherapy administration. Furthermore, previous research, such as that by Win, Stanaland, and Chan (2010), Plotnikoff and

Higginbotham (2002), and Oakley et al. (2020), supports the effectiveness

of the protection motivation theory in predicting behavior change and compliance with protective measures. Operational Definition In this section, the researcher operationalized independent and dependent variables and discussed their measurement. The Independent variable is the implementation of Sops and the dependent variables are knowledge, attitude in chemotherapy administration. Implementation is a process of training nurses on application of SOPs for safe chemotherapy administration. 6 Standard operating procedures (SOPs), a set of written instructions derived from standard guidelines for chemotherapy administration modified to suit the needs of a given organization. Knowledge is the information and understanding a nurse has about principles and practices of chemotherapy administration. Attitude is a set of emotions; feelings, beliefs, or behaviors nurses have towards utilization of chemotherapy administration SOPs. Summary Chapter one

discussed the introduction to the research study , background and

problem statement , purpose, significance, research question, specific objectives, theoretical background, and theoretical model and operational terms defined. In chapter two, the researcher reviewed literature related to prevalence and statistics of cancer, training during the implementation of chemotherapy

administration SOPs and Nurses, knowledge , attitude, and practice of

chemotherapy administration , and a summary of the review and gaps Identified. Chapter 3 will discuss the research design of the study. Chapter Two: Literature Review In this study, the researcher evaluated the effect of implementing SOPs for Chemotherapy Administration on nurses' knowledge and attitude of safe

chemotherapy administration at an oncology Unit. The literature reviewed the prevalence and statistics of cancer, training on the use of SOPS for chemotherapy administration to nurses, and nurses' knowledge and attitude of chemotherapy

administration . Prevalence and Statistics of Cancer Cancer is a group of diseases

characterized by uncontrolled growth and spread of abnormal cells. The number

of cancer cases is increasing worldwide, leading to a rise in the use of cytotoxic drugs like chemotherapy (17.2 million cases worldwide, 1.7 million newly diagnosed cases, 43.8 million people living with cancer for five years and 8.9 million deaths (ACS, 2018). In Africa, 24 million people will be diagnosed with cancer by 2050 (Kingham et.al, 2014; Global burden of disease collaboration, 2016). Population based Statics of cancer cases in Uganda are very scanty due to cancer registry issues. Cancer treatment involves use of chemotherapy, radiotherapy and surgery. In summary, raising cancer cases have led to increase in use of cytotoxic drugs like chemotherapy that has adverse effects to patient, caregivers and nurses who are most exposed. Nurses and pharmacists are the most exposed health workers to chemotherapy, and exposure can result in both short-term and long-term effects. Training on SOPs for Chemotherapy Administration Exposure to chemotherapy drugs during the administration process can cause harm to both patients and nurses. Exposure maybe during preparation, administration or handling patient excretes. Nurses and

pharmacists are more exposed health workers with nurses being the most exposed. Exposure may result into long-term or short-term effects like adverse 8 reproductive outcome and increased risk of cancer (Graeve, McGovern, Arnold & Polovich, 2017). Chemotherapy competency that includes product storage, preparation, transportation, administration, spill management, documentation and monitoring is an essential element of oncology nursing practice to ensure safe, effective treatment and minimize risks to health workers, patients and caretakers. At the oncology unit, nurses perform these roles mentioned above with exception of preparation, which is done by the pharmacist. Research studies about chemotherapy administration have not been done in Uganda, if done they are not yet published. To minimize this risk, the American Society of Health-System Pharmacists (ASHP) and the National Institute for Occupational Safety and Health (NIOSH) developed chemotherapy administration guidelines. Studies have shown that nurses lack adequate knowledge about chemotherapy drugs and their administration safety measures . Additionally, their attitudes toward chemotherapy safety are influenced by their level of knowledge and practice in handling chemotherapy, which is still inadequate. In order to minimize health workers' exposure to cytotoxic drugs, the American society of health-system pharmacist (ASPTA) and the National institute for occupational safety and health (NIOSH) came up with chemotherapy administration guidelines to guide health workers on how to administer chemotherapy and how to eliminate exposure to cytotoxic drugs. Unfortunately, many nurses are unaware of the existence of these guidelines. Nurses have reported unavailability of safe handling guidelines in their work places (Asefa, Dinegde & Demie, 2022).These findings are similar to the study oncology unit where CA guidelines exist and institutionalized however not implemented in all oncology units. Researchers recommend provision of guidelines in chemotherapy units and training of at risk personnel as administrative control. Chemotherapy administration guidelines should be accessible to all health care team. Similarly, there is need to ensure accessibility to CA 9 guideline in all units to guide the nurses and those involved. Without guidelines, errors are most likely to occur. A study conducted by Ulas (2015) in Turkey showed one or more errors during chemotherapy preparation and administration . This call for argent need to find feasible interventions that enhance nurses' knowledge, attitude and practice in order to ensure adherence to safe chemotherapy administration precaution and training is one of the intervention. Health care workers involved in handling and administration of cytotoxic drugs should have comprehensive education and training in chemotherapy-related knowledge. This safety culture involves collective attitude, belief, and behavior for everyone (Gwen & Nickle, 2017). The findings and recommendations are similar to those of Shemmer, Williams, Merado, Pitts and Polancich, (2019) who recommended all members to get involved in a drive to implement safe handling programs to ensure adherence to current guidelines. There is need to cultivate a safe healthcare environment by promoting safe practices, nurturing a just culture and improving process that detect, mitigate or prevent harm . Many researchers recommend standardized process for nurses who administer chemotherapy, education and training in use of guidelines be encouraged. This requires a multidisciplinary involvement of all team players. In addition, there is

need for assessment of patient safety culture, application of safe science principals and methods. There is need for identification and reporting patient safety risks and events. Consistence in chemotherapy administration through identification of best chemotherapy administration practices, setting up a multidisciplinary team of nurse leaders, pharmacist, educators and all-important team players to develop and evaluate current process and develop best practices (Carreon et al. 2012; Beener and Agan, 2015; Carreon, Sugar man, Beener and Agan, 2015 and Looper et al. 2016). There should be a standardized process for nurses who administer chemotherapy 10 whereby for one to administer chemotherapy he/she must have completed ONS chemotherapy program, three-chemotherapy administration observation and chemotherapy provider card renewed every two years. These measures are not in

place at the oncology unit. Studies have shown that nurses lack adequate

knowledge about chemotherapy drugs and their administration safety

measures . Additionally, their attitudes toward chemotherapy safety are influenced by their level of knowledge and practice in handling chemotherapy, which is still inadequate. According to response efficacy construct, if nurses believe that taking an adaptive response will work they will appreciate the use of SOPs in ensuring safety chemotherapy administration and will adapt them. Although chemotherapy administration guidelines are in place, nurses are unaware of their availability despite of them being the most exposed group of health workers. There is need to educate and train them on standard processes for chemotherapy administration. Chemotherapy Administration. Nurses involved in administration of cytotoxic drugs should have comprehensive education and training. A safety culture to improve outcome involves collective attitude, belief and behavior for everyone involved (Gwen & Nickle, 2017). All members must get involved in a drive to implement safe handling program to ensure adherence to current guidelines. These recommendations are similar to one of Ann, Vioral, heather and Kennihan, 2012, Meade 2014 and Looper et al., 2016, who encourage institutions to set up multidisciplinary team comprising of nurse leaders, pharmacist, educators and all-important team players to develop and evaluate current best Practices. Shemmer, Williams, Merado, Pitts & Polancich (2019) recommended application of healthcare quality competency framework that cultivates a safe healthcare environment by promoting safe practices, nurturing a just

culture and improving processes that detect, mitigate or prevent harm .

Assessment of patient safety culture , application of safe 11 science principals and methods and identification and reporting patient safety risks and events are encouraged. Safe handling guidelines are unavailable at work places, there should be provision of guidelines in all chemotherapy units (Asefa et al., 2021).Furthermore, and there should be training of at risk personnel as administrative control. Through implementation of chemotherapy administration SOPs guidelines, the above stated measures will be instituted. Every oncology unit required to avail guidelines in chemotherapy units. Nurses' competence in oncology care should be accessed

through self-learning, return demonstration, observation on job and skill

marathon with nurses moving from station to station in groups (Crannell, 2012). A practice that aims at enhancing mastering of skills. The researcher also recommend training nurses using simulation methodology suitable for nurse as it gives them room to learn without being crowded of patient's interaction. They are able to express themselves openly and gain competence before acting on a patient. Summery; every

oncology unit should have guidelines accessible by all staff and develop a collective safety culture all staff involved through training. Mentoring Nurses in Chemotherapy Administration Mentorship facilitates retention of organizational values and for one to succeed as a mentor must be available in clinical area, good communicator, and give report to management on behalf of other mentors (Sewell, 2012).The researcher intends to mentor nurses in clinical area to assist in mastery of skill in chemotherapy administration. Nurses Knowledge of Chemotherapy Administration Nurses (63%) who administer parental chemotherapy have knowledge gap errors in chemotherapy administration and not fully exposed to utilization of chemotherapy administration guidelines (Neuss et al., 2016). Over 140 errors occur in medication error like under dosing, over dosing schedule, time errors, omission of drugs or hydration, improper

12 preparation of drugs and chemotherapy administration to wrong

patients . Other causes identified include stress, understaffing, lack of experience and unclear orders as factors believed to contribute to occurrence of

errors . They expressed a need for periodic review of guidelines since technology in medicines and treatment modalities keep shifting hence need for cancer nurses to keep advancing in knowledge and skill. When nurses lack this knowledge, they will not take protective measures. They need to understand principals, practice and safe

handling protocols of chemotherapeutic agents . To minimize this risk, the American Society of Health-System Pharmacists (ASHP) and the National Institute for

Occupational Safety and Health (NIOSH) developed chemotherapy administration guidelines. However, many nurses are unaware of the existence of these guidelines, and there is a reported lack of safe handling guidelines in their workplaces. Studies

have shown that nurses lack adequate knowledge about chemotherapy

drugs and their administration safety measures . Additionally, their attitudes toward chemotherapy safety are influenced by their level of knowledge and practice in handling chemotherapy, which is still inadequate. Nurses are unaware of availability of CA guidelines (Carreon, Sugarcane, Beener &Agan, 2015). The nurses in the study conducted by Ramanand, Basant, Kumar, and Karn (2012) exhibit unsatisfactory levels of knowledge on chemotherapy drugs (CDs) issues. Nurses who handle CDs lack knowledge of preventive measures, leading to increased unsafe

behaviors among health workers. Training of all staff involved in any aspect of

handling of hazardous drug is one of the essential elements described in

occupational safety and administration guidelines . One of the crucial

elements outlined in occupational safety and administration guidelines is the

training of all staff engaged in any aspect of handling hazardous drugs. If unaware of the 13 guidelines, they are likely not adopting precaution while handling chemotherapy. There is an expressed need for training in chemotherapy handling (Simon &Toland (2017; Ramanand, Basant, Kumar & Karn, 2012; Turk et al. 2004). In contrast, one study conducted Borges, Silvino and Santos (2015) to assess

knowledge, attitude and practice of health professionals working in

chemotherapy treatment units, health professions were aware of the drug exposure. They consider themselves vulnerable to chemical risks. The institution suggests periodic exams for staff members handling antineoplastic drugs to improve adherence to preventive measures like using PPE and enhancing safety infrastructure. Nurses can reduce chemical exposure by following best practice guidelines. Health professionals are aware of their vulnerability to chemical risks from drug exposure. It is recommended to involve all staff in training programs for safely handling hazardous substances and to increase adherence to preventive measures, such as using PPE and following best practice guidelines to minimize chemical exposure. Alehashem and Baniasadi (2018), highlighted that nurses who handle cytotoxic drugs have insufficient ongoing education. They emphasized the necessity for experts to conduct continuous training to keep nurses' knowledge current. The authors suggested that oncology nurses should seek formal training from reliable sources to ensure they possess the

necessary and practical knowledge for safe handling of cytotoxic drugs . Nurses

Attitude of Chemotherapy Administration In his article on the role of a verifying chemotherapy nurse, Becze (2016) recommends that if errors occur, the nurse should follow up with the prescriber to make corrections and report the error as a near miss

in the institution database . However, some nurses believe double-checking chemotherapy does not prevent errors instead interrupts work flow, time consuming and one may not be accountable for the error (Schwappach, Taxis & Peiffer, 2018; Koulounti, roupa, Charalambous & Noula, 2019).They still have inadequate knowledge and 14 practice in handling chemotherapy, which positively influences their attitude

towards chemotherapy safety. Training in safety and continuous health education on protective measures in their rightful order was recommended. Also employers should employ nurses of high education level, long experience and high performance. Similarly, Zayed, Saled, El- Sallany and Shehata (2019) recommend conduction of pre-employment and ongoing refreshing training programs. Literature shows that through conducting continuous health education on protective measures in their rightful order and employing highly qualified nurses' enhances safe chemotherapy administration practices. From the above findings, nurses still have knowledge gap for handling cytotoxic drugs and there is poor ongoing education for nurses. Nurses Practices of Chemotherapy Administration Health care workers in oncology units are exposed to cytotoxic drug as reported by Ndaw and Remy (2023) following their research finding after conducting surface contamination and urine collection from staff which showed exposure to CD. Similarly a study by Simon and Toland (2017), health care workers experiencing adverse effects of chemotherapy drugs either during preparation or during administration. These findings indicate that nurses not trained in chemotherapy administration are more exposed to cytotoxic agent than those who had. Majority of nurses administering chemotherapy did not use adequate PPE, a practice that exposed them to droplets to chemotherapy. A study done by Graeve, McGovern, Arnold and Polovich (2016) showed that PPE use was lower than recommended. They found chemical residue in several areas. Nurses in ambulating health centers exhibited lower use of PPE, possibly due to employers having less formalized safety programs and limited direct supervision over staff. This trend mirrors the practice observed at the study site, where some nurses either handle chemotherapy without appropriate protection or rely on single gloves. Implementing comprehensive precautionary measures, rather than just supplying spill kits, emerged as a crucial protective factor. Such 15 actions signify a proactive approach by management in addressing the issue of antineoplastic drug exposure,

highlighting their commitment to prioritizing the health and safety of their employees (Dejoy et al., 2017). Nurses administering chemotherapy have reported experiencing adverse side effects of chemotherapy during preparation or administration, (Ndaw & Remy 2023; Toland & Simon, 2017). They advised that closed system devises along use of PPE reduce exposure of health care workers. However, this equipment is not used in every health setting. Meade (2014), in her document on how to avoid accidental exposure to intravenous cytotoxic drugs, acknowledged health care workers as having up-to-date comprehensive education and training. He advises involvement of all members of the multidisciplinary team in a drive to implement safe handling program to ensure adherence. Through implementation of safety measures, it portrays an image of how serious the problem of antineoplastic drug exposure sis and value is and safety of employees (Dejoy et al., 2017). In 2015, Chera et al. implemented a strategy to enhance patient safety by advocating for understanding the system's behavior through the use of flow maps to comprehend the flow of information between each step. To develop systems with a high degree of flexibility to handle unexpected events and ensure staff maintain safety awareness, they established an environment and infrastructure. This environment facilitates all staff and patients in developing an awareness of safety and feeling empowered to discuss errors and inefficient systems. Leaders are motivated to openly address safety concerns, as well as to encourage, acknowledge, reward, and publicly celebrate individuals engaging in improvement initiatives. Additionally, they conducted safety rounds; where they spoke with frontline worker at site, discussed safety and quality concerns. Process improvement was noted (reduced waiting time, reduce interruption, reduced number of patients requiring re-planning). Campbell (2014) recommends the adoption of a closed

intravenous cytotoxic administration system to minimize the risks 16 associated with cytotoxic exposure. Findings indicate that with appropriate risk assessment and stakeholder consultation, nurses at bedside can implement safety improvement. From literature, we see nurses working in resource-limited setting unlikely to adhere to use of protective gears due to work overload. They may perceive use of PPE as time consuming. If a nurse has to invest a significant amount of time, effort, or money in adopting standard operating procedures (SOPs), they may feel hesitant to implement them or if they face opposition from influential individuals, they might feel awkward to carry it out. Intravenous Administration Nurses lack skill in assessment of chemotherapy induced peripheral neuropathic pains among patients receiving cytotoxic chemotherapy (Al-Atiyyat & Banifawaz, 2018). Since nurses rarely perform this procedure, they wait on clinician to perform the neurologic assessment. Implementation of SOPs will guide nurses understand what is expected of them other than handpicking what to do or not to do. Many nurse start working in oncology units without prior training, a thing that causes them to be stressed due to lack of knowledge on safe chemotherapy administration (Kapucu at el., 2015). In their developed model of cancer patient participation in intravenous chemotherapy safety

, Na et al. (2017) recommend that staff assist patients in deciding between self-care and supervised care during chemotherapy infusion. They recommended that management design an organizational system and safety culture to ensure the smooth

progress of activities in which cancer patients can participate. At the study unit, such systems are none existence, patients rely on information given to them by nurses or doctors. Majority do not know the medication they are receiving. Nurses monitor and assess drug side effects. There are no clear guidelines to guide vascular access used in administration of chemotherapy. Different vascular access has different advantages and disadvantages. Infection rate for peripheral inserted central catheters (PICs) and planted vascular access devices (pots) remain high though may improve

patients' 17 quality of life. However, the type of venous access used may vary depending on perception about risks involved (Lavasseur et al. 2018). Most health workers do not use PPEs yet safe handling programs should be for all health workers, there should be system behavior through use of flow maps to understand information. Drug Monitoring Physicians and oncology nurses overestimate how often nausea and vomiting occur and underestimate how much these symptoms affect the daily quality of life of patients. There is perceptual gap between health profession who prescribe anti-emetic and patients who receive them. Over 38% of patients surveyed in this study reported not adhering to antiemetic prescribed attributed to the burden of medication already on. The researchers recommend on minimizing and eliminating requirement to swallow medication of which are also perceived as triggering vomiting (Vidall et al., 2015). Waste Management Management should always select a lead person to follow up and evaluate implemented waste management equipment post safe equipment for cytotoxic waste management (Gemma & Wadwy, 20217). The lead person identifies those likely to resist change, involve them at the beginning of training, and let them come up with other innovative ways of proper waste management. At the study unit waste management is left to the cleaners who collect and dispose of waste with exception of pharmacy department where biohazard team collect and dispose of used up chemotherapy vials. Waste is not segregated at all, used up chemotherapy bottles are mixed together with food leftovers, a practice that puts those handling waste to danger and endangering our community. Daylo, Alemayelu and Baraki (2018) stressed a concern of not segregating waste among developing countries a practice that cause serious environmental hazards. They recommended training of health care workers in waste management. In their findings, 47.7% of surveyed healthcare workers showed knowledge of hospital waste 18 management, while 42.3% demonstrated its proper practice. Almost half of the health care workers have poor knowledge and practice of waste management yet they are the one handling hazardous wastes. Researchers like Janmaimool, 2017; Lwin, Stanaland & Chan, 2010; Plotnikoff & Higginbotham, 2002, Searle, Vedhara, Norman, Frost and Herrad, 2000, Health communication campaigns should be packaged and well communicated to determine people's compliance to behavioral changes. Rise in Cancer cases has led to increased use of chemotherapy drugs; these are toxic with high risk of causing harm to patients and t and nurses during its administration, and waste disposal. Several researches have reported nurse's exposure during administration, employers do not provide adequate supplies of PPE to their staff leading to diminished adherence to safety precautions. Knowledge gaps on safe handling practices and preventive measures have been reported among nurses. In order to limit exposure to cytotoxic effects, chemotherapy administration guidelines have been developed to guide health workers on safe practices. These emphasize a need for training and mentoring staff at risk, and reassessing them periodically to update their knowledge and skills to ensure adherence to correct guidelines, cultivate a safe environment, improving processes that mitigate or prevent harm. Though chemotherapy administration guidelines exist, nurses' knowledge and attitude of utilization of chemotherapy administration guidelines is unknown. There are no chemotherapy administration studies reported in Uganda to inform about patient's safety and nurses. At the study site all nurses administering chemotherapy are not certified oncology nurses, they learn on job. Their knowledge of chemotherapy administration is unknown. Basic concepts of oncology nursing are provided to newly recruited staff however, it's limited in content. No specific training on use of SOPs for chemotherapy administration as adopted from guidelines. There is urgent need to institutionalize chemotherapy administration guidelines, train and mentor nurses in use of 19 SOPS, and conduct refresher training for staff to ensure continuity of safety measures. The researcher will assess nurses' knowledge and attitude regarding

chemotherapy administration , train and mentor them in using SOPs for safe chemotherapy administration. Summary: Raising cancer cases have led to increase in use of cytotoxic drugs like chemotherapy that has adverse effects to patient, caregivers and nurses who are most exposed. Although chemotherapy administration guidelines are in place, nurses are unaware of their availability despite of them being the most exposed group of health workers. Nurses still have knowledge gap for handling cytotoxic drugs and there is poor ongoing education. There is need to educate and train them on standard processes for chemotherapy administration.

Chapter Three: Methodology In Chapter three, the study outlines the research design employed, describes the study area's population, specifies the sample size and selection process, outlines the sampling technique , explains the data collection method , discusses the data collection instrument's validity and reliability , and clarifies the validity of the data and the data collection procedure. The chapter also elaborates on the data analysis and addresses ethical considerations. Study Design The researchers designed a descriptive cross-sectional study to evaluate how effectively implementing chemotherapy administration SOPs impacted nurses' knowledge and attitude According to Polite and Beck (2008), the design allows the collection of data from two or more samples of participants, information from each samples obtained once. The design fitted well in this study in that the researcher collected data at pre and posttest once for each group. At the beginning of training, a pre cross sectional assessment comprised of semi-structured questionnaire was given after which training on use of chemotherapy administration SOPS followed. Thereafter, a post cross sectional assessment was served to the same group. These contained questions assessing knowledge and attitude based on PMT constructs for each of the behavioral domain. They received a training intervention on risks and protective factors for each step of CA SOPs (preparation, transportation, administration, monitoring side effects, and waste management).This method was similar to the ones used by Roozbzhani, Kaviani & Khosandi (2020); Ying Wu, Stanton, Li, Lwin, Stanaland & Chan (2010); Galbraith & Cole (2005). Study Setting Uganda's Ministry of Health owns a specialized oncology unit called the Uganda Cancer Institute, which operates autonomously under the Uganda Cancer Institute Act (2016). The institute is responsible for coordinating and delivering comprehensive cancer care and 21 prevention services, conducting cancer-related research and training, and formulating policies on cancers and related diseases. It is recognized as the leading center of excellence for oncology in East Africa, catering to a population of 170 million across six member states. The institute is closely linked to Makerere University College of Health Sciences and the Mulago hospital complex . It collaborates with local and international organizations in the areas of training and research. It provides community based ambulatory and in-patient services to cancer patients. Its structure is composed of clinical directorate (pharmacy, nursing, laboratory, medical, pathology, and medical records) technical services (accounts, human resource, and procurement) and support services (catering, utility facilities, cleaning services. Its work force has a range of

qualification ranging from certificates, diplomas, degrees and postgraduate degree and PhDs. Its employees come from various ethnic groups with diverse cultural background male and females. It also has visiting teams from various regions national and international as it collaborates with many organizations. The nursing directorate contributes 70% of the total workforce from which a sample will be obtained given the fact that they are the most exposed group. According to Majid (2018), description of demographic characteristics of a population are defined including age, ethnicity, social economic status, educational level, marital status and work status. Conceptualization of the population of interest will help in identification of eligibility criteria, study setting and sample strategies. Study Population The correspondents comprised of 72 out of 100 nurses working at UCI, the remaining staff were either on annual leave, study leave or sick leaves or off duty during time of data collection. Sample selection and sample size. None probability convenience sampling was used based on accessibility of participants in a population (Mallory& Kim, 2014).Participants were selected by convenience depending on their availability on the pre- determined dates. Seventy two nurses out of hundred working at the oncology unit as per human resource office at the time of study that meet the inclusion criteria and provided a signed informed consent form participated in the study. A list of all nursing staff at the oncology unit was obtained from the human resource office. Selection of participants depended on staff duty schedules and their availability. Inclusion criteria All nurses with or without experience in chemotherapy administration at Uganda cancer institute at the time of study. Staffs who had gained experience at job on its administration and give chemotherapy administration. New recruits only observe their seniors until they fill confident enough to start administering it. All nurses who had consented to take active participation in the study. This ensured that participants fully understood the study purpose and all risks involved and voluntarily accept to participate. It avoids also legal implications involved with research. All carders of nurses employed by oncology unit because the population is small (90) and all carders are expected to administer chemotherapy. Exclusion criteria Visiting nurses since these are temporally and may not be available during the period of study. Student nurses allocated at the unit by the time of study as these are temporally. Data Collection method Questions selected were obtained from literature reviews of those who conducted similar studies (Zayed, Saied, El-Sallamy, &Shehata, 2019; Maryam &Shadi, 2018; Graeve, McGovern, Arnold, &Polovich, 2017; Mohsen &Fareed, 2013 Polovich & Martha, 2012 and Ben-Ami, Shaham, Rabin, Melzer. &Ribak, 2001).This tool had been shown to be effective in gathering information about knowledge, practice and attitude of chemotherapy administration. It was a suitable tool because the questions arise from concepts used in PMT which is the theoretical frame work guiding

the study. The researchers used a self-administered questionnaire survey as the

data collection tool. The questionnaire consisted of three sections:

the first section included nine questions about the participants' demographic data, the second section contained 18 questions assessing nurses' knowledge, and the third section described attitudes towards chemotherapy administration, including preparation, transportation, administration, side effects management, and waste management of ANPD. Each correctly answered knowledge question received one mark, while incorrect answers were awarded zero marks, resulting in a highest possible score of 18 and a lowest score of zero on the knowledge

section. The attitude section utilized statements on a 5-point Likert scale ,

where a higher score indicated a more positive attitude. After obtaining consent

from the participant, the researcher administered a self- administered questionnaire to each participant at pre-test before commencement of training and this took over 30 minutes. Then on completion, the researcher collected the filled up questionnaires that was kept in a locked cardboard accessed by a researcher only to ensure confidentiality. Training in chemotherapy administration SOPs followed up until all the processes (steps) were completed. At the end of training, a posttest was given and questionnaire taken for marking and analysis. This process went on for all other groups of participants. Data was sorted checked for completeness, coded and entered in computer and statistically analyzed. 24 Validity and reliability: To ensure face validity of the questionnaire survey, we ensured it by selecting questions that were reviewed by experts in literature review of similar studies. For content validity, questions selected corresponded to the theoretical concepts designed to measure the variables. The questions were developed based on literature review of similar studies (Zayed, Saied, El-Sallamy, & Shehata, 2019; Maryam & Shadi, 2018; Graeve, McGovern, Arnold, & Polovich, 2017; Mohsen & Fareed, 2013 Polovich & Martha, 2012 and Ben-Ami, Shaham, Rabin, Melzer. & Ribak, 2001).These tools have shown to be effective in gathering information about knowledge, practice and attitude of chemotherapy administration. It was a suitable tool because the questions rose from concepts used in PMT which was the theoretical frame work guiding the study. Data management and analysis Collected data was sorted, crosschecked for completeness of the questions. Incomplete questionnaires were excluded. Completed data was then coded, tallied and entered into computer using research electronic data capture (Redcap). Researcher exported the entered data to Software for statistics and data science (STATA) version 15 for statistical analysis. The analysis of demographic data involved presenting it numerically in a frequency table. Knowledge-related data were illustrated using graphs, pie charts, or frequency tables for categorical variables, and descriptive statistics such as mean, median , mode, and standard deviation for continuous variables . Attitudes were analyzed and displayed through frequency tables and bar charts. Continuous variables were compared using T-test and chi-squire to determine relationship between effectiveness of implementing chemotherapy administration SOPs and the nurses' opinion about the intervention.

Ethical consideration An introductory letter was obtained from the university (UCU) introducing the researcher to the oncology unit. A researcher wrote a request through the research and training committee at the study unit seeking for permission to conduct the study . After receiving approval from the internal research view board the researcher proceeded to seek further permission from top management including executive director of the institution, clinical head, nurse administrator, hospital administrator to be contacted for their support. Thereafter, training work plan and time schedules with guidance of head nurse depending on participant's work schedules made. In order to ensure research ethics honored the following done: Autonomy: The researcher sought consent from the study participants at the time of enrollment. Those that accepted to participate in the study signed the consent form. Those that declined to participate in the study were at liberty to do so voluntarily. Those that consented were given a pretest before training session. Pre and post interviews were given to

participants to assess level of knowledge and attitude of SOPs for CA at baseline and after training. Feedback from the interview were returned after all participant had completed training to avoid participants from getting clue to the question to avoid getting unrealistic the information. Confidentiality: The information provided was stored in a locker and accessible to only the investigators when needed. Feedback from the interview returned after all participants had completed training. This avoided contamination of the information. Only the researcher had access to data collected. No person's name was used to ensure confidentiality of the participants. Beneficence and Non – maleficence: No risks were involved in this research; findings from this study benefited nurses to understand their level of performance and work harder to improve. Management was able to identify strength and weaknesses and devise ways of overcoming them. Nurses gained knowledge in safe chemo administration. 26 Justice: All nurses who met inclusion criteria recruited without discrimination, and no penalties to those who declined to participate in the study Risks involved: There was no risk involved except ones variable time. The assessment informed us of the needs required by our patients to have proper planning and allocation of resources by management. Right of refusal to participate and withdrawal : A participant was free to choose to participate or not in the study and would withdraw at any time . No conflict of interest to participants and researcher. The research not funded by any organization A descriptive cross-section study design was used to evaluating effectiveness of implementing chemotherapy administration SOPs on nurses' knowledge and attitude at specialized oncology unit . Over 72% of nurses who met inclusion criteria and consented were sampled. A self-administered questionnaire survey was used. Validity and Reliability was ensured by selecting questions reviewed by experts in literature review of similar studies and those that corresponded to the theoretical concepts designed to measure the variables. Completed data was coded, tallied and entered Redcap, exported to STATA version 15 for analysis. An introductory letter was obtained from the university (UCU) introducing the researcher to the oncology unit. Informed consent was sought from all participants and data collected stored in a locker and accessible to only the investigators when needed. No risks were involved, participant were free to choose to participate or not in the study and would withdraw at any time . No conflict of interests, research was not funded. We shall look at chapter four where results of the study findings are discussed. Chapter Four: Result This chapter covers presentation of data, analysis and interpretation of results. It presents findings of the study in four sections: of CA SOPs shown by chi-squire and t-test results in knowledge and attitude table of results. Demographic section will discuss characteristics of participants. Analysis of findings will be presented looking at each participant response following the research objectives: Assess nurses' knowledge of chemotherapy administration SOPs before and after training Social demographic characteristics of the respondents, comparison of knowledge items scored rightly between pre and post evaluations, comparison of attitude items between pre and post evaluations, nurses'

rating of the effectiveness of the training of SOPs and Nurse's Opinion of the effectiveness of the training, describe nurses' attitude of use of chemotherapy administration SOPS before and after training, describing the effectiveness of implementing chemotherapy administration SOPs and the nurses' opinion about the intervention. Data obtained from the study was analyzed using research electronic data capture (Redcap). Entered data was exported to Software for statistics and data science (STATA) version 15 for statistical analysis. Social demographic The table below shows demographics of participants which comprised of gender, age , marital status, level of education, years of experience in nursing years of experience , years of experience as an oncology nurse , number of patients receiving chemotherapy per nurse and number of patients receiving chemotherapy per unit . Table 1: Social Demographic Characteristics of the respondents Variable Frequency (Percent) Mean (SD) Median (IQR) Median (P25- P75) Sample size n (%) 72(100.0) Age in complete years, mean (sd) 36.8 (7.9) Age in complete years, median (iqr) 35.0 (8.3) Age in complete years, median (P25- P75) 35.0 (31.3; 39.5) Age group in years, n (%) 25 to 29 9 (12.5) 30 to 34 24 (33.3) 35 to 39 21 (29.2) 40 to 44 6 (8.3) 45 and Above 12 (16.7) Sex, n (%) Male 12 (16.7) Female 60 (83.3) Level of education, n (%) Diploma 46 (63.9) Bachelor's degree 26 (36.1) Marital status, n (%) Married 47 (65.3) Single 23 (31.9) Divorced 1 (1.4) Widower/Widow 1 (1.4) Marital status, n (%) Single 25 (34.7) Married 47 (65.3) Years of nursing experience, mean (sd) 12.2 (7.) Years of nursing experience, median (iqr) 10.0 (5 .8) Years of nursing experience, median (P25-P75) 10.0 (7.3; 13.0) Years of oncology nursing experience, mean (sd) 6.3 (5.) Years of oncology nursing experience, median (iqr) 4.0 (8.0) Years of oncology nursing experience, median (P25-P75) 4.0 (2.0; 10.0) Years of chemotherapy handling experience, mean (sd) 6.4 (5.6) Years of chemotherapy handling experience, median (iqr) 4.0 (8.0) Years of chemotherapy handling experience, median (P25-P75) 4.0 (2.0; 10.0) Number of patients receiving chemotherapy per day at your unit , mean (sd) 24.6 (30.1) Number of patients receiving chemotherapy per day at your unit , median (iqr) 10.0 (25.8) Number of patients receiving chemotherapy per day at your unit , median (P25-P75) 10.0 (4.3; 30.0) Number of patients you personally administer chemotherapy to, mean (sd) 21.0 (25.0) Number of patients you personally administer

chemotherapy to, median (iqr) 10.0 (33.5) Number of patients you personally

administer chemotherapy to, median (P25-P75) 10.0 (2.5; 36.0) The table below shows the demographics of the participants starting from level of education, marital status, years of nursing, years of oncology nursing, years of chemotherapy handling,

number of patients receiving chemotherapy per day, per nurse: Most participants were female between ages of 30 to 34 years, diploma holders and married in a reproductive age. Average years of nursing experience was 12.2 with Oncology nursing experience being 6.3years.Few participants had experience in chemotherapy administration and administered chemotherapy to twenty five patients per day at a unit. One nurse administers chemotherapy to twenty one patients. Table 2: Compared knowledge at pre and post training. Pre Post Chi-sq Knowledge of antineoplastic drugs (ANPDs) are, 65.3 70.8 17.624 Knowledge of routes of exposure to ANPDs, 73.6 75.0 20.044 Knowledge of all adverse health effects of ANPDs except 54.2 63.9 20.007 Knowledge of the most appropriate guidelines and standards for safe preparation, 44.4 50.0 32.400 Knowledge of role of biological safety cabinet (BSC) 52.8 54.2 29.257 Knowledge of chemotherapy exposure to the body through contact with, 76.4 75 24.667 Knowledge of required PPE in chemotherapy administration 69.4 70.8 9.877 Knowledge of how one protect him/herself from chemotherapy exposure 81.9 86.1 4.540 In table two the researcher compared Knowledge items at pre and post training and evaluated the outcomes. Evaluations Total knowledge was scored out of 15 for one who got it right at pre and post, and P value determined to assess for association. The higher the score the more knowledge one had about antineoplastic drug. Key Observations: Across various knowledge areas, there was improvement in participants' knowledge from the pretest to the posttest. Notable increases in knowledge were observed in understanding the adverse health effects of ANPDs, use of biological

safety cabinets and correct usage of personal protective equipment (PPE).

Knowledge regarding safety measures in ANPD administration and the correct way of using PPE slightly decreased however, the overall trend shows positive improvements in knowledge. In several areas, such as knowledge of routes of exposure to ANPDs and waste disposal of cytotoxic agents, participants maintained a similar level of knowledge from pretest to posttest. The highest score was observed in understanding of self-protection from chemotherapy exposure both at the pretest and posttest. Knowledge on use of BSC was scored lowest at pretest, many did not know what it was and its use. Though knowledge on use of protective gears improved, there correct way of using them and safe waste disposal of cytotoxic agents remained low at posttest. Range at pre was 0-12 and at post was 0-13. Table 3: Comparison of Attitude items between Pre and Post Evaluations Variable Pre Post T-test Chi-sq P-Value Sample size n (%) 72 (100.0) 72 (100.0) 0.58 NA NA 1. Use of PPE in handling of ANPDs

is essential , n (%) 70 (97.2) 71 (98.6) -0.65 0.029 0.865 2. Adverse health effects

of ANPDs exposure are worrying , n (%) 68 (94.4) 66 (91.7) 2.10 9.626 0.002 3. Am given enough information on how to protect myself from chemotherapy exposure, n

(%) 40 (55.6) 52 (72.2) 0.36 14.179 0.000 4. I do not feel confident in my

competency to handle chemotherapy emergencies , n (%) 21 (29.2) 23 (31.9) -0.19 12.241 0.000 5. Giving chemotherapy to patients makes me feel guilty, n

(%) 53 (73.6) 52 (72.2) -0.33 7.947 0.005 6. It is easy to inform patients about their treatment but harder to help them e, n (%) 42 (58.3) 40 (55.6) 2.03 5.040 0.025 7. I know that all precautions are taken to ensure that I am not at risk from chemotherapy , n (%) 35 (48.6) 47 (65.3) 0.00 20.549 0.000 8. I pay attention to precautions measurements, n (%) 58 (80.6) 58 (80.6) -0.19 22.310 0.000 9. I try to avoid patients that are experiencing bad side effects from chemotherapy , n (%) 53 (73.6) 52 (72.2) -0.17 4.938 0.026 10. Giving chemotherapy impedes communication with patients. n (%) 31 (43.1) 30 (41.7) 1.20 11.694 0.001 11. I always feel that I have supported patients during their chemotherapy treat, n (%) 53 (73.6) 59 (81.9) 0.87 10.090 0.001 12. I know that when I administer chemotherapy patients have understood as much , n (%) 44 (61.1) 49 (68.1) 0.52 9.858 0.002 13. I know enough about chemotherapy to answer patient's questions adequately , n (%) 44 (61.1) 47 (65.3) 0.35 27.236 0.000 14. I feel confident in my competency to handle complications caused by chemotherapy , n (%) 46 (63.9) 48 (66.7) -0.38 18.813 0.000 15. My job duties do not often interfere with my being able to follow chemotherapy , n (%) 20 (27.8) 18 (25.0) 1.18 23.631 0.000 16. On my unit, all reasonable steps are taken to minimize hazardous job tasks, n (%) 27 (37.5) 34 (47.2) -0.50 12.498 0.000 17. Compared to my co-workers, my chance of harm from chemotherapy exposure is l , n (%) 34 (47.2) 31 (43.1) -0.34 4.323 0.038 18. I have enough work in my work place to always follow chemotherapy safe hand, n (%) 31 (43.1) 29 (40.3) 0.58 4.798 0.028

Results Attitude questions were scored as one if response was positive and 0 if it was negative this aimed at having a sense of outcome in one direction. Although most participants understand how essential it was to use PPE in handling of ANPDs (98.6%) and the adverse health effects of ANPDs exposure (94.4%), many participants have less information on how to protect themselves from chemotherapy exposure . They lack confidence to handle chemotherapy emergencies. They also find it hard to inform patients about their treatment. Participants at pre and posttest were in agreement (80.6%) that they pay attention to safety precautions however, there some (48.6%) who don't know precautions to safeguard against risks from chemotherapy exposure. No wonder most of them do not talk to patients prior to chemotherapy administration to find out if a one understood information about chemotherapy. Although reasonable steps are taken to minimize hazardous exposure, most (43.1%) nurses had enough work in their work places to always follow chemotherapy safe handling. Generally, nurses' attitude to paying attention to

precautions measurements did not change much after training, this is explained by the fact that attitude changes with time. Summary: This chapter looked at social demographic characteristics of the respondents, comparison of knowledge items scored rightly between pre and post evaluations, comparison of attitude items between pre and post evaluations, nurses' rating of the effectiveness of the training of SOPs and Nurse's Opinion of the effectiveness of the training, describing the effectiveness of implementing chemotherapy administration SOPs and the nurses' opinion about the intervention. The next chapter will discuss the findings, limitations and also generate recommendations for the study. Chapter Five: Discussion The fifth chapter of this dissertation involves discussing the study findings, which aimed to

assess the effect of implementing Chemotherapy Administration Standard

Operating Procedures (SOPs) on nurses' knowledge and attitude at Uganda Cancer Institute. The research objectives were to assess nurses' knowledge of

chemotherapy administration SOPs before and after training, describe their attitude toward using these SOPs, and evaluate the effectiveness of their implementation as well as the nurses' opinion about the intervention. The chapter will also include review of literature as well as recommendation and implications. The research results were presented following the research objectives: To assess nurses'

knowledge of chemotherapy administration SOPs before and after training, describe nurses' attitude of use of chemotherapy administration SOPS before and after training and describing the effectiveness of implementing chemotherapy administration SOPs and the nurses' opinion about the intervention. The discussion is guided by the protection motivation theory by Roger and Maddux (1983-1985) that proposes two appraisal pathways, threat appraisal and coping appraisal, as determinants of behavior. that guided in selection of test items in a questionnaire. This theory based on principal that behavior is a function of two appraisal pathway,

threat appraisal and copying appraisal. Threat appraisal is comprised of

two elements, Severity of a threat and vulnerability of the threat

while copying appraisal is comprised of three elements; response efficacy,

self-efficacy, and response cost. In this case, perceived severity positively influences nurses' intention to acquire knowledge and skill in safe chemotherapy administration. Milne and Sheern (2000) believed that the theory variables arouse, sustain, and direct activity and operationalize in terms of people's intention to

perform a recommended precautionary behavior Social demographics characteristics of respondent Most nurses (80%) participated in the study giving a good presentation. Nursing staff comprised mostly of female diploma holder nurses in their reproductive age (22-29) with minimal working experience (6.3 years). Nurse workforce is still young in terms of academic progress and skill acquisition. Oncology care is highly specialized and requires a multidisciplinary teamwork nursing inclusive. From finding, nurses need further training academically at least to a graduate level, they can specialize in oncology nursing. In Uganda nursing specialization has not yet taken shape like other countries. The staff are still young and in reproductive age group, making them more vulnerable to effects of cytotoxic exposures hence a priority group to train and empower in chemotherapy handling to avoid adverse effect. This calls for more training of staff in chemotherapy administration to ensure good

adherence to guidelines to safeguard from adverse effects of exposure. With high number of patients and few nurses administering the drug, the nurse and patient safety is unknown. Majority of nurses are married (63.9%) and indication of how engaged the team is are they have to take care of the family and balance up with cancer care. With the mean years of experience being 12.2 and that of oncology nursing experience is lower at a mean of 6.3.This is an indicator that the staff are still inexperienced in area of oncology care and chemotherapy administration many are fresh from school. This explains why more training of chemotherapy administration is

required. Mean of patients receiving chemotherapy per day at each unit was 24.6. Compared to the ratio of nurse to patient on ground, the number of patients

receiving chemotherapy at UCI is high, implying that prevalence of exposure to chemotherapy agents is high. The same nurses administering chemotherapy is expected to give care to other needs of the patients like drug administration, procedures, counselling and other needs. On average, a nurse administers chemotherapy to 21.0 patients. This is a big number to a nurse given the other duties he/she has to perform. On average, 10 patients receive chemotherapy per day at each unit. In 43 Summary, Majority of the staff at the study site are diploma holders, married and with few of oncology nursing experience. This puts them at a risk of being expose to cytotoxic agents during process of patient care. The patient and caretakers are neither safe nor the environment around. Nurses Knowledge of chemotherapy administration SOPs Nurses' knowledge about antineoplastic drugs being cytotoxic increased from 65.3% to 70.8% after training. Findings are similar to those by Hojat, Goudaezi, Hasanv and, Galehdar and Birjandi (2023) whose findings showed improvement in knowledge of chemotherapy safety standards. They expressed a need for using various learning methods such as E- learning to provide learning. At the study site, training in chemotherapy administration is still insufficient. This is attributed among other challenges the workload on nurses given high nurse patient ratio. From the findings 25% of nurses still lack knowledge of routs of chemotherapy administration yet these are the people who administer chemotherapy agent. Nurses'

perception of the perceived severity of exposure to chemotherapy agents is still

low as half of the nurses had knowledge (54.2%) of adverse health effects of ANPDs and training had minimal impact on their knowledge (63.9%). Only 50% of staff are well acquitted with appropriate guidelines and standards for safe

preparation . When nurses have low threat appraisal of chemotherapy they may not adapt to behavior of safe chemotherapy administration. There is need to train more nurses to arouse their awareness so that they respond appropriately to SOPS implementation. When nurses get to understand these dangers, he/she will positively respond to the safety measures instituted hence leading to adherence to safety precautions. Perceived vulnerability: Perceived vulnerability positively influence nurses' intention to acquire knowledge and skill of safe chemotherapy administration. In this study, nurses (83%) are knowledgeable about their vulnerability to exposure of ANPD and are 44 knowledgeable about the use of PPEs correctly (70%). They understand their vulnerability to the adverse effect of chemotherapy exposure, they adhere to protective measures. However most of them do not know the biosafety cabinet BSC (94%).This explains why a few staff knew how to use it (6.9%) and many nurses do not know (93.1%) the types of protective wears to wear while preparing chemotherapy. There is need for more training of use of PPEs. These finding are similar to one by Silver-Rodriguees, Silva, Nunes, Cardos & Nascimento, (2019) who examined nurse's attitude towards administration of antineoplastic as being

concerned with extravasation and lack of appropriate devices for drug administration. Self-efficacy: In this study many nurses do not know most appropriate guidelines and standards for safe preparation (50.0%). Self-efficacy positively influences nurse's intention to adopt knowledge and skills in safe chemotherapy administration. When nurses perceive the use of Sops in chemo administration as easy to follow, the more they will take an active part in adapting it. These finding are similar to ones in literature where many nurses do not know the existence of guidelines hence likely not to take protective measures while administering the drug Most nurses had good attitude towards use of PPE as a measure for protection against adverse effects of chemotherapy exposure an indication that they intend to adopt knowledge and skills in safe chemotherapy administration. They perceive the use of Sops in chemo administration as easy to follow and are more willing take an active part in adapting

them. More than two -third (66.7%) of nurses had unsatisfactory knowledge and

practice in chemotherapy administration (Mahdy, Rahman, EI and Ahmed, (2018).They recommended designing in service training and educational program to improve nurses knowledge, practice and attitude regarding chemotherapy

administration . A study site, nurses are not fully exposed to CA guidelines 50% of the participants did not know availability of CA guidelines. No reports of error or near miss have been documented despite of literature finding indicating reports of errors in chemotherapy administration (Neuss et al, 2016). With knowledge gap nurses will not take up protective measures hence patient safety and their safety are at stake. Given the ratio of nurses' patient in chemotherapy infusion, the rate of errors in terms of dosing, time errors omission of drug or hydration status is unknown. Patients receiving chemotherapy have reported severe side effected few days after chemo infusion and some have been reported dead. There is need to monitor chemo infusion at pre and post treatment. Guidelines are crucial in ensuring proper administration. Staff knowledge on chemotherapy handling still unsatisfactory as reported from the study where they reported not being confident to handle chemotherapy. Given the findings that nurses do not know availability of guidelines, this is a clear indication that they will not adopt too their use in daily activity. Simon & Toland (2017) further advises that when nurses are exposed to guidelines, they are likely to adopt to their use on daily activities. Training at study site have not covered all staff yet there is a need to train every staff at the study site for any chemo handling and adherence to preventive measures. Nonresistance the cleaners who clean infusion area should be training in waste management of cytotoxic agents. Trainings should be on going as reported by Alehashem and Banlasadi (2018) Attitude. Most staff understood how essential it is to use of PPE in handling of ANPDs .At least

staff now have information on how to protect themselves from chemotherapy

exposure . The next drive should be emphasizing on how to use then correctly at all times to help them gain confidence. 46 From the findings, it's evident that nurses

themselves do not trust use of chemotherapy in treatment of cancer . They

believe chemotherapy shortens the life of the patients. That is evidenced in their expression of finding it difficult to inform patients about their treatment and also very hard to help them. No wonder they do not synthetize patients about outcome of chemotherapy, they do not believe in the treatment they give to the patients .They are not confident in talking to patient about outcomes of chemotherapy administration. From findings, it's evident that nurses administering

chemotherapy are impeded in their communication to patients. Various duties of the nurses interfere with their attention paid to CA process, their attention is divided to other general nursing duties like other nursing care services like wound dressing, drug administration to mention but a few. Minimal measures are in place at UCI to minimize hazardous job tasks however, majority are exposed to chemotherapy agents. Results revealed that nurses lack competency to handle chemotherapy emergencies and complication, an indication that more training in chemotherapy administration is still required. Errors have been reported by nurses however, they are never recorded for fears of being blamed by other senior staff. Delivered chemotherapy is never crosschecked by two staff as recommended in guidelines. They do not also cross check with prescription, they administer what has been brought by the pharmacy. This is not in line with Becze (2016) who recommended role of verifying nurse in prevention of CA errors. It implies that mechanism of errors identification and management is still lacking hence magnitude of the CA errors not known. Nurse have negative attitude towards chemo safety adherence due to knowledge of gap. Literature states that positive attitude is influenced by the level of knowledge and practice of

chemotherapy administration though this is still inadequate as reported by Schwappach, Taxis & Peiffer, 2018), Kaulanti, Roupa, Charalumbous & Noula, 2019) In summary, the discussion highlights the improvement in nurses' knowledge of cytotoxic properties of antineoplastic drugs and the need for various learning methods, such as e-learning, to provide comprehensive training. It also emphasizes the importance of nurses' awareness of the severity and vulnerability of exposure to antineoplastic drugs,

as well as the need for training to ensure their knowledge and skills in safe

chemotherapy administration. The lack of knowledge and practice in chemotherapy administration, as well as the inadequate use of protective measures, pose significant risks to both the nurses and the patients. The findings also reveal nurses' unsatisfactory knowledge and practice in chemotherapy administration, as well as their negative attitudes towards chemotherapy safety adherence. The lack of competency to handle chemotherapy emergencies and complications, as well as the underreporting of errors and near misses, highlight the need for comprehensive training and continuous evaluation of nurses' performance. Analysis of findings, Knowledge score for pre and posttest was out of 15 with range for pretest at 0-12 and posttest at 0-13.Mean and median for pre and posttest were 8.5(3.0) and 9.0 (2.7) respectively. There was no much difference regarding mean, median and ranges at pre and posttest. This is explained by the fact the time between training and practicing what was learnt was short. After training, there is need to allow nurses assimilate and put into practice what was learnt unlike in this study where time interval between training and implementation was short. Similarly difference between attitude at pre and posttest did not change much given the time intervals. Change in attitude requires much more time as one practices it’s a gradual process. Conclusion: The study concludes that there is insufficient knowledge and adherence to SOPs for chemotherapy administration, and recommends institutionalized guidelines, educational training programs, and continuous evaluation of nurses' performance to enhance safety measures and protect them from exposure to cytotoxic agents. It also points out the need for separating nurses' general duties from those of chemotherapy administration, and emphasizes the importance of further research in assessing nurses' chemotherapy administration practice. Limitation The small sample size of nurses out of populations makes it difficult to make a generalization using the results of this study. Recommendations Nurses should be encouraged to attend scientific meetings

and conferences and gain updated knowledge about chemotherapy

administration for proper nursing services . Uganda Cancer Institute together with ministry of health should develop institutionalized chemotherapy administration guidelines and support implementation of educational training program for nurses. Increase nurses awareness about policies and guidelines related to chemotherapy

administration . The hospital should have an orientation program to train all

newly employed nurses and in-service refresher courses for the staff in chemotherapy administration safety. Periodically and continuously evaluation of nurse's performance should be done to improve quality of their performance. Further

research in assessment of nurses' chemotherapy administration practice is required. There should be separation of nurses' general duties from those of chemotherapy administration. Nurses in chemotherapy administration should be left to concentrate on 49 chemotherapy administration other than mixing up with other duties like drug administration, wound dressing, booking return dates and other duties. More training in chemotherapy administration is still required as many areas were not covered in the training given the time. Dissemination of the Findings The

findings will be disseminated to the School for Research and Post Graduate

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Appendices Appendix I: Consent Title of the study: Effect of Implementing Chemotherapy Administration SOPs on Nurse's Knowledge Attitude and Practice at an

Oncology Unit . Principal investigator: Kemigisha Misk Institute: Uganda Christian University Background Information Uganda Christian University is a training institute that offers undergraduate and postgraduate courses. Am undertaking a master's degree in nursing science. A student undertaking this course is required to conduct a research study in a health related field. This research proposal is in fulfillment of the above requirement. Introduction I am Kemigisha Misk a student at Uganda Christian University under taking a master's degree in nursing sciences. Am undertaking a research in chemotherapy administration. Am glad to interact with you as I gain insight in this study of the effect of implementing chemotherapy administration SOPs

on nurses knowledge, attitude and practice . Since you have administered chemotherapy before, I find you a resourceful person to provide this information. I

invite you to take part in this study. Purpose of the study As highlighted earlier,

the purpose of this study is to gain insight whether implementing chemotherapy administration SOPs will have effect of on nurses knowledge, attitude and practice Procedure The researcher will seek consent from the study participants study at the

time of enrollment. Those that accept to participate in the study will sign the consent form. Those that will decline to participate in the study will be at liberty to do so voluntarily. Risks involved There is no risk involved except your

variable time. The training will enrich you with more knowledge and skills in chemotherapy administration. Right of refusal to participate and withdrawal

You are free to choose to participate in the study or not. You may also withdraw

at any time . Your participation is voluntary. No compensation will be

provided for your time and willingness to take part in the study

however breakfast and lunch will be provided to all staff involved in training. You have a right not to answer any single question and can completely

withdraw from the study at any point. Confidentiality The information provided

will be stored in a locker and accessible to only the instigator when needed Available source of information If you have any questions or clarification to make, you can reach the investigator, Kemigisha on email misk. kemigisha @ yahoo.com/misk. kemigisha @ gmail.com tell; 0782705490 Authorization I have read and understood this consent form and I volunteer to participate in this research study. I understand that I

will receive a copy of this form. I voluntarily choose to participate. I permit the investigator to record or take photographs that may or may not be used in magazine

or any documentary. I..... do acknowledge that I have red and

understood the above information. I agree to participate in this study . Participant signature..... Participant name

..... Investigator's signature ..... Signature of the person obtaining consent..... Appendix II: Questionnaires Chemotherapy

administration Questionnaires Thank you for accepting to participate in this

study of nurses who administer chemotherapy . Chemotherapy administration refers to preparation, administration, disposal and coming into contact

with excreta of a patient that may be contaminated with chemotherapy

Please note the following: Please read each item carefully Please, clearly mark

your response appropriately from options provided Respond to each question to the best of your ability describing your personal practice Regarding chemotherapy

administration Section 1 : Demographic Tick where applicable for No 1&2 1. Level

of education Certificate Diploma Bachelor's degree Doctoral degree 2. Marital Married Single Divorced Widower/Widower status Please, enter the number

requested 3. Your age 4.Year of nursing experience 5.Year of oncology

nursing experience 6. Years of chemotherapy handling experience 7.

Number of patients you personally administer chemotherapy to 8. Number of

patients receiving chemotherapy per day at your unit. Section 2: Knowledge and attitude of chemotherapy administration (CA) Select the most appropriate answer for questions 1 to 15 by ticking Corre ct Not correct Knowledge assessment Select the most appropriate answer for questions 1 to 15 1.Antineoplastic drugs (ANPDs) are a).Antineoplastic drugs (ANPDs) are cytotoxic b).Antineoplastic drugs (ANPDs) are cytotoxic c). Antineoplastic drugs (ANPDs) are not toxic d). Antineoplastic drugs

(ANPDs) are cytotoxic but not teratogenic 2. The following are the routes of

exposure to ANPDs a). Mouth, skin, tough, eating contaminated food, excrete, sweat. b).Eating contaminated food, skin, nose, infection, wounds c). Inhalation, ingestion, absorption through skin and eyes, injection d).Ingestion, sharing meals, contact, contact with cancer patient 3. All are adverse health effects of ANPDs except a). Vomiting, fevers, mucositis, bone marrow suppression, b), Fevers, teratogenic effects, increased risk of cancer c). Toothache, fainting, short nails, admission to hospital d).Loss of appetite, abdominal pain, Joint pain, loss of hearing

4. What is the management of adverse health effects of ANPDs a).Take antiemetic's, good hygiene, exercise, good nutrition b). Stay hydrated, take local herbs, stay indoors, take your medication c). Hyper hydrate, radiation, council patient, good hygiene d).Avoid fatty meals, monitor patient, avoid sex 5. Identify the most appropriate guidelines and standards for safe preparation of ANPDs except: a). Guidelines for ordering, preparation and administration. b) .Guidelines for managing pain, oral sores, drug side effect c).Guideline for neutropenia, anemia, bone marrow suppression d).Guideline for managing vomiting, skin irritation and anemia. 6. What are the safety measure in safe administration of ANPDs a). Clean up spills, use protection, wear disposable gloves b).Boil drinking water, wear, shoes, eat a balanced diet. c).Educate the patient, mange stress, eat plenty of fruits. d).take a balanced diet, prevent infections, avoid exposure 7. What is the role of biological safety cabinet (BSC)? a) For preparation of hazardous drugs . b). For safety of workers c) For checking for drug contamination d).For helping in putting on PPEs 8. What is the use of BSC? a).For transporting chemotherapy drugs b). For preparation of chemotherapy drugs c).For protection against spills d) For Safety of the patient. 9. What are the required PPE in chemotherapy administration? a). Gumboots, plastic cover, priming b) Gowns, face shield, face masks c) Protection against spills 10. What is the correct way of using PPE? a). Donning two pairs of gloves, wearing disposable gown, use eye glasses b). Wearing a disposable gown or clinical court, wear mask c). Using eye glasses, face covers, shoe covers d) Use Face shield, clean linen, covered shoes 11. What if the safest way of waste disposal of cytotoxic agents? a) Dispose of All unused drugs, used drug containers, equipment in a leak-proof container well labelled as containing cytotoxic drugs b).Burn cytotoxic wastes in an open pit where there is good aeration. c).Do not sort none cytotoxic waste from the cytotoxic one. 12. Chemotherapy can enter the body through contact with a) Spills and splashes . b) Contaminated water c)An infected person d) Exposed body 13. What type of protective wear do you wear while preparing chemotherapy ? a).Shoes, lab coat, face mask, gown b) Mask, chemo splashes, gloves c).Cover shoes, helmet, eye glasses d).Gloves, face shield, chemo gown, 14. How does one protect him/herself from chemotherapy exposure? a) Wearing head capes b). Cleaning the floor well c). Using PPE appropriately d). Avoiding handling chemo gents 15.How can you protect yourself from chemotherapy aerosols a).Use of face masks b).Use of face shield c). Use of surgical mask Section 2: attitude of chemotherapy administration

(CA) Indicate your level of agreement with these statements about CA SA= Strongly Agree; A= Agree; N= Neutral; D =Disagree; SD Strongly Disagree S A A D S D Attitude of chemotherapy administration 1. Use of PPE in handling of ANPDs is essential 2. Adverse health effects of ANPDs exposure are worrying 3. Am given enough information on how to protect myself from chemotherapy exposure 4 .I do not feel confident in my competency to handle chemotherapy emergencies 5. Giving chemotherapy to patients makes me feel guilty . 6. It is easy to

inform patients about their treatment but harder to help them emotionally 7. I know that all precautions are taken to ensure that I am not at risk from chemotherapy

8. I pay attention to precautions measurement's 9. I try to avoid patients that are experiencing bad side effects from chemotherapy 10. Giving chemotherapy impedes communication with patients . 11. I always feel that I have supported patients during their chemotherapy treatment 12. I know that when I administer chemotherapy patients have understood as much as they wish to know about their treatment 13. I know enough about chemotherapy to answer patients questions adequately 14. I feel confident in my competency to handle complications caused by chemotherapy 15. My job duties do not often interfere with my being able to follow chemotherapy safe handling precautions . 16. On my unit, all reasonable steps are taken to minimize hazardous job tasks 17. Compared to my co-workers, my chance of harm from chemotherapy exposure is lower 18. I have enough work in my work place to always follow chemotherapy safe handling precautions Assessing nurses opinion on use of chemo administration SIOPs 1.On a scale of 5, how would you rate the effectiveness of training 2. What is your perception about the training of use of chemotherapy administration SOPS? Specify……. Appendix IV: Work Plan Activity Time frame Output Responsible person JANUARY FEBRUARY MARCH N o Wk1 Wk 2 Wk 3 Wk 4 Wk 1 WK 2 Wk 3 Wk 4 Wk k1 Wk 2 Wk 3 Wk 4 1 2 Obtain permission from IRB at UCI Training and Data collection and analysis Dissertation x x x Permission granted Nurses trained Pre and post tests done Data analyzed Report Principal investigator Principal investigator Investigator 68 Appendix V: Approval Letter Appendix VI: Permission Letter Appendix VII: Plagiarism report 1 2 5 7 20 22 23 25 27 34 35 36 37 38 39 40 41 42 45 47 48 50 53 55 56 57 58 59 60 61 62 63 64 65 66 67 69 70 71 72 73

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DISSERTATION CORRECTION COMPLIANCE REPORT BY THE CANDIDATE (POST VIVA FORM)

Date: May,2nd 2024

Name of Candidate: Kemigisha Misk **Reg. No:** RM17/M11/029

Title of Dissertation: Effect of Implementing Chemotherapy Administration SOPs on Nurse's Knowledge and Attitude at Uganda Cancer Institute

SN	COMMENTS BY EXTERNAL EXAMINER	ACTION TAKEN	INDICATOR
1	Page13/120: The researcher implemented chemotherapy administration SOPs to equip nurses with appropriate knowledge on chemotherapy drug administration, attain expert knowledge and achieve competencies of its administering (Hatatet & Oakley, 2019). Findings informed management	Highlighted content transferred to back ground	Page 15 of 120 has transferred content

	about the level of performance of nurses in chemotherapy administration; knowledge of staff, strength and weakness to aid in decision making while allocating scares resources for training needs identified or areas that require support and maintenance.		
2	Page 13/120: Cancer represents a collection of diseases characterized by the uncontrolled growth and spread of abnormal cells, and if not managed properly, it can lead to death (American Cancer Society (ACS), 2018). Chemotherapy, a cornerstone of cancer treatment, involves a complex and high-risk administration process, as it requires precise clinical information, treatment selection, planning, consent, ordering, preparation, monitoring, and assessment of response and toxicity to ensure safe administration (Garzon, Pinacho, Bustos, Gustavo, Bustamante, 2019). **Commen**t: All this should be under introduction, which gives a general overview of the phenomenon under study. The background gives the contextual picture. So, the researcher should write about chemotherapy administration by nurses in Uganda and Uganda Cancer Institute in particular, whether there are SOPs and guidelines etc	Page 14/120: Content about UCI chemotherapy administration and guidelines use has been provided. At UCI Chemotherapy administration has the highest frequency of CA in the world as explained by several challenges like uncertainties in cancer staging, absence of prognostic biomarkers which lead to error ide of aggressive treatment (Low et al. (2017) Page 15/120: Chemotherapy administration guidelines are available however, nurses lack knowledge about their availability and utilization	Information provided on page 14/120 and 15/120 about chemotherapy administration at UCI and guidelines at UCI

3	**Statement of the Problem** The burden of cancer has led to increased use of chemotherapy drugs, It would be good to give the burden of cancer at UCI and the number of nurses there	According to UCI (Cancer burden report, 2020 & 2022), there is a steady increase in cancer cases. In 2020 there were 34,008,22 new cases, 992 deaths and 62,545 leaving with cancer in five years. In 2022, there were 34,008,22 new cases, 992 deaths and 62,545 people leaving with cancer per year.	Page 16/120 shows cancer burden statistics in Uganda and at UCI
4	**Specific Objectives**: The specific objectives were to assess nurses' knowledge of chemotherapy administration SOPs before and after training, describe nurses' attitudes toward the use of chemotherapy administration SOPs before and after training, and evaluate the effectiveness of implementing chemotherapy administration SOPs from the nurses' perspective.	**Specific Objectives** 1. Assess nurses' knowledge of chemotherapy administration SOPs before and after training. 2. Assess nurses' attitudes toward the use of chemotherapy administration SOPs before and after training. 3. Evaluate the effectiveness of implementing chemotherapy administration SOPs on nurses' knowledge e and attitude.	Page 17/120 corrected
5	**The Independent variable** is the implementation of SOPs and the dependent variables are knowledge, attitude in chemotherapy	**The Independent variable** is the implementation of chemotherapy administration SOPs and the dependent variables are knowledge, attitude in chemotherapy administration	Page 19/120

	administration. **Nurses Practices of Chemotherapy** **Administration** Health care workers in oncology units are exposed to cytotoxic drug as reported by Ndaw and Remy (2023) following their research finding after conducting surface contamination and urine collection from staff which showed exposure to CD	CD: Chemotherapy drugs PPE: Personal protective equipment (PPE)	Page 28/120
6	Page 37/120: Report this under Data collection tool section	Reported under data Collection tool	Page 37/120
7	After obtaining consent from the participant,	Number of participants per group, and procedure for consenting process explained on page 37/120 under sampling procedure.	Page 37/120
8	Training in chemotherapy administration SOPs followed up until all the processes (steps) were completed.	A conference room was booked throughout the period of training. Training was conducted on alternate days that is Monday, Wednesday and Friday for each group due to tight work schedules.	Page 37/120
	This process went on for all other groups of participants. Data	Group one had 30 participants, group two 25 and group three 17 participants from different units including; general OPD, Private OPD, emergency, radiotherapy	Page 37/120

		unit, pediatrics OPD, adult STC, LTC, PVT ward, pediatric ward, surgical unit, theatre and CCP). A conference room was booked throughout the period of training.	
	the internal research view board,	Research and ethics committee (REC)	Page 39/120
	A descriptive cross-section study design was used to evaluating effectiveness of implementing chemotherapy administration SOPs on nurses' knowledge and attitude at specialized oncology unit. Over 72% of nurses who met inclusion criteria and consented were sampled. A self-administered questionnaire survey was used. Validity and Reliability was ensured by selecting questions reviewed by experts in literature review of similar studies and those that corresponded to the theoretical concepts designed to measure the variables. Completed data was coded, tallied and entered Redcap, exported to STATA version 15	All deleted	Page 40/120

	for analysis. An introductory letter was obtained from the university (UCU) introducing the researcher to the oncology unit. Informed consent was sought from all participants and data collected stored in a locker and accessible to only the investigators when needed. No risks were involved, participant were free to choose to participate or not in the study and would withdraw at any time. No conflict of interests, research was not funded. We shall look at chapter four where results of the study findings are discussed.		
	Table 1: Social Demographic Characteristics of the respondents Marital status is repeated, and yet it does not give the same figures for those who were single. I also don't understand the repetition of the characteristics highlighted yellow	Table 1 Social Demographic Characteristics of the respondents modified	Page 43/120

	below	Above	Page 43/120
	high	On average, a nurse administers chemotherapy to 21 patients. This is a big number to a nurse	Page 51/120
	Appendix IV: Work Plan	It was deleted	Page 75/120

SN	COMMENTS BY INTERNAL EXAMINER	ACTION TAKEN	INDICATOR
1	We need to hear about SOPS	These involve the process of chemotherapy administration which involves clinical information, treatment selection, planning, consent, ordering, preparation, transportation, administration, monitoring, and assessment of response, waste management and toxicity to ensure safe administration	
2	Problem statement can be small with no reference	Reduce as advised	Pg 57/120
3	Study not cross-sectional but a pre and post internal study, then your objectives should match your tittle.	Well stated to match the title: 1. Assess nurses' knowledge of chemotherapy administration SOPs before and after training. 2. Assess nurses' attitudes toward the use of chemotherapy administration SOPs before and after training. 3. Evaluate the effectiveness of implementing chemotherapy administration SOPs on nurses' knowledge e and attitude.	
4	How was knowledge calculated?	Each correctly answered knowledge question received one mark, while incorrect answers were awarded zero marks, resulting in a highest possible score of 18 and a lowest score of zero on the knowledge section.	
5	What difference did training do to and	This is explained in inferential statistics	Effectiveness of the

	real measure of effect		implementation of SOPS on nurse's knowledge and attitude was determined by inferential statistics where t-test, Chi-square and P-value were determined for knowledge and attitude. In table one and two of results there is significant differences in t-test values for knowledge and attitude at pre and posttests evaluation as a result of implementing an intervention which was training. Additionally, the P-value was less than 0.05 an indication that the study was statistically significant.

SN	COMMENTS BY VIVA VOCE PANNEL	ACTION TAKEN	INDICATOR
1	Which processes are involved in chemotherapy administration	The process involves clinical information, treatment selection, planning, consent, ordering, preparation, transportation, administration, monitoring, and assessment of response, waste management and toxicity to ensure safe administration	Stated on Page 13/120

2	The research design is not descriptive cross-sectional study it's a quasi-experimental design	The researcher design is a single group pretest-posttest quasi experimental design study to evaluate how effectively implementing chemotherapy administration SOPs impacted nurses' knowledge and attitude.	Restated on page 34/120
3	Sample size of 72 out of 100 is adequate to give an insight on generalization of the findings given the fact that only UCI is a government institution where chemotherapy is accessible in Uganda and the only oncology unit.	The statement has been deleted	Page 57/120
4	Bring out clearly the effect of your training on nurse's knowledge and attitude	Inferential statistics where t-test, Chi-square and P-value were determined for knowledge and attitude. Findings showed that the training was effective, nurse's knowledge of chemotherapy administration SOPs improved and attitude changed positively. This agreed with participants who said that the implementation of these SOPs was effective and educative the study was statistically significant given that P-value was less than 0.05.	

Kemigisha Misk  Dr. Nakate Grace 

Candidate's Name Signature Supervisor's Name Signature