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Nursing Knowledge and Perceived Comfort Level in Acute Infusion Reactions from Antineoplastic Agents

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NURSING KNOWLEDGE AND PERCEIVED COMFORT LEVEL IN
ACUTE INFUSION REACTIONS FROM ANTINEOPLASTIC AGENTS

by

ANDREA L. MAIORINI

A thesis submitted in partial fulfillment of the requirements
for the Honors in the Major Program in Nursing
in the College of Nursing
and in the Burnett Honors College
at the University of Central Florida
Orlando, Florida

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ABSTRACT

INTRODUCTION: Acute infusion reactions from antineoplastic agents can include hypersensitivity reactions, anaphylaxis, and cytokine release infusion reactions. Severe acute infusion reactions happen in about 5% of the oncology patient population and nurses are responsible for assessment and management of the reaction. This is a high stress task for a nurse magnified by the lack of exposure. This project explores nursing knowledge and perceived comfort level of acute infusion reactions caused by antineoplastic agents.

METHODOLOGY: An original survey was created to test nursing knowledge and assess comfort level. Nursing knowledge was broken down into six subscales: general knowledge of acute infusion reactions, signs and symptoms of hypersensitivity, anaphylaxis, and cytokine release infusion reaction, and drugs most likely to cause hypersensitivity and anaphylactic reactions and cytokine release infusion reactions. Comfort questions were asked on a 6-point Likert scale from extremely uncomfortable to extremely comfortable. There was an additional section in the survey related to nurses' distress and support in situations with acute infusion reactions. The questions were presented using a 6-point Likert scale ranging from strongly disagree to strongly agree. There were two open-ended questions that were designed to allow the nurses to share any additional information about their experiences with acute infusion reactions. Oncology nurses working with adults and pediatric populations were invited to participate. Descriptive statistics were used to analyze the survey results. T tests were used to compare groups and Pearson R statistics were used to examine relationships between total knowledge, knowledge subscale score, and comfort level.

RESULTS: 20 nurses completed the survey. 12 were from the adult nurse population and 8 were from the pediatric nurse population. The typical participant was forty-four years of age, had sixteen years experience as a Registered Nurse, and thirteen years experience in the oncology setting. The average total knowledge score was a 56% based on 84 possible points. The basic knowledge section and the anaphylactic signs and symptoms were the highest scoring subscales, both scoring a 62%. Cytokine release infusion reaction signs and symptoms was the lowest scoring subscale with a 45%. There were no significant differences in knowledge between groups. The nurses chose an overwhelming agree/strongly agree when asked to choose the signs and symptoms related to each type of infusion reaction. The total comfort level score indicated that nurses were very comfortable managing acute reactions. There was no significant difference between the adult and pediatric setting comfort level scores. There was no statistically significant relationship between total knowledge score and total comfort level score.

DISCUSSION: The knowledge score showed knowledge deficits while the comfort score indicated confidence in management of acute infusion reactions. The high frequency of agree/strongly agree for all three subscales of signs and symptoms indicates that the nurses at least know what to look for even if they cannot assign the specific sign and symptom to the type of infusion reaction. Knowledge about signs of specific types of drug reactions may not be necessary as long as a basic understanding of what to look for and how to manage a reaction is present.

DEDICATION

For my husband, thank you for always supporting me through my dreams. Your belief in me has pushed me to succeed in more ways than I could have ever imagined. Graduating with my nursing degree and completing this thesis is as much your success as it is mine. We are an undeniable team, and I so grateful to have you in my life.

For my mother, your kindness and love has shaped me into the person I am today. You have always believed in me and for that I am forever grateful.

Your strength and courage through this stage in your life makes you my biggest hero. Cancer cannot conquer your fierce courageous spirit, and I like to think you passed that spirit onto me. You are my best friend and mentor in life. Thank you for your love and guidance.

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INTRODUCTION

According to The American Cancer Society, in 2015 there was an estimated 1,658,370 newly diagnosed cases of cancer in the United States (2015). For a majority of these patients the best course of action for treating cancer is the use of chemotherapy or biotherapy. These drugs help patients in the treatment of their disease, but sometimes these antineoplastic drugs can cause an acute infusion reaction (Lee, Gianos, & Klaustermeyer, 2009).

The acute infusion reaction can be categorized as a hypersensitivity reaction or an anaphylactic reaction (to chemotherapy), or a cytokine release infusion reaction (to biotherapy). The hypersensitivity reaction can range from minor skin rashes and pruritus to nausea and vomiting. The anaphylactic reaction can cause hemodynamic instability i.e. bronchoconstriction and eventually lead to shock (Gobel & O'Leary, 2011). The cytokine immune response typically happens with the first infusion of the immunotherapy drug and can exhibit all of the symptoms of a hypersensitivity reaction (Gobel & O'Leary, 2011).

The overall rate of severe hypersensitivity reactions, or those that could lead to anaphylaxis, in antineoplastic drugs is about five percent (Gabel & O'Leary, 2011). While this is rare, anaphylaxis can be severe enough to lead to death, and quick recognition and response by nurses is crucial to patient survival.

For some antineoplastic drugs, skin testing can be done to determine a patient's likelihood of a hypersensitive reaction (Lee, Gianos, & Klaustermeyer, 2009). Certain drugs can be given with a desensitizing agent, and other drugs can be given at a slower IV infusion rate (Gobel & O'Leary, 2011). However, acute infusion reactions are not 100% preventable, and the antineoplastic drug may be the only treatment option available to treat the disease. Furthermore,

a hypersensitivity reaction can occur at any time during an infusion. Just because a patient did not show any signs of a reaction during the first or second infusion does not mean that a reaction will not take place on a subsequent dose (Gabel & O'Leary, 2011 & Maloney, 2016).

The nurse's role is to educate the patient and family on the signs and symptoms of acute infusion reactions, follow correct procedures for giving the antineoplastic treatment, monitor the patient against expected norms and baseline vital signs, and respond appropriately to hypersensitivity and anaphylactic reactions (Maloney, 2016). The nurse's role is vital in the treatment of anaphylaxis, which could lead to death if not treated quickly and correctly. This creates a high stress environment for the nurse. If a reaction occurs, nurses not only have to be comfortable in responding quickly, they need to be confident enough to calm and reassure the patient. The patient can experience a great deal of fear and anxiety related to the treatment plan. The nurse needs to be equipped with the confidence to reassure the patient in his/her ability to recognize and respond quickly to potential reactions.

Oncology nurses are expected to give complex chemotherapeutic drug regimens while ensuring the patient's other healthcare needs are addressed. The high demands placed on oncology nurses to complete complex tasks and deal with emotionally draining patients has been known to cause burnout (Russel, 2016). The demanding schedule of oncology nurses may greatly impact their stress levels when encountering a patient who is having a hypersensitivity reaction to chemotherapy or a cytokine release infusion reaction to biotherapy.

Currently there are no studies about nurses' knowledge level and perception of comfort level to treat and respond to acute infusion reactions caused by antineoplastic agents. With the infrequency of this severe reaction, nurses may not feel comfortable with their knowledge and

ability to manage the reaction. The goal of this research will be to explore if the nurses' knowledge of acute infusion reactions relates to their perceived comfort level in dealing with these reactions in the oncology patient.

METHODS

Study Design

This study used a cross sectional descriptive design. An online survey, developed by the principal investigator, was made available to nurses working with oncology patients at the University of Florida (UF) Health Cancer Center-Orlando and Arnold Palmer Hospital. The research was completed through the University of Central Florida's Honors in the Major program under the supervision of Dr. Victoria Loerzel.

The primary objective of this research was to evaluate nurses' knowledge and perceived comfort levels related to risk factors, signs and symptoms, and actions towards acute infusion reactions from antineoplastic agents in oncology patients. A secondary objective was to explore any relationships between nurses' knowledge and comfort level towards acute infusion reactions from antineoplastic agents.

Research Aims:

- 1) What is the nurse's basic knowledge level with acute infusion reactions from antineoplastic agents?
- 2) What is the nurse's overall comfort level with managing acute infusion reactions from antineoplastic agents?
- 3) What is the relationship between nurses' knowledge and comfort level towards acute infusion reactions from antineoplastic agents?

Sample and Setting

Participants for this study were registered nurses who worked with the pediatric or adult oncology population at Arnold Palmer Hospital or the UF Health Cancer Center – Orlando in both the inpatient and outpatient settings. Nurses were included if they were 18 years or older, worked directly with oncology patients, and administered antineoplastic agents. Nurses were excluded if they were clinic or office nurses who did not administer antineoplastic agents to oncology patients.

Procedure

Sub-Investigators, Dr. Patricia Geddie and Ms. Jennifer Penn explained the purpose of the study to potential participants during “huddles” at UF Cancer Center-Orlando and Arnold Palmer Hospital respectively. An e-mail inviting nurses to participate was sent to the nurses’ work e-mail accounts and included an informational letter and a link to progress to the survey on Qualtrics if they chose to participate. Consent was conveyed if the nurse answered questions on the survey. The survey was anonymous and no personal identifiers were collected. All data was kept private and confidential.

The survey was open for two weeks from June 7, 2016 through June 21, 2016. Participants were asked to complete a 114 question investigator-developed instrument designed to assess nursing knowledge of acute infusion reactions and evaluate nurses’ comfort level in managing these acute infusion reactions in the oncology setting. Demographic questions were also included. The survey was expected to take 20 minutes to complete.

Instrument

The Orlando Health Adult Oncology Chemotherapy Hypersensitivity Reaction Protocol and the well-known *Cancer Nurses Principals and Practice* and *Core Curriculum for Oncology Nursing* books were the resources used to create the survey. Dr. Patricia Geddie, a clinical nurse specialist with over 30 years of experience in oncology nursing from the UF Health Cancer Center, and Jennifer Penn, a Learning Specialist from Arnold Palmer Hospital for Children, agreed to review the survey as experts in the oncology field and provide face validity. They provided feedback related to the survey content and relevance to acute infusion reactions. This feedback was used to revise the survey. Qualtrics software was used to design the survey and collect data.

The survey was designed to test nurses' knowledge of acute infusion reactions and to rate their perceived comfort level with managing the reactions. First, a series of demographic questions were asked to determine experience, followed by knowledge questions presented in multiple choice, true/false, and Likert scale format, and then a Likert scale was used to ask questions about comfort level and feelings about the stress and support surrounding the nurses when dealing with these reactions. Finally two qualitative questions were asked to assess nurses' desire for further education and to give them a chance to add anything they felt was important. All sections are described in more detail below.

Twelve demographic questions were asked related to participant age, highest degree completed, number of years in practice, number of years working with the oncology patient population, membership in professional organizations, experience giving antineoplastic drugs,

additional training completed, current work setting, the primary patient population, and the frequency the nurse encounters acute infusion reactions from antineoplastic agents.

Knowledge questions were broken down into six subscales: the basic knowledge subscale (n=17), signs and symptoms of hypersensitivity reactions (n=15), signs and symptoms of anaphylactic reactions (n=15), signs and symptoms of cytokine release infusion reactions (n=15), drugs that have a high potential to cause hypersensitivity and anaphylaxis (n=11), and drugs that have a high potential to cause cytokine release infusion reactions (n=11). A total knowledge score was computed based on the number of correct answers for all of these items with the highest possible score being 84 points.

The basic knowledge subscale had 4 multiple choice questions, 12 true/false questions, and 1 select all that apply. These questions were related to type and frequency of acute infusion reactions, factors that increase the risk of acute infusion reactions, and protocol for assessing and managing an acute infusion reaction.

The sign and symptom subscales were created using a 5-point Likert scale that ranged from strongly disagree to strongly agree. Participants were awarded points for choosing either “disagree” or “strongly disagree” for signs and symptoms that were not common to the type of acute infusion reaction or for choosing “agree” or “strongly agree” for signs and symptoms that were common. No points were awarded for “I don’t know” answers.

The drugs most likely to cause a reaction subscales were created using the same 5- point Likert scale as with the sign and symptoms subscales that ranged from strongly disagree to strongly agree. Points were awarded the same way as well.

The comfort level questions (n=7) asked nurses to rate their comfort with nursing actions related to acute infusion reactions in the oncology setting on a 6- point Likert scale ranging from extremely uncomfortable to extremely comfortable. The lowest points possible per question was 1 for extremely uncomfortable and the highest points possible per question was 6 for extremely comfortable choices. The highest total comfort level score possible was 42 points.

There was an additional section in the survey (n=9) related to nurses' distress and support in situations with acute infusion reactions. The questions were presented using a 6- point Likert scale ranging from strongly disagree (1) to strongly agree (6).

There were two open-ended questions that were designed to allow the nurses to share any additional information about their experiences with acute infusion reactions. The first open-ended question invited the nurse to explain what type of further training he/she would like in the future, if any, with acute infusion reactions from antineoplastic agents. The second open-ended question was a chance for the nurse to add anything else he/she would like to include about his/her experience with acute infusion reactions.

Data Analysis

Data was downloaded from Qualtrics into an Excel Spreadsheet and uploaded into SPSS version 22 for analysis. This study was analyzed using descriptive statistics (means, frequencies, percent's). Total knowledge and subscale knowledge scores were computed and aggregated. T-tests and ANOVA were used to examine differences between group means (adult and pediatric nurses). Pearson's R correlations were used to examine relationships between study variables (demographic and groups) and knowledge and comfort scores.

RESULTS

Thirty-two nurses accessed the survey, and twenty completed the entire survey. A Chi Square test was conducted and revealed that there were no significant demographic differences between the nurses who completed the survey versus those who did not. Of those who completed the survey, the typical participant was forty-four years of age, had sixteen year's experience as a Registered Nurse, and thirteen year's experience in the oncology setting. 70% of participants had a Bachelor's Degree, all participants held an additional certification, and were a member of a professional nursing oncology organization. Of the twenty participants who completed the survey, twelve worked in the adult oncology setting and eight worked in the pediatric oncology setting. In the adult oncology setting, seven nurses worked with the inpatient population and five worked with the outpatient population. In the pediatric oncology setting six worked in the inpatient oncology setting and only two worked in the outpatient oncology setting. See Table 1 for the demographic characteristics of the whole sample and nurses within the adult and pediatric settings

Table 1: Sample Characteristics

Characteristic	Whole Group (N=20)	Adults (N=12)	Pediatrics (N=8)
Age (χ)	44	45	46
Degree			
Diploma	1	1	0
Associates	4	3	1
Bachelors	14	8	6
Masters	1	0	1
Certifications			
OCN	8	8	0
CPHON	2	0	2
CPON	2	0	2
ONS Chemotherapy Course	0	0	0
APHON Chemotherapy Course	4	0	4
OH Verification Course	3	3	0
Other	1	1	0
Member of Professional Organizations			
APHON	6	0	6
ONS	10	10	0
Other	4	2	2
Years as a R.N. (χ)	16	16	18
Years in oncology (χ)	13	13	13
Years giving chemotherapy (χ)	13	13	14
Work setting			
Inpatient	13	7	6
Outpatient	7	5	2
Adult	12	0	12
Pediatric	8	8	0
Number of reactions seen in 1 month (χ)	2.4	2.83	1.75
Number of reactions seen in 1 year (χ)	4.5	4.92	3.88

Note Numbers rounded to the nearest whole number.

(χ) = Sample mean

Research Question 1: What is the nurse's basic knowledge level with acute infusion reactions from antineoplastic agents?

The mean total knowledge score for all participants of the survey was 47.3 out of 84 possible points or 56%. Nurses working in the adult oncology setting scored an average of 49.92 out of 84 possible points or 59%, and nurses working in the pediatric oncology setting scored an average of 43.38 out of 84 possible points or 52%.

Table 2 shows a breakdown of the subscale scores for the whole group. The highest scores were in the basic knowledge subscale and in recognizing signs and symptoms of an anaphylactic reaction. The lowest scores were in recognizing signs and symptoms of both hypersensitivity reactions and cytokine release infusion reactions.

Table 2: Mean Total Knowledge and Subscale Scores for the Whole Group			
Subscale	Points Possible	Mean Score	Mean Percent Score
Basic Knowledge Score	17	10.6	62%
Hypersensitivity Reactions Signs and Symptoms	15	7.45	50%
Anaphylactic Reactions Signs and Symptoms	15	9.3	62%
Cytokine Release Infusion Reactions Signs and Symptoms	15	6.75	45%
Drugs that cause Hypersensitivity and Anaphylactic Reactions	11	6.7	60%
Drugs that cause Cytokine Release Infusion Reactions	11	6.5	59%

Table 3 shows a breakdown of subscale scores by adult and pediatric settings. In the adult setting the highest score (67%) was in the subscale about which drugs are most likely to cause cytokine release infusion reaction, followed closely by recognizing signs and symptoms of anaphylactic reactions at 65%. Their lowest scores were in recognizing the signs and symptoms of hypersensitivity reactions and cytokine release infusion reactions at 51% and 50% respectively.

In the pediatric setting nurses tended to score slightly lower than nurses in the adult setting in all subscales. Their highest score was in the basic knowledge subscale at 62%. Their lowest score (38%) was in recognizing signs and symptoms of cytokine release infusion reactions. This was the lowest score for nurses in both settings.

When comparing the two settings further, the biggest gap in subscale scores was in recognizing signs and symptoms of cytokine release infusion reactions and selecting drugs most likely to cause cytokine infusion reactions. In the adult setting there was a mean score of 50% for recognizing the signs and symptoms compared to 38% in the pediatric setting. Likewise in selecting drugs the mean was 67% for the adult setting and 48% for the pediatric setting. However, this was only about a 2-point difference for the mean score in each subscale.

Table 3: Mean Knowledge Subscales of Nurses in Adult and Pediatric Settings					
		Adult Setting		Pediatric Setting	
Subscale	Points Possible	Mean Score	Mean Percent	Mean Score	Mean Percent
Basic Knowledge Score	17	10.67	63%	10.5	62%
Hypersensitivity Reactions Signs and Symptoms	15	7.67	51%	7.13	48%
Anaphylactic Reactions Signs and Symptoms	15	9.75	65%	8.63	58%
Cytokine Release Infusion Reactions Signs and Symptoms	15	7.50	50%	5.63	38%
Drugs that cause Hypersensitivity and Anaphylactic Reactions	11	7	64%	6.25	59%
Drugs that cause Cytokine Release Infusion Reactions	11	7.33	67%	5.25	48%

In the general knowledge subscale there were some knowledge deficits about the risks associated with acute infusion reactions. For example, 75% of participants chose the incorrect answer for a question about being able to continue a chemotherapy infusion as long as signs and symptoms of hypersensitivity are mild. This is false. The hospital's protocol requires that the infusion be stopped immediately at any sign of a reaction. In another example, 60% believed that a patient could not receive an antineoplastic drug once he/she has had a reaction. The correct answer was false, because there often is not another class of drugs that can be used for treatment. Finally 60% of nurses did not know that a patient with a history of hypersensitivity reactions to something like food or bee stings is more likely to react to a chemotherapy drug. Prior hypersensitivity or allergic reactions are a warning sign that an acute infusion reaction may occur.

Overall, the biggest knowledge deficit was in determining the correct signs and symptoms of each specific type of infusion reaction. There was a trend to choose agree or strongly agree for most signs and symptoms regardless of the type of infusion reaction. Almost every sign and symptom for each of the three infusion reactions had a higher frequency for agree and strongly agree. Table 4 outlines the percent of participants who chose agree and strongly agree based on the frequencies. There were only seven instances in which the percent of those who chose agree/strongly agree was less than 50%.

Reliability statistics were run on the Likert knowledge based questions. The Alpha coefficients were as follows: signs and symptoms of hypersensitivity reactions- 0.838, signs and symptoms of anaphylactic reactions- 0.829, signs and symptoms of cytokine release infusion

reactions- 0.83, drugs most likely to cause a hypersensitivity or anaphylactic reaction- 0.541, drugs most likely to cause a cytokine release infusion reaction- 0.863.

Table 4: Percent of nurses who chose "agree"/"strongly agree" for signs and symptoms of specific infusion reactions			
	Hypersensitivity Reactions	Anaphylactic Reactions	Cytokine Release Infusion Reactions
	Percent Agree/Strongly Agree	Percent Agree/Strongly Agree	Percent Agree/Strongly Agree
Angioedema	60% **	90%	50%
Pruritus	90% **	60%	70% **
Nausea and Vomiting	70% -**	45%	60% **
Laryngeal Edema	75%	100% **	35%
Fever or Chills	95%	55%	90% **
Hypotension	85%	80%	65% **
Dyspnea	90%	90%	80% **
Watery Nose	80%	55%	45%
Feelings of Impending Doom	70% **	95% **	45%
Tongue or Throat Swelling	75%	100% **	45% **
Wheezing	80% **	80% **	50% **
Asthenia	35%	35%	50% **
Tachycardia	90% **	90% **	75% **
Bronchospasm	80% **	80% **	60%
Chest Tightness	80% **	80% **	60%
<i>Note: ** denotes correct answer.</i>			

The second largest knowledge deficit was in selecting the drugs that would most likely cause either hypersensitivity and anaphylactic reactions or cytokine release infusion reactions.

There was a trend with these two subscales to select “I don’t know” as the answer choice. This

trend did not exist in any other subscales. Table 5 shows the percent of “I don’t know” answers, the highest of which was 60% for the biotherapy drug Azacitidine.

Table 5: Percent of whole group who responded "I don't know" to drug selection subscales			
	Hypersensitivity and Anaphylactic Reactions		Cytokine Release Infusion Reactions
Drug Name	“I don’t know” percentages	Drug Name	“I don’t know” percentages
Procarbazine	45%	Interferons	10%
Methotrexate	5%	Interleukons	10%
Docetaxel	15%	Rituximab	5%
Taxanes	25%	Cetuximab	10%
Hydroxyurea	25%	Bortezomib	20%
Dacarbazine	40%	Azacitidine	60%
Asparaginase	10%	Alemtuzumab	45%
Cisplatin	10%	Bevacizumab	25%
Etoposide	0%	Gemtuzumab	25%
Bleomycin	5%	Trastuzumab	25%
Carboplatin	5%	Panitumumab	25%

Research Question 2: What is the nurse’s overall comfort level with managing acute infusion reactions from antineoplastic agents?

The overall comfort score was a 37.75 out of 42 possible points. All participants were moderately to extremely comfortable in most areas. The overall comfort score for nurses working with an adult oncology population was 38.08 out of 42 possible points, and the overall comfort score for nurses working with a pediatric oncology population was 37.25 out of 42 possible points. There was no significant difference in comfort scores between the adult and pediatric populations. 10% of the overall population felt slightly uncomfortable about managing

an anaphylactic reaction. In addition, 5% of the overall population felt slightly uncomfortable administering medications in the event of an anaphylactic reaction.

Research Question 3: What is the relationship between nurses' knowledge and comfort level towards acute infusion reactions from antineoplastic agents?

There was no correlation between total knowledge score and total comfort level score. Additionally, correlations were examined between the demographic variables, total knowledge and comfort scores. There was no correlation between total knowledge or comfort score and nurses who worked in inpatient or outpatient settings. Likewise, there was no correlation between total knowledge or comfort score and highest degree achieved or number of years of experience. Finally there was no correlation between the total knowledge or comfort score and number of acute infusion reactions seen in a month or year. Positive correlations were noted between several of the knowledge subscales (Cytokine Release Infusion Reaction signs and symptoms, and both the Hypersensitivity/Anaphylaxis and Cytokine Release Infusion reaction drugs) and total knowledge score. Another positive correlation was noted between the Cytokine Release Infusion reaction drug subscale and Total comfort. See table 6.

Table 6: Relationships between knowledge and comfort								
	Basic knowledge	S/S hypersensitivity subscale	S/S Anaphylaxis subscale	S/S CRIR subscale	HAR drug subscale	CRIR drug subscale	Total Knowledge	Total comfort
Basic knowledge	1	-.412	.398	.155	.196	-.149	.293	.149
S/S hypersensitivity subscale		1	.004	-.007	.076	.241	.254	-.101
S/S Anaphylaxis subscale			1	.209	.095	-.097	.437	-.091
S/S CRIR subscale				1	.290	.640**	.817**	.367
HAR drug subscale					1	.305	.572**	.226
CRIR drug subscale						1	.721**	.548**
Total Knowledge							1	.403
Total comfort								1
Note: ** correlation is significant at the 0.02 level (2 tailed)								
S/S=Signs and Symptoms								
CRIR= Cytokine Release Infusion Reactions								
HAR= Hypersensitivity and Anaphylactic Reactions								

Additional Responses

An additional Likert scale was included in the survey that asked questions about nurses' feelings and beliefs about distress and support. Most notably from this section was the question about whether nurses feel a great deal of stress about the possibility that an acute infusion reaction could happen at any time. 65% of participants agreed that they feel stressed. However, 100% of nurses agreed that they felt support from other nurses when encountering an anaphylactic reaction, 95% felt support reviewing the events that led to the anaphylactic reaction, and 100% felt support educating patients and families about the events that led to the anaphylactic reaction. In addition, 10% of nurses did not feel supported in coping with the stress related to the experience of dealing with an anaphylactic reaction.

Qualitative Responses

There were two qualitative questions at the end of the survey. When asked what type of additional training would be beneficial, responses repeatedly stated that more hands on practice would be helpful in a simulation setting. To lower anxiety about reactions, nurses would like to

review quick ways to recognize anaphylaxis. Nurses also asked for specific updates on new drugs that are being used, specifically biotherapies. They wanted to know what to look for based on the drug and what side effects could indicate an infusion reaction.

The last question asked the participants if there was anything else they would like to share about their experience with acute infusion reactions. The nurses said being prepared with the medications that should be given in the event of an anaphylactic reaction is an important step to administering any antineoplastic drug. The nurses support each other on the unit in event of reactions. Many nurses said that they have not seen many acute infusion reactions since they are not very common, and this makes handling the reactions stressful when they do occur. Patient load was also a concern. Nurses worried that they might miss signs and symptoms of a reaction when they have a busy patient load. Patient observation is key to managing reactions quickly and effectively.

DISCUSSION

Results from this study indicate that a knowledge deficit related to acute reactions exists. Nurses were knowledgeable about approximately 50% of the items. The general knowledge questions showed some gaps in knowledge. Some of these knowledge gaps could impact patient safety. For example, nurses need to understand that any sign and symptom of a hypersensitivity reaction could escalate to anaphylaxis if not treated. The first step to safety is stopping the infusion and then checking with the physician on how treatment should proceed. In addition, 60% of nurses did not believe that a patient would receive the antineoplastic agent again once an acute infusion reaction had occurred. The rationale behind this belief makes sense with most classes of drugs. If a patient has an allergy to a drug, the nurse knows not to give that medication. However, nurses need to realize that many times with antineoplastic drugs there is no other alternative to treatment and that patient may indeed receive the drug they reacted to at a later date. The nurse should be vigilant in checking the patient's past history with the drug, because past history of an infusion reaction indicates a high risk that it will happen again.

The last general knowledge question that 60% of nurses missed was the relationship between hypersensitivity reactions to things like food or bee stings and the increase likelihood of a patient to react to a chemotherapeutic drug. Without being taught about this connection, a nurse would not know to ask about hypersensitivity reactions when assessing the patient. This simple question could be a clue to the nurse that the patient is more susceptible.

In several subscales, Nurses were asked their level of agreement when identifying signs and symptoms related to the three types of infusion reactions: hypersensitivity, anaphylaxis, and cytokine release infusion reactions. Each subscale had correct and incorrect answers. It is

interesting that for all subscales, nurses tended to agree that most signs/symptoms were an indication of a specific reaction. It seems that participants could not discriminate between specific signs and symptoms they might see with each type of reaction. The acquiescence response bias did not indicate a total lack of knowledge. The overwhelming choice of agree or strongly agree for signs and symptoms in all three infusion reactions suggests an understanding that anything unusual when giving an antineoplastic agent could indicate an acute infusion reaction. Assigning a sign or symptom to a particular type of infusion reaction may not be important to the scope of practice. What is more important is that the nurse reacts properly to anything that indicates a reaction.

The large responses of “I don’t know” answers for the subscales asking participants to agree with drugs that are most likely to cause an acute infusion reaction may be an indication that the nurses do not commonly work with these drugs. Regardless of the nurses’ answers, the most important thing a nurse must understand about these drugs is they all possess some level of potential to cause an acute infusion reaction. Even if the nurse knows which drugs have a high potential to cause an acute infusion reaction and which drugs have a rare potential, the potential is present in all drugs. Nurses in the pediatric nurse setting scored lower in selecting drugs that cause cytokine release infusion reaction. This many indicate that pediatric nurses do not administer these drugs as frequently.

The overall comfort score of 37.75 out of 42 possible points for managing acute infusion reactions indicates that nurses feel very comfortable in their role of managing acute infusion reactions. Nurses feel comfortable assessing for signs and symptoms, educating patients on these signs and symptoms, managing the anaphylactic reaction, administering chemo and biotherapy,

preparing medication in the event of an acute infusion reaction, and administering the medication. This is interesting given the knowledge gaps that were found. However, this may be a positive indication that regardless of knowledge gaps related to basic information about acute infusion reactions, nurses feel capable and ready to respond in the event of an infusion reaction.

There was no relationship between the total knowledge score and total comfort level score, but this does not mean that no conclusions can be drawn. A strong foundation in knowledge might not be needed to manage an acute infusion reaction. The nurses still possess knowledge in how to manage an acute infusion reaction; they just lack specific knowledge related to details of the type of infusion reactions and the drugs. Perhaps what is most important in training successful and confident nurses is ensuring that they know what to assess and how to react when necessary. In a study conducted with nursing students in which the knowledge of genetics was tested pre course work and post course work, nurses seemed to be more familiar with higher level applications of genetic issues despite being unable to answer the genomic basic knowledge subset (Monroe & Loerzel, 2016). This suggests the same concept, that a nurse can manage an acute infusion reaction without knowing other basic concepts on the topic. The oncology nurses know they need to be prepared to act, so they must recognize any sign or symptom and then feel comfortable reacting.

Correlations show a positive relationship between some knowledge subscales and total knowledge score. This makes sense, because if the knowledge in the subscales was low, it was reflected in the total (low) knowledge score. The correlation between the cytokine release infusion reactions drug selection subscale and total comfort is interesting. More research is needed to explore this relationship and determine if it is meaningful.

Limitations

The limitations of this study include the investigator-developed survey. While two experts in the field reviewed this survey and provided face validity, it might not have been adequate to capture nurses' knowledge of management of an acute infusion reaction. Questions may have been unclear to participants and may not have adequately captured specific aspects of knowledge related to acute infusion reactions. Upon further examination, the survey's knowledge section and comfort level section are asking different concepts about acute infusion reactions. The knowledge questions seek to test drug knowledge, signs and symptoms specific to infusion reactions, and risk factors. The comfort level questions ask more about management of the reaction. If the knowledge question and comfort level questions were more closely aligned, perhaps there would have been a relationship present between the two variables.

Another limitation of the survey were the demographic questions: how many infusion reactions do you see in a month and year? The use of the word "see" does not verify whether the nurses actually took part in managing this reaction.

An additional limitation was the sample size. A larger sample size would have produced more reliable results. In addition, there was not a lot of variation among demographics. Using a sample size of new nurses might have shown a correlation between knowledge scores and comfort scores, because clinical experience would not have influenced their comfort subscale.

Implications for Research

A revised survey that connects knowledge style questions to comfort level questions would be beneficial to continue this research. Further revision of the survey may focus on knowledge of nursing management of acute infusion reactions. A bigger more diverse sample

would be more indicative of whether there is a relationship between knowledge score and comfort level. A test of how nurses react and manage acute infusion reactions could also measure if comfort level matches actual performance. The knowledge Likert scales all scored high in internal consistency when Alpha-coefficients were run for reliability except for drugs most likely to cause hypersensitivity and anaphylactic reactions. This would need to be examined in a future study.

Implications for Education and Practice

The gaps in knowledge that were identified and the needs reported by nurses in the qualitative section inform our implications for practice and education. The knowledge gaps addressed in the discussion suggest a few points that nurses would benefit reviewing. Some nurses still reported feeling a great deal of stress about the potential for an acute infusion reaction to happen. In the qualitative responses there were several nurses who wanted more hands on training and review of new and most used drugs. Simulation training and in-service training could help nurses feel more prepared. Nurses could practice in an environment where mistakes were safe to make. Reinforced hands on training quarterly could also decrease stress, because one of the largest reasons nurses complained of stress was lack of exposure to these reactions.

Posters on the units with the most common drugs that cause acute infusion reactions may be helpful to nurses, especially if the signs and symptoms of what to look for are present. Nurse huddles could also be a great time to review new drugs that are being used in treatment, since some nurses complained of not feeling up-to-date on all of the new drugs being used. This was also consistent with their lack of knowledge on the specific drugs.

APPENDIX A: ORLANDO HEALTH IRB APPROVAL



Harry Wingfield <no-reply@irbnet.org>

6/3/2016

Patty Geddie <patricia.geddie@orlandohealth.com>; andreacarlson2009; Jennifer Penn <jennifer.penn@orlandohealth.com>; Victoria Loerzel ✉

Please note that Orlando Regional Medical Center (ORMC) IRB has published the following Board Document on IRBNet:

Project Title: [913937-1] Nursing knowledge and perceived comfort level in acute infusion reactions from antineoplastic agents
Principal Investigator: Andrea Maiorini

Submission Type: New Project
Date Submitted: May 25, 2016

Document Type: Exempt Letter
Document Description: Exempt Letter
Publish Date: June 3, 2016

Should you have any questions you may contact Harry Wingfield at harry.wingfield@orlandohealth.com.

Thank you,
The IRBNet Support Team

www.irbnet.org

**APPENDIX B:ORLANDO HEALTH NURSING RESEARCH COUNCIL
APPROVAL LETTER**



Orlando Health
Center for Nursing Research
1414 Kuhl Ave. MP 161
Orlando, FL 32806
321.841.8332
harriet.miller@orlandohealth.com
orlandohealth.com

May 17, 2016

Harry Wingfield, MFA, CIP
Manager
Institutional Review Board
Orlando Regional Medical Center

Dear Harry,

I am writing to let you know that Andrea Maiorini, (PI) Nursing Student in the Nursing Honors in the Major Program at the College of Nursing, University of Central Florida submitted her proposal for a research study entitled **Nursing Knowledge and Perceived Comfort Level in Acute Infusion Reactions Antineoplastic Agents** to the Orlando Health Corporate Nursing Research Council for review.

The Nursing Research Council reviewed the proposal and they recommended changes prior to Institutional Review Board submission (IRB). This proposal is recommended for IRB submission and Andrea Maiorini (PI) will be forwarding the new proposal to you.

Thank you for allowing us to review this protocol.

Sincerely,

Harriet D. Miller, PhD, ARNP, CPN, CCRP

Harriet D. Miller., PhD, ARNP, CPN, CCRP
Chair, Nursing Research Council and
Nurse Scientist
Center for Nursing Research

**APPENDIX C: ORLANDO HEALTH HUMAN RESOURCES APPROVAL
E-MAIL**

and do not necessarily represent those of Orlando Health.

s presented in this e-mail are solely those of the author

APPENDIX D: ENDORSEMENT LETTER



College of Nursing

May, 5, 2016

Dear Members of the Institutional Review Board,

I am writing this letter in support of Ms. Andrea Maiorini, an undergraduate nursing student in the College of Nursing who is conducting original research as part of her Honors in the Major thesis. Ms. Maiorini would like to survey nurses who administer chemotherapy in the adult and pediatric, inpatient and outpatient departments, about their knowledge of and comfort level in managing acute infusion reactions.

This research is important because acute infusion reactions, while rare, can happen at any time. Nurses need to be knowledgeable and comfortable identifying early signs of a reaction in order to intervene early. In addition, managing an acute infusion reaction can cause distress in nurses, leading to burnout. Assessing knowledge and comfort is the first step in learning how we can help nurses be more prepared to manage this type of reaction.

As her thesis chair, I will be involved in all aspects of this conduct of this research project. If you have any questions, please do not hesitate to contact me.

Respectfully,

A handwritten signature in black ink, appearing to read 'Victoria Loerzel'.

Vicki Loerzel, PhD, RN, OCN
Associate Professor
UCF College of Nursing
Victoria.loerzel@ucf.edu

RE: Nursing knowledge and perceived comfort level in acute infusion reactions from antineoplastic agents

College of Nursing
12201 Research Parkway #300 • Orlando, FL 32826 • 407-823-2744 • FAX 407-823-5675

An Equal Opportunity and Affirmative Action Institution

APPENDIX E: STUDY INFORMATION SHEET

Nursing knowledge and perceived comfort level in acute infusion reactions from antineoplastic agents

Principal Investigator

Andrea Maiorini
University of Central Florida College of Nursing
407-802-7404
andreacarlson2009@knights.ucf.edu

Sponsor

N/A

Sub Investigator(s):

Dr. Victoria Loerzel
Dr. Patricia Geddie
Mrs. Jennifer Penn

- You are being asked to participate in a research study that will seek to evaluate nurses' knowledge and perceived comfort levels related to risk factors, signs and symptoms, and actions towards acute infusion reactions from antineoplastic agents in oncology patients.
- You are eligible to participate in this study if you are at least 18 years or older and a registered nurse who works with oncology patients.
- The research procedures involve taking the following survey that will take approximately 15-20 minutes to complete.
- Possible discomfort(s) associated with the study are...
There are no discomforts associated with this study.
- There are no direct benefits from participation in the study. However, this study may indicate the need for further preparation programs for nurses when working with antineoplastic agents.
- Participation in this study is voluntary. There is no cost to you for participating. You may refuse to participate or discontinue your involvement at any time without penalty. You may choose to skip a question or a study procedure.
- You will not be paid for your participation in this research.
- All research data collected will be stored securely and confidentially through a secure Qualtrics user account.
- The research team and authorized Orlando Health personnel may have access to your study records to protect your safety and welfare. Any information derived from this research project that personally identifies you will not be voluntarily released or disclosed by these entities without your separate consent, except as specifically required by law.
- If you have any comments, concerns, or questions regarding the conduct of this research please contact the researchers listed at the top of this form.
- If you are unable to reach the researchers listed at the top of the form and have general questions, or you have concerns or complaints about the research, or questions about your rights as a research subject, please contact the Orlando Regional Medical Center IRB by phone at (321) 841-5895.

APPROVED STUDY INFORMATION SHEET
ORMC IRB
IRB# 16.061.05

Original Version:
Revised and Amended Version:

May 26, 2016

You are not required to sign a consent form to participate in this study. However, by continuing to the survey you will be conveying your consent to participate in this study.

NOTE: this form may be appropriate for Exempt review research. Expedited review research will likely require either a full consent form, or a request for waiver of consent.

APPENDIX F: DATA COLLECTION TOOL

Nursing Knowledge and Comfort Level with Acute Infusion Reactions

Demographic Questions

Q1 Are you currently working as a registered nurse with direct patient care?

- ☐ Yes
- ☐ No

Q2 What is your age?

Q3 What is the highest educational degree that you have received?

- ☐ Nursing Diploma
- ☐ Associate of Science
- ☐ Bachelor's Degree
- ☐ Master's Degree
- ☐ Doctoral Degree

Q4 How many years have you practiced as a registered nurse?

Q5 How many years have you worked with the oncology patient population?

Q6 Are you a member of a professional oncology nurse organization?

- ☐ Association of Pediatric Hematology/ Oncology Nursing (APHON)
- ☐ Oncology Nursing Society (ONS)
- ☐ Other _____

Q7 How many years have you administered antineoplastic drugs (e.g: chemotherapy) to patients?

Q8 What certifications or trainings have you completed relating to oncology nursing?

- ☐ Oncology Certified Nurse (OCN)
- ☐ Certified Pediatric Hematology/Oncology Nurse (CPHON)
- ☐ Certified Pediatric Oncology Nurse (CPON)
- ☐ ONS Chemotherapy & Biotherapy Course
- ☐ APHON Chemotherapy & Biotherapy Course
- ☐ Orlando Health Chemotherapy Verification Course
- ☐ Other _____

Q9 What is your current work setting?

- ☐ Inpatient
- ☐ Outpatient

Q10 What is your primary patient population?

- ☐ Adult
- ☐ Pediatric

Q11 How many acute infusion reactions caused by antineoplastic drugs do you see in a month?

- ☐ 0
- ☐ 1-2
- ☐ 3-4
- ☐ 5-6
- ☐ 7-8
- ☐ 9-10
- ☐ 10+

Q12 How many acute infusion reactions caused by antineoplastic drugs do you see in a year?

- ☐ 0
- ☐ 1-2
- ☐ 3-4
- ☐ 5-6
- ☐ 7-8
- ☐ 9-10
- ☐ 10+

Please answer the following questions about acute infusion reactions caused by antineoplastic agents.

Q13 What is the probability of a patient having a severe infusion reaction to antineoplastic agents?

- ☐ 5%
- ☐ 10%
- ☐ 25%
- ☐ 50%
- ☐ 90%

Q14 Select the statement that best describes a hypersensitivity reaction.

- ☐ A severe life-threatening allergic reaction.
- ☐ Allergic reaction triggered by a drug, diluent, or solution.
- ☐ An immune response to a monoclonal agent.

Q15 Select the statement that best describes an anaphylactic reaction.

- ☐ A severe life-threatening allergic reaction.
- ☐ Allergic reaction triggered by a drug, diluent, or solution.
- ☐ An immune response to a monoclonal agent.

Q16 Select the statement that best describes a cytokine release infusion reaction.

- ☐ A severe life-threatening allergic reaction.
- ☐ Allergic reaction triggered by a drug, diluent, or solution.
- ☐ An immune response to a monoclonal agent.

Please answer the following questions about acute infusion reactions.

Q17 Cumulative doses of asparaginase increases the likelihood that a hypersensitivity reaction will occur.

- ☐ True
- ☐ False

Q18 Hypersensitivity reactions are more common when the antineoplastic agent is administered intermittently versus daily.

- ☐ True
- ☐ False

Q19 A patient is more likely to have a hypersensitivity reaction to antineoplastic agent on the first dose than with subsequent doses.

- ☐ True
- ☐ False

Q20 A patient is more likely to have an infusion reaction to biotherapy on the first dose than with subsequent doses.

- ☐ True
- ☐ False

Q21 Hypersensitivity reactions are more common when chemotherapy is administered parenterally versus intramuscularly.

- ☐ True
- ☐ False

Q22 As long as signs and symptoms of hypersensitivity are mild the chemotherapy infusion may be continued.

- ☐ True
- ☐ False

Q23 The chance of a patient receiving an antineoplastic drug once he/she has had an anaphylactic reaction is highly unlikely.

- ☐ True
- ☐ False

Q24 Hypersensitivity reactions can occur up to two weeks after chemotherapy is administered.

- ☐ True
- ☐ False

Q25 Rapid infusion of a chemotherapeutic drug is more likely to prevent hypersensitivity reactions.

- ☐ True
- ☐ False

Q26 A patient with a history of hypersensitivity reactions to something like food or bee stings is more likely to react to a chemotherapeutic drug.

- ☐ True
- ☐ False

Q27 You only need to observe the patient for signs and symptoms of a hypersensitivity reaction for 15 minutes.

- ☐ True
- ☐ False

Q28 Epinephrine should be administered by IV Push in the case of an anaphylactic reaction.

- ☐ True
- ☐ False

Q29 At the first sign of a hypersensitivity reaction, the most common medications prescribed and administered are: (Select all that apply.)

- ☐ Acetaminophen (Tylenol)
- ☐ Diphenhydramine (Benadryl)
- ☐ Hydrocortisone (SoluCortef)
- ☐ Meperidine (Demerol)

Q30 Which of the following signs and symptoms are most commonly associated with hypersensitivity reactions?

	Strongly Disagree (1)	Disagree (2)	I don't know (3)	Agree (4)	Strongly Agree (5)
Angioedema	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pruritus	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nausea and Vomiting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Laryngeal Edema	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fever or Chills	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hypotension	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dyspnea	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Watery Nose	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Feelings of Impending Doom	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tongue and Throat Swelling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wheezing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Asthenia	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tachycardia	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bronchospasm	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Chest Tightness	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q31 Which of the following signs and symptoms are most commonly associated with anaphylactic reactions?

	Strongly Disagree (1)	Disagree (2)	I don't know (3)	Agree (4)	Strongly agree (5)
Angioedema	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pruritus	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nausea and Vomiting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Laryngeal Edema	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fever or Chills	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hypotension	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dyspnea	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Watery Nose	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Feelings of Impending Doom	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tongue and Throat Swelling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wheezing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Asthenia	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tachycardia	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bronchospasm	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Chest Tightness	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q32 Which of the following signs and symptoms are most commonly associated with cytokine release infusion reactions?

	Strongly Disagree (1)	Disagree (2)	I don't know (3)	Agree (4)	Strongly agree (5)
Angioedema	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pruritus	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nausea and Vomiting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Laryngeal Edema	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fever or Chills	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hypotension	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dyspnea	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Watery Nose	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Feelings of Impending Doom	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tongue and Throat Swelling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wheezing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Asthenia	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tachycardia	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bronchospasm	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Chest Tightness	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q33 Which of the following chemotherapeutic drugs have a high potential for causing hypersensitivity and/or anaphylactic reactions?

	Strongly Disagree (1)	Disagree (2)	I don't know (3)	Agree (4)	Strongly agree (5)
Procarbazine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Methotrexate	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Docetaxel	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Taxanes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hydroxyurea	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dacarbazine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Asparaginase	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cisplatin	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Etoposide	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bleomycin	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Carboplatin	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q34 Which of the following chemotherapy and/or biotherapy drugs have a high potential for causing a cytokine release infusion reaction?

	Strongly Disagree (1)	Disagree (2)	I don't know (3)	Agree (4)	Strongly agree (5)
Interferons	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Interleukins	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Rituximab	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cetuximab	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bortezomib	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Azacitidine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Alemtuzumab	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bevacizumab	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gemtuzumab	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Trastuzumab	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Panitumumab	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Extremely uncomfortable (1)	Moderately uncomfortable (2)	Slightly uncomfortable (3)	Slightly comfortable (4)	Moderately comfortable (5)	Extremely comfortable (6)
Assessing for signs and symptoms of acute infusion reactions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Educating patients and families on the signs and symptoms of acute infusion reactions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Educating patients and families on the antineoplastic drug prescribed to the patient	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Managing an anaphylactic reaction	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Administering chemotherapy and biotherapy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Preparing medications to administer in the event of an acute infusion reactions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Administering supportive medications in the event of an acute infusion reactions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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	Strongly disagree (1)	Disagree (2)	Somewhat disagree (3)	Somewhat agree (4)	Agree (5)	Strongly agree (6)
I am able to remain calm and react quickly in the presence of a severe acute infusion reaction.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel a great deal of stress about the potential for an anaphylactic reaction to occur in one of my patients.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I believe there is a potential for my patient to have an anaphylactic reaction at any time.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
After encountering an anaphylactic reaction, I felt I acted appropriately and confidently.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

<p>If I encounter an anaphylactic reaction in the future, I believe I will act appropriately and confidently.</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<p>I have support from other nurses when encountering an anaphylactic reaction.</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<p>I have support reviewing event that led to an anaphylactic reaction.</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<p>I have support educating patients and families about the events that led to an anaphylactic reaction.</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I have support in coping with the stress related to the experience of dealing with an anaphylactic reaction.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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The last two questions are opening ended responses. Please include anything else you feel may be pertinent to this survey or anything else you would like to share.

Q37 What type of further training would be beneficial to you with hypersensitivity reactions from antineoplastic agents?

Q38 What else would you like to include about your experience with hypersensitivity reactions in the oncology setting?

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