

RETENTION OF KNOWLEDGE AND APPLICATION OF POISONED PATIENT
MANAGEMENT
USING 3-D VIRTUAL POISON CENTER

by

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ABSTRACT

Nurse educators must decide how best to prepare nursing students to be ready to care for all patients, including the poisoned patient. Knowledgeable of the poison control center, the resources available to nurses providing poisoned patient care and how to obtain this information is often overlooked from most nursing programs. The purpose of this experiential study is to determine the effectiveness of a clinical experience using a 3D virtual technology method as demonstrated by improved student posttest scores compared to posttest scores of students receiving the traditional lecture. The use of 3D technology has been used in nursing programs but there is a gap in the literature of the application of 3D technology to teach nursing students the importance of the poison center as a resource.

This research study was a quasi-experimental, two-group pretest-posttest, longitudinal research design consisting of one experimental group and one control group. The instrument used was an identical 25-item multiple-choice pretest and posttest, followed by a 90-day follow-up posttest. The pretest and posttests permitted the researcher to identify learning outcomes between the groups. An independent *t*-test was done to compare the experimental and control groups. Paired *t*-tests were performed to compare pretest to posttest within groups. The level of statistical significance was set at $p < .05$. Both started the study at the same level, as there was no significant difference between groups. Both groups demonstrated statistically significant improvement from the pretest to the posttest. Repeating the identical posttest 90 days later and

comparing the posttest scores to the 90-day posttest scores within groups was used to measure retention of knowledge. The findings of the 90-day posttest did not show statistical significance in either group.

DEDICATION

This dissertation is dedicated to my beloved parents, the late Marilyn Evans Hill and Jack Evans. You taught me well that the rewards of working hard, never giving up and we could be anything we choose; that everything is possible through Christ.

To my dear husband Joe, thank you for never protesting when I spent our anniversaries in class, drained our savings for tuition, or locked myself up in our camper while on vacation so I could write. You really are my rock! To my beloved children; Craig, Brad, Hunter and Heather, Thank you for encouraging me to keep working so I could better myself and to not give up.

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LIST OF ABBREVIATIONS AND SYMBOLS

AAPCC	American Association of Poison Control Centers
ACCS	Alabama Community College System
ADN	Associate Degree Nurse
CVI	Content Validity Index
<i>df</i>	Degrees of freedom: number of values free to vary after certain restrictions have been placed on the data
ED	Emergency Department
HRSA	Health Resources and Services Administration
I-CVI	Item Content Validity
ICU	Intensive Care Unit
IOM	Institute of Medicine
IRB	Institutional Review Board
<i>M</i>	Mean: the sum of a set of measurements divided by the number of measurements in the set
MKO	Most Knowledgeable Other
MUVE	Multiple User Virtual Environment
N	Number of participants in the study
n	Number of participants in a group
NCLEX	National Council Licensure Examination
NLN	National League for Nursing

<i>p</i>	Probability associated with the occurrence under the null hypothesis of a value as extreme as or more extreme than the observed value
PC	Poison Center or Poison Control Center
S-CVI/Ave	Scale level Content Validity Average
SD	Standard Deviation of Sample
SL	Second Life
SPSS	Statistical Package for Social Sciences
SPI	Poison Information Specialist
VREP	Validation Rubric for Expert Panel
MUVE	Multiple User Virtual Environment
VRS	Virtual Reality Simulation
ZPD	Zone of Proximal Development

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small, but what I do with what you have taught me will impact change for poison center educators and nursing students in the future. You have been tremendous!

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CHAPTER I

INTRODUCTION

An adult is unintentionally poisoned once every 39 seconds in the U.S. (Center for Disease Control [CDC], 2008). In 2013, there were more than 2.2 million unintentional human poison exposures reported to the 57 poison centers (PC) in the U.S. (Mowry, Spyker, Cantilen, McMillan, & Ford, 2013). Additionally, an untold number of people choose not to call the PC and did not go to the emergency department (ED) for help, suggesting this number of exposures is under reported (Saywall et al., 2009). There is an average of 300,000 hospitalizations for poison exposures in the U.S., and the mortality rate has increased 56% in the last decade (Mowry et al., 2013).

Many people in their communities may choose not to use the PC, but go directly to the ED (Kelly & Groff, 2000). Kelly and Groff (2000) found that 46% of the children brought to the ED by caregivers had not first called the PC. Sixty-eight percent were aware of the PC prior to the exposure and did not call first (Kelly & Groff, 2000). Many of these exposures may have been managed safely at home had they called the PC first. As a result, the first healthcare professionals to be involved in the care of the poisoned patient are often the ED nurses. Undergraduate nursing students, including Associate Degree Nursing (ADN) students, may also be involved in the patient's care while participating in an ED clinical rotation.

Nurses often feel uncomfortable or insecure to care for the poisoned patient, even nurses with many years of critical care experience. In addition, not all poisoned patients look sick or have a specific constellation of signs and symptoms when they arrive in the ED. According to

Kelly and Groff (2000), taking care of the poisoned patient requires specialized knowledge and creative thinking. As poison emergencies present less often than other emergencies in the ED, the ED nurse must keep current the skills required to care for these patients and up to date on the cutting edge technology that is required. Taking care of the poisoned patient requires specialized knowledge and creative thinking (Kelly & Groff, 2000). It is imperative, therefore, that care for this group of patients is provided in an appropriate and timely manner in order to ensure the best possible outcome (Kelly & Groff, 2000).

Many ED nurses rely on information obtained from the PC when caring for the poisoned patient, however this is not always the case. A study by Cummins et al. (2013), looked at the inefficiencies and vulnerabilities between EDs and PCs. They emphasized that there must be more collaboration between the ED and the PC, and the communication process should occur in three phases: notification, collaborative care, and ongoing consultation (Cummins et al., 2013).

Nursing Education

With the rapid growth of health knowledge coupled with rapid advances in technology, nursing programs today are challenged with deciding how to provide their students with a quality education. Nursing education should develop future nurses that have the knowledge and skills needed to work safely, professionally and with competence (Brandon & All, 2010). Specialty organizations, including PCs, recommend that core competencies specific to their area of practice should be included in undergraduate nursing programs. If these competencies were included in the undergraduate curricula, the curricula could be strengthened. Including information about the PC and how it may serve students as a resource could better prepare nurses for managing poisoned patient across the life span in various clinical settings (Giddens & Brady, 2007).

Therefore, the question is how are nursing students currently being prepared to care for patients with poison emergencies? A clinical rotation through a regional PC would be ideal for nursing students to learn about services offered by PCs and how effective collaboration takes place with other healthcare personnel in the management of poisoned patients. Nevertheless, the geographical location of PCs and logistics may prohibit this as an alternative clinical experience. Additionally, while some nursing students may be involved in caring for a poisoned patient while participating in an ED clinical rotation, this opportunity is not available to all students.

In reality, poison prevention and poison patient management may be mentioned in the pediatrics or pharmacology curriculum, but the benefit of observing collaboration with the PC is often lacking. Poison center educators are often invited as guest speakers at a nursing school or a healthcare facility. Within the allotted time period, typically one hour, the educator delivers the presentation. The talk is often a one-directional, teacher-centered lecture that closely resembles the traditional classroom. It is similar to a teacher delivering material in the traditional lecture format as they were taught (Brandon & All, 2010). Evaluations following these presentations are summative; they address how well the presenter delivered the material, whether all the objectives were covered, and if participants believe they understood the concepts covered. From this style of evaluation, the PC educator does not know if the students are able to attain and apply the principles of patient management guidelines that were discussed.

Associate Degree Nursing Programs

While there are several different types of nursing programs that prepare students to take the National Council Licensure Examination for Registered Nurses (NCLEX-RN), graduates from ADN programs account for up to 66 % of the entry-level registered nurses (IOM, 2010), and up to 48 % of the nurses in the workforce (HRSA, 2010). The ADN programs offer a

quality education that accommodates students' needs; they are more affordable, more accessible geographically and require less time to complete than baccalaureate nursing programs. Students in ADN programs are often adult learners with diverse backgrounds and various school and work experiences. Therefore, students possess a variety of learning styles.

Associate degree nursing programs were initially established in 1952. Clinical experiences were mainly community-driven, usually including nursing homes, day care facilities and public schools within the community in addition to some hospital-based experience (Mahaffey, 2002). Over the last 6 decades, ADN programs have evolved from a project to meet individual communities' healthcare needs to over 600 programs available in the U.S.

Role of the Poison Center

Regional PCs in the U.S. must be certified with the American Association of Poison Control Centers (AAPCC). Regional PCs must be accessible 24/7, available to assist in languages other than English, and accessible to the hearing impaired. Poison information resources must be readily available (IOM, 2004). Communication with the PC is based on telephone communication. Staff answering the PC telephones, referred to as poison information specialists (SPI), must be either a registered nurse, pharmacist or a physician, and be specially trained and certified in toxicology in order to offer information and recommendations on prevention and treatment of poison exposures. Becoming a SPI can take years of preparation and training.

In "Forging a Poison Prevention and Control System" (2004), a report by the Institute of Medicine (IOM), PCs were charged to prevent poisonings and reduce morbidity and mortality. According to this report, the public health problem of morbidity and mortality lies within the PC,

where there is a lack of sharing and collaboration of resources among the centers throughout the U.S.

Role of the Poison Center Educator

The AAPCC criteria for PCs to qualify for regionalization status as well as the reports from the IOM (2004) require that regional PCs must employ educators. The educator works with communities, including nursing schools and healthcare facilities to increase awareness of PCs, how to access the PC and address the underutilization of PCs through the presentations. Increasing public and professional awareness of a PC is often the focus of the PC educator's presentation. The following topics are emphasized in these presentations: what is the PC; who can call the PC; how does one call the PC; when should the PC be called; what to expect when using the PC, including the expense to the caller and the languages that are available are emphasized. When the public or the healthcare professional consults the PC early in the course of events, appropriate treatment is initiated earlier, unnecessary use of the ED may be prevented, the patient may be spared unnecessary treatment, and ultimately unnecessary healthcare expenses are saved (Kelly & Groff, 2000; LoVecchio et al., 2008).

Poison center educators are also available to assist nurse educators to better prepare future nurses with the knowledge, skills and attitudes necessary for optimal care of the poisoned patient. Still, not all nursing schools take advantage of this opportunity. Therefore, nursing students may graduate with only limited education related to the services PCs offer. This knowledge may help nursing students understand how collaborative efforts between PCs and healthcare professionals can assist in providing up-to-date care for poisoned patients. Knowing how to access accurate information in a timely manner to deliver appropriate nursing care may mean the difference in the poisoned patient's outcome.

Problem Statement

Poison center educators are responsible for educating the public and healthcare professionals about the risk of poisonings, and how to obtain help from the poison center. The delivery method utilized in most poison prevention presentations use the same one-directional teacher-centered format of traditional teaching. The literature supports the fact that handing out brochures is insufficient in increasing awareness, and that current poison prevention educational efforts by poison centers have failed to reduce morbidity and mortality (Krenzelo, Mirvos, & Mazo, 2007). There is no guarantee that participants learn or retain new knowledge as a result of the PC educator's efforts.

Similarly, many nurse educators continue to teach just as they were taught (Brandon & All, 2010). The traditional lecture style of teaching coupled with a growing body of knowledge and content, often leads to a gap between academia and practice. Nursing needs to rethink its current curricular design to avoid content saturation (Giddens & Brady, 2007). In 2003, the National League for Nursing (NLN) called for a paradigm shift in nursing education (Giddens & Brady, 2007).

In this information age, there is a need to move away from teacher-centered pedagogy and content repetition. Nurse educators, including PC educators, need to find diverse methods to conceptualize content in the nursing curriculum (Giddens & Brady, 2007). This requires a change in the way content is presented. Educators must shift from content saturation and adopt concept-based pedagogy to meet the needs of the 21st-century learners (Brown, Kirkpatrick, Mangum & Avery, 2008; Stanley & Dougherty, 2010). With the change in the healthcare environment, nurse educators need to develop research-based pedagogies that demonstrate partnerships among faculty, students and healthcare providers (Brown et al., 2008). Nurse

educators have been called to reform nursing education (Ulrich, Farra, Smith, & Hodgson, 2014), and the IOM has called for innovative strategies to be incorporated to meet the need of competencies (Cook, 2012). Students need practice applying knowledge and skills, particularly in preparing for public health disasters and fast-paced environments such as the ED or critical care areas (Schmidt & Stewart, 2009).

Purpose of the Study

The purpose of this study was to determine if a clinical experience using the 3D virtual technology with Second Life[®] (SL) as an interactive teaching method would improve students' knowledge on posttest scores and enhance knowledge of benefits of the PC on the 90-day FU scores compared to scores of students receiving the traditional lecture.

The research questions guiding this study include:

1. What effect does traditional lecture have compared to a 3D virtual reality interaction on the knowledge of poisoned patient management among ADN students on pretest to posttest scores?
2. What effect does experiencing a traditional lecture (control group) have on the knowledge of poisoned patient management among ADN students on pretest and posttest scores?
3. Do participants in the control group that received the traditional lecture retain knowledge of poisoned patient management after 90 days?
4. Does a 3D virtual reality clinical experience impact the results between pretest and posttest scores among ADN students?

5. Is there a difference in retention of poisoned patient management material from the posttest to the 90-day FU in the experimental group receiving the 3D virtual reality clinical experience?

Conceptual Framework

The overall goal of this study is to prepare nursing students to be knowledgeable of the PC resources needed when providing appropriate and timely care to poisoned patients. Teachers assist students to move from the low level of understanding to the higher level of knowledge through various teaching methods. While the traditional lecture method has historically provided students with an increased knowledge base, incorporating Chickering and Gamson's (1987) Seven Principles of Good Practice in Undergraduate Education has been used to improve teaching practice (Graham, Cagiltay, Lim, Craner, & Duffey, 2000) and is applicable in an online environment setting (Dreon, 2013; Graham et al., 2000; Hutchins, 2003). This study incorporated both Chickering and Gamson's principles of good practice and Vygotsky's Zone of Proximal Development Framework (ZPD) to guide the research.

These seven principles of effective teaching proposed by Chickering and Gamson (1987) include: 1) encouraging contact between faculty and students, 2) cooperation among students, 3) active learning, 4) prompt feedback, 5) time on task, 6) high expectations and 7) respect for diverse talent and ways of thinking. Students develop communication skills and work as a team, learning to lead and to follow. During the debriefing immediately following the simulation lab, students give and obtain feedback from classmates and faculty. Immediate feedback on their performance is one of the biggest benefits of simulation for nursing students (Guise, Chambers, & Valimaki, 2012). Feedback is necessary as it helps students develop new skills and realize consequences of decision-making.

The Vygotskian Framework related to cognitive development includes: 1) children construct their knowledge, 2) development cannot be separated from its social context, 3) learning can lead development and 4) language plays a central role in mental development. For the purpose of this study, the researcher focused on the social context that leads learning. Vygotsky's theory of ZPD enables teachers to assess what students are capable of learning (Leichsenring, 2013). Teachers assist students to move from the low level of understanding to the high level of knowledge through the ZPD. Vygotsky described the ZPD as the distance between one's actual developmental level, as determined by their problem solving ability, and the level of potential development that may be reached with adult guidance or collaboration with experienced peers (Leichsenring, 2013).

When Chickering and Gamson's (1987) principles of good practice in undergraduate education are used to compare the traditional lecture format to a 3D virtual reality intervention using SL, more opportunities for student's active participation occur with SL (see Table 1). In SL students actually visit a virtual PC and see additional case studies that often occur between the ED/ICU nurse and the SPI. Through this virtual reality experience students have the opportunity to better understand the communication process between these two healthcare professionals, and ultimately understand the vast resources at PCs that are available to nurses caring for the poisoned patient. Through SL students actually visualize the PC and become submerged in the virtual world experience (Skiba, 2009). Students also may experience opportunities to communicate with and discuss these resources with other students visiting the 3D virtual reality PC simultaneously. According to De Gagne, Oh, Kang, Vorderstrasse, and Johnson (2013), SL permits students to experience social presence, which has been demonstrated as an essential component of motivation and active learning.

Traditional Lecture	Second Life®
<p>1: Student – Faculty Contact</p> <ul style="list-style-type: none"> • Direct contact with students; study defined, consent obtained, pretest, presentation and posttest. • Clearly defined how to contact researcher with questions about study. • Questions or complaints about your rights as a research participant, call Research Compliance Officer of the UA. • Researcher contact is a factor in student motivation and involvement. • Communication was clear, concise. • Instructor concern helps students get through rough times and keep on working. • Sharing past experiences, values, and attitudes, knowing instructors enhances students’ commitment. 	<p>1: Student – Faculty Contact</p> <ul style="list-style-type: none"> • Direct contact with students; study defined, consent obtained, pretest given on initial day. • Created avatars; access to SL is explained. Attended and supported students through process of avatar development. • Clearly defined how to contact researcher with questions about study. • Questions or complaints about your rights as a research participant, call Research Compliance Officer of the UA. • Communication was clear, concise, demonstrated concern for students; together we will get through rough times and keep on working. • Sharing past experiences, values, and attitudes, knowing instructors enhances students’ commitment. • Researcher contact is a factor in student motivation and involvement. • Electronic office hours clearly defined. Phone number given to students, and made self available 24/7 • During the following class, the presentation is given in SL. • Attempted to learn students by name, treat students as humans with full real lives; ask how they are doing. • Made “out of class” tutorial sessions available. • Encouraged use of researcher’s email to encourage and inform; described when emails are checked. • Take students to professional events in the PC.
<p>2: Cooperation Among Students</p> <ul style="list-style-type: none"> • Students could raise questions but not interrupt presentation. • Learning was individual and isolated. • Asked students to give constructive feedback. • Explained difficult ideas, answered questions following posttest. 	<p>2: Cooperation Among Students</p> <ul style="list-style-type: none"> • Students were asked to share information about each other’s backgrounds and academic interests during initial encounter. • Learning was group involvement, encouraging social presence. • Learning is enhanced when students collaborate. • Working with others often increases involvement in learning. • Sharing one’s own ideas and responding to others’ reactions improves thinking and deepens understanding. • Encourage students to work together on case scenarios.

Table 1: Comparison of Traditional Lecture vs. Second Life® According to Chickering and Gamson's Seven Principles of Good Practice in Undergraduate Education (continued on next page)

Traditional Lecture	Second Life [®]
	<ul style="list-style-type: none"> • Students could create study groups within the course if not a guest presentation. • Study used small group discussions, collaboration, group representation, and case study analysis. • Presentation asked students to discuss key concepts with classmates whose backgrounds and viewpoints may be different from their own. • Good learning, like good work, is collaborative and social, not competitive and isolated. • Students were encouraged to openly raise questions and discussion, to interrupt presentation as needed. Explained difficult ideas, answered questions throughout presentation. • Asked students to give constructive feedback.
<p>3: Active Learning</p> <ul style="list-style-type: none"> • Students sit in class listening to presentation. • Students given concrete, real life situations to retain. • Addressed questions following presentation posttest and gave feedback. • PowerPoint technology for presentation may encourage active learning. • Could assign a project for student to share with class. 	<p>3: Active Learning</p> <ul style="list-style-type: none"> • SL allows students to share with one another, collaborate. • Case studies incorporated into SL experience develops problem solving skills • Students can talk about what they are learning and relate it to past experiences; apply it to the future clinical experiences. • Engage in SL environment makes what they learn part of themselves. • Students discussed key concepts with one another. • Debriefing after the experience gives students immediate feedback. • Encouraged students to feel a connection, social presence with the PC clinical environment. • Social presence is an essential component to motivate students and creates an active learning.
<p>4: Prompt Feedback</p> <ul style="list-style-type: none"> • Following presentation and posttest, answered questions and gave feedback. • Students asked to give constructive feedback after posttest. • Through feedback students identified learning needs and clarified key concepts. 	<p>4: Prompt Feedback</p> <ul style="list-style-type: none"> • Study defined, consent obtained, and pretest given on initial day. Created avatars; access to SL is explained. • Clearly defined how to contact researcher with questions about study. • Researcher's contact information gave prompt Feedback, which is a factor in student motivation and involvement. • Communication was clear, concise. • Researcher's concern for students helped them get

Table 1: Comparison of Traditional Lecture vs. Second Life[®] According to Chickering and Gamson's Seven Principles of Good Practice in Undergraduate Education (continued on next page)

Traditional Lecture	Second Life[®]
<ul style="list-style-type: none"> • Validate progress, and resources for further learning. • To know what is known and not known guides learning. 	<p>through rough times and keep on working.</p> <ul style="list-style-type: none"> • Sharing past experiences, values, and attitudes, knowing instructors enhances students' commitment. • Electronic office hours; clearly defined; the following class, the presentation is given in SL. Attempted to learn students by name. • Attend and support students while developing avatar. • Treat students as humans with full real lives; ask how they are doing. • Made available "out of class" tutorial sessions. • Use email regularly to encourage and inform. • Inform students when you will routinely check email. • Students were encouraged to ask questions spontaneously, giving immediate response. • Take students to professional events in the PC. • Students asked to give constructive feedback after posttest. • Through feedback students identified learning needs and clarified key concepts. • Validate progress, and resources for further learning.
<p>5: Time on Task</p> <ul style="list-style-type: none"> • Learning takes time. • Time commitment for study defined while explaining study. • Students asked to jot down questions and not interrupt presentation. • Learning is individual and isolated. • Students isolated during guest presentation; no group activity. • Students referred to AAPCC and PC for additional learning opportunities. 	<p>5: Time on Task</p> <ul style="list-style-type: none"> • Learning takes time. • Time commitment for study participation was defined in the initial meeting. • Students were encouraged to ask questions spontaneously and to take time through the PC where SPIs were able to provide more details about the AAPCC and PCs. • Students were given timeline of learning experience; what to expect in terms of length of time allocated. • Students referred to AAPCC and PC for additional learning opportunities.
<p>6: High Expectations</p> <ul style="list-style-type: none"> • Hold high expectations not only for motivated and highly prepared, becomes a challenge for poorly prepared and unmotivated students. • Expectations for study clearly 	<p>6: High Expectations</p> <ul style="list-style-type: none"> • Expectations for study and students' experience was clearly described in opening remarks. • Researcher met students in front of Carmichael Hall, with enthusiasm and high expectations for the PC visit in SL. • Offered encouragement and praised the class for all

Table 1: Comparison of Traditional Lecture vs. Second Life[®] According to Chickering and Gamson's Seven Principles of Good Practice in Undergraduate Education (continued on next page)

Traditional Lecture	Second Life[®]
<p>described in opening remarks.</p> <ul style="list-style-type: none"> • Students encouraged to write thoughts, questions, remarks on disturbed note cards. • Presentation was presented in a logical, sequential manner. • Communication was clear, concise, and with enthusiasm. 	<p>participating in attendance.</p> <ul style="list-style-type: none"> • High energy and expectation of researcher helps motivate students to participate in a virtual learning environment, never used in their college before. • Students encouraged to write thoughts, questions, remarks on disturbed note cards. • Presentation was presented in a logical, sequential manner. • Communication was clear, concise, and with enthusiasm.
<p>7: Respect Diversity</p> <ul style="list-style-type: none"> • Students bring a variety of talents and life experiences to the classroom. • Students learn in different ways, at different rates. • Students lacking experience in PC or healthcare may need additional activities. • Using a variety of teaching styles may reach out to more students; active, reflective, intuitive, sensing, visual and auditory. • Use multitude of activities – videos, guest speakers, lecture discussion, group projects. 	<p>7: Respect Diversity</p> <ul style="list-style-type: none"> • Students bring a variety of talents and life experiences to the classroom. • SL allows for a variety of teaching styles to reach out to more students; active, reflective, intuitive, sensing, visual and auditory. • SL permits students to interact and problem solve as a group. • SL may be structured for multitude of activities such as videos, group projects. • Students can talk about what they are learning and relate it to past experiences, apply it to the future clinical experiences. • Engage in SL environment makes what they learn part of themselves. • Students discussed key concepts with one another. • Debriefing after the experience gives students immediate feedback. • Encouraged students to feel a connection, social presence with the PC clinical environment. • Social presence is an essential component to motivate students and creates an active learning experience. • Students feel a sense of presence and getting a hands on experience in PC through use of SL.

Table 1: Comparison of Traditional Lecture vs. Second Life[®] According to Chickering and Gamson's Seven Principles of Good Practice in Undergraduate Education

Figure 1 illustrates how Vygotsky's ZPD and Chickering and Gamson's seven principles for good practice in undergraduate education served as the conceptual framework for this study and guided implementation of the 3D intervention. Vygotsky's Framework represented by the shaded box is divided into 3 sections. The first section illustrates the knowledge that students

have about PCs prior to the PC presentation/intervention. The middle section is where learning takes place as a result of teaching methods used by the researcher. Traditional lecture is used for the control group and 3D virtual reality using SL is used for the experimental group. The researcher serves as the Most Knowledgeable Other (MKO) to facilitate student understanding of the PC from a low level to a higher level of knowledge across the ZPD. The last section depicts learning that occurs as a result of later clinical and educational experiences, which is beyond the scope of this study. This darker section represents desired knowledge needed by nurses to adequately care for the poisoned patient using resources available at the PC.

The middle area representing the ZPD is the focus of this study. Dotted lines on either side of the ZPD depict the different knowledge levels that students have prior to and as a result of the PC presentation/intervention. Comparing each student's score on the pretest to the posttest and 90-day posttest derives this information. Chickering and Gamson's (1987) Seven Principles for Good Practice in Undergraduate Education are incorporated within the ZPD in both teaching methods used in this study. The color gradient within the box and arrow at the top of the figure depict the desired increase in students' knowledge related to PCs. The smaller arrow at the top of the figure also used color gradient to illustrate the increase in social presence that is depicted by comparison of the traditional lecture to the 3D virtual reality intervention using SL as illustrated in Table 1.

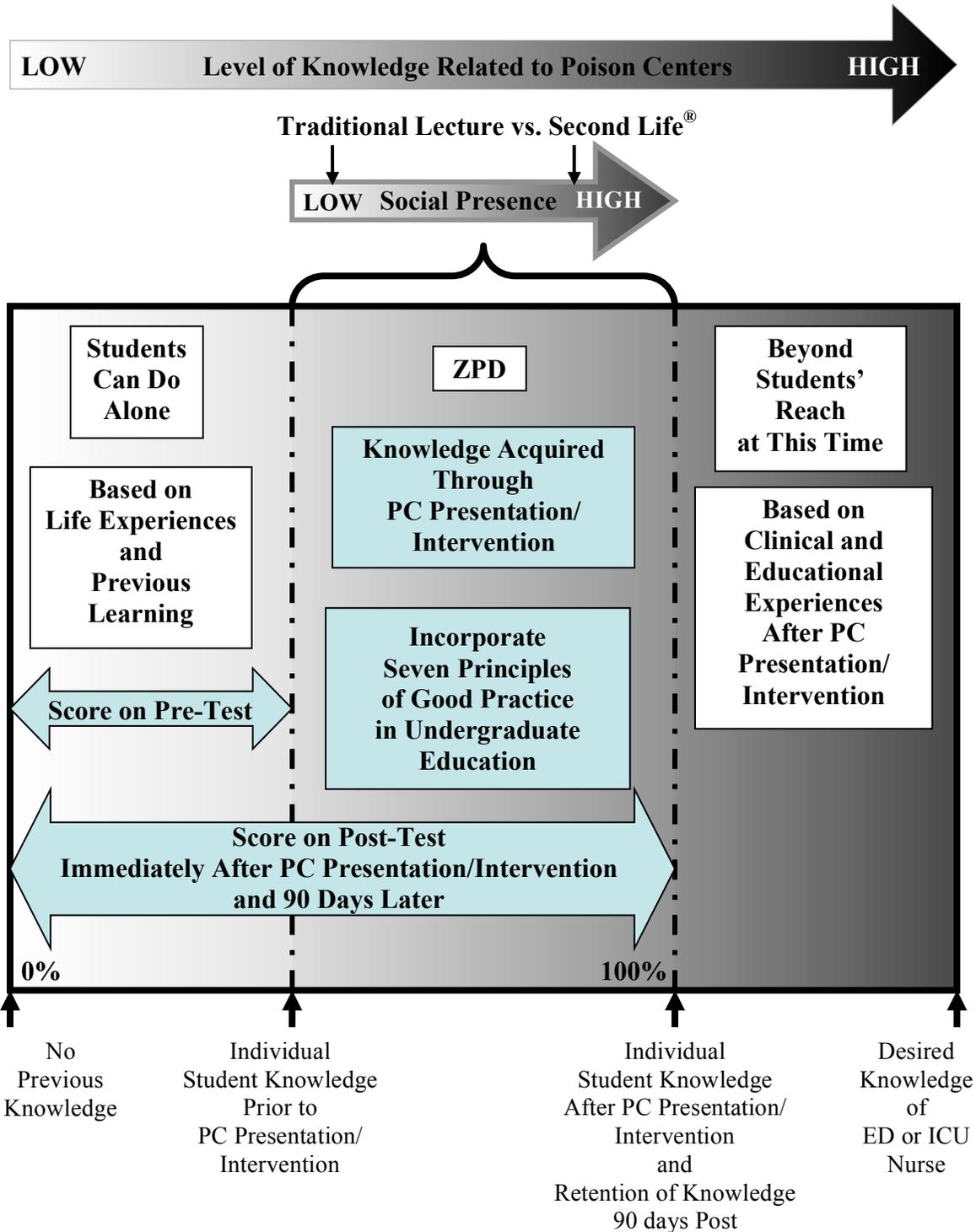


Figure 1. Level of Knowledge Based on Vygotskian's Framework with Chickering and Gamson's Seven Principles of Good Practice Incorporated Within the ZPD

Definitions

Active learning: Active learning includes activities that involve students doing things to learn and thinking about what they are doing (Fink, 2003).

Associate Degree Nursing Program (ADN): The National League accredits Associate Degree Nursing Programs for Nursing Accreditation Commission (NLNAC) and graduates are authorized to sit for the National Council of State Boards of Nursing Licensure Exam for Registered Nurses (NCLEX-RN) (Mahaffey, 2002).

Avatar: An avatar is a body one creates to represent them as they move about and manipulate their environment in a virtual world such as Second Life (Robbins & Bell, 2008; Schmidt & Stewart, 2012; Wang & Burton, 2012).

3D technology: Virtual world technology in 3 dimension (Schmidt & Stewart, 2010).

More knowledgeable other (MKO): The more knowledgeable other refers to someone who has a higher level of knowledge or ability than the learner, such as a teacher or other adult, but may be a peer or electronic tutors (McLeod, 2007).

Multiple user virtual environments (MUVES): Multiple users in a virtual environment that permits avatars to communicate with one another (Schmidt & Stewart, 2010).

Poison Center (PC): There are 55 regional poison centers in the U.S. that offer free, confidential medical advice 24/7 through the Poison Help line at 1-800-222-1222 that provides assistance to individuals and healthcare professionals in the care of various types of poisoning exposures (AAPCC, n.d.).

Poison Information Specialist (SPI): SPIs are registered nurses, pharmacists or physicians specifically trained and certified in toxicology, and are available 24/7 through

telephone triage to assist individuals and hospital professionals in providing appropriate and timely care to patients in poison exposure situations (AAPCC, n.d.).

Poisoned patient management: Poisoned patient management includes familiarity with services offered by PCs and knowing when to call the PC, what information to gather prior to calling the PC, and why collaboration with the PC SPI is essential for better patient outcomes (personal communication, September, 2014).

Second Life[®] (SL): Launched in 2003 and created by Linden Labs, SL is an online three-dimensional environment where users socialize in a virtual world (Schmidt & Stewart, 2010; Walsh, 2011).

Social Presence: Social presence is the degree students feel connected to their fellow classmates and the teacher in a 3D virtual learning environment (Sung & Mayer, 2012).

Traditional lecture: A classroom using traditional education is often teacher-centered, and uses face-to-face didactic lectures, handouts, and textbooks and requires memorization, repetition and reciting information (Feng et al., 2013; Giddens & Brady, 2007; Stanley & Dougherty, 2010).

Virtual reality (VR): Virtual reality is multisensory computer-generated environment (Ulrich, 2014).

Virtual Reality Simulation (VRS) or Virtual simulation (VS): Virtual simulation, sometimes referred to as Virtual reality simulation (VRS), is a strategy using active learning, permitting students to practice and apply learned content (Ulrich et al., 2014).

Zone of proximal development (ZPD): The zone of proximal development is "the distance between the actual developmental level as determined by independent problem solving and the

level of potential development as determined through problem solving under adult guidance, or in collaboration with more capable peers" (Vygotsky, 1978, p. 86).

Assumptions of the Study

For the purpose of this research study, the following assumptions were made:

1. The researcher is a PC educator with the knowledge and ability to teach content related to poisoned patient management using SL.
2. ADN programs have the appropriate bandwidth for all students to access SL simultaneously.
3. Participants have the computer skills to interact with SL with minimal assistance.
4. The participants' pretest and posttest scores represent their level of knowledge about poisoned patient management prior to and after intervention by the PC educator, respectively.

Significance of the Study

This research study is the first to use virtual reality and specifically SL technology in teaching nursing students about PCs and benefits derived from appropriate and early intervention. The results of this study contribute to the body of knowledge needed to improve the way that poison center information is communicated to future nurses who are often confronted with caring for patients with poison exposures following graduation.

Summary

The purpose of this experiential study is to determine if a clinical experience using 3D virtual technology as an interactive teaching method improves knowledge and retention of poisoned patient management compared to traditional lecture among ADN students. The research questions were identified. Vygotsky's theory of cognitive development (see Figure 1)

and the Chickering and Gamson's Seven Principles of Good Practice (see Table 1), which guided the sequence of this study, were clarified. Definitions appropriate for this research were identified. Assumptions of this research were described. The chapter concluded with an explanation of the significance of the study.

CHAPTER II

REVIEW OF THE LITERATURE

This chapter reviews the literature as related to this research study. Vygotsky's theory of Zone of Proximal Development and the 4 basic principles of Vygotsky's framework, as well as Chickering and Gamson's Seven Principles of Good Practice (1987) and active learning guided this research. Games and simulation used in nursing education, digital games and social presence as well as application of 3D technology in nursing education is discussed. The needs of today's college students are reviewed. The benefits and barriers of using 3D technology and the importance of making ADN students aware of the poison control center conclude this chapter.

Vygotsky's Theory

Lev Vygotsky was a Soviet psychologist that focused his work in the area of cognitive development. The Vygotskian Framework includes: 1) children construct their knowledge, 2) development cannot be separated from social factors, 3) learning can enhance development and 4) language plays a critical role in mental development. For the purpose of this study, the researcher focuses on the social context that guides learning. Vygotsky's theory of Zone of Proximal Development (ZPD) enables teachers to assess what students are capable of learning (Leichsenring, 2013). Through the use of More Knowledgeable Others (MKO), those with greater experiences, knowledge or expertise, students could achieve skills they otherwise could not have accomplished with the guidance from the MKO. Important to note too, is that a MKO does not have to be human. Electronic sources and educational games may also be a MKO programmed to deliver information that the student already has (Leichsenring, 2013).

Seven Principles of Good Practice

Chickering and Gamson (1987), in response to poor teaching outcomes, wrote the “Seven Principles for Good Practice in Undergraduate Education,” that identifies practices that positively affect learning in higher education (Bangert & Easterby, 2008). Although the Seven Principles was originally written as a tool for evaluating teaching skills in the undergraduate traditional classroom, these principles are still applicable to improving teaching methods in an online environment (Dreon, 2013; Graham et al., 2000; Hutchins, 2003). More than five decades of research in higher education went into writing “The Seven Principles for Good Practice in Undergraduate Education.” The seven principles have been used in assessing faculty inventory, institutional inventory and online courses to improve teaching practice (Graham et al., 2000). The seven principles of effective teaching include: 1) encouraging contact between faculty and students, 2) cooperation among students, 3) active learning, 4) prompt feedback, 5) time on task, 6) high expectations and 7) respect for diverse talent and ways of thinking (Chickering and Gamson, 1987). Chickering and Gamson’s (1987) “Seven Principles for Good Practice in Undergraduate Education,” guided this research study, which examined knowledge development among ADN students.

1. Encourage Contact Between Students and Faculty

Interactive teaching is defined as a two-way process where students play an active role in answering questions and are expected to contribute to explaining or demonstrating to the class (Ridley, 2007). Educators serve as facilitators by challenging students to become independent learners, causing them to learn actively while respecting their prior knowledge (Bangert & Easterly, 2008; Ridley, 2007). Educators learn along with students through active listening. Students make sense of the experience, evaluate themselves and set future goals using whatever

learning style(s) that best suites them (Ridley, 2007). As mentioned in chapter one, the success of the ADN programs, according to the Alabama Community College System (ACCS, 2016), is a result of the relationships developed between students and faculty. Nursing students must learn communication skills to be effective with other health care workers and to be a team member. Getting the appropriate education and training and developing the aptitude to transfer skills from the classroom to patient care are essential to creating new nurses (Tschannen, Aebersold, McLaughlin, Bowen, & Fairchild, 2012). Effective nursing education is research-based and theory-driven, with a focus on behaviors, interactive and experiential learning activities that engage students (Herbert, & Lohrmann, 2011). The major catalyst for changed behavior is a program using active, skill-based strategies, not lists of facts (Herbert, & Lohrmann, 2011). There is not enough evidenced-based research to guide current nursing education, and nursing educators are unaware of the findings of research done in other health related areas (Oermann, 2007). The use of didactic teaching has been the conventional method used by nurse educators, perpetuating the teaching styles used when they were taught.

The first principle of Chickering and Gamson's Seven Principles (1987), instructs teachers to encourage frequent interaction between faculty and the students. Being included in discussions and knowing teachers and classmates are readily available motivates students and promotes the feeling of being involved (Bangert & Easterby, 2008; Chickering & Gamson, 1987; Hutchins, 2003). Faculty should make teacher expectations for submitting assignments public and a plan for technological difficulties (Koeckeritz, Mulkiwicz, and Henderson, 2002). For faculty that are concerned about getting overwhelmed with emails from students that need immediate response, Graham et al. (2000) recommend guidelines for clear expectations, types of communication and timelines for response be defined and shared with students and faculty.

Nursing faculty must provide contact information and describe various means students may contact them for assistance, such as email, office or cell number, texting, Facebook or Twitter. The hours a teacher is available lets students know the faculty are there when they need assistance (Dreon, 2013).

In the study by Bangert and Easterby (2008), email was used as the primary tool of communication in an online nursing class. The study found that students agreed or strongly agreed that student-faculty interaction was high, instructors were more readily available outside the electronic classroom hours, and that faculty was enthusiastic about teaching. In addition, the feedback to the students gave them ideas of how to improve an assignment so they could make corrections and resubmit assignments (Bangert & Easterby, 2008).

2. Develop Reciprocity and Cooperation Among Students

The need for change in nursing education to focus on the needs of the student became clear by the National League for Nursing's (NLN) position statement in 2003. The NLN specified that nursing education should provide an active leaning environment that induces critical thinking, analytical and problem solving skills (Stanley & Dougherty, 2010; Weatherspoon & Wyatt, 2012). The needed paradigm shift in nursing education moves away from students learning passively to that of active participants (Brandon & All, 2010; IOM, 2010; Ulrich, Farra, Smith & Hodgson, 2014). Nurse educators must also shift their methodology to support a learner-centered environment (Brown et al., 2008; Gidden et al., 2012). For decades, traditional nursing pedagogies have been used, and they have produced knowledgeable nurses by using a teacher-centered approach. There are significant generational differences, however, today's students require a different approach to instruction than students of the past (Brown et al., 2008). Today's students are nontraditional life-long learners who engage in reflective practice,

not memorization. They are self-motivated and can critique themselves (Brandon & All, 2010; LeCroy, 2006). Millennial students prefer working in groups and collaborative learning (Collins et al., 2010). These students synthesize information, link concepts and think critically (Brandon & All, 2010; Brown et al., 2008; Chia, 2013). Teaching strategies must be interactive, experiential, involve modeling, and allow time to practice skills (Herbert & Lohrmann, 2011). Students have preferred learning styles the nurse educator must consider. Learning may occur through auditory, visual, or psychomotor means, or a combination of these. Knowledge acquisition and retention improved by approximately 90% when nursing faculty incorporated a combination of all three learning styles (LeCroy, 2006).

Green's Synergy Model of Nursing Education considers the relationships of the student, faculty, and external influences or systems (Stanley & Dougherty, 2010). In this student-centered model, competencies of both students and faculty create learning outcomes for students and teachers alike to achieve common goals (Stanley & Dougherty, 2010). Nursing students view nursing education as a means of securing employment following graduation. Students are consumers, purchasing the skills needed to make them nurses. Today's nursing students often have busy lifestyles, are required to work while attending school, and provide financially for their families. Nursing students want key concepts and theories they need to apply to future patient care (Stanley & Dougherty, 2010). Nursing faculty must provide evidence-based instruction, design environments of active learning, and promote students' need to seek knowledge and lifelong learning (Stanley & Dougherty, 2010).

Chickering and Gamson's (1987) second principle describes students working as a team to enhance their learning. Whether students attend class in a traditional classroom, on an online class or in a virtual world, cooperation among students is imperative for a successful learning

environment (Koerckeritz, Malkiewicz, & Henderson, 2002). Good learning requires collaboration and social interaction (Chickering & Gamson, 1987; Jones et al., 2009). When students work together and share ideas, they develop a deeper level of understanding (Jones et al., 2009). Such communication promoted sharing of resources, learning from one another and enhanced problem solving and critical thinking skills (Koeckeritz et al., 2002).

Collaborative structures need to be developed in an online class to encourage student interaction. When teachers develop interactive strategies into their online courses, students are encouraged to interact and work together (Dreon, 2013). By communicating with one another, students may share ideas and help each other learn concepts (Dreon, 2013). Koeckeritz et al., (2002) reported that studies of over 500 undergraduate students have shown that when computer-based means of communication were used between students-students and students-faculty, there was more frequent contact between groups (Koeckeritz et al., 2002).

Graham et al. (2001) cautioned that teachers that require class participation in the online discussions only, students' comments had little meaning and responses were shallow. They suggested that discussion groups should be small, and discussions should focus on a specific task and engage learners. Discussion should produce an outcome or product, students should receive prompt feedback, and evaluations should be based on the quality rather than the length of the discussion (Graham et al., 2001). Students that feel isolated in an online class often are unsuccessful (Dreon, 2013).

3. Active Learning

Active learning as a teaching strategy, Chickering and Gamson's third principle (1987), involves creating a fun, interactive learning environment based on trust among students and teachers, that encourages engagement, promotes deep learning and meaning (Chickering &

Gamson, 1987; Dreon, 2013; Lucas, Testman, Hoyland, Kimble, & Euler, 2013; Robinson & Kakela, 2006; Wolfe, 2006). Learning should not be a passive sport, and students will not learn by sitting and listening (Jones, 2009). Students must talk about it, write about it, relate to it from past experiences and then apply it (Chickering & Gamson, 1987). Nurse educators search for ways to provoke students' understanding of concepts in their course of study (Ostorga & Farruggio, 2013). The teacher facilitates original thinking and expands learning beyond a classroom with field trips and using guest speakers (Robinson & Kakela, 2006). Engaging students with guest speakers promotes critical thinking and deep learning. A student that is fully engaged in a situation is completely focused on a particular task (De Gagne et al., 2009).

Lucas et al., (2013) found that pharmacy students soon forgot material following an exam. Students' attention continues for approximately 15 minutes in a lecture-based pedagogy, but retention declines 10 minutes later (Lucas et al., 2013). The pharmacy students received 5 lectures over 1.5 weeks, and the experimental group that received active learning retained both short-term and long-term material. Lucas et al. concluded that students' in the active learning class had a gain in knowledge; it empowered them to have a better sense of responsibility and improved their retention of information.

Ostorga and Farriggio (2013) define deep learning as a focused attention of linking new theories or ideas to already learned concepts (Ostorga & Farruggio, 2013). Teachers are facilitating new knowledge when they invite a guest speaker to share experiences with their students. Not only are students led into deeper learning, but also the engagement helps students visualize the change from theory to practice (Ostorga & Farruggio, 2013). The use of guest speakers has been studied in areas of psychology, marketing, accounting, forestry, and environmental law (Robinson & Kakela, 2006). Ostorga and Farriggio (2013) even referenced a

virtual guest speaker used to teach an online course by Hemphill and Hemphill in 2007. Experts in a specific field may contribute to student learning and understanding using real life perspectives (Ostorga & Farruggio, 2013).

4. Give Prompt Feedback

One of the greatest gifts teachers can give students is feedback on their performance, showing the student what they are doing well and what areas they need to improve (Dreon, 2013). Feedback communicates to the student how the teacher sees their progress, allowing the students an opportunity to reflect on their experiences (Jones, 2009; Koeckeritz et al., 2002). From the reflection, students begin to expand their learning needs and identify goals to achieving success (Gaberson & Oermann, 2010). Online courses have become popular among students as it offers them greater flexibility in their schedules, allowing for timely feedback. For the faculty, however, teaching online may mean more papers or tests to grade, making it more time consuming (Dreon, 2013). Feedback is a tool that engages students to evaluate their progress as they work together in small groups. Together they may identify difficult concepts, teach one another, and the immediate feedback they receive enhances their understanding (Lin & Rogers, 2010). The nurse educator's presentation also benefits and becomes enriched by the students' feedback concerning which concepts need to be better clarified or reinforced (Lin & Rogers, 2010).

Graham et al. (2001) evaluated four online courses using the “Seven Principles” and found that teachers use either informative feedback or acknowledgement feedback. Informative feedback evaluated student performance and provides an answer to a question or a grade to an assignment. An acknowledgement feedback just lets the sender know that their message has been received. Prompt feedback is more frequent in the beginning of a semester, but as the

semester wears on, responses decreased and took greater amount of time to receive a response (Graham et al., 2001). Detailed personal feedback to each student would be ideal, however, instructors can give feedback to the class as a whole in a discussion, limiting the amount of time required, while still providing an opportunity to address class trends (Graham et al., 2001). In the case of simulation or virtual world experience, students are debriefed. Students share what they saw, how they felt, what went well and areas they need to improve. This discussion reinforces learning, provides collaborative learning and an opportunity to link virtual and real-world practice (Cook, 2011).

5. Time on Task

Time plus energy is necessary for learning; this is the message of the fifth principle according to Chickering and Gamson (1987). Learning takes time so a realistic timeline should be established early within the course (Dreon, 2013; Hutchins, 2003; Jones, 2009). Nursing instructors should prepare students for completing tasks in a timely fashion. Faculty must also set realistic goals, allowing students sufficient time to complete given assignments (Hutchins, 2003).

Taking an online class may allow for greater flexibility, but does not mean there is no time commitment (Dreon, 2013; Koerckeritz et al., 2002). Students that are familiar with web-based online environments tend to spend more time in the course and ultimately have a greater satisfaction (Arbaugh & Hornik, 2006). Bangert and Easterby (2008) found that in an online class where students were given a logon page, then were then directed to a Welcome Page that provided students with links to the syllabus, calendar, learning modules and student-faculty profiles. The results indicated the students found the course user-friendly, they could complete learning tasks efficiently, the course was motivating as it reinforced their learning, and it also

supported students' ability to complete assignments on their own time and place (Bangert & Easterby, 2008).

Time management is a skill many students, and faculty too, could benefit from additional practice (Jones, 2009). Class calendars and friendly reminders by the faculty can assist students to stay on schedule (Koeckeritz et al., 2002). If a guest lecture is coming, that should also be conveyed to the students. If a particularly large or heavily weighted project is coming up, a good nursing instructor will communicate this to students and remind them to get started.

6. Communicate High Expectations

Set high expectations, and students will get more from learning (Jones, 2009; Chickering & Gamson, 1987). Faculty should set high expectations, but this must also be conveyed to the students (Hutchins, 2003; Jones, 2009). Chickering and Gamson believe that if high expectations are set, students will be motivated to perform. Teachers can accomplish this by giving challenging assignments such as having students apply theories to real situations (Graham et al., 2001). Teachers may provide samples or models to exemplify work for students to use as a guide to follow. Also, publicly praising students' work illustrates high expectations (Graham et al., 2001). Setting clear, written expectations for assignments, grading criteria and attendance sets high expectation for the class (Bangert & Easterby, 2008; Koeckeritz et al., 2002). Online courses may increase students' performance through the use of peer review of assignments. By making class assignments visible to other students, peer reviews provide students feedback from their fellow classmates and increases expectations (Arbaugh & Hornik, 2006). Providing students with detailed comments and tips for future learning endeavors also enhances high expectations (Koeckeritz et al., 2002).

7. Respect Diverse Talents and Ways of Learning

Chickering and Gamson's (1987) seventh principle reminds us to respect the diversity of student talents and learning styles (Hutchins, 2003; Koeckeritz et al., 2002). Learning opportunities should be constructed in ways to appeal to a variety of students' learning styles. Offering a variety of teaching styles and assignments permits students to demonstrate their own unique talent that works best for them (Hutchins, 2003). Dreon (2013) recommends that teachers should use a variety of multimedia in delivering content to students. Rather than long papers, consider a lesson delivered on YouTube (<http://www.youtube.com/>), Vimeo (<http://vimeo.com/>), and screen casting tools or have students create a video instead of writing a paper. Graham et al. (2001) evaluated an online course that permitted students to pick a topic of their choice, research the topic and then prepare a presentation and defend the topic according to their current policy. Permitting students to select a topic gave students a voice while encouraging them to express their own ideas (Graham et al., 2001).

Students in Community Colleges and Learning Styles

According to the Alabama Community College System (ACCS), the state of Alabama has twenty-one community colleges. In addition, the ACCS also has 4 technical schools, 1 upper division University, and 1 Military Institute (ACCS, n.d.).

Many community college students may already have jobs and families to support. Many are attending community college to enter the workforce quickly or in effort to have a better life. Some students attend community colleges first to get basic courses completed in small classes at a lower tuition before transferring to a four-year college. The average cost of tuition in community colleges was less than \$4,000 in 2011 (ACCS, n.d.). The average student attending a community college, according to ACCS, is 27 years old. Ninety-five percent are in-state

residents. Nursing students of associate degree programs must comply with the same standards and regulations and successfully complete the National Council Licensure Examination for Registered Nurses (NCLEX-RN) as nurse graduates from BSN programs (Mahaffey, 2002).

The ACCS trains more nurses in the 20 Registered Nursing Programs than any other educational system in Alabama (ACCS, n.d.). One factor that affects the success of the ADN student is the teacher-student relationship. The diversity of students in the ADN programs must be taken into consideration by the faculty when designing a class, including generational differences (Mangold, 2007; Revell & McCurry, 2010). Mangold (2007) identified the average nursing faculty to be 46.5 years, while students were nearly 20 years younger. Many nursing faculty were “baby boomers” born between 1946 and 1960, teaching students born between 1981 and 1999 (Mangold, 2007). Baby boomers were taught by lectures, at a time when not everyone had even a black and white television, and then only received 3 channels. Baby boomers are process-oriented workaholics, needing to know how things work more than the ultimate outcome (Mangold, 2007). Key life experiences are shared by each generation, although baby boomers tend to be very competitive.

Students born in 1982 or later are referred to as millennial students (Revell & McCurry, 2010). Conversely, millennial students are technology experts. Millennial students value the Internet more than television, value doing more than knowing and are prone to manipulate data to gain knowledge. Technology, for millennial, is not optional. Millennial students are accustomed to multiple uses of media simultaneously so they are excellent at multi-tasking. Learning should be fun and interactive. They prefer working in teams with individual feedback, collaborating on a problem by doing and discovery as in the case of simulation (Mangold, 2007; Revell & McCurry, 2010). Nursing faculty must seek ways to include technology in their

teaching styles to meet the needs of the millennial students. Simulations work well for millennial students as simulations are learner-centered and nursing faculty can facilitate the learning experience. Students learn by doing, analyze the effects, synthesize the learning and evaluate the outcomes (Mangold, 2007).

Games and Simulation in Nursing Education

Games are defined as a competition between adversaries with objectives and rules (Graham & Richardson, 2008; Nehring & Lashley, 2009). Games are used in education because they have properties for learning and are an interactive technique that makes learning fun. It also permits the acquisition of knowledge by reviewing information already learned (Graham & Richardson, 2008; Royce & Newton, 2007). Games can stimulate the desire to learn, even if the content tends to be tedious and boring (Baid & Lambert, 2010; Oermann, 2007; Royce & Newton, 2007). Games can encourage group cooperation, development of conflict resolution, and motivate students to practice new skills (Herbert & Lohrmann, 2011). Games can be short and easy to use, or elaborate and intensive. The content to be covered, the time required for the game, and appropriate audience selection will be determined by the game selected (LeCroy, 2006; Oermann, 2007). Educational games, although not intended for introducing new material, may help students learn and review content, and reinforces existing knowledge. Games should only be used for formative evaluation (LeCroy, 2006; Royce & Newton, 2007).

The use of simulation has been used in nursing education since about 1980 (Barber & Norman, 1989). Simulation enables nursing students to experience challenges in patient care that resembles real-world situation (Bambini, Washburn, & Perkins, 2009; Tschannen et al., 2012). Nursing simulation offers nursing students opportunities to practice in safe environments, and to repeat procedures as often as necessary to gain proficiency and

confidence (Baker & Brusco, 2011; Guise, Chambers, & Valimaki, 2012; Tschannen et al., 2012). Simulation improves patient safety, improves clinical judgment, can be used to teach a specific skill, and helps students to apply previously learned knowledge (Baker & Brusco, 2011; Tschannen et al., 2012). According to Barber and Norman (1989), innovative teaching such as with simulation encourages students to be excited and motivated while enjoying the learning experience, although some cite simulation as a fad (Barber & Norman, 1989). Simulation in nursing education has been used to teach clinical judgment skills in areas of cardiac, acute or critical care, orientation and to undergraduate and graduate students (Baker & Brusco, 2011; Guise et al., 2012; Nehring & Lashley, 2009; Tschannen et al., 2012; Smith & Hamilton, 2015).

Advantages of simulation include connecting course objectives to student outcomes, visualizing the clinical effects their actions may have on a patient in a safe environment, and helping nursing students develop critical thinking skills and decision-making skills while developing a sense of confidence in themselves as a nurse (Nehring & Lashley, 2009; Tschannen et al., 2012). Students develop communication skills and work as a team, learning to lead and to follow. The debriefing session occurring immediately following the simulation lab gives students a chance to reflect on their experience and to obtain feedback from classmates and faculty. Immediate feedback on their performance is one of the biggest benefits of simulation for nursing students (Guise et al., 2012). Feedback is necessary as it helps students develop new skills and realize consequences of decision-making (Guise et al., 2012).

The cost of implementing a simulation lab for some colleges may be prohibitive. Mannequins alone, especially high fidelity models, are expensive to purchase and expensive to maintain. Development of scenarios can be time-consuming and often require the use of several faculty members to implement (Guise et al., 2012; Nehring & Lashley, 2009). The number of

students that can participate simultaneously is limited, and some students expressed increased anxiety with this method of teaching (Nehring & Lashley, 2009). Some students are not comfortable with simulation and prefer traditional didactic methods (Royce & Newton, 2007). Nehring and Lashley (2009) reviewed the literature for high-fidelity simulation nursing research studies, examining the use of simulation in nursing education. Overall, research studies revealed that simulation is a beneficial adjunct to nursing education, and students and faculty found high-fidelity patient simulation to be a positive experience (Nehring & Lashley, 2009).

Games and Retention

Games used in nursing education are effective in intensifying retention of information and encourages problem-based learning (Royce & Newton, 2007). One study conducted by Cowen and Tesh, (as cited in Royse & Newton, 2007 p. 265) examined whether knowledge retention improved with lecture and games versus lecture alone. Fifty pediatric nursing students participated and received content regarding congenital heart issues. A pretest and posttest were used to evaluate the results. The pretest scores were not significantly different, but the posttest scores revealed that the students that received a lecture and a game had a 94% knowledge retention compared to 85% for the control group. These results support the use of games as an effective adjunct to traditional education efforts (Royce & Newton, 2007). Aqel and Ahmed (2014) used a pretest-posttest experimental design with a control group to examine high-fidelity simulators on acquisition and retention of CPR skills compared to a control group receiving traditional lecture. The results failed to show any significant difference in knowledge and a drop of knowledge for both groups over time (Aqel & Ahmed, 2014).

Digital Gaming: 3D Technology

Nurse educators have been called to reform nursing education (Ulrich, et al., 2014), and the IOM has called for innovative strategies to be incorporated to meet the need of competencies (Cook, 2012). Students need practice applying knowledge and skills, particularly in preparing for public health disasters and fast-paced environments such as the ED or an intensive care unit (ICU) (Schmidt & Stewart, 2009). One technological approach to help prepare nurses for skills they need in a disaster or critical care environment is through virtual reality simulation (VRS); a multiuser computer-generated virtual environment that allows students the feeling of actually being there in the virtual environment (Ulrich et al., 2014). Virtual reality simulation allows nursing education to bridge theory into practice (Schmidt & Stewart, 2010; Smith & Hamilton, 2015). According to Cook (2012), virtual simulation offers students the opportunities to practice clinical decision making without risk to patient safety before encountering these situations in the real world. Virtual simulations help students link learning processes to outcomes as well as motivate and engage students, and gives them self-confidence (Cook, 2012; Tschannen et al., 2012).

Multiple user virtual environments (MUVES) have been in use since the 1970s, originally in a simple text-base format, and have evolved into a three-dimensional (3D) real-world simulator. MUVES allow multiple students to interact simultaneously with one another (Wang & Burton, 2012). According to Smith and Hamilton (2015), VRS offers supplemental practice time, enhances skills preparedness, and improves skill performance. Several 3D MUVES available have been applied to educational purposes including Active Worlds and AppleEdTech Zone, but the most popular MUVES used in education is SL (Schmidt & Stewart, 2009; Wang & Burton, 2012).

Second Life

Second Life was developed by Linden Labs and launched in June 2003 (Schmidt & Stewart, 2009; Wang & Burton, 2012). A computer-based simulated environment, SL is an open-ended design permitting participants to use tools to create and manipulate their environment. Students in SL create human-like (or other forms) avatars to represent themselves as they move about and manipulate their environment (Schmidt & Stewart, 2012; Wang & Burton, 2012). Users can own property, create buildings, conduct business, and have a currency called Linden\$. Thus, SL permits students to “construct, communicate and collaborate” (Wang & Burton, 2012, p. 359).

Second Life provides students an opportunity to participate in simulation and practice skills by being submerged in a virtual world experience (Baker & Brusco, 2011; Skiba, 2009). Second Life encourages students to role-play, collaborate and interact with fellow classmates and faculty (Skiba, 2009). Second Life, according to Wong and Burton (2012), has become the upcoming technology tool for education. In 2008, there were more than 150 colleges and 13 countries with a presence in SL (Schmidt & Stewart, 2009). Likewise, SL has been used by musicians, artists, and businesses to display their wares, and has attracted nonprofit organizations and government agencies as well (Baker & Brusco, 2011; Schmidt & Stewart, 2010). According to Baker and Brusco (2011), SL has been used for competency training, patient assessment, equipment training and nursing students can even learn how to scrub in for surgery. Communication through the use of avatars and interactive 3D environments increases social presence, enhancing communication and cooperation among the users (Greiner, et al., 2014; Tschannen et al., 2012). The study conducted by Greiner, Caravella and Roth (2014) examined whether avatar communication was as effective as face-to-face communication. Their findings

reveal that social interactions in SL are more cooperative than in the real world when there is no communication. They suggest perhaps more cooperative people are using virtual worlds or that the exciting environment may make users more cooperative, and the high level of cooperativeness reduces the need for avatar-to-avatar interaction, reducing the social distance (Greiner, et al., 2014). Three key benefits to using SL in nursing education according to Tschamenn et al. (2012) include: nursing students may complete tasks otherwise unable to do so in real life due to cost or distance; SL permits growing social interaction as a foundation for collaborative education; and SL as a teaching medium can be adapted and changed to meet the learning needs of the students.

Social Presence

As the number of online courses available for students continues to grow, educators continue to focus their attention on outcomes and satisfaction (Cobb, 2009). Students view virtual world learning activities as enjoyable and beneficial, and report feeling immersed in virtual classrooms (Richardson & Swan, 2003; Swan & Shih, 2005). Richardson and Swan (2003) described student satisfaction associated with teacher presence and learning. According to De Gagne, Oh, Kang, Vorderstrasse and Johnson (2013), students demonstrate greater interest and motivation following a virtual class. Simulated 3D virtual learning environments permit students to see and interact with one another through avatars, creating a sense of group presence and group learning (Franceschi & Zanakis, 2009) and critical to learning (Richardson & Swan, 2003). Swan and Shih described a correlation between increased social presence and higher levels of student satisfaction, motivation and attention (De Gagne, et al., 2013).

Short, Williams, and Christie (1976) first described the theory of social presence in 1976 in the field of telecommunications to describe the effects of face-to-face communication with

various forms of communication (as cited in Sung and Mayer, 2012, p. 1739). Short et al. (1976) defined social presence as “the degree of salience of the other person in the interaction and the consequent salience of the interpersonal relationship” (as cited in Sung and Mayer, 2012, p. 1739). Sung and Mayer (2012, p. 1739) defined social presence as “the degree to which a person is identified as being real in a particular communication medium, and the medium further influences intimacy and immediacy and how personally others interact.” Several studies demonstrate that intimacy and immediacy are two components that can predict a student’s learning. Intimacy relates to nonverbal cues such as eye contact, smiling, physical distance and the personal topic of discussion, whereas immediacy refers to the psychological distance between the one doing the communicating and the one receiving the information. Immediacy includes both verbal and nonverbal cues (Sung & Mayer, 2012). In their study, Sung and Mayer (2012) studied the social and affective facets of online learning and redefined social presence to mean the student’s perception of being connected in an online learning environment (Sung & Mayer, 2012). Social presence is the degree students feel connected to their fellow students and the teacher in a 3D virtual learning environment (Sung & Mayer, 2012). Students report feeling as though they are “there”, interacting with real persons while in a 3D environment (Sung & Mayer, 2012). Social presence can affect student interaction, learning, student satisfaction, and creates a sense of a learning community (Sung & Mayer, 2012).

Sung and Mayer (2012) further identified five strategies to increase social presence in online learning in their study: social respect, social sharing, open mind, social identity and intimacy. First, the online instructors must make students feel encouraged to communicate, that their comments are valuable, give a timely response, and use humor to encourage social presence. Second, sharing personal information such as beliefs, professional interests, and

professional work helps to build relationships between faculty and students. Third, faculty must create a congenial environment so students feel comfortable and free to share their ideas and feedback. Open mindedness promotes intimacy and trust, encouraging social presence. Next, identity can be difficult to recognize online. Students can feel unrecognized and isolated, and loose connection to the class. Using the students' names not only increases their sense of belonging, but also may increase participation. Lastly, sharing professional experiences and stories helps students connect as humans, and allows them opportunities to share their experiences in a comfortable environment. Incorporating the five factors of online social presence can contribute to the enhancement of the students' sense of belonging and social presence (Sung & Mayer, 2012).

Application to Practice

An adult is unintentionally poisoned every 39 seconds in this country, and unintentional poisonings continue to be a significant public health concern in the U.S. (HRSA, 2009). Health Resources and Services Administration (HRSA) regards PCs as the nation's primary defense against injury and death from poisonings (HRSA, 2009). The role of the PC educator is to improve patient care and to monitor outcomes (IOM, 2004). Education efforts on the part of the PC can increase awareness of the PCs' responsibility for patient care, and address issues pertaining to the Health Insurance Portability and Accountability Act of 1996 (HIPAA). The PCs are part of the health care team, relying on the cooperation of hospital nurses to obtain necessary information such as laboratory results and vital signs. This information is collected not only for the current patient, but it may help best practice for the next patient that is poisoned as well (Sonier & Cole, 2005). One PC nurse with previous ED and ICU experience describes hospital nurses as being unaware of what PC nurses do and the role PCs play in patient care

(Badillo, 2009). Not knowing the role Poison Information Specialists play, as members of the healthcare team, creates difficulty in obtaining follow-up information on poisoned patients. Hospital nurses may lack understanding of what PCs do and that they are in the network of health care providers that follow HIPAA regulations. The IOM established ten essential services of poison centers, including assuring the competency of the public health and healthcare workforce (IOM, 2004, p 10). The IOM recommended that PCs collaborate with other healthcare agencies to promote poison prevention and increase awareness of PC services (IOM, 2004). Educating healthcare professionals of PC resources is essential, and may be most effectively achieved by increasing awareness of the PC role and what they do in relation to other health care professionals (Badillo, 2009). Likewise, the IOM's 2003 report *Health Professions Education: A Bridge to Quality* identifies that the healthcare providers must deliver patient-centered care as members of an interdisciplinary team to positively impact patient care (Ainsley & Brown, 2009).

New ADN graduates are commonly confronted with knowing the poisoned patients' needs (Gaberson & Oermann, 2010). Even if the new ADN graduate has had previous clinical experience or a preceptorship in acute or critical care, according to Gaberson and Oermann (2010), new graduate students describe feeling ill-prepared and lack critical skills necessary to perform proficient patient care (Guisse et al., 2012; Oermann, et al., 2013). Studies indicate it can take 9 months to several years for graduating students to develop self-confidence in their abilities. Programs have been designed to help new graduates ease into clinical practice such as extended orientation, nurse residencies, and mentoring.

The goal of the researcher is to create a virtual poison center to familiarize nursing students with the essential services PCs may provide and the poison information specialist who

can facilitate nursing interventions. Nurses as poison information specialists (SPI), is a sub-specialty that many nursing students are not exposed. Exposure to this area may encourage the next generation of nurses to feel comfortable and utilize the PC. The PC SPIs are an excellent resource for consulting and mentoring new ADN graduates. Students exposed to the availability of the PC as a resource are more inclined to use them for support as registered nurses.

Summary

To summarize, the Constructivist model is based on the principle that faculty are facilitators to create educational learning opportunities that support students while they actively develop knowledge and meaning based on new knowledge built on previous experiences. Learning occurs when students synthesize information, linking concepts and learn to think critically (Brandon & All, 2010; Phillips, 2005). Experience, or doing, is not enough for learning to occur. Students must reflect on the experiences, formulate concepts based on reasoning experiences, and apply to future situations (Rivas & Murray, 2010). Chickering and Gamson (1987), wrote *Seven Principles for Good Practice in Undergraduate Education* that identifies seven principles of effective teaching: 1) encouraging contact between faculty and students, 2) cooperation among students, 3) active learning, 4) prompt feedback, 5) time on task, 6) high expectations and 7) respect for diverse talent and ways of thinking. The IOM charged poison centers of assuring the competency of the public health and healthcare workforce (IOM, 2004, p. 10), and healthcare providers to provide patient-centered care as interdisciplinary team members. Green's Synergy Model of Nursing Education aligns with this theory as it considers the relationships of the student, faculty, and external influences or systems (Stanley & Dougherty, 2010). In a student-centered model, competencies of both students and faculty create learning outcomes for students and teachers alike to achieve common goals (Stanley & Dougherty, 2010).

Nurse educators have been called to reform nursing education (Ulrich, et al., 2014) and the IOM has called for innovative strategies to be incorporated to meet the need of competencies (Cook, 2012). Students need practice applying knowledge and skills, and new graduate students often feel ill prepared and lacking skills necessary to perform proficient patient care (Guise et al., 2012; Oermann, et al., 2013).

One technological approach to help nursing students develop skills they need in a critical care environment is through virtual reality simulation (VRS); a 3D multiuser computer-generated virtual environment that allows students the feeling of actually being there in a virtual environment (Ulrich et al., 2014). Virtual reality simulation helps to bridge nursing theory into clinical practice (Schmidt & Stewart, 2010; Smith & Hamilton, 2015). Virtual simulation offers students the opportunity to practice clinical decision making without risking patient safety (Cook, 2012). Virtual simulations help students link learning processes to outcomes. They also motivate, engage students and promote self-confidence (Cook, 2012; Tschannen et al., 2012). Simulated 3D virtual learning environments permit students to see and interact with one another through avatars, creating a sense of group presence and group learning (Franceschi & Zanakis, 2009) and critical to learning (Richardson & Swan, 2003). With more than 2.2 million unintentional poison emergencies reported to PC in the U.S. each year, this area of nursing will not soon go away. Poison centers will need dedicated nurses to help meet the staffing needs and to be properly prepared and proficient in public health and hazardous materials training. Nurses in the ED and critical areas must be ready to call the PC for advice on snakebites, carbon monoxide exposures, hydrogen fluoride and countless other chemicals and pharmaceuticals. Learning takes time. The Vygotsky Framework can help nursing students move from the low end of understanding of the PC through the ZPD to a higher level of understanding. Nurse

educators may invite PC educators as guest experts or they may incorporate the Virtual PC through SL for a clinical experience to learn about the PC and its resources. Implementing the MKO will facilitate nursing students to gain this knowledge. And finally, Chickering and Gamson's Seven Principles are essential for the delivery of a quality 3D clinical experience.

CHAPTER III

RESEARCH METHODOLOGY

The purpose of this experiential study is to evaluate the effectiveness of a virtual (world) poison center clinical experience on the knowledge of the PC among ADN students as evidenced by their increased posttest scores versus a control group taught by the traditional method of classroom lecture. It is also imperative to assess if students in the two groups know when to call the poison center and what patient information will be needed when talking with the SPI. This knowledge may directly impact acquisition of timely recommendations for patient management and ultimately affect patient outcomes. This chapter outlines the process the researcher used to determine if a differences exist between ADN students taught using an interactive virtual world technology compared to ADN students taught the identical content through traditional lecture. This chapter describes the methodology for conducting this research study. The research design, study sample, setting, recruitment and procedures, obtaining consent, the intervention and process for data collection and instrumentation are discussed.

Research Design

This research study was a quasi-experimental, two-group pretest-posttest, longitudinal research design consisting of one experimental group and one control group. A control group was used to strengthen the study internal validity (Polit & Beck, 2008). Students attending the virtual poison center clinical experience are the independent variable in this research study. Students receiving the traditional lecture are the control group and the dependent variable. The study was designed to examine whether interactive teaching with the use of virtual technology

such as SL is more effective than traditional lecture as a teaching strategy on ADN students' knowledge of the poison center. A 25-item multiple-choice test on PC was developed by the researcher as the instrument used in this study. Instrumentation threat did not exist in this study as the pretest and posttests were identical tests (Polit & Beck, 2008). All students in each Nursing Through the Lifespan III ($N= 77$) were given the pretest to determine prior knowledge and experience the students may have had with a poison center before the lecture on the management of the poisoned patient. An identical posttest was administered immediately following the presentations in each group to determine whether a difference in ADN students' knowledge of poison centers develops as a result of the presentation. To measure retention of knowledge following the presentation, identical posttests were given again to each group (longitudinal) 90 days later (90-day posttest). To increase reliability and validity, the researcher presented the presentations to both the experimental and control groups (Polit & Beck, 2008).

Setting

The setting for this study is one of the community colleges authorized by the Alabama legislature in 1963. This particular community college was created by consolidating a technical school in 1992, merging a junior college in 1993, before adding two community colleges in 1998 to complete the 4 campuses. The Southern Association of College and Schools Commission on Colleges accredited this community college to award associate degrees. The associate degree-nursing program has continued accreditation by the Accreditation Committee for Education in Nursing, Inc.

The study was conducted in a local ADN program Nursing Through the Lifespan III classes during the spring semester of 2016. The researcher presented identical 50-minute class presentations to each group concerning the dangers of poisons, how and when to call the PC for

help. Students in the control group received a 50-minute class presentation (the dependent variable) without an interactive intervention and no additional learning opportunities were made available. The pretest and posttest was the traditional pen and paper method administered immediately before and after the presentation.

Students in the experimental group received the intervention consisting of developing an avatar in the computer lab, and then the students attended “class” in the virtual poison center. The implementation of this study was in the form of the researcher being a guest lecturer on the subject of PCs. The expectations of the unit on poisons were shared with students in the course objectives for that day. Students participating in the experimental group were made aware that they were permitted to create any avatar they desired as long as it was in keeping with the school’s dress code.

Participation in the virtual PC for the 50-minute presentation was done with the use of SL. Students had the option of reviewing poison case studies. The students also had the ability to visit a virtual PC and get additional caveats from the PC nursing staff. This was the independent variable. The posttest was constructed to be available in the virtual PC.

Population and Sample

Convenience samples of 77 nursing students enrolled in Nursing Through the Lifespan III at a local ADN nursing program in Alabama and were invited to participate in the study. Convenience sampling is a traditional method used in recruiting students as subjects because they are readily available and it is appropriate for homogeneous populations (Polit & Beck, 2008). Pre and posttests were collected from all consenting students.

A power analysis was used to reduce the risk of a Type II error and determine the number of students necessary in the sample to detect an effect in this study. Based on a G-Power

Analysis with the power set at .95 with an α set at .05, it is estimated that a sample size of 35 students willing to participate in the experimental group and 35 students in the control group would be necessary. The overall sample size of $N = 77$ students, $n = 41$ in the control group and $n = 36$ students in the experimental group met the sample size criteria.

To be included in the study, students had to be enrolled in Nursing Through the Lifespan III during the spring semester 2016. Included students had to have submitted written informed consent, and had to complete the pretest, posttest and 90-day follow-up (90-day FU). Exclusion criteria included students declining to sign the consent form or complete the demographic survey (see Appendix C). Also excluded were students in the experimental group absent from class on the day of the intervention. Four students were absent on the day of the intervention and were unable to complete the study, so the experimental group size became $n = 32$ students. The overall sample size was reduced to $N = 73$. If any student had later asked to be dropped from the study and not participate, their scores would have been excluded. No students asked to drop from the study. The population was homogenous as they shared similar communities and demographics.

Recruitment and Procedure

The researcher was granted approval from the IRB at The University of Alabama where the researcher was enrolled in the doctoral program. An IRB approval was then granted by the community college where the study took place (see Appendix E). Approval to conduct the study with community college students enrolled in Nursing Through the Lifespan III was obtained from the program coordinator. A meeting was scheduled with the program director and faculty members teaching the Nursing Through the Lifespan III classes at the Community College ADN programs prior to the 2016 spring semester. Permission to present the unit on management of

the poisoned patient was obtained. Dates were scheduled to approach students in the class to explain the purpose of the study and to obtain signed consent forms (see Appendix B).

On the initial meeting with students of the control group and the experimental group, potential students were given a written description of the study. The researcher read a recruitment script to the students (see Appendix A). The researcher reviewed the Informed Consent Non Medical Study with the students, describing the purpose of the study, the amount of time required, cost and compensation, risks, benefits and confidentiality. Participants' rights and contact information of the researcher and Research Compliance Officer at The University of Alabama were also provided. Students were informed their participation was voluntary. Students received the consent forms and were asked to provide the last 4 digits of their student number for identification.

Protection of Human Subjects

Institutional Review Board (IRB) approval was obtained from the university where the researcher is a doctoral student for an expedited review due to perceived minimal risk to the students. Students received written and verbal explanations of the study and were invited to participate in the study. Written informed consent forms and demographic data were obtained from each student. Students were assured that participation was completely voluntary and would in no way affect their grades. All data collected is kept confidential and maintained by the researcher in a locked file for 3 years. All data obtained for this study will be destroyed upon completion of the study.

Intervention

Control Group

To ensure that the lecture was identical for both groups, the researcher delivered the presentations to the experimental and control groups. On the day of the regularly scheduled class, the researcher presented the lecture on the management of the poisoned patient to the control group utilizing PowerPoint slides. Students were asked not to interrupt the lecture or ask questions until the end of the presentation. They were given index cards prior to the presentation to jot down their questions or comments, to be addressed after the posttest. This was done to maintain consistency between the control group and the experimental group. Questions and clarifications were provided to the control group after the presentation and posttest. The lecture lasted approximately 50 minutes. The control group received only the lecture followed by the written posttest. Scores obtained from the pretests and posttests will not influence their course grades.

Experimental Group

After an explanation of the study and obtaining demographic information and consent to participate in the study during the regularly scheduled time in class, the experimental group then moved to the computer lab for development of their avatars. The instructions of how to access the virtual poison center in SL were typed up and handed out to the students. During the next class, 2 days later, students attended the lecture in the 3D virtual PC. The posttest was completed immediately following class and included questions that addressed the principles discussed in the lecture. The posttest was identical to the posttest used with the control group (see Appendix D). Students had additional access to real-life case scenarios (see Appendix F). Each scenario offered treatment options, allowing ADN students an opportunity to experience

caring for a poisoned patient from the 3D virtual critical care area. The scenarios were optional. Students also had access to visit the SPIs in the 3D virtual PC where they learned additional caveats from the experts about managing a poisoned patient (see Appendix G).

Instrumentation

Identical multiple-choice pretest, posttest, and a 90-day FU test (see Appendix D) were used to collect student data. A valid tool did not exist in the literature for measuring ADN nursing students' learning outcomes involving the care of the poisoned patient, so the researcher developed a 25-item multiple-choice question pretest, posttest, and 90-day FU.

Instrument Development

The test questions were designed to test the students' understanding of key concepts identified in the learning objectives and the student's ability to recall facts about managing a poisoned patient. The researcher identified learning objectives and constructs for the PC presentation. Next, the researcher developed a 30-item multiple-choice test to be used as the tool for the pretest, posttest and 90-day FU utilizing the Content Validity Index (CVI). A panel of 5 PC educators, considered poison center educator experts in nursing, public health and pharmacy, were selected by the researcher to review the set of learning objectives, constructs and a set of 30 questions.

Each expert was asked to rate each item on a 4-point Likert scale according to the relevancy of the question as either: not relevant, somewhat relevant, quite relevant, or highly relevant (Polit, Beck & Owen, 2007). The questions scoring either a 3 or 4 divided by the number of experts yielded the item content validity (I-CVI). The I-CVI demonstrates the degree of consensus among experts regarding relevancy for each question. Using 6 experts, the score must be .83 to reflect consensual agreement. Scale-level content validity (S-CVI/Ave) was

determined by averaging the I-CVI across all thirty question items and retaining only those items (questions) scoring .90 or higher by the content experts (Polit, Beck & Owen, 2007). The goal was to reduce the test from thirty to twenty questions using this method. Only 5 questions scored less than .90 so the pretest, posttest and 90-day FU was modified to include the twenty-five questions that had identical scores.

The Survey Validation Rubric for Expert Panel (VREP) (Simon & White, 2013) was included in the CVI materials sent to the expert panel as this tool asks them to consider face and construct validity in addition to content validity. The face validity asks the experts to examine the appearance, such as: is it well designed and does it look as though it will work reliably? Additionally, VREP checks for question clarity, wordiness, negative wording, overlapping responses, balance, jargon, appropriateness, technical language, application to praxis, and relationship to the problem (see Appendix H). Construct validity looks for agreement between concept theory and the tool measuring the identified constructs. The expert panel was asked to critique each construct identified in the presentation using the VREP on a Likert Scale.

The content validity is measured by experts in the field and examines if the tool actually measures the identified content as described in the objectives and constructs. Instrument validity is used to check accuracy of the tool compared to already existing tools or instruments. After searching for such an evaluative tool in the literature and surveying all PC educators in the U.S., it was determined this instrument needed to be created. According to Simon and White (2013, "Types of Validity", para 4), "If after an extensive search of the literature, such an instrument is *not* found, then the instrument that meets the other measures of validity are used to provide criterion related validity for future instruments". The initial responses from the experts provided many suggestions in wording, stem of questions, and the fact only nurses were discussed in the

presentation when actually SPIs are also pharmacists and doctors. Their scores were generous as though they thought they were helping the researcher to look good. According to Polit and Beck (2008), the first CVI round should focus on items and a balance in constructs, hence I-CVI or item content validity. An I-CVI score in this study was .84; indicating items were highly relevant (Polit & Beck, 2007). A second CVI round was conducted using 3 of the previous experts, using the more competent judges and eliminating those with incongruent responses from the others. The second CVI round examined the relevance of the revised set of questions and calculation of the S-CVI was computed. A minimum of .8 is necessary as a lower limit (Polit & Beck, 2008). The S-CVI/Ave must be at least .9, whereas this test scored .99, which is important to the study because it gives information as to how each item will perform. As a result of this process, final revisions were made to the multiple-choice instrument.

Final Instrument

The final pretest and posttests contained 25 multiple-choice questions, each was worth 4 points for a correct answer and a zero for an incorrect or absent answer, with a possible score range of 0 to 100. The pretest, posttest and 90-day FU contained identical questions and were administered to both the experimental and control groups (see Appendix D). Multiple-choice question, National Research Council (NRC) are used to advance student understanding of complex content (2000). Exposing students to the PC followed by multiple-choice questions, students may better grasp key principles, visualize and verbalize their understanding of how they could use the PC as nurses (NRC, 2000). An instrument threat did not exist in this study because identical questions were used for the pretest, posttest and 90-day FU (Polit & Beck, 2008). Ninety days was selected as the time between posttest and the 90-day posttest to measure knowledge retention. According to Polit and Beck (2008), studies have shown a high correlation

in test scores when little time has elapsed, and lower correlation as time elapses. Instrument reliability was measured as .83 using Cronbach's alpha. The 25-item multiple-choice pretest and posttests is in Appendix D.

Data Analysis

The results of the pretest, posttest and 90-day FU data from the experimental and control groups were entered into the Statistical Package for Social Sciences (SPSS) for analysis. Descriptive statistics using the means and standard deviations were calculated on the test scores for differences in pretest, posttest scores and the 90-day FU scores. An analysis was done using independent sample *t*-tests to compare the experimental and control groups. Paired *t*-tests were performed to compare pretest to posttest within groups. The level of statistical significance was set at $p < .05$.

Summary

Chapter 3 discusses the study's research design, setting, population and sample size, recruitment, data collection, and data analysis. A pretest and posttest design with a comparison group research model framework was used. This study compares the outcomes between two groups of ADN nursing students taking the same class. The experimental group experienced the same content via SL as the control group that received the traditional classroom lecture and posttest. The control group and the experimental group received 90-day FU to measure retention of the poison management material.

CHAPTER IV

RESULTS

This chapter provides a description of the samples, the pretest, posttest and 90-day posttest scores (90-day FU). Demographic, descriptive and inferential statistics are provided. Inferential statistics involved using independent and paired *t*-tests. This chapter presents the results and the analysis of data obtained. A description of the demographic characteristics of all participants is presented, followed by an explanation of each research question with corresponding data analysis.

Demographic Data

The study used a convenience sample of ADN students enrolled in Nursing Through the Lifespan III at an Alabama community college housed on two campuses. Based on power analysis, the study needed to recruit a total of 70 students. Seventy-eight students volunteered to participate and were enrolled in the study. There were 41 students in the control group, and 36 in the experimental group. Four students from the experimental group were excluded from the research study, as they were absent from class on the day of the experiment. Thus, 32 students remained in the experimental group. All 41 students in the control group participated in the study.

The demographic survey (see Appendix C) was collected during the initial meeting on the same day that written informed consent was obtained (see Appendix B). The sample consisted of 66 (90.4 %) females and 7 (9.6 %) males. A chi-square test was performed and showed there was no statistical difference between groups, $X^2(1, N = 73) = .557, p = .456$. The

age of the students ranged from aged 19 - 50, most were between 19 - 30 years of age. None of the students were < 19 years of age. Twenty-one students were aged 26 - 30 (28.8 %). Nineteen students were aged 19 - 21 (26 %) and 18 students were aged 22 - 25 (24.7 %). There was a difference in the ages of students between the control and experimental group, $X^2(6, N = 73) = 12.994, p = .044$. Sixty-two (84.9 %) students identified themselves as Caucasian and 11 (15.1%) as African American. None of the students identified themselves as Hispanic, Asian American or any other ethnicity. There was no statistical differences in ethnicity between groups, $X^2 = (1, N = 73), = .294, p = .588$. The educational background of the students varied. Forty-six (63 %) were high school graduates, 9 (12.3 %) had earned a certificate in another field, 12 (16.4 %) had earned an associate degree in another field, and 5 (6.8 %) had earned a baccalaureate degree in another field. One student left the field blank. None of the students had earned a master's degree. Employment status revealed that 35 (47.9 %) worked part-time, 9 (12.3 %) worked full-time and 28 (38.4 %) reported they were not employed. One student left this field blank. There was no statistical difference in education, $X^2 = (4, N = 73) = 8.213, p = .084$. The student's characteristics are noted in Table 2.

Table 2
Student Characteristics

Demographics		N	%
Gender	Male	7	9.6
	Female	66	90.4
Age	19-21	19	26
	22-25	18	24.7
	26-30	21	28.8
	31-35	7	9.6
	36-40	5	6.8
	41-45	2	2.7
	46-50	1	1.4

Ethnicity	African American	11	15.1
	Caucasian	62	84.9
Education	No Answer	1	1.4
	High School	46	63.0
	Certificate – Other	9	12.3
	Associate Degree – Other	12	16.4
	Bachelors – Other	5	6.8
Employment	Part Time	35	47.9
	Full Time	9	12.3
	Not Employed	28	38.4
	No Answer	1	1.4

N=73

Data Analysis

Students volunteering to participate in this research study were administered a pretest to determine prior knowledge of services the poison center offers, how to access the poison center and basic poisoned patient management. The intent was to verify that participants both reported similarities between experimental and control group. The 41 students in the control group ($n = 41$) and 32 students of the experimental group ($n = 32$) completed identical pretests. All 41 students of the control group and 32 students of the experimental group ($N = 73$) completed an identical posttest immediately following the intervention.

Research Question 1: What effect does traditional lecture have compared to a 3D virtual reality interaction on the knowledge of poisoned patient management among ADN students on pretest and posttest scores?

Initially, comparisons were made using an independent t -test at the start of the study to determine if there were any pre-intervention differences between participants in the control group and the experimental group pretest scores. The independent t -test was $t = -1.593$ ($df = 71$)

and $p = 0.116$. The pretest scores for both groups showed no statistical difference between the groups at the start of the study in terms of their knowledge of the poison center. The data were entered into SPSS for statistical analysis. All tests were conducted with $\alpha = .05$. The results are indicated in Table 3.1.

Table 3.1

Independent t-test for Pre-Intervention Between Control and Experimental Group Pretest

Pretest	<i>t</i>	<i>Df</i>	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Control	-1.593	71	0.116	-2.631	1.652
Experimental	-1.570	62.673	0.121	-2.631	1.676

$N = 73$

Table 3.2 identifies the group pretest means and standard deviation between the control group and experimental group.

Table 3.2

Means and Standard Deviations for Control and Experimental Groups Pretest

Group	<i>N</i>	<i>M</i>	<i>SD</i>
Pretest Control	41	70.24	6.636
Pretest Experimental	32	72.88	7.448

$N = 73$

Next, to test for differences in knowledge between the control group and the experimental group, independent *t*-tests were conducted to compare pretest to posttest scores. The independent *t*-test was $t = 1.149$ ($df = 71$) and $p = .254$. The posttest scores in the control group and the experimental group statistically improved as noted in Table 4.1.

Table 4.1

Independent t-test Between Control and Experimental Groups Posttest Scores

Posttest	<i>t</i>	<i>Df</i>	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Control	1.149	71	0.254	1.646	1.433
Experimental	1.102	53.591	0.275	1.646	1.494

N = 73

Table 4.2 identifies the group pretest means and standard deviation between the control group and experimental group.

Table 4.2

Means and Standard Deviations Between Control and Experimental Groups Pretest to Posttest

Between Groups	<i>N</i>	<i>M</i>	<i>SD</i>
Pretest	41	71.40	7.076
Posttest	32	87.42	6.087

N = 73

Research Question 2: What effect does experiencing a traditional lecture (control group) have on the knowledge of poisoned patient management among ADN students on pretest and posttest scores?

When comparing differences within the control group, the pretest to posttest scores was significant indicating the traditional lecture had a significant effect as noted in Table 5.

Table 5

Means and Standard Deviations for Control Group Pretest to Posttest

Control Group	<i>M</i>	<i>n</i>	<i>SD</i>
Pretest	70.24	41	6.636
Posttest	88.15	41	5.067

n = 41

The pretest means was 70.24 and the posttest was 88.15. The control group showed a significant improvement. Paired *t*-test was performed to measure if there was a statistical difference in the control group between the pretest to posttest. The control group showed significant improvement $t = -14.285$, ($df = 40$) with $p = .000$ as Table 6 demonstrates.

Table 6

Paired t-test Control Group Pretest to Posttest

Control Group	<i>t</i>	<i>Df</i>	Sig. (2-tailed)
	-14.285	40	.000

n = 41

Research Question 3: Do participants in the control group that received the traditional lecture retain knowledge of poisoned patient management after 90 days?

The participants in the control group did not retain the material after 90 days. The scores went down from posttest to 90-day FU. The results are indicated below in Table 7.

Table 7

Means and Standard Deviations for Control Group Posttest to 90-day Follow-up

Control Group	<i>M</i>	<i>n</i>	<i>SD</i>
Posttest	88.15	41	5.067
90-day FU	81.07	41	9.253

n = 41

A paired *t*-test was performed to measure the statistical difference between the posttest to 90-day FU and shows $t = 5.508$, ($df = 40$), and $p = .000$ as indicated in Table 8.

Table 8

Paired t-test for Control Group Posttest to 90-day Follow-up

Control Group		
<i>t</i>	<i>Df</i>	Sig. (2-tailed)
5.508	40	.000

n = 41

Research Question 4: Does a 3D virtual reality clinical experience impact the results between pretest and posttest scores among ADN students?

There was a significant difference in the pretest to posttest scores in the experimental group. The mean score on the pretest was 72.88 compared to 86.50 on the posttest as indicated in Table 9.

Table 9

Means and Standard Deviations for Experimental Group Pretest to Posttest

Experimental Group	<i>M</i>	<i>n</i>	<i>SD</i>
Pretest	72.88	32	7.448
Posttest	86.50	32	7.166

n = 32

A paired *t*-test was performed to determine statistical difference in the experimental group from the pretest to posttest. The comparison between the pretest to posttest scores for the experimental group showed a significant difference. The results were $t = -12.495$, ($df = 31$), $p = .000$ are indicated below in Table 10.

Table 10

Paired t-test for Experimental Group Pretest to Posttest

Experimental Group		
<i>t</i>	<i>Df</i>	Sig. (2-tailed)
-12.495	31	.000

n = 32

Research Question 5: Is there a difference in retention of poisoned patient management material from the posttest to the 90-day FU in the experimental group receiving the 3D virtual reality clinical experience?

The experimental group did not retain the material from the posttest score to the 90-day posttest. The mean posttest score was 86.5 and the 90-day FU was 79.38 as described in Table 11.

Table 11

Means and Standard Deviations for Experimental Group Posttest to 90-day Follow-up

Experimental Group	<i>M</i>	<i>n</i>	<i>SD</i>
Posttest	86.50	32	7.166
90-day FU	79.38	32	8.864

n = 32

A paired *t*-test was performed to measure statistical difference in the experimental group between the posttest to 90-day FU. The scores revealed a $t = 3.914$, ($df = 31$), $p = .000$. These results indicate the scores went down after 90 days. The results are indicated below in Table 12.

Table 12

Paired t-test for Experimental Group Posttest to 90 day Follow-up

Experimental Group	<i>t</i>	<i>Df</i>	Sig. (2-tailed)
	3.914	31	.000

n = 32

Summary

The researcher addressed five research questions in this study. Demographic information of the study participants was described. Data were collected and analyzed for the purpose of investigating if a clinical experience using 3D virtual technology compared to traditional lecture

improves knowledge and retention of poisoned patient management among ADN students. The statistical significance of the research questions in this study was interpreted using independent *t*-test to define the mean scores and the standard deviations and the appropriate inferential statistics for each hypothesis. Paired *t*-tests were conducted on the control and experimental groups. Paired dependent *t*-tests were used to compare the means between 2 related groups on the same dependent variable as they are related, and this method is often used in pretest and posttests. The discussion of the research findings, implications and recommendations for future studies will be covered in Chapter V.

There were no significant differences in pretest scores between the control and experimental group indicating there were no pre-intervention differences between the groups. The between group differences for pretest ($M = 70.41$) to posttest ($M = 87.42$) scores were up significantly and showed significant improvement.

In this longitudinal study, a 90-day FU test, identical to the posttest, was administered to both the control group and the experimental group 90 days following the traditional lecture (control) or 3D intervention (experimental) to identify retention of the presented content. The control group did not retain the material after 90-days. The experimental group showed a significant difference between the pretest and posttest but did not retain the material on the 90-day posttest.

CHAPTER V

DISCUSSION OF RESEARCH RESULTS

This study was designed to determine if an exposure to instruction could prepare nursing students to be knowledgeable of the PC resources when providing care to poisoned patients. The purpose of this study was to determine if a clinical experience using the 3D virtual technology with SL as an interactive teaching method would improve students' knowledge on posttest scores and enhance knowledge of benefits of the PC on the 90-day FU scores compared to scores of students receiving the traditional lecture. A quasi-experimental research design was used to test the effect of a virtual clinical experience in SL on the students' level of knowledge. An independent and paired *t*-tests were used for statistical analysis. Whereas the results of this study were presented in Chapter IV, this chapter presents a discussion of the major research findings, study limitations, suggested recommendations for future nursing research and conclusions.

Major Findings

Research Question: Does a clinical experience in 3D virtual technology (SL) as an interactive teaching method improve knowledge on posttest scores and enhance retention of poisoned patient management on the 90-day FU scores among ADN students?

A pretest at the beginning of the study was used to compare the control group with the experimental group for any previous knowledge and experience differences that could bias the results. The results showed there was no statistical difference in students' knowledge of the poisoned patient and the PC as a resource at the start of the study regardless of which group they were in. Additional information on the demographic survey, such as what certificates or

previous careers students have had, might have revealed there were paramedics in the control group that were returning to school to become nurses, however this had no effect on the results.

A 3D virtual PC was created as an interactive clinical environment to teach ADN students the services PCs provide and what to expect when calling the PC. The literature review indicated that when interactive learning technologies such as field trips, guest speakers, role-playing and SL were incorporated in a course, it improved student engagement, promoted deep learning and decision-making skills (Chickering & Gamson, 1987; Dreon, 2013; Robinson & Kakela, 2006; Ostorga & Farriggio, 2013; Stanley & Dougherty, 2010; Wolfe, 2006). This study was consistent with the findings in the literature. Independent *t*-tests were performed to determine the effectiveness of a 3D virtual reality clinical experience on the knowledge of poisoned patient management, and results showed the experimental group did have statistically significant differences from the pretest to the posttest. Likewise, the control group taught by a traditional guest lecture using PowerPoint slides also showed significant improvement from the pretest to posttest scores. Mean scores of both groups significantly improved, which is consistent with other results in the literature. Royce and Newton (2007) stated that improved posttest scores indicate the students achieved the objectives, and in this study, learning about the PC had occurred.

A key component of this study was to determine if 3D virtual technology would improve retention of knowledge of poisoned patient management compared to traditional lecture. Retention was measured by retesting the same students with a second identical posttest approximately 90-days following the first posttest. The control groups' mean retention scores dropped approximately 7 points, indicating the students did not retain the information for 90

days. The students' mean retention scores of the experimental group also dropped approximately 7 points, indicating they did not retain information from the posttest to the 90-day FU either.

Many studies have hailed SL as the technology of the future as it promotes construct, communication and collaboration among students, and avatars decrease the sense of social isolation (Cook, 2012; De Gagne et al., 2013; Skiba, 2009; Wang et al., 2013). Wang and Burton (2013) reviewed the literature for published studies using SL in education from 2006 to 2011. They reviewed over 100 peer-reviewed papers and analyzed 50 studies that met the criteria. The study revealed SL is no longer a new technology in education, and actually found the use of SL peaked in 2009 in the literature (Wang et al., 2013). Second Life is used mainly among college courses in subjects such as languages, computer, business, hospitality and tourism. Many medical and nursing articles in the literature describe SL (Baker & Brusco, 2011; Cook, 2012; Skiba, 2007, 2009). Students can learn by playing games and simulation in SL (Cook, 2012). Ulrich et al. (2014) used an alternative virtual program Kinect[®] and stated that virtual reality as a multisensory computer environment gives students the sense of "being there". Twenty-three nursing students participated in this study and students reported feeling safe and immersed in the VR class as a means of learning disaster skills (Ulrich et al., 2014). These students said they could remember, recall and apply class content better after the hands-on feeling they experienced in the VR. Second Life has been applied to nursing in the areas of mental health, operating room (Baker & Brusco, 2011), anesthesia, pharmacology (Collins et al., 2010), and now the importance of using the PC. Directional voice and sounds such as breath sounds, bowel sounds, heart sounds and communications between avatars are now enhanced in SL and further promotes the sense of presence (Franceschi et al., 2009). According to Swan and Shih (2005), social presence was correlated to students' higher levels of attention, motivation and satisfaction,

enhancing interaction between students and faculty, and sense of belonging as these contribute to a successful learning experience (De Gagne et al., 2013).

The decrease in knowledge retention after 90 days is consistent with several studies. The ability of students to retain information or recall special points is one of the benefits of VRS students described (Ulrich et al., 2014). Aqel and Ahmed studied the effect of achievement of knowledge and retention using simulation in teaching CPR, and found no significant gain in knowledge and both the control and experimental groups decreased skills over time (2014). Some studies recommended future studies looking at the retention of information over longer periods of time (Ulrich et al., 2014; Weatherspoon et al., 2012).

Limitations

This study has a number of limitations that impact interpretation of the results. First, the study was conducted on two campuses within one community college so the nursing students demographic data represented a homogenous group. Second, the participants were a convenient sample instead of a randomized sample. Although the students at one campus were the control group and the experimental group was from a sister campus, including the remaining two campuses in the college's system would have allowed for a randomized trial with two control groups and two experimental groups and then tested for differences. The inclusion of ADN students in community colleges from different areas of the state in the study might have revealed different results, but would still not represent students from other ADN programs nationwide. Third, students in the experimental group were pretested on one day and then two days later got the intervention and the posttest whereas the control group took the pretest and the posttest was immediately following the lecture. The 2-day delay may have had an impact on outcome results. Fourth, the expert panel selected to evaluate the learning objectives, constructs and narrow down

the initial pretest and posttest to the final instrument was originally six members. Although all panel members selected are PC educators, one panel expert consistently misinterpreted the instructions and the assessment results were inconsistent with other experts. According to Polit and Beck (2008), outliers with disproportionate scores may be omitted from the second round. The second round of evaluation, therefore, was performed on the remaining 5 educators. Only one PC educator in the 55 PC in the U.S has earned an Ed.D, and that was in instructional design. Had more teachers been included on the panel, the content of the final instrument may have been different than the one that was actually used. Finally, not all community colleges share the same resources. The study was designed with the idea of students in the experimental group using their own computers and attending class online through SL. They would all virtually meet the researcher at the designated spot on the quad at the University of Alabama. The students would each log in to SL using their own servers. The course instructor had the students come to school to use their laptops or computer lab computers for the intervention. Although the IT department installed SL on the computers in the computer lab for the students and made sure each student could access SL, the computers were not tested for multiple students getting on SL together. The bandwidth at this particular school could not support all of the students on the server at one time. The students were brought to the auditorium and SL was brought up on the large screen so all students could see. Two students were logged in to SL and met the researcher at the designated place. The students got to explore the PC and met the SPI bots, and received the caveats the SPIs had to share. The PC classroom phone was designed to have poison scenarios for the students to problem solve, however the phone did not work correctly so the course instructor read the text messages aloud to the students. The projector screen in the classroom was designed to contain the presentation, however could not be made

active in the 3D classroom either. The presentation used for the control group saved on a jump drive, was used as a backup plan and projected on the large screen. The script used with the traditional lecture was presented for the 3D presentation to the class. The developer of the virtual PC did not release his permissions so this researcher could make necessary adjustments to insure proper function of the virtual PC.

Conclusions

The focus of this study is to better prepare nursing students to be aware of the PC and its resources when caring for poisoned patients. Critical care areas are often fast-paced and public health disasters are unpredictable. Students need practice applying knowledge and skills in an area of nursing where clinical experiences are few. The use of simulation and 3D technology has been implemented in nursing, but no reference could be found in nursing literature describing the use of these technologies in learning about the role a PC has in clinical practice. Pretest scores between groups were not statistically different which suggests both groups started the study at comparable levels of understanding about the PC. However, both groups also improved from pretest to posttest, which could suggest both methods of teaching facilitated learning. The fact that both groups ultimately received the identical presentation in PowerPoint due to systems failure suggests that active learning in PowerPoint was successful in student learning.

Chickering and Gamson's Seven Principles were helpful in guiding this study.

The nursing students of today have different needs from classes taught 20, 10 or even 5 years ago. There is a need for nurse educators to incorporate 3D technologies in the classroom. The literature supports use of SL as a successful technology in many disciplines. Businesses, CPR training, new equipment training, continuing education, orientation and skills competency assessments have all been described in the literature as successfully using 3D technology.

Studies have demonstrated the longer length of time after an intervention, the greater drop in retention (Aqel & Ahmed, 2014). This finding of a drop in posttest scores 90-days after the intervention is consistent in the control and experimental groups of this study. Ulrich et al. (2014) suggested students should have more time in SL to practice and to become familiar and comfortable using the VRS. Increasing time in the virtual PC and reviewing the principles pointed out in the presentation may have improved the retention of the material after 90-days. This study provided quantitative evidence supporting the use of 3D technology in nursing education and clinical education of the PC in particular. Students achieved the learning objectives as evidenced by the significantly improved posttests in both groups. Future studies are needed after small improvements to the virtual PC and improved Wi-Fi access are worked out.

Implications for Nursing Education

The findings of this study contribute to nursing education's limited experience of preparing nursing students to be knowledgeable of the PC resources needed to provide appropriate care to poisoned patients. The use of SL to provide nursing students an experience in the virtual PC and to learn about the benefits the PC and its resources may provide is the first study of its kind. Vygotsky's ZPD assists teachers to know what students are capable of learning and facilitates students' ability to move from low level of understanding to a higher level of knowledge.

Chickering and Gamson's Seven Principles guided this study. Increased student-faculty contact was achieved by being in direct contact with students to define the study, help them develop an avatar, being available for out of class assistance and communication by phone or email. The students demonstrated their willingness to cooperate in the study by sharing

information of themselves in the demographic survey (see Appendix C). The students collaborated and worked together through the case studies in the virtual poison center that were designed to promote the students' problem-solving skills. Students were able to visit the virtual PC where bots were used to represent SPIs. Bots are actually avatars that do not speak, but a text bubble appears over their head with additional information. The original development plan included the use of heads-up design (HUD) that would activate the bots to stand and deliver PC facts when an avatar came into close proximity. Had this technology worked, it would have further promoted the students' sense of social presence.

The time required for student participation in the study was clearly defined during the initial meeting. Learning takes time, and the design of this study would have allowed students to revisit the virtual poison center to reinforce what they saw and heard in the virtual experience. Students remember best with repeated exposures or experiences. The support of the course instructor and her enthusiasm encouraged the students to look forward to the experiment. Even when the Wi-Fi failed to support multiple users simultaneously, the students were engaged and worked together to answer questions in the virtual classroom as a group rather than individually. Respect for diversity was demonstrated when students owned what they were learning as personal knowledge. Following the intervention, students in the experimental group were debriefed; thereby giving them immediate feedback and allowing them time to ask questions.

Future Research Recommendations

The recommendations for future nursing research are a result of this study's findings. Although the sample size of this study were similar to the size identified by the power analysis, increasing the study to include the other 2 sister campuses in this community college or inviting other schools from across the U.S. to participate in the study may have strengthened the study

and revealed different results. Randomized sampling in future studies would make the study more trustworthy and is preferred in equalizing groups, however randomization would have been difficult in this study due to the small size of each group. Future studies should include colleges with comparable resources as this can make a difference in the teaching methods faculty use and could influence their decision to utilize 3D technology such as SL on their campus. Finally, future studies should test-drive the technology before implementing the study. The number of students that log on to a single server may impact future studies. In future studies using a virtual environment, the researcher must verify that the developer releases their permissions so the researcher may control the project. Additionally, future studies could add a counter to the SL classroom that would document which students revisited and how often the students visited the virtual PC. A follow-up of this study with these few adjustments to the virtual PC may show significantly different outcomes using 3D technology in future studies.

Summary

Nurse educators are challenged to create future nurses to assume roles in our healthcare system to be competent, confident, critical thinkers and problem solvers. With more than 2.2 million unintentional poison emergencies reported to PCs in the U.S. each year, this area of nursing will not soon go away. Poison centers will need dedicated nurses to help meet the staffing needs and to be properly prepared and proficient in public health and hazardous materials training. Nurses in the ED and critical areas must be ready to call the PC for advice on snakebites, carbon monoxide exposures, hydrogen fluoride and thousands more chemicals and pharmaceuticals. Learning takes time. The Vygotsky Framework can help nursing students move from the low end of understanding of the PC through the ZPD to a high level of understanding. Nurse educators may invite PC educators as guest experts or they may

incorporate the Virtual PC through SL for a clinical experience to learn about the PC and its resources. Implementing the MKO will facilitate nursing students to gain this knowledge. And finally, incorporating Chickering and Gamson's Seven Principles that includes contact between faculty and students, cooperation among students, active learning, prompt feedback, time on task, high expectations and respect for diversity are essential for the delivery of a quality 3D clinical experience.

REFERENCES

- Ainsley, B. & Brown, A. (2009). The impact of informatics on nursing education: A review of the literature. *The Journal of Continuing Education in Nursing*, 40(5), 228-232.
- Alabama Community College System (n.d.). About ACCS: History. Retrieved from www.aacc.cc/index.cfm/about-accs/history/
- American Association of Community Colleges (n.d.). AACCS Fast Facts: By the Numbers. Retrieved from www.aacs.cc/assets/File/DPE_Stat/2011fastfacts.pdf
- American Association of Community Colleges (2014). 2014 Fact sheet: Why community colleges? Retrieved from www.aacc.nche.edu
- American Association of Poison Control Centers (n.d.) Health care providers. Retrieved from <http://www.aapcc.org/prevention/health-care-providers/>
- Aqel, A. & Ahmad, M. (2014). High-fidelity simulation effects on CPR knowledge, skills, acquisition and retention in nursing students. *Worldviews on Evidence-Based Nursing*, 11(6), 394-400.
- Arbaugh, J., & Hornik, S. (2006). *Do Chickering and Gamson's seven principles also apply to online MBAs?* The Journal of Educators Online, 3(2), 1-18
- Badillo, R. (2009). How nursing profession can impact poison control centers. *The Oklahoma Nurse*, 54(1), 4-5.
- Baid, H & Lambert, N. (2010). Enjoyable learning: the role of humor, games and fun activities in nursing and midwifery education. *Nurse Education Today*, 30(6), 548-552.
- Baker, J. & Brusco, J. (2011). Tapping into technology: Nursing education gets a second life. *AORN Journal*, 94(6), 599-605. doi:10.1016/j.aorn.2011.09.004
- Bambini, D., Washburn, J., & Perkins, R. (2009). Outcomes of clinical simulation for novice nursing students: Communication, confidence and clinical judgment. *Nursing Education Research*, 30(2), 79-82.
- Bangert, A., & Easterby, L. (2008). Designing and delivering effective online nursing courses with the evolve electronic classroom. CIN: Computer, Informatics, *Nurse Educator*, 26(2), 99-105.

- Barber, P., & Norman, I. (1989). Preparing teachers for the performance and evaluation of game-simulation in experiential learning climates. *Journal of Advanced Nursing*, 14, 146-151. 10.1111/j.1365-2648.2008.04843
- Brandon, A., & All, A. (2010). Constructivism theory analysis and application to curricula. *Nursing Education Perspectives*, 31(2), 89-92.
- Brown, S., Kirkpatrick, M., Mangum, D., & Avery, J. (2008). A review of narrative pedagogy strategies to transform traditional nursing education. *Educational Innovations*, 47(6), 283-286.
- Center for Disease Control and Prevention. Poisoning in the United States: fact sheet [data file]. Retrieved from <http://www.cdc.gov/HomeandRecreationalSafety/Poisoning/poisoning-factsheet.htm>
- Chia, P. (2013). Using a virtual game to enhance simulation based learning in nursing education. *Singapore Nursing Journal*, 40(3), 21-26.
- Chickering, A., and Gamson, Z. (1987). Seven principles for good practice in undergraduate education. *The American Association for Higher Education Bulletin*, 1987.
- Cobb, S. (2009). Social presence and online learning: A current view from a research perspective. *Journal of Interactive Online Learning*, 8(3), 241-254.
- Collins, A., Graves, B., Gullette, D., & Edwards, R. (2010). *Journal of Nursing Education*, 49(7), 410-413. doi: 10.3928/01484834-20100331-04
- Cook, M. (2012). Design and initial evaluation of a virtual pediatric primary care clinic in Second Life. *Journal of the American Academy on Nurse Practitioners*, 24, 521-527. doi:10.1111/j.1745-7599.2012.00729x
- Cummins, M., Crouch, B., Gresteland, P., Wycoff, A., Allen, ., Muthukutty, A. Palmer, R., Peelay, J. and Reko, K. (2013). Inefficiencies and vulnerabilities of telephone –based communication between U.S. poison centers and emergency departments. *Clinical Toxicology*, 51(6), 435-443. doi: 10.3109/15563650.2013.801981
- De Gagne, J., Oh, J., Kang, J., Vorderstrasse, A., & Johnson, C. (2013). Virtual worlds in nursing education: A synthesis of the literature. *Journal of Nursing Education*, 52(7), 391-400.
- Dreon, O. (2013). Applying the seven principles for good practice to the online classroom. *Faculty Focus*. Retrieved from <http://facultyfocus.com/articles/online-education/applying-the-seven-principles-for-good-practice-to-the-online-class/>

- Feng, J., Chang, Y.T., Chang S., Erdley, W., Lin, C., Chang, Y.J. (2013). Systematic review of effectiveness of situated E-learning on medical and nursing education. *Worldviews on Evidence-Based Nursing*, 10(3), 174–183.
- Fink, L.D. (2003). *Creating significant learning experiences*. CA: Jossey-Bass.
- Franceschi, K., Lee, R., Zanakis, S. & Hinds, D. (2009). Engaging group e-learning in virtual worlds. *Journal of Management Information Systems*, 26(1), 73-100. doi: [10.2753/MIS0742-1222260104](https://doi.org/10.2753/MIS0742-1222260104)
- Gaberson, K. & Oermann, M. (2010). *Clinical teaching strategies in nursing*. New York, New York: Springer Publishing.
- Giddens, J. & Brady, D. (2007). Rescuing nursing education from content saturation: The case for a concept-based curriculum. *Journal of Nursing Education*, 46(2), 65-69.
- Graham, I. & Richardson, E. (2008). Experiential gaming to facilitate cultural awareness: its implication for developing emotional caring in nursing. *Learning in Health and Social Care*, 7(1), 37-45.
- Graham, C., Cagiltay, K., Lim, B., Craner, J., & Duffy, T. (2001, March/April). Seven principles of effective teaching: A practical lens for evaluating online courses. *The Technology Source*. Retrieved from <http://ts.mivu.org/default.asp?show=article&id=1034>
- Greiner, A., & Knebel, E, (Eds.). (2003). *Health professions education: A bridge to quality*. National Academics Press.
- Greiner, B., Caravella, M., & Roth, A. (2014). Is avatar-to-avatar communication as effective as face-to-face communication? An ultimatum game experiment in first and Second Life. *Journal of Economic Behavior & Organization*, 108, 374-382. doi.org/10.1016.j.jebo.2014.01.011
- Guise, V., Chambers, M., & Valimaki, M. (2012). What can virtual patient simulation offer mental health nursing education? *Journal of Psychiatric and Mental Health Nursing*, 19, 410-418.
- Health Resources and Services Administration. (2009). Justification of estimates for appropriation committees. Department of Health and Human Services. Washington, DC: U.S. Government Printing Office.
- Health Resources and Services Administration. (HRSA). (2010). The registered nurse population: Initial findings from the 2008 national sample survey of registered nurses. Washington, DC: U.S. Department of Health and Human Service.
- Herbert, P. & Lohrmann, D. (2011). It's all in the delivery! An analysis of instructional strategies from effective health education curricula. *Journal of School Health*, 81(5), 258-264, doi:10.1111/j.1746-1561.2011.00586.x

- Hutchins, H. (2003). *Instructional immediacy and the Seven Principles: Strategies for facilitating online courses*. *Online Journal of Distance Learning Administration*, 6(3). Retrieved from <http://www.westga.edu/~distance/ojdla/fall63/hutchins63.html>
- Institute of Medicine. (2004). *Forging a poison prevention and control system*. Washington, DC: The National Academies Press.
- Institute of Medicine (2010). *Future of nursing: Leading change and advancing health*. Retrieved April 17, 2015, from <http://iom.edu/Reports/2010/The-Future-of-Nursing-Leading-Change-Advancing-Health.aspx>
- Jones, P., Sheppard, M., Snowden, C., Miller, T., Nelkin, V., Nguyen, D., Tominack, I., & Dunlap, H. (2010). Impact of poison prevention education on the knowledge and behaviors of seniors. *American Journal of Health Education*, 41(3), 139-146.
- Kelly, N., & Groff, J. (2000). Exploring barriers to utilization of poison centers: A qualitative study of mothers attending an urban women, infant and children clinic. *Pediatrics* 106(1), 199-204.
- Koeckeritz, J., Malkiewicz, J., & Henderson, A. (2002). *The seven principles of good practice: Applications for online education in nursing*. *Nurse Educator*, 27(6), 283-287.
- Krenzelok, E., Mirvos, R. & Mazo, E. (2007). Combining primary and secondary poison prevention in one initiative. *Clinical Toxicology*, 46, 101-104. doi: 10.1080/15563650701342189
- LeCroy, C. (2006). Games as an innovative teaching strategy for overactive bladder and PBH. *Urologic Nursing*, 26(5), 381-385.
- Leichsenring, A. (2013). The influence of Piaget and Vygotsky on everyday elementary classroom teaching and learning. Retrieved from <http://www.edartical.com/>
- Lin, S. & Roger, S. (2010). The use of interactive formative assessments with first-year occupational therapy students. *International Journal of Therapy and Rehabilitation*, 17(11), 575-586.
- Lo Vecchio, F., Curry, S. Waszolek, K., Klemens, J., Hovseth, K. & Glogn, D. (2008). Poison control centers decrease emergency healthcare utilization costs. *Journal of Medical Toxicology*, 4(4), 221-224. Retrieved from <http://qs7qk6ub8p.search.serialssolutions.com.libdata.lib.ua.edu/?genre=article&atitle=Poison%20control%20centers%20decrease%20emergency%20healthcare%20utilization%20costs&title=Journal%20of%20Medical%20Toxicology&issn=15569039&isbn=&volume=4&issue=4&date=20081201&aulast=LoVecchio%20Frank&spage=221&pages=221-224&sid=EBSCO:Academic%20OneFile:edsgcl.188900262>

- Lucas, K., Testman, J., Hoyland, M., Kimble, A., & Euler, M. (2013). Instructional design and assessment: Correlation between active-learning coursework and student retention of core content during advanced pharmacy practice experiences. *American Journal of Pharmaceutical Education*, 77(8).
- Mahaffey, E. H. (2002). The relevance of associate degree nursing education: Past, present, future. *Online Journal of Issues in Nursing*, 7(2), Manuscript 2. Available: www.nursingworld.org/ojin/mainmenucontents/volume72002/No2May2002/RelevanceofAssociateDegree.aspx
- Mangold, K. (2007). Educating a new generation: Teaching baby boomer faculty about millennial students. *Nurse Educator*, 32(1) 21-23.
- McLeod, S. (2007). Lev Vygotsky. *Simply Psychology*. Retrieved from <http://simplypsychology.org/vygotsky.html>
- Mowry, J. Spyker, D., Cantilen, L., McMillan, N., Ford, M. (2013). Annual report of the American Association of Poison Control Centers' National Poison Data System (NPDS): 31st Annual report. *Clinical Toxicology*, 52(10), 1032-283.
- National League for Nursing (NLN). (2003). *Nursing education: A call to reform. Position statement*. Retrieved April 17, 2015, from <http://www.nln.org/aboutnln/PositionStatements/index.htm>
- National Research Council (2000). How people learn: Brain, mind, experience and school: Expanded edition. Committee on Developments in the Science of Learning, J.D. Bransford, A. L. Brown and R. Cocking (Eds.). Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academy Press.
- Nehring, W. & Lashley, F. (2009). Nursing simulation: A review of the past 40 years. *Simulation & Gaming*, 40(4), 528-552. Doi: 10.1177/1046878109332282
- Oermann, M. (2007). Approaches to gathering evidence for educational practices in nursing. *The Journal of Continuing Education in Nursing* 38(6), 250-256.
- Oermann, M., Poole-Dawkins, K., Alvarez, M., Foster, B., & O'Sullivan, R. (2010). Managers' perspective of new graduates of accelerated nursing programs: How do they compare with other graduates? *The Journal of Continuing Education in Nursing* 41(9), 394-400.
- Oermann, M. (2015). Technology and teaching innovations in nursing education: Engaging the student. *Nurse Educator*, 40(2), 55-56. doi:10.1097/nne.000000000000139
- Ostorga, A. & Farruggio, P. (2013). The use of virtual guest speaker as a catalyst for deep learning. *Social and Behavioral Sciences*, 93, 2144-2151. Doi: 10.1016/j.sbspro.2013.10.180

- Phillips, J. (2005). Strategies for active learning in online continuing education. *The Journal of Continuing Education in Nursing* 36(2), 77-83.
- Polit, D & Beck, C. (2008). *Nursing education: Generating and assessing evidence for nursing practice*. Philadelphia: Lippincott Williams & Wilkins
- Polit, D., Beck, C., & Owen, S. (2007). Is the CVI an acceptable indicator of content validity? Appraisal and recommendations. *Research in Nursing & Health* 30(4), 459-467.
- Revell, S. & McCurry, M. (2010). Engaging millennial learners: Effectiveness of personal response system technology with nursing students in small and large classrooms. *Journal of Nursing Education*, 49(5), 272-275. doi:10.3928/01484834-20091217-07
- Richardson, J. & Swan, K. (2003). Examining social presence in online courses in relation to student's perceived learning and satisfaction. *Journal of Asynchronous Learning Networks*, 7(1), 68-88. Retrieved from <http://eds.a.ebscohost.com.libdata.lib.ua.edu/eds/detail/detail?vid=19&sid=b29a656f-f96242ad84ee60ada6da973c%40sessionmgr4002&hid=4202&bdata=JnNpdGU9ZWRzLWxpdmUmc2NvcGU9c2l0ZQ== - db=edsgao&AN=edsgcl.284222716>
- Ridley, R. (2007). Interactive teaching: A concept analysis. *Journal of Nursing Education* 46(5), 203-209.
- Rivas, K., & Murray, S. (2010). Exemplar: Our shared learning experience of implementing action learning sets in an acute clinical nursing setting: approach taken and lessons learned. *Contemporary Nurse*, 35(2), 182-187.
- Robbins, S. & Bell, M. (2008). *Second Life for dummies*. Hoboken, NJ: Wiley Publishing.
- Robinson, C. & Kakela, P. (2006). Creating a space to learn: A classroom of fun, interaction, and trust. *College Teaching*, 54(1), 202-206.
- Royce, M., & Newton, S. (2007). How gaming is used as an innovative strategy for nursing education. *Nursing Education Perspectives*, 28(5), 263-267.
- Saywall, A., Zollinger, T., Kochhar, K., Roberson, C., Cole, B., Mowry, J., & Martir, J. (2009). Factors associated with Hispanic underutilization of the Indiana Poison Center. *Hispanic Health Care International*, 7(1), 30-34. doi:10.1891/1540-4153.7.1.30
- Schmidt, B. & Stewart, S. (2009). Implementing the virtual reality learning environment: Second Life. *Nurse Educator*, 34(4), 152-155. doi:10.1097/NNE.0b013e3181aabb8
- Schmidt, B. & Stewart, S. (2010). Implementing the virtual world of Second Life into community nursing theory and clinical courses. *Nurse Educator*, 35(2), 74-78.

- Skiba, D. (2009). Nursing education 2.0: A second look at Second Life. *Nursing Education Perspectives*, 30(2), 129-131.
- Simon, M. & White, J. (2013). Survey/Interview validation rubric for expert panel – VREP. [Adobe Digital Editions version]. Retrieved from <http://dissertationrecipes.com/guides-tools-worksheets-slideshows/>
- Smith, P. & Hamilton, B. (2015). The effects of virtual reality simulation as a teaching strategy for skills preparation in nursing students. *Clinical Simulation in Nursing*, 11(1), 52-58. doi.org/10.1016/j.ecns.2014.10.001
- Sonier, T. & Cole, T. (2005). Oh, no, it's the poison centre, tell them I'm busy! *NENA Outlook*, 28(1), 15-16.
- Stanley, M., & Dougherty, J. (2010). A paradigm shift in nursing education: A new model. *Nursing Education Perspectives*, 31(6), 378-80.
- Sung, E. & Mayer, R. (2012). Five facets of social presence in online distance education. *Computers in Human Behavior*, 28, 1738-1747. doi.org/10.1016/j.chb.212.04.014
- Swan, K. & Shih, L. (2005). On the nature and development of social presence in online course discussions. *Journal of Asynchronous Learning Networks*, 9(3), 115-136. Retrieved from <http://qs7qk6ub8p.search.serialssolutions.com/?genre=article&atitle=On%20the%20nature%20and%20development%20of%20social%20presence%20in%20online%20course%20discussions&title=Journal%20of%20Asynchronous%20Learning%20Networks&issn=19395256&isbn=&volume=9&issue=3&date=20051001&aulast=Swan%2C%20Karen&page=115&pages=115-136&sid=EBSCO:Academic%20OneFile:edsgcl.284325585>
- Tschannen, D., Aebbersold, M., McLaughlin, E., Bowen, J., & Fairchild, J. (2012). Use of virtual simulations for improving knowledge transfer among baccalaureate nursing students. *Journal of Nursing Education and Practice*, 2(3), 15-24. doi: 10.5430/jnep.v2n3p15
- Ulrich, D., Farra, S., Smith, S., & Hodgson, E. (2014). The student experience using virtual reality simulation to teach decontamination. *Clinical Simulation in Nursing*, 10, 546-553. doi.org/10.1016/j.ecns.2014.08.003
- Vygotsky, L. (1978). *Mind in society: The development of higher psychology process*. Cambridge: Harvard University Press.
- Vygotsky, L. (1986). *Thought and language*. In A. Kozulin (Ed.). London, England: Massachusetts Institute of Technology Press.
- Wang, F. & Burton, J. (2013). Second Life in education: A review of publications from its launch to 2011. *British Journal of Educational Technology*, 44(3), 357-371. doi: 10.1111/j.1467-8535.2012.01334.x

- Weatherspoon, D. & Wyatt, T. (2012). Testing computer-based simulation to enhance clinical judgment skills in senior nursing students. *Nursing Clinics of North America*, 47, 481–491. doi.org/10.1016/j.cnur.2012.07.002
- Wolfe, A. (2006). Student perceptions of guest speakers in marketing education. MMA Fall Conference, *Marketing Management Journal*, 2006.
- Zhan, Z. & Mei, H. (2013). Academic self-concept and social presence in face –to-face and online learning: Perceptions and effects on students’ learning achievement and satisfaction across environments. *Computers & Education* 69, 131-138. doi: org/10.1016/j.compedu.2013.07.002

APPENDICES

APPENDIX A

Recruitment Script

Hello! My name is Lois Dorough. I am a doctoral candidate at The University of Alabama, under the leadership of Dr. Susan Appel. I am working on my doctorate degree in the area of nursing education. I have provided guest presentations on the management of the poisoned patient for many years. I am a registered nurse and a certified poison information specialist. A nurse poison information specialist is a subspecialty of nursing most nursing students seldom are exposed to.

My research study is to evaluate the effectiveness of two teaching strategies on associate degree nursing students' knowledge and retention of caring for the poisoned patient. I have asked your professor's permission to speak to you today, so that I may make you aware of my dissertation study and invite you to participate in the study.

At this time I will give each of you a copy of the informed consent form. Please read the form as I read it aloud to you and do not hesitate to ask any questions you may have. The study will be conducted during an upcoming class. (*Pass out a copy of the Informed Consent Form - to be read aloud.*)

APPENDIX B

UNIVERSITY OF ALABAMA HUMAN RESEARCH PROTECTION PROGRAM

Informed Consent Non Medical Study

Study title: Retention of Knowledge and Application of Poisoned Patient Management Using 3-D Virtual Poison Center

Lois Dorough, RN, MSN, CSPI; University of Alabama Doctoral Candidate Educational Doctorate in Nursing Leadership in Nursing Education

Institution if other than or collaborating with UA: Beville State Community College

You are being asked to be in a research study. The study is called “**Retention of Knowledge and Application of Poisoned Patient Management Using 3-D Virtual Poison Center**”. This study is being done by Lois Dorough and is being supervised by Dr. Susan Appel, Associate Professor Capstone College of Nursing.

What is this study about?

You are being asked to participate in a dissertation research project. The purpose of this study is to determine if a clinical experience in a 3-D virtual poison center will improve knowledge and retention of poisoned patient management compared to students receiving the traditional guest lecture from a poison center educator. Nursing schools use simulation to teach students nursing skills, however students are not prepared to care for poisoned patients. Nursing skills required to care for the poisoned patient requires specialized knowledge and creative thinking. Knowing how to access accurate information in a timely manner to deliver appropriate nursing care, may mean the difference in the poisoned patient's outcome.

Why is this study important?

Nursing schools use lectures and simulation to teach students nursing skills, however students are not prepared to care for poisoned patients. Not all poisoned patients look sick or have a specific constellation of signs and symptoms when they arrive in the ED. The results of this study are important to develop collaboration between nursing schools and the poison centers. A virtual poison center clinical experience will help develop future nurses that are better prepared to handle common poisonings, thus reducing morbidity and mortality in the U.S.

Why have I been asked to take part in this study?

You have been selected to take part in this study because you are a nursing student enrolled in ADN NUR 203: Nursing through the Lifetime III at the Beville State Community College at either the Jasper or Fayette campus.

How many people will be in this study?

The investigator is inviting all students enrolled in NUR 203: Nursing through the lifespan III to take part in the study; or roughly 70 students.

What will I be asked to do in this study?

If you agree to participate in this study, you will be asked to complete a demographic survey and a pretest. Then you will participate in the 50-minute presentation, and complete a posttest about poisons and the poison center. You may be asked to attend this class online.

How much time will I spend being in this study?

Completion of the survey and pretest will take about 10 minutes to complete. The class presentation will take about 50 minutes, and the posttest will take about 10 minutes to complete.

Will being in this study cost me anything?

The only cost to you is your time.

Will I be compensated for being in this study?

You will not receive money for your time or class credit as a result of participating in the study.

Can the investigator take me out of this study?

No, the investigator cannot take you out of the study. At any time during the completion of the assessment, you may choose not participate by exiting the assessment or by not submitting the assessment.

What are the risks (problems or dangers) from being in this study?

There are minimal risks from being in this study. You may feel some stress while you participate in the 3-D Virtual Poison Center and when you evaluate your performance after the experience. You may feel slight anxiety while you collaborate with class members in a virtual environment.

What are the benefits of being in the study?

There are no direct benefits to you for participating in this study. You will benefit from taking part in the study by knowing you contributed in the evaluation of virtual clinical experience compared to a lecture format in teaching about poisoned patient care. You will also benefit in reflecting on what you have learned, and the satisfaction of knowing you helped shape future nursing students' clinical experiences.

What are the benefits to science or society?

This study will help nurse educators use more interactive teaching strategies and subject material experts to bring subspecialty areas of nursing to the students.

How will my privacy be protected?

The only place your name will appear in connection with the study is on this informed consent form. The primary investigator will collect the consent forms. They will be placed in a sealed envelope. The envelope will be locked in a file drawer in the investigator's office. Your last 4 digits of your student number will be used as your identifier when completing the surveys in the study.

How will my confidentiality be protected?

You will use the last 4 digits of your student ID number on the consent form, demographic study, pretest and posttest. You and your teacher will be the only ones to know the identity of your ID number. This number is important only to match the study, pretest and posttest. Your ID number will never appear in the data, in the dissertation or published in any way. All information in this study will remain anonymous. The data you provide will be kept in a locked file drawer in the investigator's office. The information you provide in the survey will be kept confidential.

When the investigator uses the data from this study to write a dissertation and to write research articles, participants will be identified only as "nursing students in central Alabama".

What are the alternatives to being in the study?

The alternative to being in this study is to not participate, indicated by circling No on the consent form.

What are my rights as a participant?

Participation in this study is totally voluntary. It is your free choice. You may choose not to be in it at all. If you start the study, you can stop at any time. Not participating or stopping participation will have no effect on your grade in the course or your relationships with the University of Alabama, Beville State Community College or the researcher.

The University of Alabama Institutional Review Board is a committee that looks out for the ethical treatment of people in research studies. They may review the study records if they wish. This is to be sure that people in research studies are being treated fairly and that the study is being carried out as planned.

Who do I call if I have questions or problems?

If you have questions about this study right now, please ask them. If you have questions at a later time, please call Lois Dorough at 205-826-5378. If you have questions or complaints about your rights as a research participant, call Mr. Carpantato Myles the Research Compliance Officer of the University of Alabama at 205-348-8461.

You may also ask questions, make a suggestion, or file complaints and concerns through the IRB Outreach Website at http://osp.ua.edu/site/PRCO_Welcome.html. After you participate, you are encouraged to complete the survey for research participants located on the same website, or you may ask Lois Dorough for a copy of it. You may also send e-mail to participantoutreach@bama.ua.edu.

I have read this consent form. I have had a chance to ask questions.

Do you wish to participate in this study? (Circle one) Yes No

Signature of Research Participant _____ Date _____

Last 4 digits of your student ID _____

Signature of Investigator _____ Date _____

APPENDIX C

Demographic Survey

Name/Code: _____

Instructions: This questionnaire is designed to gather information about you as a student in this class. Your replies are anonymous and will be compiled as a group. No individual student identifiers will be made public. Completion of the questionnaire will be deemed consent to participate in the study.

Please circle the best answer for each of the following questions. Please select a response for each question.

1) Gender: Male Female

2) Age: under 18 18 to 21 22 to 25 26 to 30 31 to 35

36 to 40 41 to 45 46 to 50 51 to 55 56 to 60 61 to 65 66 or above

I choose not to answer this question

3) Ethnicity: African American Caucasian Hispanic Origin

Asian American/Pacific Islander Native American/Alaskan Native

Multiethnic I choose not to answer this question

3) Academic Level in the current program: Not used; all were graduating 5th semester seniors

1st Semester 2nd Semester 3rd Semester 4th Semester 5th Semester Other: _____

4) Level of education: High School Diploma Diploma – another field

Associates Degree – another field Bachelors Degree - another field

Masters - another field

5) Employment Status: Part time Full time Not employed

I choose not to answer this question

6) Registration status: Full time Part time I choose not to answer this question

APPENDIX D

Pretest/Posttest/90-day FU

1. What is the most important thing to remember when someone is poisoned?
 - a. Notify the next of kin, then lavage
 - b. Induce vomiting for all poisons
 - c. Call the poison center immediately
 - d. Give some milk to drink

2. What is the primary function of a Regional Poison Control Center?
 - a. Provide a resource for doctors to call when a patient has an office visit.
 - b. Provide information from 9 AM – 5 PM Monday through Friday to assist the physician make accurate medical decisions.
 - c. Provide information for anyone that encounters a poisoned patient.
 - d. Instruct the nurse how long the patient should be observed.

3. The critical care nurse should call the poison center for which of the following?
 - a. Before the patient arrives or is assessed
 - b. Anytime the nurse has a question
 - c. Before the patient is transferred to the floor with a doctor's order
 - d. When there is an unconfirmed exposure in a symptomatic patient

4. What is the goal of patient management when someone is poisoned?
 - a. Distance the patient from the poison
 - b. Capture the statistical information
 - c. Get an IV started before any changes occur
 - d. Get poison prevention material into the home

5. Why are children 60% more likely to be unintentionally poisoned than an adult?
 - a. They read well
 - b. They want to imitate an adult
 - c. Safety closures were in place
 - d. They know right from wrong

6. What is the best initial management for oral ingestions of toxic substances or overdose situations?
 - a. Induce vomiting with Syrup of Ipecac
 - b. Administer whole bowel irrigation
 - c. Lavage with activated charcoal
 - d. Call the poison center

7. As a clinical nurse, it is important to remember:
 - a. Discuss patient information to anyone privately
 - b. Poison centers are HIPAA approved healthcare providers
 - c. Poison centers are intended to handle pediatric exposures
 - d. Consult the Internet for poison recommendations

8. What is the best way to obtain appropriate treatment recommendations for a poison exposure?
 - a. Call the manufacturer for treatment guidelines
 - b. Research the Internet for treatment guidelines
 - c. Research Medline for current treatment recommendations
 - d. Call the poison center for treatment recommendations

9. What is the most common exposure reported to poison centers?
 - a. Ocular
 - b. Inhalation
 - c. Dermal
 - d. Oral

10. You are about to discharge a 3 year-old child from the ED. What should you teach the parents of this child?
 - a. Keep medications in a convenient location and readily available.
 - b. Worry about side effects of medications to be given on discharge.
 - c. Avoid using generic over-the-counter medications.
 - d. Use child resistant medication containers.

11. Nurses in clinics and the ED are often required to calculate dosages for particular drugs. What information is essential when calculating a possible overdose situation for a specific drug?
 - a. Health status, nutritional status, and hydration status
 - b. Age and weight of the patient
 - c. Use of prescription, over-the-counter, and homeopathic medications
 - d. Allergies and medical history of the child and family

12. The ED nurse recognizes that one concern for caring for the older adult patient with multiple medications includes:
 - a. They may have difficulty remembering the list of their current medications.
 - b. They may have obtained prescription medications from multiple healthcare providers.
 - c. They may experience altered mental capacity.
 - d. All are correct.

13. A client presents in the ED with symptoms of acute disorientation. What information would be most helpful regarding the client's medication use?
 - a. Is the patient taking any new medications?
 - b. Does the patient take his medications with a full glass of water?
 - c. Do the medications make the patient nauseated?
 - d. Does the patient have dementia or is the patient mentally challenged?

14. While working in the ICU with a patient experiencing cardiac dysrhythmias, you learn from the family that your patient's symptoms may be related to taking too many of his heart pills. What should you do?
 - a. Call the poison center for overdose information on patient's heart pills.
 - b. Obtain an order for a digoxin level
 - c. Auscultate the carotid arteries
 - d. Obtain an order for a urine drug screen

15. What is the definition of a poison?
 - a. A poison is something that will kill you.
 - b. A poison is something that has a harmful effect on the body.
 - c. Poisons are only prescription medications.
 - d. Poisons only affect children.

16. Where are Poison Centers located?
 - a. Most states
 - b. Every county
 - c. Washington, D.C.
 - d. Every state health department

17. Features of a regional poison center include free treatment recommendations for the public, open 24/7, and _____.
 - a. staffed only by nurses
 - b. available to treat animals
 - c. provides confidential information to healthcare providers
 - d. charge hospitals a nominal fee

18. One third of all unintentional exposures reported to poison centers involve:
 - a. Seniors
 - b. Children < 6
 - c. High school students
 - d. Adults

19. Which of the following situations would qualify by the poison center nurse to treat an adult patient at home?
 - a. Speaks English and is coherent.
 - b. Unintentionally got a drop of bleach in her tongue.
 - c. Is sorrowful and regrets taking an overdose.
 - d. Spilled a quart of malathion concentrate on him 4 hours ago.

20. Poison centers help decrease healthcare costs and _____.
- Prolong length of hospital stays
 - Have no effect on patient outcomes
 - Provide best-practice advice for healthcare providers
 - Receive federal funding for all patients referred to hospitals
21. A patient presents to the ED with a history of a dermal exposure. What key concept should the nurse remember?
- To wear gloves to prevent cross contamination
 - To wash with cold water
 - To not wash because the chemical may react with water
 - To schedule a surgical consults
22. A patient arrived in the ED with an ocular exposure to gasoline. You called the poison center and were instructed to irrigate the eyes. What key concept should the nurse remember?
- To irrigate only for 10 minutes
 - Apply an eye patch
 - Remove contact lenses first
 - Irrigate with tap water only
23. Poison centers help save unnecessary healthcare costs when people call the poison center prior to going to the hospital. How much savings is predicted?
- \$23 billion dollars
 - \$1 dollar per patient
 - \$13.39 for every dollar spent on poison center
 - For every \$1 spent on patient care save \$23.95 in healthcare costs
24. A nurse in the ED receives a call from the paramedics that a patient is being transported with an antihistamine overdose. You called the poison center and the poison center nurse tells you appropriate assessment data to collect. They instruct you to call poison center back after the patient arrives because they need to know:
- Name of product and ingredients, and amount ingested
 - What time poisoning happened
 - Age and weight of the person poisoned
 - All of the above
25. The poison center nurse called to give a report on a patient they referred to your ED. The patient took unknown amounts of benzodiazepines, acetaminophen, and cocaine. Which treatment should be considered for this patient?
- Monitor vital signs, urine drug screen, acetaminophen level
 - Lavage to remove medications from stomach
 - Administer Ipecac to make the patient vomit before he seizes
 - Obtain a mental health consult

APPENDIX E

IRB Approval Letters

11/21/2015

iCloud Mail

Approved!

November 19, 2015 at 9:06 AM

From kbarnett@bscc.edu

To Lois Dorough

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Hi Lois,

Your research request has been approved by our Review Committee. You are clear to begin working on your research with Reitha Cabaniss in the Spring semester. Please let me know if I can do anything further to assist. I look forward to hearing the results of your study.

Best regards,

Kristi Barnett
Director of Grants, Planning, Research, and Institutional Effectiveness
205.387.0511 ext. 5703
kbarnett@bscc.edu



November 20, 2015

Lois Dorough
Capstone College of Nursing
The University of Alabama
Box 870358

Re: IRB # 15-OR-365-ME, "Retention of Knowledge and Application of Poisoned Patient Management Using 3-D Virtual Poison Center"

Dear Ms. Dorough:

The University of Alabama Institutional Review Board has granted approval for your proposed research.

Your application has been given expedited approval according to 45 CFR part 46. Approval has been given under expedited review category 7 as outlined below:

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

Your application will expire on November 19, 2016. If your research will continue beyond this date, please complete the relevant portions of the IRB Renewal Application. If you wish to modify the application, please complete the Modification of an Approved Protocol Form. Changes in this study cannot be initiated without IRB approval, except when necessary to eliminate apparent immediate hazards to participants. When the study closes, please complete the Request for Study Closure Form.

Please use reproductions of the IRB approved stamped consent forms to obtain consent from your participants.

Should you need to submit any further correspondence regarding this proposal, please include the above application number.

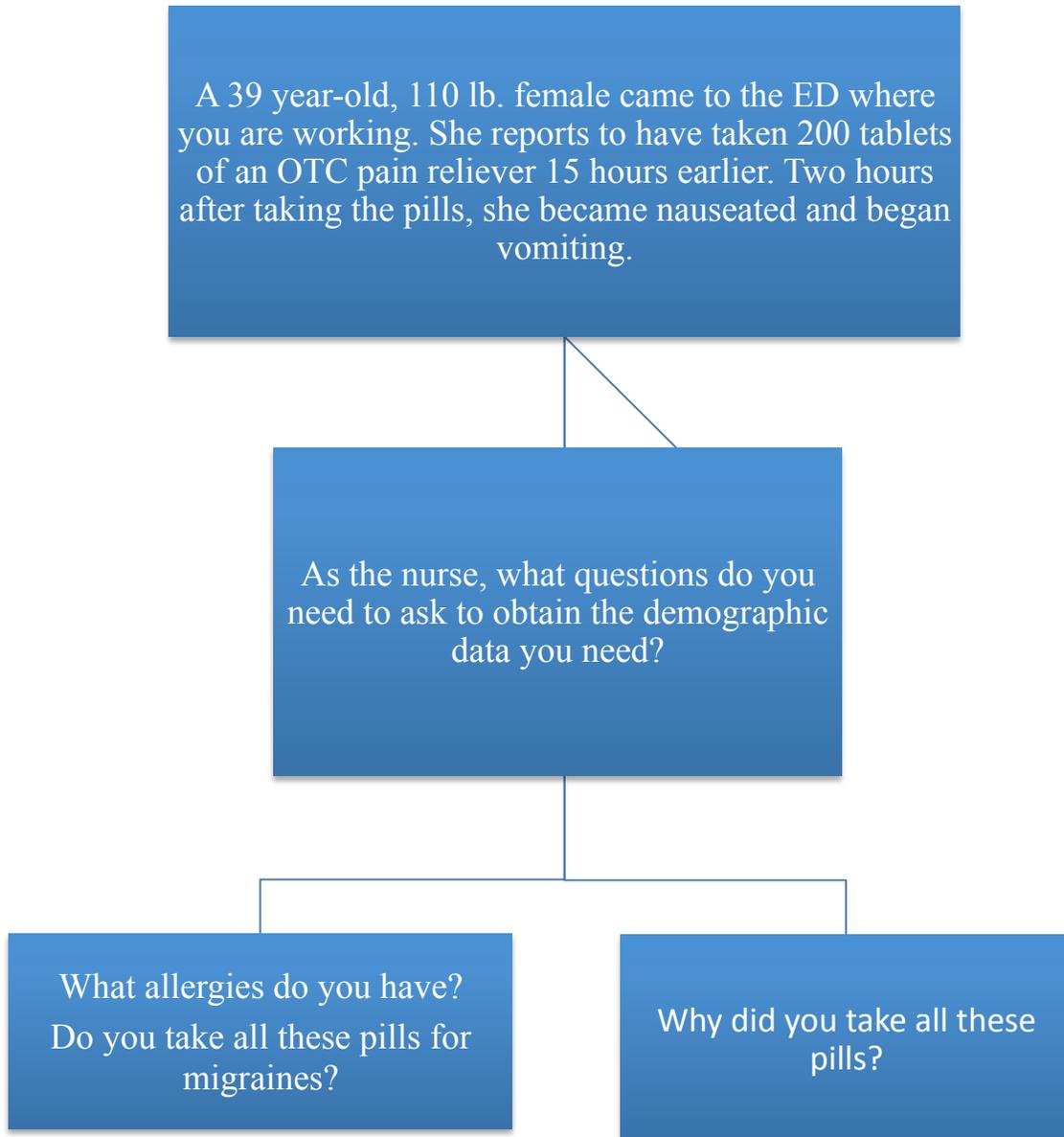
Good luck with your research.

Sincerely,

Carpantato T. Myles, MSM, CIM, CNP
Director & Research Compliance Officer
Office for Research Compliance

APPENDIX F
Scenarios

1. Acetaminophen



You learn the patient has no known allergies and no medical history. In addition to asking when was her last menstrual period, what else would you need to ask?

What was the exact name of the product on the bottle?

Did you call your doctor?

After checking initial vital signs and notifying the physician, what is the next step to take?

Contact her family and doctor first.

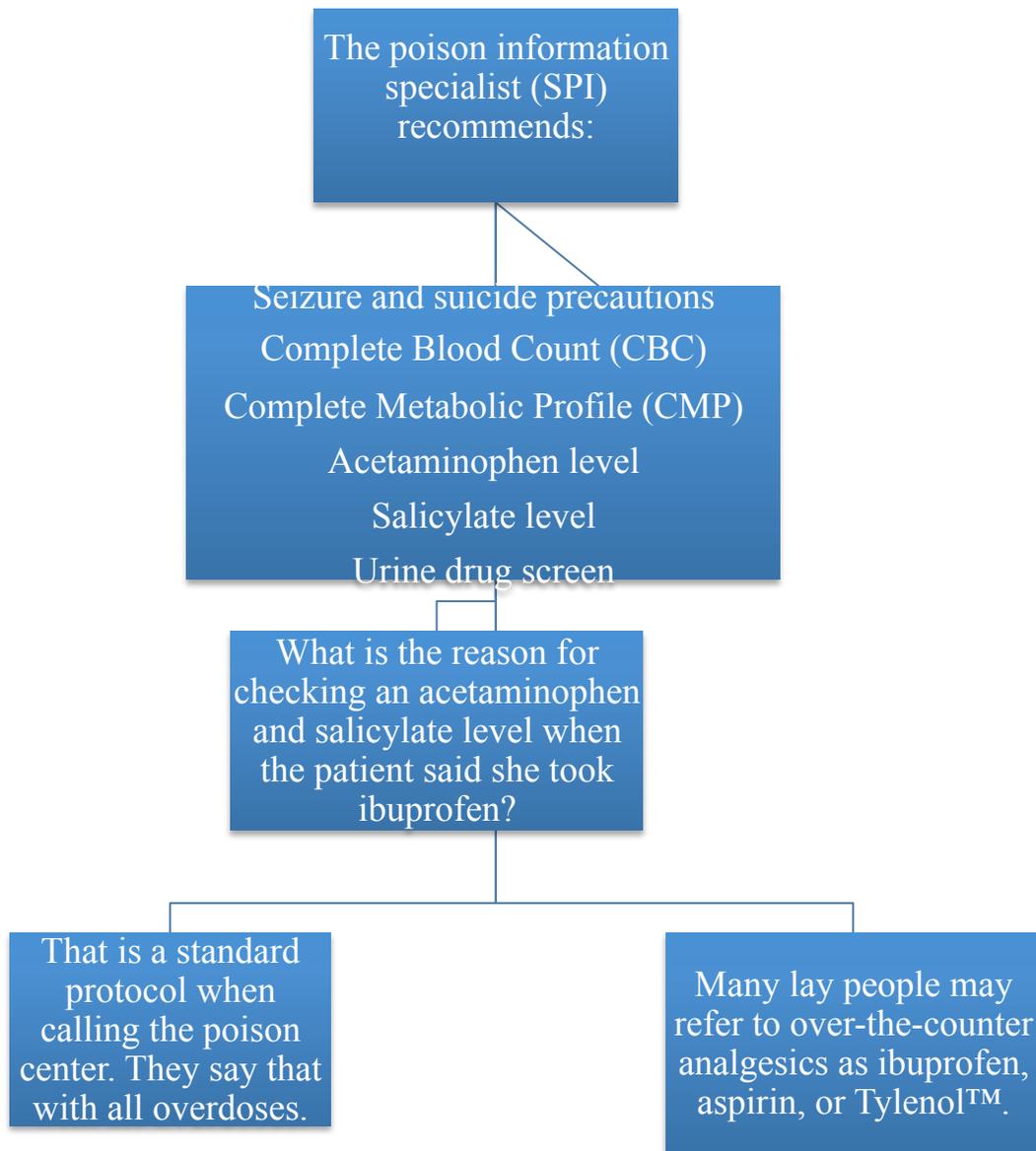
Call the poison control center (PCC) for recommendations

Upon calling the PCC, the RN gives the PC RN (SPI) the history.

The patient's temperature is 97.6°F, heart rate 86, respirations 18, and blood pressure 110/76. The ER RN wants to know how severe is this ingestion?

This is a potentially toxic ingestion and may cause metabolic acidosis.

The patient should be fine as it happened 15 hours earlier and she didn't mean to take so many.



The doctor ordered the poison center be called. The patient claims she didn't take any aspirin or acetaminophen. Which result has alerted the doctor something is wrong with the history?

The urine drug screen is negative.

The salicylate level is < 3 mg/dL.

The acetaminophen level is 110 mcg/mL 15 hours post ingestion.

As the patient's nurse, how do you interpret this information?

She ingested acetaminophen instead of ibuprofen.

The patient doesn't know what she took. She calls all OTC analgesics ibuprofen.

Based on this acetaminophen level, the SPI informs you the serum concentration is in the probable hepatotoxic range.

What *antidote* should the SPI consider recommending for this patient?

Cimetadine, oxygen and
Vitamin C

N-acetylcysteine (NAC)

The SPI recommends IV NAC to be started as the antidote for acetaminophen toxicity.

Loading dose: 150mg/kg in 200 mL of 5% dextrose to infuse over 60 minutes.

Maintenance dose: 50mg/kg (total dose) in 500 mL of 5% dextrose, infuse IV over 4 hours.

This is followed by 100 mg/kg (total dose) in 1 L 5% dextrose until infused per order.

When ordering IV NAC from the pharmacy, you learn the hospital does not have IV NAC. What should you do?

Dilute the oral NAC and use a filter to give it IV.

Call the poison center back and ask for instructions on giving oral NAC instead.

When the infusion of IV NAC is complete, what else will the patient need?

Call the poison center back for advice. The SPI recommends for PT/INR, AST/ALT, BUN and Creatinine. Repate acetaminophen levels.

Call the pharmacist and ask him what to do.

Your patient is admitted to ICU. What other information might you need from the poison center?

Will mucomyst breathing treatments enhance elimination of acetaminophen?

How often should liver function studies be monitored, and what adverse effects should they look for while giving NAC?

On day 4, your patient's liver enzymes have returned to normal and the patient is feeling much better!

Good Job!

Remember to recommend a psychiatric evaluation once the patient is medically cleared.

2. Salicylate

Tracy is a 22 yo, 125 lb. sophomore at the local college. She plays on the school basketball team, but will lose her scholarship if she fails her history class. She took a test this morning and is sure she failed it. She went to the drug store and bought a 100 count bottle of aspirin PM and a bottle of regular enteric coated aspirin 50 tablets. Seven hours after Tracy fell asleep, her roommate found her and called EMS. There were 35 pills missing from each bottle, and she smelled of alcohol.

On arrival to the ED, the patient's BP was 120/60, HR 110, RR 30, T 101.2, and O2 sat 90% on room air.

She complains of abdominal pain, nausea, and has vomited twice, but otherwise appears fine.

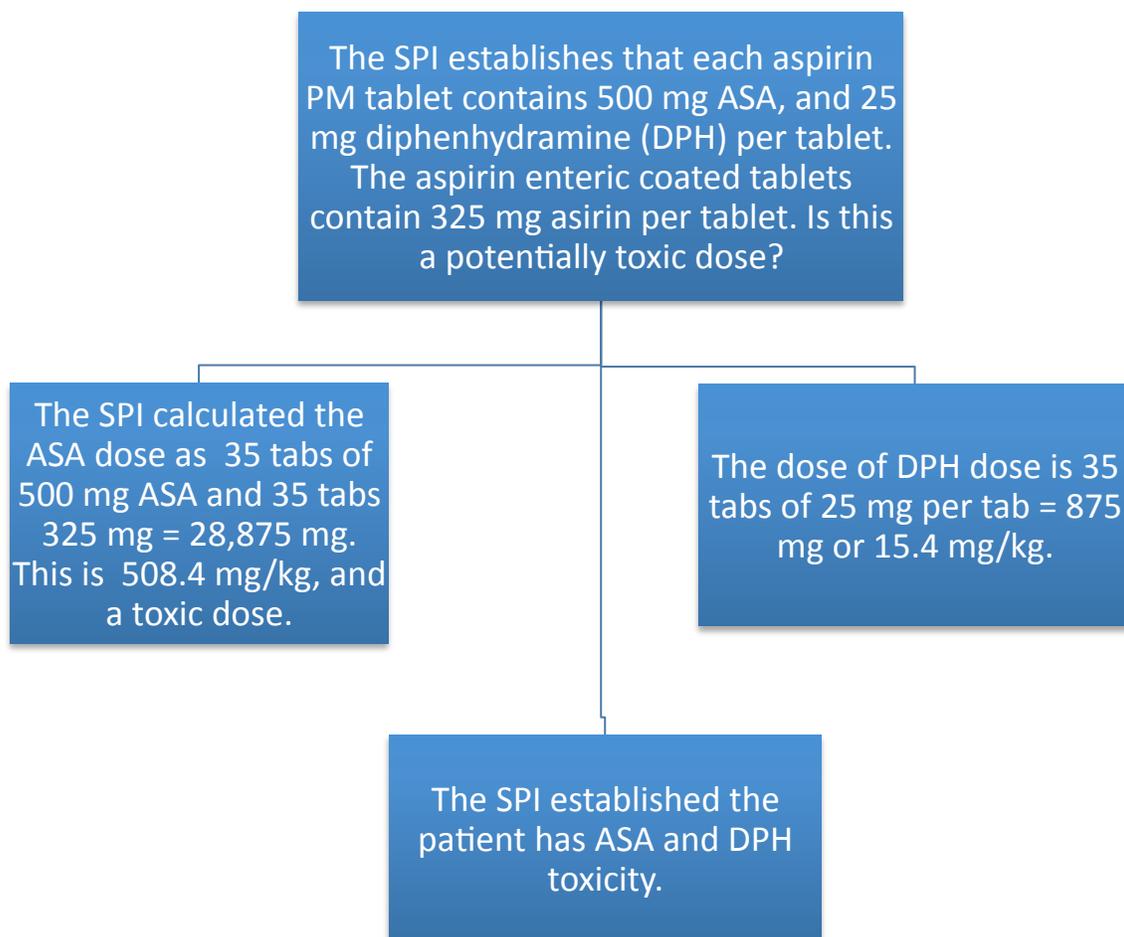
What information does the nurse need when calling the poison control center?

The Poison Information Specialist (SPI) RN will need to know allergies, home medications and how long the patient has been on them, why the patient took these, and the date of her last menstrual period.

The SPI asked for the name and dose of each product, how long has she taken the medication and potential for other co-ingestants ingested and how much alcohol was also ingested.

The SPI asked for the exact name of the products, the number of pills available and the number of remaining pills.

The ER doctor instructs you, the patient's nurse, to call PCC for advice. Could the patient have taken a toxic dose?



The SPI informs you to monitor serum salicylate levels every 4-6 hours until levels continue to decline. ASA overdose may form concretions in the stomach so absorption may be erratic.

There are no specific antidotes for ASA. Oxygen and ventilatory support may be necessary.

IV fluids for rehydration with Sodium bicarbonate is used to alkalinize the urine and enhance ASA elimination.

Symptoms to monitor for include tachycardia, hyperthermia, tachypnea, dehydration, nausea and vomiting, lethargy and metabolic acidosis.

Treat seizures, hypotension, coagulopathies, hyperthermia, metabolic acidosis, cerebral and noncardiogenic pulmonary edema.

ABG's revealed pH 7.21,
pCO₂ 11 mm Hg, pO₂ 134
mm Hg, and HCO₃ 8.0 mEq/
L

Urine pH 5.0

The hallmark of ASA overdose
is respiratory alkalosis with
compensatory metabolic
acidosis and an elevated anion
gap.

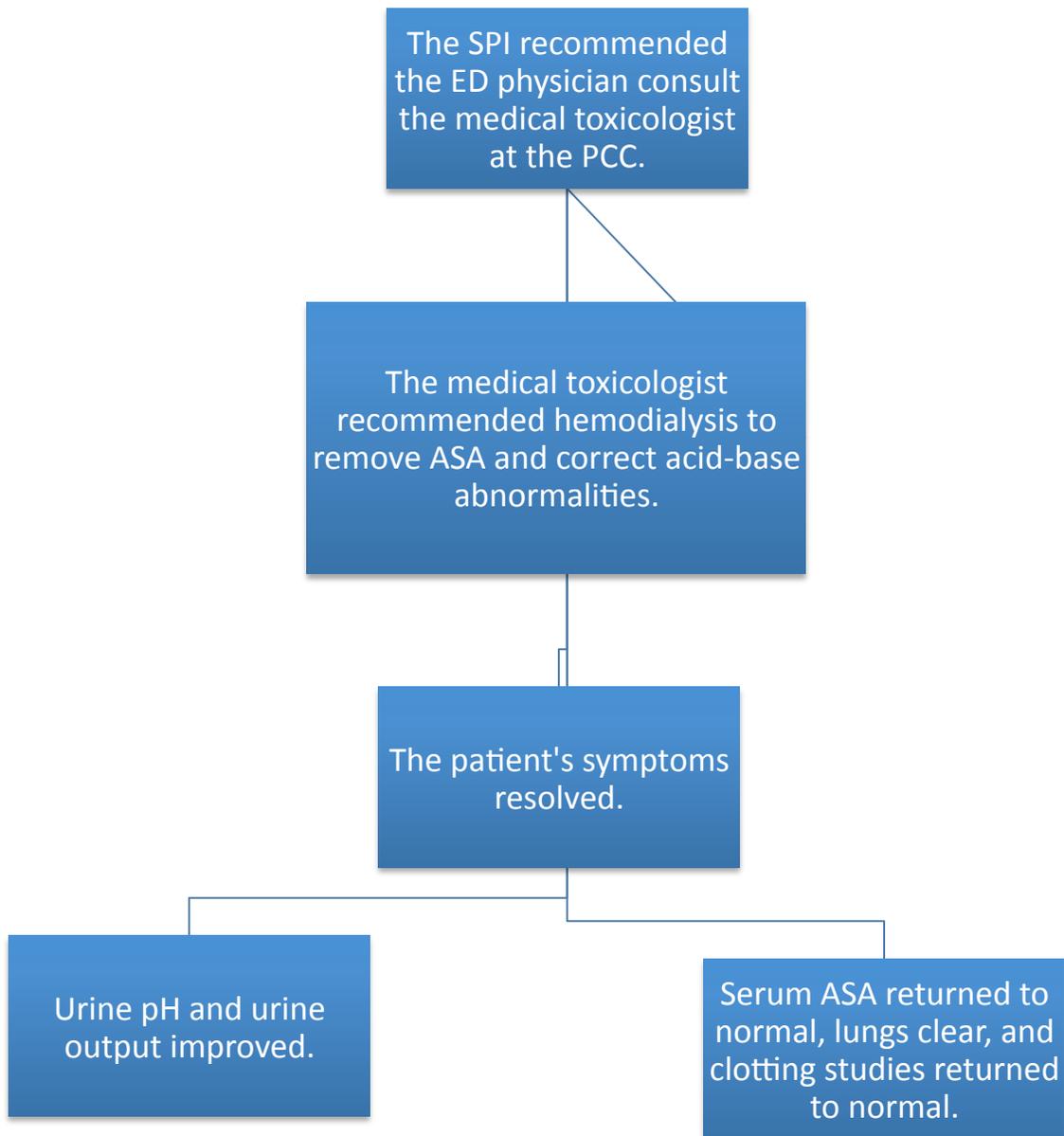
What other lab results will
the SPI need to determine
severity of the exposure?

Electrolytes: Na⁺ 144 mEq/L
K⁺ 3.8 mEq/L
Cl⁻ 98 mEq/L
HCO₃⁻ 8.0 mEq/L
BUN 23 mg/dL
Creatinine 0.9 mg/dL
Glucose 88 mg/dL
Calcium 9.6 mg/dL

The ED physician ordered 88 mEq/L of sodium bicarb and to initiate a bicarb drip of 132 mEq/L in 1 L D5W to infuse at 250 mL/hr.

2 hrs later the SPI calls you back for a follow up. VS: HR 140, BP 106/64, RR 36, she has bilateral wheezes, T 102, O₂ sat 86% on room air.

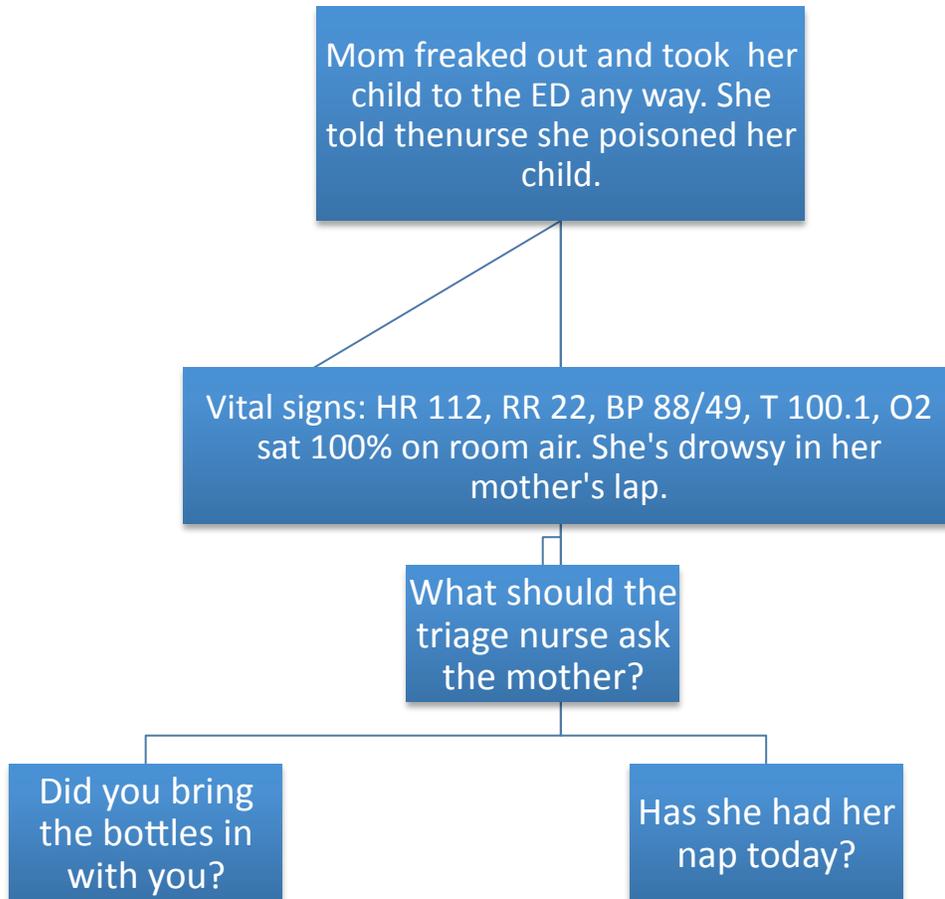
ABG's: pH 7.31, pCO₂ 13.9, pO₂ 116 mm Hg, HCO₃⁻ 3.0 .

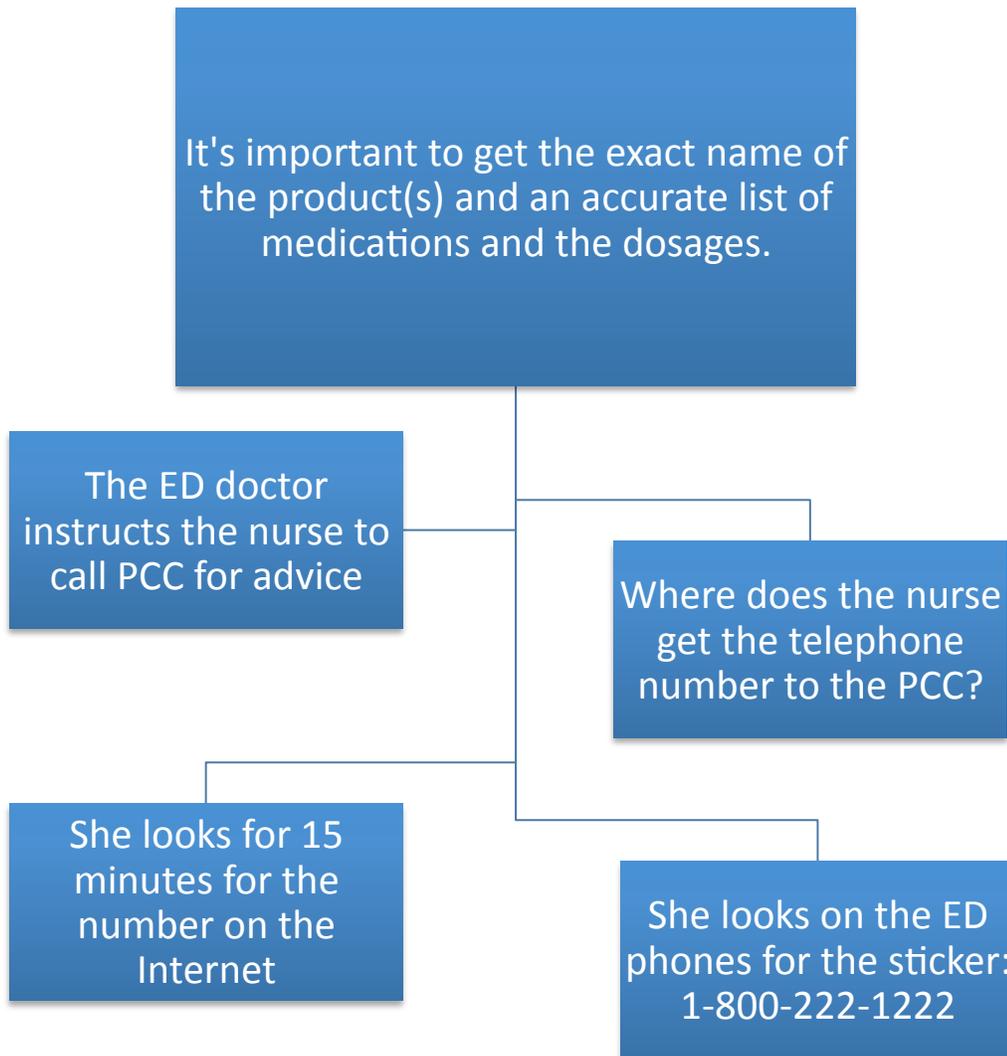


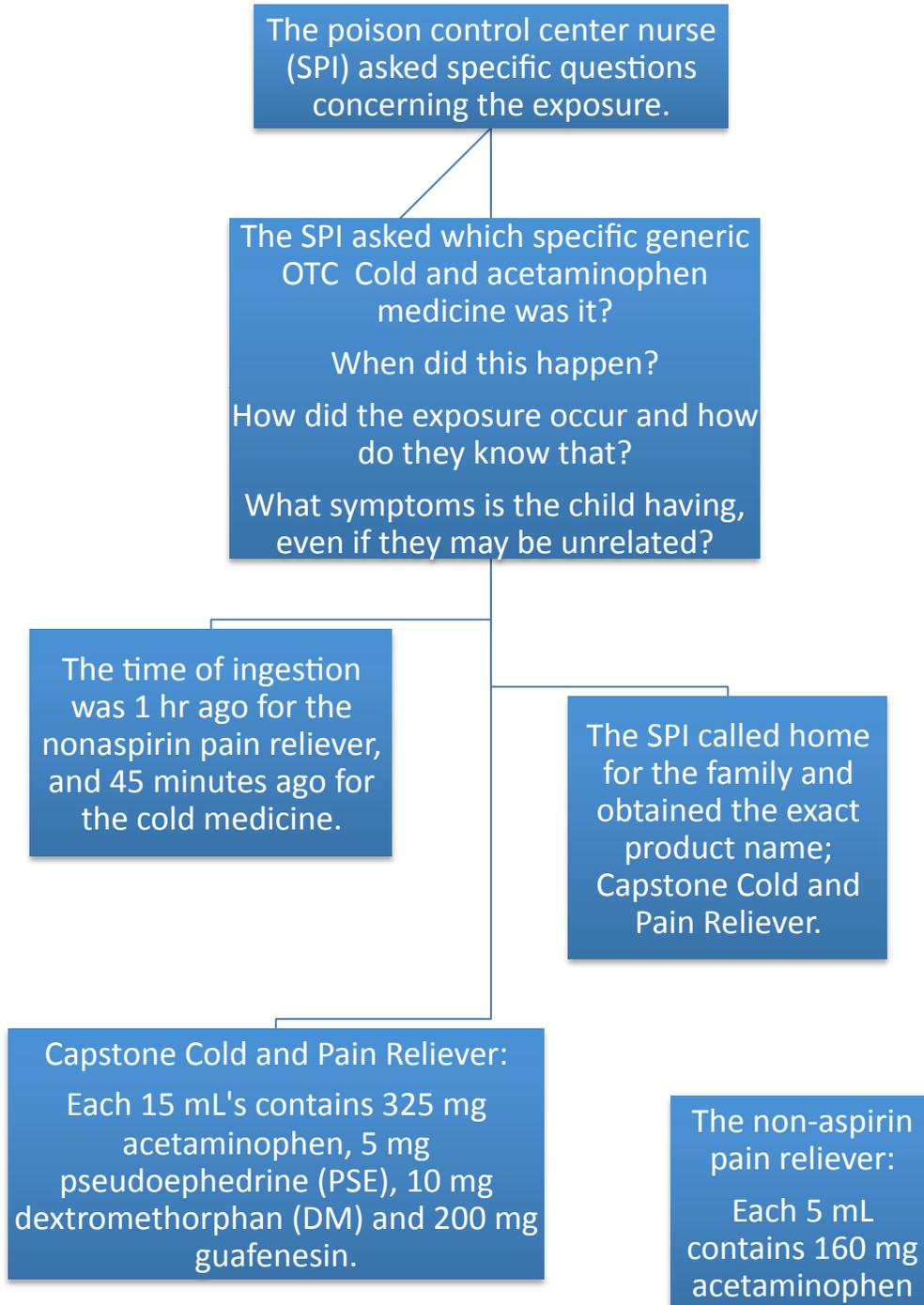
The SPI recommended a psychiatric evaluation once the patient was medically stable.

Good job!
Your patient did well!

3. Cold Medication





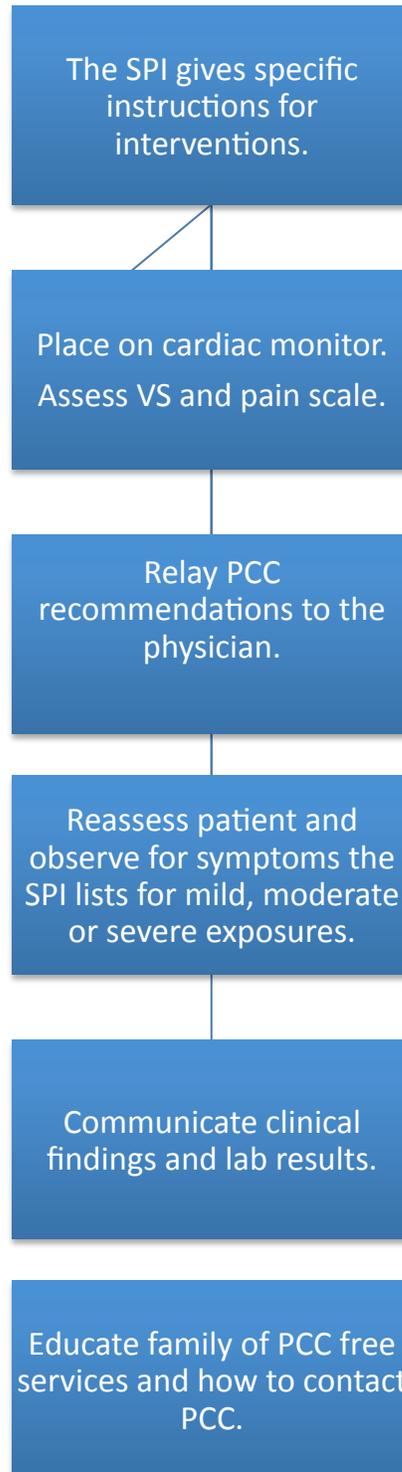


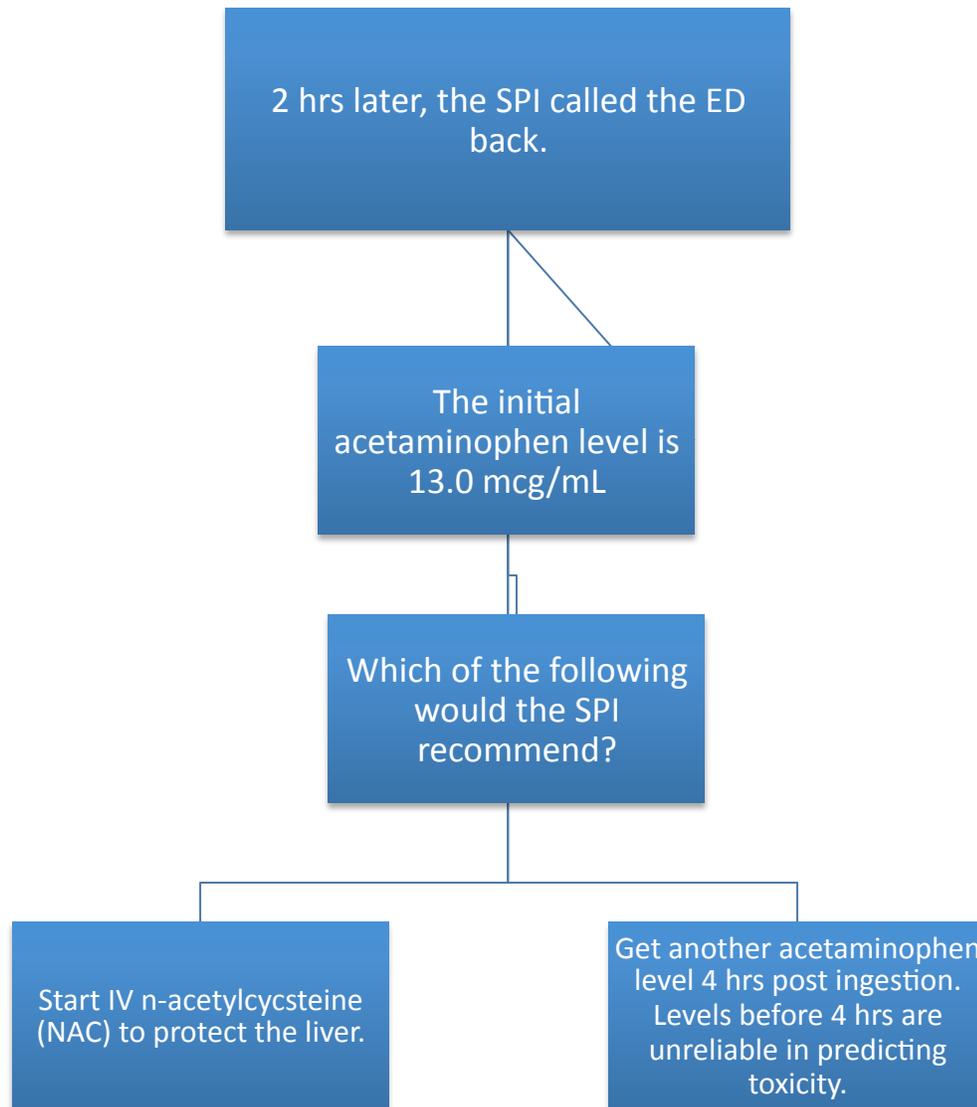
The SPI calculated the child's dosage.

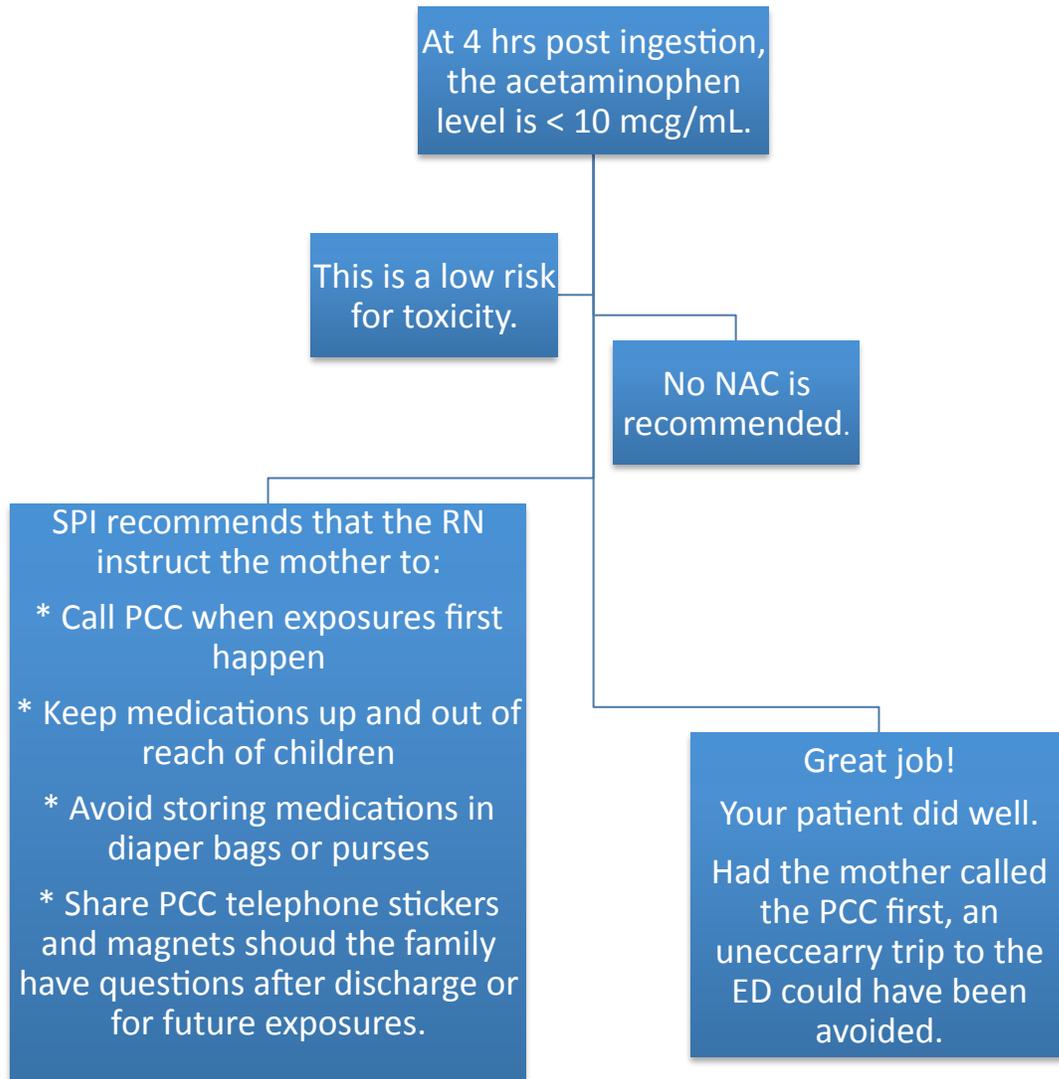
Acetaminophen is 970 mg = 85.1 mg/kg., which is less than a toxic dose.

DM: 20 mg = 1.75 mg/kg
PSE: 10 mg = 0.88 mg/kg
Guafenesin: Nontoxic

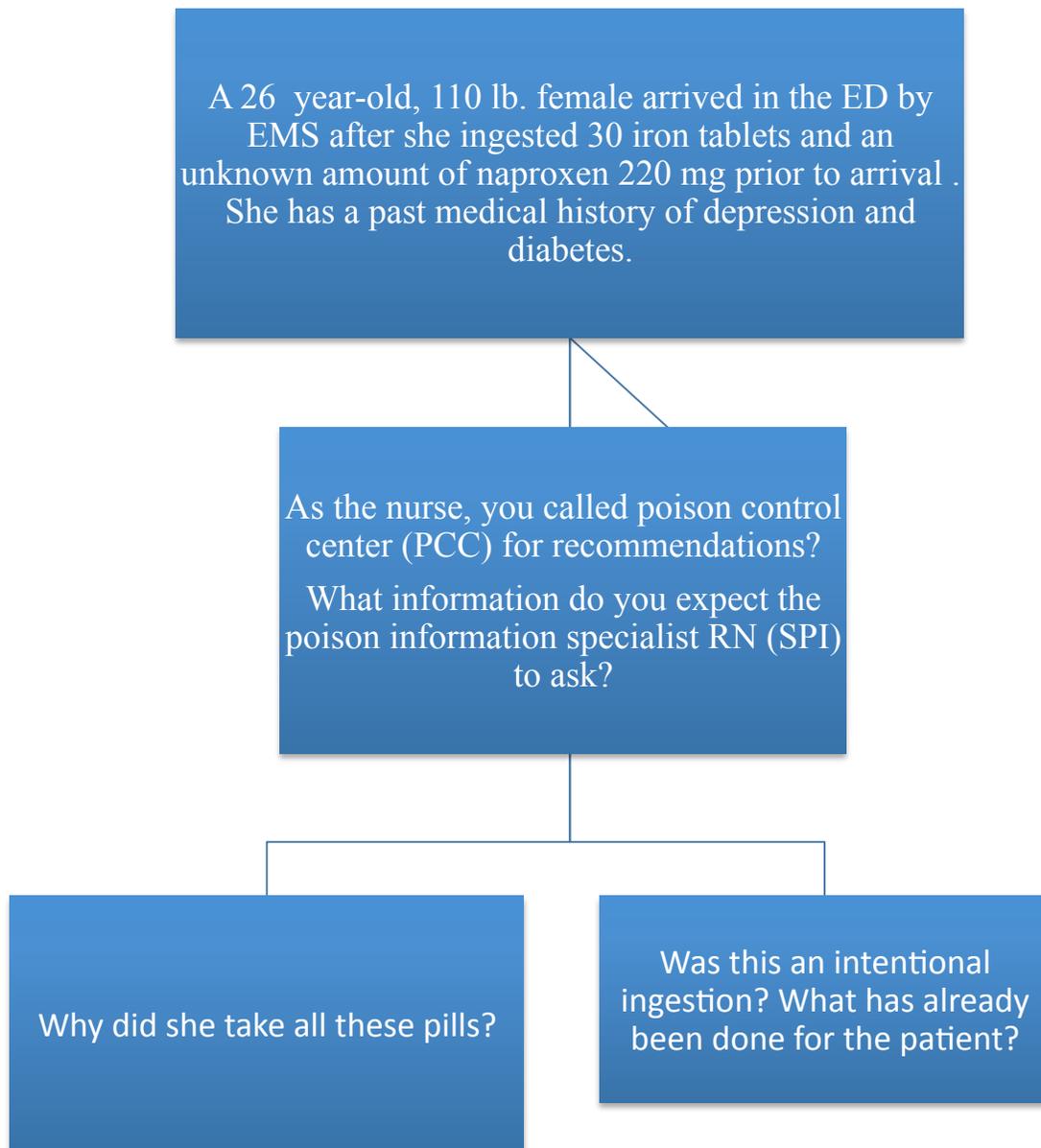
The PCC recommendations: 4 hour acetaminophen level, monitor VS and for GI symptoms and progression of CNS depression .
Use ibuprofen for temperature.







4. Iron

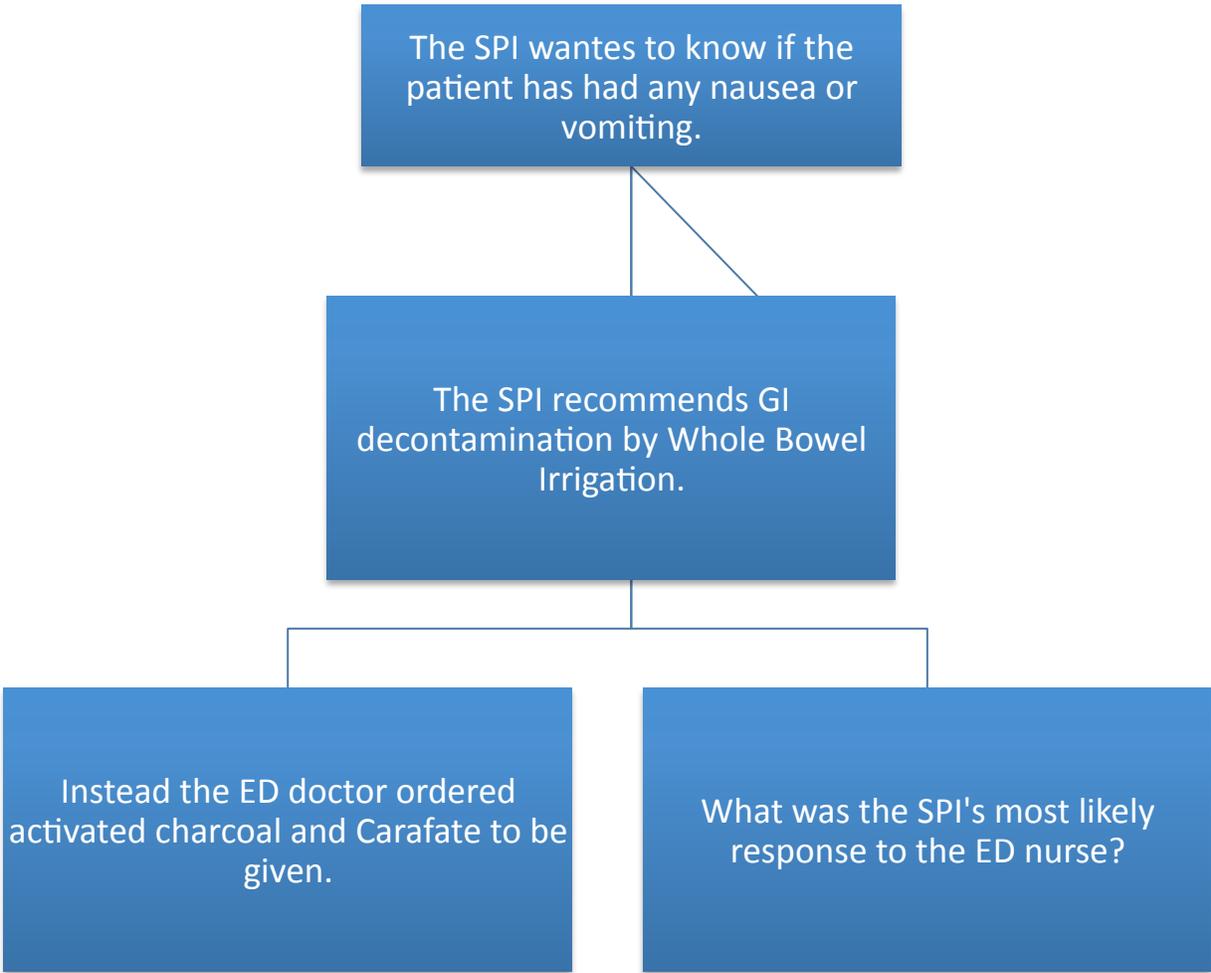


The ED nurse reports the patient is awake, alert, and oriented. Her pupils are 4 mm and reactive.

The HR 88, RR 19, BP 152/90, and T 98.5.

Her skin is warm and dry and lungs are clear.

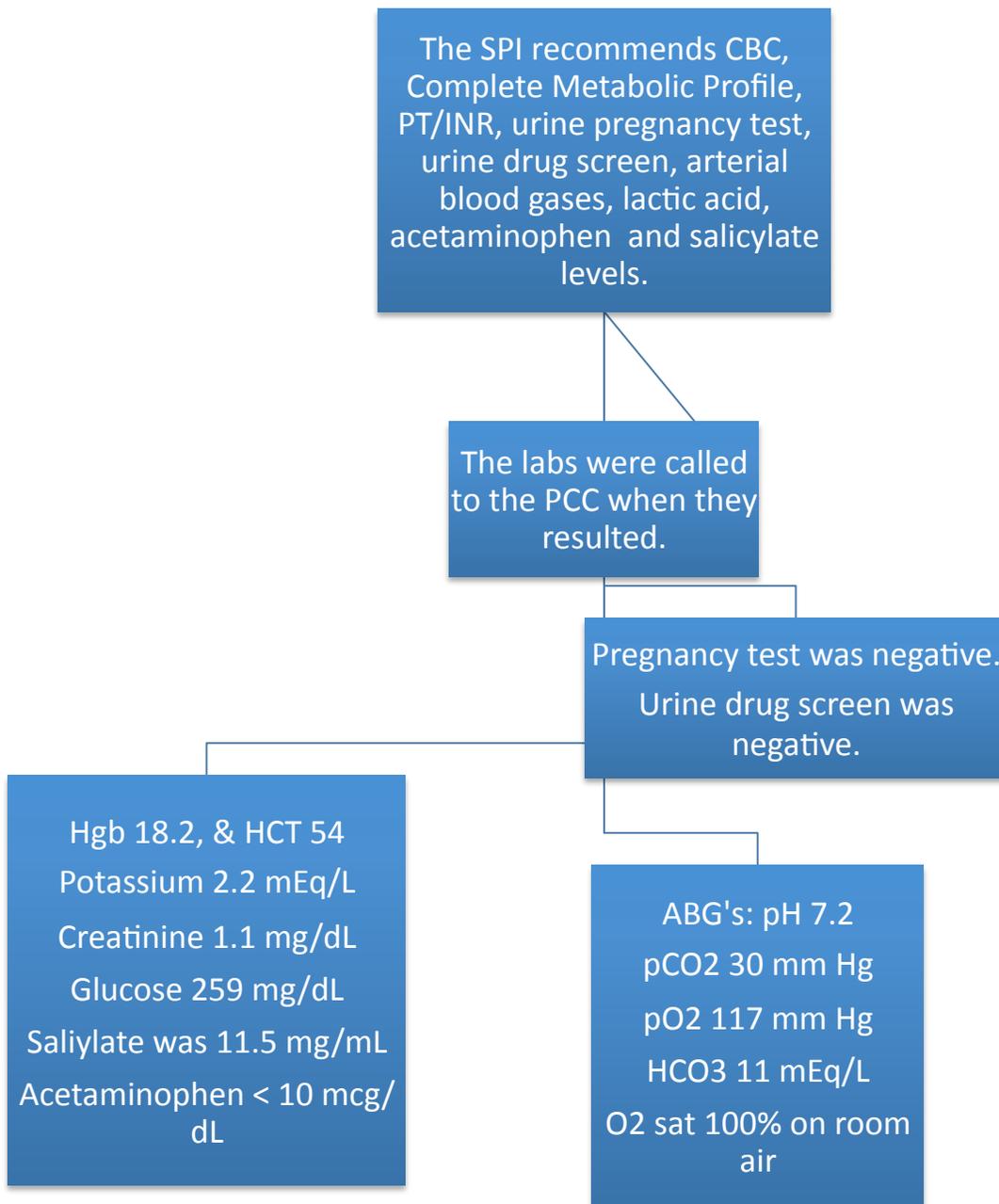
What symptoms of an iron overdose will the SPI be looking for?



The SPI tells the ED nurse that iron, as with all heavy metals, does not bind to activated charcoal.

The patient was admitted to ICU with an IV of D5 1/2 normal saline infusing with 20 mEq/L KCL at 200 cc/hr.

What labs does the SPI recommend?



In ICU, the patient remained awake and alert. She complained of throat pain.

Ondansetron (Zofran) was given for nausea.

The patient's vital signs at 12 hrs post-ingestion: HR 92, RR 20, BP 125/70, and T 98.5.

At 12 hrs post-ingestion, the patient was considered medically stable and she was transferred to behavioral medicine for psychiatric care.

Had the PCC been called, what would the SPI have recommended?

The PCC was called at 36 hrs post-ingestion.

The 2 hr serum iron level was not available for 2 days. The 2 hr serum iron level was 825 mcg/dL.

INR was 22, she had bled out a liter so was receiving fresh frozen plasma.

IV normal saline was infused.

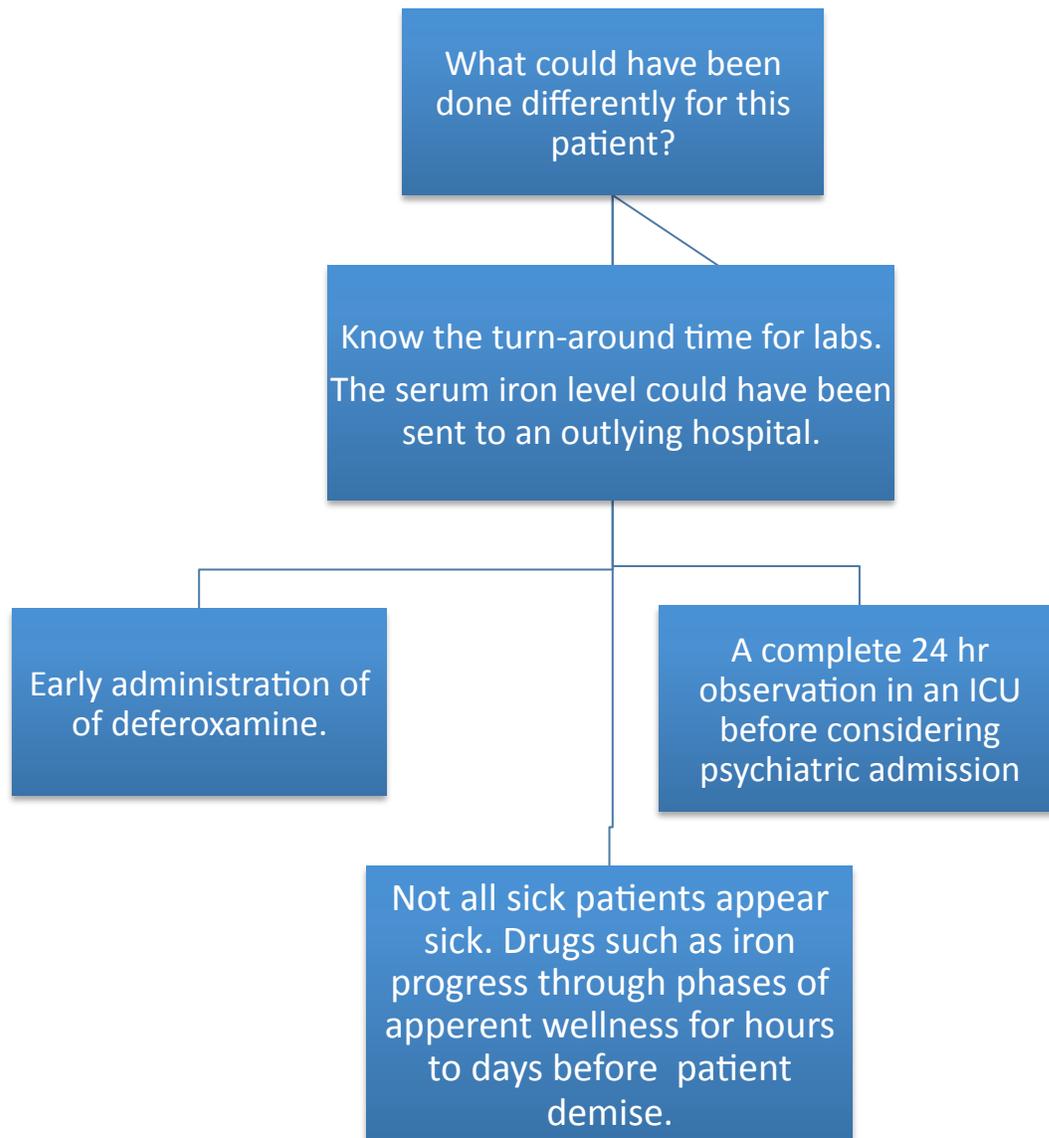
What specific antidote is given for iron overdoses?

Deferoxamine is the specific antidote for iron toxicity. The patient was given the appropriate dose of deferoxamine for her weight IV.

At 48 hrs post-ingestion, the repeated iron level was 800 mcg/dL

The VS were HR 129, BP 98.43, RR 29, O2 sat 100% on room air.

The patient was now in hepatic failure, and was transferred to a larger hospital for a possible liver transplant.



APPENDIX G

Messages From SPIs

1. How can a nurse get a job working in a poison center?

Pharmacists or nurses called poison information specialists, and doctors that are medical or clinical toxicologists staff poison centers in the U.S. The poison information specialists must be specially trained in toxicology to become nationally certified as a specialist in poison information (CSPI). The poison information specialist operates under the direct supervision of a medical director with expertise in emergency medicine, medical toxicology or some other related field.

2. How does one find the number for their local poison center?

To reach the poison center, the number is 1-800-222-1222 from anywhere in the U.S. All poison centers use the same telephone number. Calls to a poison center are routed to the appropriate poison center based on one's area code and telephone number prefix. If you call the poison center from a cell phone from another state, you will access that poison center. It is important to call back using the same telephone, as a phone with another area code would call a different poison center unfamiliar with your call. Calling 9-1-1 will also reach the poison center, but this often delays treatment, as the operator has to reroute the call. Keep 1-800-222-1222 on your cell phone and nursing station.

3. Who may call the poison center?

The poison center offers expert advice and treatment recommendations for anyone that calls. Poison control centers are confidential, free and available 24 hours a day, 7 days per week, and 365 days a year. The staff may communicate with callers in more than 150 languages.

4. Why should nurses call the poison center?

Nearly 20% of the calls to poison centers originate from a health care facility. Nurses, doctors, pharmacists may call for information concerning a toxin or therapy. Nursing, pharmacy and medical students often call the poison center for assistance. Nurses do not have to have a doctor's order to call the poison center.

5. What specific information can the poison center give to nurses?

The poison center can provide information about assessment guidelines for a particular toxin, what signs and symptoms to expect, recommendations for decontamination, range of toxicity, and potential drug-to-drug interactions to expect. The staff can assist with locating and administration guidelines of antidotes. The poison center can arrange for toxicology consults with the medical director and other specialists.

6. What role does poison centers play in the healthcare system?

In 2012, there were more than 3.3 million calls to poison centers, of which, 2.2 million calls were human exposures. Poison centers play a vital role the health care system in the U.S., providing consultation to the public and healthcare facilities. The staff offers assistance to nurses, physicians, and veterinarians in the care of the poisoned patient. Poison centers provide real-time toxicosurveillance to help identify and track threats to public health and the environment. During natural disasters, bioterrorism and disease epidemics, the poison center have access to emergency information. In addition to providing educational outreach for poison prevention and safety in the communities, professional training opportunities are available for healthcare providers including nursing, pharmacy and medical schools through the poison center.

7. Serious poisonings are increasing in the U.S.

According to the CDC, poisoning deaths rank second only to motor vehicle crashes as the leading cause of unintentional injury death in the U.S. More than 90% of unintentional and undetermined poisoning deaths are caused by pain medications. Poison centers save lives, protect the public's health, and save more than \$1 billion per year.

8. There are 55 poison centers to serve the people in the U.S.

In the report, Final Report on the *Value of the Poison Center System*, shows evidence of overwhelming return on investments poison centers provide in the healthcare system. The poison centers save more than \$1.8 billion every year, which is about \$13.39 for every dollar spent to fund the poison center system, or \$0.43 per person in the U.S.

Poison centers manage nearly 70 % of the calls at home, saving \$752.9 million due to unnecessary medical utilization. Another \$441.1 million are saved due to reduced hospital length of stay. \$603 million are saved due to reduced work-loss days, and nearly \$24 million are saved due to in-person outreach programs.

APPENDIX H
Validation Rubric for Expert Panel (VREP)

**PERMISSION TO USE AN EXISTING VALIDATION RUBRIC FOR
EXPERT PANEL (VREP)**

June 17, 2015

To: Lois Dorough

Thank you for your request for permission to use VREP in your research study. I am willing to allow you to reproduce the instrument as outlined in your letter at no charge with the following understanding:

- You will use this survey only for your research study and will not sell or use it with any compensated management/curriculum development activities.
- You will include the copyright statement on all copies of the instrument.
- You will send your research study and one copy of reports, articles, and the like that make use of this survey data promptly to our attention.

If these are acceptable terms and conditions, please indicate so by signing one copy of this letter and returning it to me.

Best wishes with your study.

Sincerely,
Marilyn K. Simon, Ph.D

3/20/15

Signature

I understand these conditions and agree to abide by these terms and conditions.

Signed

_____ Date 07/16/15

Expected date of completion: 08/15/16

Survey/Interview Validation Rubric for Expert Panel - VREP©

By Marilyn K. Simon with input from Jacquelyn White

<http://dissertationrecipes.com/>

Criteria	Operational Definitions	Score				Questions NOT meeting standard (List page and question number) and need to be revised. Please use the comments and suggestions section to recommend revisions.
		1=Not Acceptable (major modifications needed)	2=Below Expectations (some modifications needed)	3=Meets Expectations (no modifications needed but could be improved with minor changes)	4=Exceeds Expectations (no modifications needed)	
		1	2	3	4	
Clarity	<ul style="list-style-type: none"> The questions are direct and specific. Only one question is asked at a time. The participants can understand what is being asked. There are no <i>double-barreled</i> questions (two questions in one). 					
Wordiness	<ul style="list-style-type: none"> Questions are concise. There are no unnecessary words 					
Negative Wording	<ul style="list-style-type: none"> Questions are asked using the affirmative (e.g., Instead of asking, "Which methods are not used?", the researcher asks, "Which methods <i>are</i> used?") 					
Overlapping Responses	<ul style="list-style-type: none"> No response covers more than one choice. All possibilities are considered. There are no ambiguous questions. 					
Balance	<ul style="list-style-type: none"> The questions are unbiased and do not lead the participants to a response. The questions are asked using a neutral tone. 					
Use of Jargon	<ul style="list-style-type: none"> The terms used are understandable by the target population. There are no clichés or hyperbole in the wording of the questions. 					
Appropriateness	<ul style="list-style-type: none"> The choices listed allow participants to 					

of Responses Listed	respond appropriately. <ul style="list-style-type: none"> The responses apply to all situations or offer a way for those to respond with unique situations. 					
Use of Technical Language	<ul style="list-style-type: none"> The use of technical language is minimal and appropriate. All acronyms are defined. 					
Application to Praxis	<ul style="list-style-type: none"> The questions asked relate to the daily practices or expertise of the potential participants. 					
Relationship to Problem	<ul style="list-style-type: none"> The questions are sufficient to resolve the problem in the study The questions are sufficient to answer the research questions. The questions are sufficient to obtain the purpose of the study. 					
Measure of Construct: A:	The survey adequately measures this construct A: Poison centers and services provided					
Measure of Construct: B:	<ul style="list-style-type: none"> The survey adequately measures this construct B: Incidence of Intentional and unintentional exposures by age 					
Measure of Construct: C:	The survey adequately measures this construct C: Demographic information and HIPPA Act					
Measure of Construct: D:	<ul style="list-style-type: none"> The survey adequately measures this construct D: Basic management by exposure route 					

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APPENDIX I

Permission by AAPCC

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November 11, 2014

Lois E. Dorough
Regional Poison Control Center Children's Hospital of Alabama
1600 7th Avenue South
Birmingham, AL 35233

Dear Ms. Dorough,

Thank you for your letter requesting permission to use the Poison Help logo and the Poison Control in Action PowerPoint presentation. This letter serves as your notice of authorization to use both files, as well as the key points for the health care provider information on aapcc.org for your PhD dissertation project activities targeting nursing students. We hope that in using the logo, presentation, and information from aapcc.org for your project you are able to raise awareness among future nurses of the value and benefits poison centers provide to them as health care practitioners.

Sincerely,

Steve Kaminski, Executive Director
American Association of Poison Control Centers

Call 1.800.222.1222 for poison emergencies or questions. This nationwide number is answered by the poison center that serves you.