Self-Efficacy, Locus of Control and the Use of Simulation in Undergraduate Nursing Skills Acquisition

A Dissertation
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By Leland Jerome Rockstraw
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Dedications

This dissertation is dedicated to three individuals that have provided invaluable support, guidance, understanding, love, and friendship.

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Abstract

Self-Efficacy, Locus of Control and the Use of Simulation in Undergraduate Nursing Skills Acquisition
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The confidence to perform a skill (self-efficacy) is affected by multiple factors (ability, personality, self-estimate of ability, locus of control, and motivation). Sixty beginning nursing students (freshman and early sophomores) were studied as to their self-efficacy and locus of control in the acquisition of basic nursing skills in two simulated educational methods. Students were randomly assigned to the human-patient simulator (HPS) a computerized life-size mannequin, or to the standardized patient (SP) an actor trained to simulate a patient. Educational simulations share essential attributes: 1) they imitate but do not duplicate reality, 2) they offer chances to ‘make an error’ and 3) they provide feedback. These characteristics make simulations important in nursing practice thus allowing the student to learn from their mistakes without causing any harm and provide objective feedback (McGuire, 1999). Data was collected using pre and post self efficacy and locus of control questionnaires from students who received 80% or greater on performance of nursing skills such as: measuring blood pressure and pulse. Analysis of the data suggests a significant (p<0.001) increase in self-efficacy from pre to post score and a non-significant change towards an internal locus of control. Implications for healthcare and for nursing programs are discussed.
Chapter 1: Introduction

Background

Nursing faculty who teach curriculum and coordinate clinical practica at universities provide the basic education required for students who enter the profession of nursing. Research shows that the coordination of the clinical practica is a complex educational process and suggests that nursing students who perform poorly in the practica are probably less effective in their practice than students who perform satisfactorily (Morgan, Cleave-Hogg, DeSousa & Tarshis, 2004; Pfeil, 2003). It also has been observed that the evaluation process of the clinical practica is often ambiguous and subjective. In contrast, evaluation of the didactic content is objective and quantified through multiple testing systems such as written course examinations and the Nursing Council of Licensing Examination, a national licensing examination that all graduating nursing students must pass in order to practice the profession of nursing.

Traditionally, nursing students initially practice basic skills on other students under the direction of a nursing faculty in a Clinical Learning Resource Center (CLRC). At one university in Philadelphia, students practice for five weeks and after demonstrating proficiency in certain fundamental nursing skills, advance to engaging in clinical activities with actual patients in many different types of healthcare agencies. Clinical nursing instructors may have up to ten students in these largely uncontrolled settings and therefore they are unable to visually supervise each student for the entire duration of the clinical phase.

Most recently, the use of simulation education pedagogies to enhance nursing clinical practica is receiving increased attention (Feingold, Calaluce, and
Kallen, 2004; Ravert, 2004). Some universities are creating nursing simulation clinical practice settings that mirror a patient in the hospital. A major benefit of simulated clinical environments is the ability to safely learn in an environment where human error to human patients is minimized. Here students who perform an ‘incomplete’ nursing assessment or an ‘incorrect’ nursing intervention cannot harm patients and then are able to immediately learn from their mistakes. The literature on this subject is sparse, but what does exist suggests that simulated clinical environments may actually replace some of the traditional on site practica, and may help reduce the possibility of ‘student errors’ in real settings (Issenberg, McGaghie, Hart, Mayer, Felner, Petrusa, et. al., 1999; Kapur & Steadman, 1998).

Outside the profession of nursing, simulation education has a long history. In professions such as in aviation, maritime operations, and nuclear power management, simulation in education is used regularly (Gaba, 1997; Garrison, 1985). Simulation is relatively new to health care professions; however, anesthesiology has used simulation with medical students for the past 15 years in learning intubation, starting intravenous catheters, and administering anesthetics (Gaba, 2000; Leape, 1994). Two types of simulation pedagogies increasingly being used in healthcare educational settings are (1) the human-patient simulator (HPS), a computerized life-size mannequin and (2) the standardized patient (SP), an actor trained to simulate a patient who can offer a controlled, yet realistic clinical scenario.

The first pedagogy is the Human-patient simulator (HPS) a computer-driven, full-sized mannequin which delivers experiences that are true-to-life
scenarios that swiftly change to meet the educators’ goals. A human-patient simulator can blink, speak, breathe, and has a heartbeat, a pulse, and accurately mirrors human responses to such procedures as cardiopulmonary resuscitation, intravenous medication, intubation, ventilation, and catheterization. These attributes allow nursing students to perform safely on computerized mannequins that proxy for a real live patient and can be programmed to exhibit multiple physiologic events (Bond & Spillane, 2002; Ravert, 2002; Treloar, Hawayek, Montgomery, & Russel, 2001).

The second pedagogy is the use of standardized patients who are actors educated to simulate real patients. The primary goals of standardized patient encounters are to offer consistent clinical experiences, consistent methods of instruction, and to standardize evaluation criteria in education (Bromley, 2000; Rubin & Philp, 1998; Wallace, 1997). Standardized patients are educated to portray a wide variety of clinical cases, such as diabetes, chest pain, and depression; to help overcome many of educational problems inherent in traditional on site clinical practice environments (Ainsworth, Rogers, Markus, Dorsey, & Blackwell, & Petrusa, 1991; Gibbons, Adamo, Padden, Ricciardi, Graziano, Levine, et. al., 2002). Standardized patients have been used to evaluate medical student’s performance since the early 1990’s; and more recently have been used to evaluate nurse practitioner student’s performance. Research supports the use of the standardized patient in the acquisitions of physical assessment skills, critical thinking, as well as increasing confidence for both medical students (Barrows, 1993; Barrows, Williams, & Moy, 1987) and nurse practitioner students (Vessy & Huss, 2002). The use of the standardized
patient with undergraduate nursing students is in its earliest stages and there is a paucity of research about the use of this teaching pedagogy in this population.

Studies indicate performance is related to self-efficacy; when a person feels confident, their performance is enhanced (Phillips & Gully, 1997; Wood & Bandura, 1989). In order to perform a skill, a person needs knowledge, psychomotor skills, and confidence in their ability. Performance is also related to an individual’s LOC because when a person believes he/she has control over the outcome, performance is improved. Tompson and Dass (2000) identify that when a person’s self-efficacy enhances or improves their task interest, persistence, ability and desire to exert effort, and in the end, task performance.

**Theoretical Framework**


Bandura (1997) defined perceived self-efficacy as “belief in one’s capabilities to organize and execute the courses of action required to produce given attainments” (p 2-3). He hypothesized that individuals are not simply efficacious (i.e., confident) or not, but the degree of efficacy they have within a specific activity determines their confidence level (1978, 1986). If one assumes that the outcome of one’s actions is important, Bandura believes that individuals
make two judgments: (a) ‘Do I have the skills?’ and (b) ‘Am I in control of the consequences?’

Based primarily on social cognitive theory, studies have found that individuals with high self-efficacy set higher goals and have higher performance than individuals with low self-efficacy (Thomas & Mathieu, 1994; Wood & Bandura, 1989). Self-efficacy is thought to reflect both an individual’s self perceived ability and a motivational component. High self-efficacy also has been associated with complex skill acquisition and has been shown to be a strong predictor of complex air-traffic controller performance for instance (Ackerman, Kanfer, & Goff, 1995).

This study also investigates the locus of control concept from Rotter’s Social Learning Theory. While developing his theory, Rotter coined the terms internal and external locus of control in the year 1966. Locus of control refers to the belief that an individuals actions will or will not have an effect on what happens. Locus of control is a personality attribute reflecting the degree to which a person generally perceives events to be under his/her control (internal locus) or under the control of powerful others (external locus) (Rotter 1966, 1990, 1992). Individuals, who are more internal, believe that they are individually responsible for outcomes, while people who are more external believe that outcomes are controlled by something other than them such as luck, chance, or other more powerful beings.

With this theory, Rotter asserted that an individual’s locus of control influences the performance level of the individual. Because an external locus of control has been proposed to be related to passivity and learned helplessness
(Rotter, 1992), and because perceived environmental controllability has been found to be related to greater self efficacy (Phillips & Gully, 1997; Wood & Bandura, 1989), it is reasoned that persons with a more internal locus of control will have a higher self-efficacy than individuals with a more external locus of control. Furthermore, studies have shown that self-efficacy has an effect on a person’s performance. That is, even if a person has the ability to perform well on a task, if she or he does not believe that she or he is capable of performing well (i.e., low self-efficacy), it is unlikely that high performance goals will be set (Phillips & Gully, 1997).

These two well-researched theories of self efficacy and locus of control have been studied in nursing students in relation to academic performance (Ofori, & Charlton, 2002) and in retention and success in baccalaureate programs (Schreiber, 1995). In the area of nursing practice, it has been shown that the expectations of nurses to prevent the development of pressure ulcers are related to nurse’s self-efficacy and locus of control (Maylor, 2001). Phillips and Gully (1997) suggest that it is also reasonable to expect that personality variables such as locus of control will have an effect on an individual’s level of self-efficacy. Wood, Bandura, and Bailey (1990) suggest that stronger self-efficacy has also been shown to lead to higher self set goals.

Feltz (1994) suggests that judgments of low self-efficacy are associated with lower levels of effort and lack of persistence; whereas high self-efficacy is associated with higher levels of effort and persistence. Research suggests that individuals with higher levels of self-efficacy and internal locus of control are more likely to persist in their performance of a task for longer periods of time than
individuals with low self-efficacy and external locus of control (Strauser, Waldrop, Hamsley, & Jenkins, 1998).

Many factors influence the performance of skills by an individual. Skills may be defined as “actions (and reactions) which an individual performs in a competent way in order to achieve a goal” (Ericsson, 1996, p5). One may have no skill, some skill, or complete mastery. Therefore, when teaching or testing a skill the level of acceptable mastery must be defined based on the training level. Nursing skills that require repeated practice to master lend themselves to simulator use. The traditional reliance on the apprenticeship model is no longer the only method to remain technically proficient in an era where the techniques are continually changing.

While the body of literature describing the use of simulation in nursing education is growing (Peterson & Becktel, 2000; Rauen, 2001; Roberts, 2000; Saucier, Stevens, & Williams, 2000; Sherer, Bruce, Graves, & Erdley, 2003; Vandrey & Whitman, 2001), there has been little research on the effect that simulation education has on nursing student’s self-efficacy and locus of control. Two strategies to possibly reduce potential patient error by nursing students and future registered nurses are with computerized realistic human-patient simulators (HPS) and with standardized patients in a simulation environment (Vessey & Huss, 2002). The questions posed in this study are: (1) does the level of self-efficacy and locus of control impact the performance of basic nursing skills learned in either the human-patient simulator or with the standardized patient? Further, (2) is self-efficacy perhaps more changeable and locus of control more stable? Ultimately, (3) can basic skills acquired through the use of these two
simulation techniques be further applied to the acquisition of more complex
nursing procedures and thereby potentially decrease healthcare errors and
promote safer patient care?

Statement of the Problem

Deaths due to medical errors are thought to exceed the number
attributable to the eight leading causes of death in the United States. The total
national cost of these preventable medical errors is estimated to be between $17
and $29 billion (Kohn, Corrigan, & Donaldson, 1999). In nursing education, the
traditional clinical practica is a critical component of the curriculum and works to
guide as well as demonstrate a student’s ability to transform theoretical
information into real world situations. However, students can and will make
errors, which is part of the learning process.

While it is recognized that simulation is being used increasingly in nursing
education to instruct and evaluate students in the performance of skills, there has
been little research on the factors that impact the learning process in such
educational environments. Two well-known factors that have been documented
to affect performance are self-efficacy and locus of control which have been studied in traditional clinical environments (Ford-Gilboe, Laschinger, Laforet-Fliesser, Ward-Griffin, & Foran, 1997; Lim, Downie, & Nathan, 2004; Sadler, 2003). There is, however, now a need to explore self-efficacy and locus of control in nursing students’ performance of skills in simulation environments since simulation is being more widely used.
Statement of Purpose

The purpose of this study was to examine the effect of new simulation methods on students’ self-efficacy, locus of control, and performance in nursing skills. Students were randomly assigned to two simulation methods: (1) the human-patient simulator (HPS) and (2) the standardized patient (SP). In both methods, students were taught how to take blood pressure and a pulse.

Research Questions

The following eight research questions will frame the analyses in this study:

1. Will there be change in pre-test/post-test self-efficacy scores for students who receive the human patient simulation (HPS) training method?

2. Will there be change in pre-test/post-test self-efficacy scores for students who receive standardized patient (SP) training method?

3. Will there be a difference in pre-test/post-test self-efficacy scores for students who receive human-patient simulator (HPS) as compared to students who received standardized patient (SP) training method?

4. Will there be change in pre-test/post-test locus of control scores for students who receive human patient simulation (HPS) training method?

5. Will there be change in pre-test/post-test locus of control scores for students who receive standardized patient (SP) training method?

6. Will there be a difference in pre-test/post-test locus of control scores for students who receive human-patient simulator (HPS) as compared to students who received standardized patient (SP) training method?

With questions 1-6 above analyzed, this study addresses the two following questions:
7. Is there a relationship between performance scores on skill A (Blood pressure performance technique) and change scores of self-efficacy (SE) in students completing the human-patient simulator and standardized patient practica?

8. Is there a relationship between performance scores on skill B (Pulse reading performance technique) and change scores of self-efficacy (SE) in students completing the human-patient simulator and standardized patient practica?

**Definitions of Terms**

**Clinical Learning Resource Center** – A set of rooms located within a college of health sciences where clinical skills are put into practice with fellow classmates, mannequins, and models. The rooms are set up to mimic patient rooms, health assessment and rehabilitation areas.

**Clinical Practica** – The portion of a nursing course, which applies the theoretical content to the real world setting. The clinical practica is tied to theory specific content where nursing students work with an instructor in areas such as adult, maternal/child, mental, gerontology, and public health. A clinical practica environment may be an acute, long term, or a community setting.

**Nursing Student** – An individual who is currently enrolled and taking part in an approved baccalaureate nursing curriculum. The student, during a portion of a nursing clinical course, is assigned to a clinical faculty for the purpose of meeting specific objectives by synthesizing previously obtained knowledge. The student is supervised by, and responsible to the nursing instructors for the achievement of the objectives.
Simulation Education – A teaching pedagogy that imitates but does not duplicate reality. Essential attributes: (1) imitates but does not duplicate reality, (2) offer chances to make an error without harm and (3) provide feedback (Tekian, 1999). Simulation has been defined as “the representation of the operation or features of one process or system through the use of another” (American Heritage Dictionary, 1992, p1047) or, “the artificial replication of sufficient components of a real world situation to achieve certain goals” (Gaba, 1997, p57).

Conceptual and Operational Definitions

Human-patient simulator – Conceptual Definition: A Human-patient simulator is a computer-driven, full-sized mannequin consisting of common features that include a computer work station, and interface device that actually replicates signs and symptoms. The human-patient simulator speaks and breaths, has a heartbeat, a pulse, and mirrors human responses to such procedures as cardiopulmonary resuscitation, intravenous medication, intubation, ventilation, and catheterization. The human-patient simulator delivers experience in true-to-life scenarios that swiftly change to meet the instructor’s goals. The device used for this study is manufactured by Laerdal and is called SimMan ©.

Standardized Patient – Conceptual Definition: A standardized patient is a person who has been educated to portray an actual patient by accurately and consistently simulating an illness or other physical finding. Standardized patients are typically members of the community who are interested in making a contribution to health care education and enjoy working with people. Training for each standardized patient case involves one to three coaching session depending on the curriculum needs. The standardized patient allows the student
the opportunity to practice both clinical examination and interviewing skills, and health teaching in a safe, non-threatening, and controlled environment.

**Self-Efficacy – Conceptual Definition:** Self-efficacy is the belief in one's capability to organize and execute the courses of action required to manage prospective situations. In essence, self-efficacy is the confidence that one has in one's ability to do the things that one tries to do. It may be viewed as an individual's estimate of his or her ability to cope with a situation, and the outcome expectancy; an individual's estimate of the likelihood of certain consequences occurring. This combination of assessments of potential threat and coping resources determines how anxious an individual may become in a given situation (Bandura, 1982).

**Self-Efficacy – Operational Definition:** Self-Efficacy will be measured by the summative score of an adaptation from Jerusalem and Schwarzer's General Self-Efficacy Scale that measures information about a person’s sense of self-confidence after experiencing various kinds of stressful life events. The scale is self administered and responses are made on a four-point scale. Responses can range from 20 to 40 (low), 41 to 60 (medium), and 61 to 80 (high) for the self-efficacy scale (Jerusalem & Schwarzer, 1992; Rimm & Jerusalem, 1999; Schwarzer & Scholz, 2000).

**Locus of Control – Conceptual Definition:** Locus of control is an individual’s perception of his or her ability to control the outcomes of events. It is conceptualized as residing on a dynamic bi-polar continuum ranging from internal to external, and represents the tendency to attribute success and difficulties either to internal factors such as effort or to external factors such as chance. If individuals tend to perceive that reinforcement results from their own behavior,
they are considered to possess internal locus of control. If individuals tend to view fate, luck, or powerful others as being responsible for reinforcements, rather than their own behavior, they possess external locus of control.

Locus of Control – Operational Definition: Locus of control will be measured by score on Rotter’s 29 question scale with 23 forced choice items (internal versus external) and 6 filler questions. Scores could range from high internal locus of control (0-5) to a high external locus of control (19-23) (Rotter, 1966; 1975).

Nursing Skills – Conceptual Definition: Nursing skills are practice skills that are comprised of established criteria and are required in nursing programs.

Nursing Skills – Operationalized Definition: They will be operationalized as obtaining radial and apical pulse and measuring blood pressure. Each skill was scored using a modified checklist from Potter and Perry (2000). A student must score an 80% or higher in order to demonstrate satisfactory competency in each skill and to be included in the study.

Variables

Variables measured in this study include the following:

Independent variables: The type of simulated performance environment – human-patient simulator or standardized patient.

Dependent variables: Self-efficacy, locus of control, and performance of skills.

Significance of the Study to Healthcare Professions

The study is significant because more people die in a given year as a result of medical errors than from motor vehicle accidents, breast cancer, or AIDS (Leape, 1994). Medical errors cause patient’s financial burden, harm, and in some cases, death. Medication errors alone occurring either inside or outside
hospitals are estimated to account for over 7,000 deaths annually (Borden, 2002).

Licensing and accreditation processes in various health professions have focused only limited attention on the issue of errors and even these minimal efforts have confronted some resistance from healthcare organizations and providers (Kohn, Corrigan, & Donaldson, 2000). Despite cost pressures, liability constraints, resistance to change, and other seemingly insurmountable barriers, it is simply not acceptable for patients to be harmed by the same health care system that is suppose to be healing and comforting them. ‘First do no harm’ is an often quoted term from Hippocrates and at a very minimum, the healthcare care system needs to offer that assurance and security to the public. A comprehensive approach to improve patient safety is needed (Kohn et al, 2000).

A major force for improving patient safety starts at the beginning of the educational process of the respective healthcare practitioner. Factors in the educational environment must include current knowledge as well as tools to improve the safety and care for patients. The educational culture must encourage effective safety checks in all healthcare practitioner programs in order to have success. There are more registered nurses than any other health care discipline. Registered nurses are highly valued for its specialized knowledge, skill and care in improving the health status of the public. They are absolutely integral to ensure safe, effective, and quality care. Numbering some 2.7 million, registered nurses have a deep professional commitment to the quality of care for their patients and they are consistency ranked at the top of trusted professions by the public at large (Jones, 2005). Decades of research have consistently shown that high
quality nursing care reduces the rate of complications and lengths of stay in hospitals (American Nurses Association, 2002).

**Significance for Nursing Education**

Two interrelated variables that are thought to impact skill performance are self-efficacy and locus of control (Philips & Gully, 1997; Thomas & Mathieu, 1994; Wood & Bandura, 1989). The increasing use of human-patient simulator and standardized patient in nursing education environments may enhance student self-efficacy as well as foster an internal locus of control. Operationalized, students need the confidence to master the skills required as well as the belief that their nursing actions will affect the outcome. The use of human-patient simulator and standardized patient in the simulated clinical practica may allow students the ability to practice in a safe environment, decreasing the focus of possible harm to patients, and increasing the focus on skills attainment and mastery. This therefore, would increase self-efficacy and strengthen the student’s belief that they have control of their learning environment (increasing locus of control).

Nursing curricula that foster higher levels of self-efficacy as well as a more internal locus of control may produce a healthcare practitioner who is more confident in the actual performance in areas they are skilled in, but also in practice areas they are currently learning. Learning in a technological environment (human-patient simulator and standardized patient) that allows for errors while protecting the patient affords the learner a real world practice setting that holds promise in strengthening confidence, improving care, and reducing errors (Lane & Slavin, 2001; Nehring, Ellis, & Lashley, 2001; Ziv, Small, & Wolpe,
This study is important to nursing education for many reasons. First, adequate educational preparation is critical for safe nursing practice. Second, simulation environments are becoming the new centers of teaching excellence (Grenvik, Schaefer, Devita, & Rogers, 2004). Third, self-efficacy and locus of control may impact the simulation education process. Finally, simulation environments may supplement the traditional clinical environment making the learner or learning more efficient.

**Assumptions**

The general assumption of this study is that the clinical practicum operates in an extremely complex educational environment and that simulation can safely mimic much of that complexity. The following statements reflect a more precise illustration of some assumptions upon which the study will be based. The participants:

1. Want to feel confident in learning a new skill.
2. Want to perform well and receive good grades in their nursing programs.
3. Will honestly answer all questions posed in the study.
4. Will be honest and accurate in the specific reporting of self-efficacy and locus of control.
5. Will honestly self identify no prior learning of a skill despite possible monetary gain by participating in the study.

**Delimitations**

This study is subject to the following delimitations: only students who are in entry level basic professional nursing courses, who state that they have had no
experience or training with either blood pressure or pulse acquisition, and who volunteer to participate in this study will be included in the sample. The study is also bound by students attending one nursing program within a university in a northeastern metropolitan setting and therefore can not be generalized to other populations.

Summary

Adequate clinical preparation is essential for a safe nursing practice and is an integral component of nursing curricula. The use of the traditional clinical site as an educational pedagogy has certain risks, such as, the potential for student error with patients, inconsistencies in the evaluation process, and an environment with few controls. The use of simulation education pedagogies to enhance clinical practica offers many benefits over the traditional on site clinical environment and is receiving increased attention. Simulated clinical environments may supplement on site practica and may reduce the possibility of student error with patients (Issenbert, McGaghie, Hart, Mayer, Felner, Petrusa, et al, 1999; Kapur & Teadman, 1998). One major benefit of simulated clinical environments for skill attainment is an enhanced student self-efficacy because an error does not have to have real consequences on a patient (Cioffi, Purcal, & Arundell, 2005; Ravert, 2004). A second benefit of simulation education is the educator’s ability to set parameters of each situation and to provide a high degree of control over the experience (Long, 2005).

Two simulation pedagogies used in nursing education include the human-patient simulator and standardized patient. It is assumed that students’ performance in skill attainment is impacted by their self-efficacy as well as by
their belief in control of the outcome of their actions. Increased levels of SE and locus of control are desirable and have been associated with increased motivation, goal setting and achievement (Bandura, 2001). This study investigates relationships among two techniques for simulation education (the human-patient simulator and standardized patient) and changes of self-efficacy and locus of control on students’ skills performance in blood pressure and pulse taking.
Chapter 2: Review of Literature

Introduction

The literature review is organized into seven major areas and is limited to the questions under investigation. The review begins with introducing simulation learning theory with an explanation of concepts and relational statements that explain simulation. The second section includes a review of current literature on simulation in nursing education. The third section focuses on the use of the human-patient simulator (HPS) as a teaching pedagogy and traces the historical routes and major studies accomplished with healthcare students using human-patient simulators. The fourth section of the review addresses the simulation pedagogy of the standardized patient (SP). The review includes current literature and research studies which focus on the standardized patient in healthcare educational settings. The fifth section of the review then turns to social learning theory as the theoretical framework for this research. Major studies accomplished in self-efficacy, locus of control, and combinations of both self-efficacy and locus of control in simulation are presented. The sixth section includes research related to student performance of skills. The literature review concludes with a review of the national safety goals for our healthcare system as defined by a national report titled “To Err is Human: Building a Safer Health Care System” (Kohn et al, 2000), as well as “Nursing’s Agenda for the Future” (American Nurses Association, 2002). Figure 1 graphically depicts the concepts that guide this study in that simulated learning may likely effect efficacy and locus
of control expectations and skill performance. This section will demonstrate the need for research in simulation pedagogies in acquisition of nursing skills with undergraduate nursing students.

**Simulation Learning Theory**

Simulation education has been used in aviation, maritime operations, and nuclear power management since the 1930’s when Edwin Fink introduced the first aircraft simulator (Gaba, 1997; Garrison, 1985). As a teaching pedagogy, simulation builds on concepts of Vygotsky (1978) who believed that learning was most effective when it occurred within the zone of proximal development where learning occurs when an adult or expert mediates learning for the learner and
when what was to be learned is just beyond the current knowledge level of the student. Simulation builds upon the use of experiential learning and observational capability. Simulations depicting actual situations provide students the opportunity to practice, to learn, and even make mistakes in a controlled environment. Simulation education is also an excellent example of the use of cognitive-learning theory, because simulation forces the students to be active, requires the student to use previous knowledge and skills, and is goal directed (Billings & Halstead, 1998).

Educational simulations share essential attributes: (1) they imitate but do not duplicate reality, (2) they offer chances to ‘make an error’ and (3) they provide feedback. These characteristics make simulations important in nursing practice thus allowing the student to learn from their mistakes without causing any harm and provide objective feedback (McGuire, 1999). This is one reason that the use of simulation is gaining wider acceptance among nursing programs such as in graduate nurse practitioner education and is already well established in other healthcare disciplines such as medicine and anesthesia. Examples outside of health-care include the use of flight simulators for astronauts and pilots, various training exercises for military personnel, and technical operations for nuclear and power plant personnel (McGaghie, 1999). One of the most ambitious uses of simulations for professional training and evaluation exist in power plant training certification and licensure. Nuclear power plant simulators are required to have minimum capabilities and their National Operating

Simulation through the use of role play and gaming has also been used in other process industries. In the spring of 1997, a group of chemical engineering researchers designed a simulation project in which fourteen employees were asked to work in groups to improve the daily work of committees as well as to improve quality analysis of chemical sampling. The simulation project was based upon Cowan’s learning concept of reflection (Rosennorn & Kofoed, 1998). Cowan believed that reflection is a central process in learning and consists of stages such as reflection-for-action, reflection-in-action, and reflection-on-learning. In this project, employees were interviewed to initiate a reflection loop before the actual process began. The employee groups met at designated times in order to improve simulation work situations in the future and was instructed to act as consultants to management. Groups also formulated suggestions for further action and recognized the value of working together. A major theme of “feeling confident” in the simulation project emerged. A major strength of the project is the use of the reflection in Cowan’s Theory in carrying out the simulation project. Since insufficient quantitative data is reported, it is difficult for the reader to come to specific conclusions about the project outcomes (Rosennorn & Kofoed, 1998).

Anesthesiology has been recognized as one of the pioneer fields that have used simulation education. Anesthesiology is in the forefront in the development and application of patient simulation in the areas of research and
training (Gaba, 2000; Leape, 1994). This is largely attributed to the fact that the practice of anesthesiology is a complex one, very technological, and has expanded to include critical care medical management skills (Cooper, Newbower, Long, & McPeek, 1978; Gaba, 2000; Gaba, Maxwell, & DeAnda, 1987). Furthermore, anesthesiology practice was instrumental in raising awareness about patient safety and their specialty's rising cost of malpractice. Anesthesiology has a growing number of vocal leaders who admit that patient safety is imperfect and should be studied to achieve better outcomes (Gaba, 2000).

Simulation is also used in other health professions and Gaba suggested that simulation is one potential pedagogy and should be investigated further. Gaba also suggested that networking with other health professionals through the Society of Medical Simulation is one possible avenue to develop increased dissemination of knowledge about simulation in the education of health practitioners’ (Gaba, personal communication, September 20, 2004). Gaba suggested that there are many benefits of using simulation education in healthcare professions. The major advantages, applications, and target groups for simulation in this area are summarized in Figure 2. Computer-based simulation is increasingly being used as a pedagogical tool in health education programs. The potential of computer-based simulation as an education augmentation is enormous, but research is needed to determine effective and successful uses of human-patient simulators for nursing education (Ravert, 2002). The trend in increased use of simulation over the previous two decades is supported by the
Figure 2 Major Advantages, Applications, and Target Groups for Simulation

<table>
<thead>
<tr>
<th>Advantages of simulation for research, training, and performance assessment</th>
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<tbody>
<tr>
<td>• No risk to patients</td>
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<tr>
<td>• Many scenarios can be presented, including uncommon but critical situations in which a rapid response is needed</td>
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<td>• Participants can see the results of their decisions and actions; errors can be allowed to occur and reach their conclusion (in real life a more capable clinician would have to intervene)</td>
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<td>• Identical scenarios can be presented to different clinicians or teams</td>
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<tr>
<td>• The underlying causes of the situation are known</td>
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<td>• With mannequin based simulators clinicians can use actual medical equipment, exposing limitations in the human-machine interface</td>
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<tr>
<td>• With full re-creations of actual clinical environments complete interpersonal interactions with other clinical staff can be explored and training on teamwork, leadership, and communication provided</td>
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<tr>
<td>• Intensive and intrusive recording of the simulation session is feasible, including audio taping, videotaping, and even physiological monitoring of participants (such as electrocardiography or electroencephalography); there are no issues of patient confidentiality – the recording can be preserved for research performance assessment, or accreditation</td>
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<th>Applications and target groups</th>
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<tr>
<td>• Education of students (high school and professional school in physiology, pharmacology, or physical assessment)</td>
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<tr>
<td>• Training for allied health professions</td>
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<tr>
<td>• Training of clinical students in routine procedures and specialty specific medical issues</td>
</tr>
<tr>
<td>• Training of junior doctors (residents) in routine procedures and in critical events</td>
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<tr>
<td>• Training of healthcare staff in crisis management</td>
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<tr>
<td>• Preprocurement assessment of clinical equipment</td>
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<tr>
<td>• Staff training in the use of clinical equipment</td>
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<tr>
<td>• Performance assessment of all grades of medical staff</td>
</tr>
<tr>
<td>• Research on decision making by clinicians, on human-machine interactions, and on factors that affect performance (such as fatigue)</td>
</tr>
</tbody>
</table>

(Gaba, 2000, p786)

international scholar in simulation in medical education, comments that there is a
need for increased research in the area of professional competence in the
evaluation and measurement of simulation education teaching pedagogies (P.
Wolpe, personal communication, April 20, 2004).

**Simulation in Nursing Education – Review of Current Research**

Preparation for professional nursing practice by registered nurses includes
theory, skills learning, and practica in multiple specialties. Studies demonstrate
that nursing students who perform poorly in the practica are probably less
effective in their practice than students who performed satisfactorily (Morgan,
Cleave-Hogg, DeSousa & Tarshis, 2004; Pfeil, 2003). In 2001 the American
Nurses Association called for a development of a comprehensive pedagogy to
guide the professional practice of nursing for the year 2010. This comprehensive
plan called for educational centers of excellence with newer teaching models and
partnerships for quality. One of the newer teaching models is the use of
simulated clinical environments to produce a realistic atmosphere in a nursing
student’s education.

Currently, there is a growing body of literature on the greater use of
simulation in nursing education, which is playing an important role in skills
education. A wide variety of health care applications with simulation (human-
patient simulators and standardized patients) have been developed to include
procedure training, evaluation of individual response to critical incidents, and
team training (Peterson & Becktel, 2000; Rauen, 2001; Roberts, 2000; Saucier et
al, 2000; Sherer, Bruce, Graves, & Erdley, 2003; Vandrey & Whitman, 2001).
Simulated nursing experiences may possibly be a new pedagogy that may help nursing students practice more competently. As previously cited, it is thought that simulated nursing clinical environments can supplement “on site” practica, and may reduce the possibility of “student errors” with real persons (Issenberg, McGaghie, Hart, Mayer, Felner, Petrusa, et al, 1999; Kapur & Steadman, 1998). One major reported benefit of simulated clinical environments for skill attainment is an enhanced student self efficacy possibly because an error does not have real patient consequences in simulation (Cioffi, Purrel, & Arundell, 2005; Gordon et al, 2003; Ravert, 2004; Wood, 1994). A second benefit of simulation education is the ability to set parameters in each situation and to provide an increased sense of control of one’s actions (Long, 2005). A third benefit in the use of simulation is the avoidance of uncertainty and unpredictability of the clinical environment and the provision of greater consistency when evaluating competency skills (Oswaks, 2002). If real clinical environments with direct patient contact increase nursing student’s fear of making mistakes, the learning process may be negatively affected (Kleehemmer, Hart, & Keck, 1990).

The use of technologic simulated environments also allows nursing instructors to control the learning environment and allow experimental learning without harm to patients. It is therefore important to explore various simulated clinical environments, and how they affect-self efficacy and locus of control. If learning via simulation helps develop nurse self-efficacy, there are important implications for nursing education and practice. Nursing students with an
increased self-efficacy and a more internal locus of control may provide a higher quality of patient care.

The nursing profession in particular needs more studies examining newer teaching pedagogies and innovative nursing curricula. Since nursing science is increasing more focused on establishing evidence-based practice, it is important that nurses are aware of technology and have the confidence to base their practice upon the best standards of care. This includes research into pedagogies that can increase a student’s self-confidence and enhance internal locus of control that may lead to stronger positive outcomes of the learning process. Exposing students to practice environments such as human-patient simulator and standardized patient will also serve to enhance and strengthen comfort level with simulation and technology. The use of these new simulation environments will also enable nursing instructors with the ability to provide the same consistent clinical experience for students across the curriculum. They can also provide simulation environments can also provide nursing instructors with the ability to:

1. Challenge strong students.
2. Strengthen the weak students.
3. Increase a student’s self-efficacy.
4. Provide the student with the perception of being in control.

Simulation in health care professional education is most often associated with performance of skills. Ericsson (1996) defines a skill as “action and reaction which an individual performs in a competent way in order to achieve a goal” (p 4). One may have no skill, some skill, or complete mastery. Therefore, when
teaching or testing a skill, the level of acceptable mastery must be defined based on the training level.

The use of simulation provides the opportunity for active and interactive learning and clinical problem solving without patient risk. Students can use assessment and develop critical thinking skills to determine a course of actions, implement care, and receive immediate feedback thought “patient” outcomes. Simulation experiences can also provide opportunities for a “thinking focused” experience by instructing trainees to think aloud so that one can learn from one's introspection (McCauslan, Curran, & Cataldi, 2004). Although there are many types of simulation pedagogies, this research focuses on two types: human-patient simulator and standardized patient, which will be described in more detail.

**Human-Patient Simulator (HPS)**

The use of technology increasingly hypothesized to improve the quality of care and reduce errors in patient care such as assessment, treatments, and medication administration. Thus, the search for innovative teaching pedagogies should be directed towards those that will likely lead to increasing quality of care and reducing those errors. Current research on innovative use of human-patient simulators (HPS) in Clinical Learning Resource Centers is being conducted by the National League for Nursing and a private company Laerdal (Jeffries & Rizzolo, 2003). This is a national, multi-site, multi-method project which seeks to develop and test simulation models and protocols that nursing faculty can implement when using human-patient simulator to promote student learning. Further, the goal is to also refine the body of knowledge related to the use of
human-patient simulator in nursing education (Jeffries & Rizzolo, 2003). This project was completed in May 2006. Data was collected at five sites across the United States and focused on data examining self-confidence, performance abilities, and cognitive gains as it relates to nursing students and their care of post operative patients.

Human-patient simulators are available in various models and configurations. Sophisticated high-fidelity human-patient simulators (HPS) that allow health professional students to assess:

- changeable breath sounds and chest movement
- heart sounds
- simulated medications effects on the body
- advanced cardiac monitoring
- abdominal sounds

(Bond & Spillane, 2002; Gaba, 2000; Gordon, Tancredi, Binder, Wilkerson, & Shaffer, 2003; Nehring et al, 2001; Rauen, 2004; Ravert, 2002; Seropian, Brown, Gavilanes, & Driggers, 2004; Ziv, small, & Wolpe, 2000).

The human-patient simulator is operated by a computer and the simulated physiologic changes are preprogrammed or designed by the operator. Different patient scenarios can be created by the user with a range of disease processes and objectives that are programmed into the simulator, allowing for the same scenario and patient to be experienced by a single student as well as student groups (Ravert, 2002). Some disease processes include asthma, congestive
heart failure, hypertension, chest pain, and diabetes. The human-patient simulator in use at one Philadelphia metropolitan university is shown in Figure 3.

Figure 3 Faculty Member Introducing Freshman Nursing Students to Human-patient simulator

There are many advantages with the use of human-patient simulator. These include: (1) allowing the student to learn at their own pace, (2) presenting simple to complex scenarios, and (3) the allowing the student to err without repercussions to their learning or harm to the patient, (4) immediate feedback, (5) reinforcement, and (6) and consistent experiences for each learner. Some disadvantages include: (1) a lack of realism in the simulation experience as well as the patient response, and (2) the expenses associated with the cost of purchasing and running the human-patient simulator (Fletcher, 1996; Helmreich & Davies, 1997; Issenberg, Bordon, Bordon, Safford, & Hart, 2001; Miller, 1987; Morton, 1996; Nehring et al, 1992; Ribbons, 1998; Ziv et al, 2000).

Recently, nursing scholars have begun to study various aspects of using human-patient simulator in nursing education. One study with undergraduate
nursing students using human-patient simulator used a convenience sample of 42 senior nursing students who completed advanced medical surgical modules covering four critical incidents of airway obstruction, congestive heart failure, pulseless electrical activity, and hypovolemic shock. The purpose of the study was to examine the retention of learning of students using human-patient simulator as a teaching pedagogy. Informed consent was obtained and students were divided into eight groups. A knowledge pretest was completed by all the students, who were then presented with case scenarios in which the human-patient simulator was programmed with four critical incidents. Each student group assessed, planned, intervened, and evaluated their nursing actions to prevent a potentially fatal outcome. After the scenarios were completed, the first posttest was administered and a second posttest was administered 5 to 7 days later. The Wilcoxon Signed Ranks Test to take account of the magnitude of performance differences on each group, rather than just the group that had better performance; results indicated a significant difference existed between pretest and first posttest scores (Z=-5.84, p< 0.05). No significant difference was found between the two posttest scores indicating retention of learning regarding the four critical incidents. Major limitations to the study include a lack of control group, convenience sampling, and a small sample size (n=42) (Nehring, Ellis, & Lashley, 2001).

Nurse researchers have also studied undergraduate nursing students’ as well as faculty members’ perceptions regarding the use of human-patient simulator in simulated clinical scenarios. Feingold, Calaluce, and Kallen studied
baccalaureate students enrolled in an advanced acute care adult health nursing course. The sample included 28 fall semester students, 37 spring semester students, and 4 faculty members. Course faculty members observed the students’ performance and provided immediate feedback. Students and faculty then completed a satisfaction survey which consisted of three subscales; realism of the simulation, ability to transfer skills, and overall value of the experience. There were also seven individual items relating to environment, comfort, and faculty support. The faculty tool included the same three subscales as well as the need for faculty support and training related to use of new technology. The data was analyzed using independent-groups t-test and analysis of variance. The t-test and ANOVA F value results for the subscales of realism, transferability, and value are t-test of 0.42, 0.51, 0.24 and ANOVA F value of 0.69, 3.11, 0.18 respectively. An alpha level of 0.05 was used for all statistical tests. The majority of the students (86.1%) and faculty members (100%) identified the human-patient simulator experience as realistic and valuable. However, only approximately half of the students agreed that the skills learning using human-patient simulator would be transferred to a real clinical setting, compared to 100% of the faculty. The study is limited by a small sample size, lack of a control group, and no reported reliability and validity of the instrument that was drafted using a tool described in the literature (Feingold, Calaluce, & Kallen, 2004).

The Standardized Patient (SP)

The term standardized patient (SP) and the rational of using a simulated patient has been in use since it’s inception in 1963 (Wallace, 2005). Other names
used are programmed patient, teaching associate, patient educator, patient
instructor, professional patient, and surrogate patient (Gorter, Rethans,
Scherpbier, Heijde, Houben, Vleuten, & Linsend, 2000; Wallace, 1997). Although
both the standardized patient and human-patient simulator can portray patients
with diseases and verbal responses, the standardized patient may deviate from a
script, provide additional information and prompt the students.

The standardized patient portrays a patient in an organized and consistent
manner in either a formal setting or impromptu venue which is generally used to
evaluate the healthcare practitioner’s ability to perform a physical assessment,
diagnosis, perform certain skills, and health teaching (Hoppe, Farquhar, Henry, &
Stoffelmayr, 1990; Prislin, Giglio, Lewis, Ahearn, & Radecki, 2000; Rethans, &
Saebu, 1997). The standardized patient offers an opportunity for students to
learn skills firsthand and experience the practice clinical setting without
jeopardizing the health of real, ailing patients (Wallace, 1997).

The use of the standardized patient to evaluate the physician encounter or
medical skills is found throughout the literature (Adamo, 2003; Bromley, 2000;
Gorter et al, 2000; Makoul & Altman, 2002; Margolis, Clauser, Swanson, &
Boulet, 2003; Murrary, Boulet, Kras, Woodhouse, Cox, & McAllister, 2004; Rose
& Wilkerson, 2001; Wallace, 1997; Wettach, 2003; Williams, 2004). The
standardized patient can be asymptomatic, may have stable or abnormal findings
upon a students physical examine of the standardized patient, and able to
simulate physical findings. The use of the standardized patient in evaluation of
medical students has been shown to be a reliable and valid method to assess
performance (Norman, Tugwell, & Feightner, 1982; Oaddams-Carthon, Coleman, & Stewart, 2004; Van der Vleuten & Swanson, 1990). After an encounter with a student, the standardized patient usually reports the student’s performance on a checklist, which may be either case-specific or generic (Stillman, Brown, Redfield, & Sabers, 1977).

The effectiveness of using the standardized patient in teaching physical health assessment, clinical, and communication skills for undergraduate and graduate student nurses has also been reported (Arthur, 1999; Colletti, Gruppen, Barclay, & Stern, 2001; Schwind, Bohler, Folse, Dunnington, & Markwell, 2001). The use of the standardized patient within a clinical or lab setting is used to provide students with the opportunity to meet people who act like patients in a simulated patient setting. The students practice clinical skills as well as communication skills and can then experience the standardized patient’s responses to care (Colletti et al, 2001; Wales & Skillen, 1997).

Tamblyn, Klass, Schnabl, and Kopelow (1990) looked at the factors associated with accuracy of the standardized patient presentation. The authors examined 839 encounters involving 27 different cases acted or portrayed by 88 different standardized patients at two different sites. The objective was to identify characteristics of the patient, training process, and factors that were associated with the accuracy of the standardized patient’s presentation of the clinical problem by the medical student. A prospective cohort design was used to evaluate the relationships. The results of the study displayed a 90% accuracy rate in portraying case details, and 13 standardized patient actors had perfect
scores. Intra-rater reliability between observers displayed 98.9-100% accuracy. This study supports the use of standardized patient in simulation encounters of medical students training. One limitation of this study is the lack of documented training of the standardized patient which may influence accuracy. Factors associated with patient accuracy were classified into three groups for measurement and analysis; (1) a group that could be used to improve patient selection or test construction, (2) a group that could improve the training process and identify standardized patients who would have problems in case presentation prior to testing, and (3) a third group that could be used to improve the test procedure and identify patient-student encounters where there were problems in presentation accuracy. Group 1 factors explained 11.8% variance in overall accuracy score, group 2 explained a 10% variance in presentation accuracy, and group 3 explained a 7.4% variance in accuracy score.

Davidson and colleagues (2001) investigated the use of the standardized patient to teach health assessment skills of eye and abdominal examinations, measurement of blood pressure, chest, cranial nerve, and neck and thyroid examination, to first and second year medical students. The authors compared using traditional methods of faculty instruction (n=118) and standardized patient instruction (n=83) and found that there was a significantly higher score on measurement of blood pressure (p< 0.0001); chest examination (p< 0.003); examination of cranial nerves (p< 0.001); and neck and thyroid examination (p< 0.003) with use of the standardized patient. There was no difference in scores on the eye and abdominal examinations. The authors reported that the use of
specially-trained standardized patients was effective and a less expensive alternative to traditionally faculty lead courses for introductory physical assessment skills where the evaluation is more didactic in measurement. One major limitation in this study was that the 1st year stations on the examination were geared towards the normal exam while the 2nd year courses were intended to teach both normal and abnormal physical examinations. A second limitation was the use of physical examination teaching associates (PETA). The PETA may be viewed as a standardized patient with an expanded role based on meeting one of the following criteria: prior teaching experience, experience in a health-related field, and interest in developing new skills and knowledge relative to physical examination. The possibility of role confusion, seeing a PETA in the classroom setting and as a standardized patient may lead to role confusion for a student. Currently, PETAs are being used to teach selected components of physical examination with medical students. Even though the PETAs had experience as teachers in other settings, the transition to teaching associate in a medical school needs further investigation. The accuracy of the use of PETAs in instruction of medical students in physical assessment skills cannot be generalized to other settings; however, this cost savings benefit should be investigated within other healthcare domains (Davidson, Duerson, Rathe, Pauly, & Watson, 2001).

Colliver, Swartz, Robbs, and Cohen (1999) examined the relationship between clinical competence and interpersonal and communication skills in the fourth year assessments of medical students on history taking, physical exam, as
well as behavior related to interpersonal and communication skills in a standardized patient assessment. The data sets consisted of scores of graduating students over the course of a ten year period. The results displayed a moderate and above relationship between the clinical competence scores, interpersonal, and communication skills score. The mean of the simple correlations was 0.50, with 11 of the 15 correlations ranging form 0.44 to 0.59. Three were lower at 0.24, 0.34, and 0.35, and one – for the faculty ratings – was higher, at 0.81. All correlations were statistically significant (p< 0.05). Using a Simple Pearson correlation to compare the two dimensions in the clinical context, the correlations centered on 0.50 and the corrected cross-half and cross-case correlations were slightly higher, centering round 0.65 and 0.70 respectively. The authors suggested that a natural consequence of the clinical encounter exacts an interdependence of clinical competence and interpersonal and communication skills. The results demonstrated that clinical competence and interpersonal and communication skills are related. It seems reasonable that these are related in the clinical encounter and may affect/enhance each other.

Standardized Patient (SP) in Nursing Education

Within the domain of nursing, the standardized patient is used widely in graduate nurse education (Carney, & Ward, 1998; Coleman, Coon, Fitzgerald, & Cantrell, 2001; Gibbons et al, 2002; Ravert, 2003; Seibert, Guthrie, & Graceanne 2004; Vessey & Huss, 2002; Vetto, Petty, Dunn, Prouser, & Austin, 2002) nursing anesthesia education (Murray et al, 2004; Oswaks, 2002; Sorenson, 2002) and to a lesser extent, general nursing practice (Carney, 1994; Nuamah,
Cooley, Fawcett, & McCorkle, 1999; Robinson, Hughes, Adler, Strumpf, Grobe, & McCorkle, 1999; Sloan, Vanderveer, Snapp, Johnson, & Sloan, 1999; White, & Malik, 1999). As mentioned in chapter one, there is scant information related to the use of the standardized patient in undergraduate nursing education.

Standardized Patient in Graduate Nursing Education

Another study examined the clinical evaluation of master’s nurses using the standardized patient in health assessment and found the use of multiple evaluation pedagogies improved clinical experience for students enrolled in a graduate health assessment course. This project was conducted at the United States Uniformed Services University of the Health Sciences Simulation Center during a summer term. The sample for this project included 14 family nurse practitioner students and 13 nurse anesthetist students. Students were assigned randomly to one of nine groups of three students each. The groups changed every week, so that no three students were in the same small group during the nine week summer term. Student groups practiced health history as well as health assessment skills on standardized patients who presented with a variety of health problems. Each week students received evaluation feedback from four different sources; peers, faculty, themselves using a checklist and a global rating scale, and the standardized patient who evaluated the student using an interpersonal rating scale. The standardized patient scale evaluated the student’s data collection skills, communication skills, rapport, personal manner and satisfaction. Qualitative and quantitative data collection methods were used to evaluate the efficacy of this instructional development design. At the conclusion
of the course students were videotaped for a complete history and physical exam with mean scores 90% and 95% respectively (a mean of 89% was noted for the class of 1999). The intervention was planned for the entire class which allowed for comparison of historical controls (complete physical examination scores) with previous classes. Students completed end of course surveys and rated the combination of all four evaluation methods as most useful in the teaching learning situation. The major limitation of this project was that it did not meet the criteria for a research study, and may be viewed as an evaluation project (Gibbons et al, 2002).

Seibert and colleagues (2004) investigated the relationship of technology-based pedagogies and the improvement of knowledge outcomes and competencies used in the teaching venue of standardized patients and telemedicine. This study of graduate nurses consisted of a sample of 12 postmaster’s adult nurse practitioners certificate students enrolled in a health assessment course and used a prospective, two-condition by two-time repeated measures within-subjects ANOVA design. The authors’ focus was knowledge outcomes using the Guthrie and Wigfield Engagement Model which measures academic outcomes (topic knowledge and knowledge integration). The questions had an average Kuder-Richardson 20 reliability value of 0.80 with Spearman-Brown corrections of 0.82. The reliability (pretest and two posttests) were 0.85, 0.70, and 0.85 respectively. Both groups interacted via teleconference with either the preceptor (control group) or with a standardized patient (experimental group). The students demonstrated that with carefully selected engagement
elements (environmental, student, and outcomes) integrated into a technology-mediated course, learning becomes more effective and knowledge outcomes can significantly improve. Students within the intervention group (SP) consistently scored higher than the control group. Knowledge outcomes differed significantly between the control and redesign conditions. Topic knowledge scores and knowledge Integration scores were significantly higher ($p < 0.01$, $p < 0.05$, respectively) than when they were in the control group. Limitations included no measurement of the impact of the individual student on learning outcomes; or the individual elements of the academic outcomes (the four elements were measure as one effect, rather than four). The sample size was small ($n=12$), thus a larger sample would have strengthen these findings.

Despite the increasing use of standardized patients in nursing education, there has been little published research about the efficacy of the use of standardized patient as a measure of clinical outcome performance. Vessey and Huss (2002) conducted an evaluation project to determine whether the advantages outweighed the drawbacks of using standardized patients as a clinical outcome measure. Using a retrospective descriptive design, data from 26 videos of student’s standardized patient encounter was analyzed using a checklist developed by faculty and piloted with previous students. Reliability and validity of the checklist was not cited. The sample consisted of 9 pediatric nurse practitioner students (PNP) and 17 adult nurse practitioner (ANP) students. Both groups had standardized patients with identical complaints and diagnosis of acquired hypothyroidism. The ANP students interviewed middle-aged women
and the PNP students interviewed a female teenager. The results indicated that there was considerable variation in the thoroughness of the examination and did not reflect their performance on other clinical evaluation measures or their performance on national certifying examinations. The gap between the student’s performance and faculty expectations reinforced the belief that the standardized patient did not appropriately evaluate the clinical skills of the students, and that the use of standardized patient as a summative evaluation pedagogy requires further research.

**Standardized Patient in Undergraduate Nursing Education**

Historically, the Drexel University’s College of Nursing & Health Professions undergraduate nursing program began to use the standardized patient in evaluation of a nursing students’ ability to conduct a health history and physical examination in 2002. The standardized patient is used in senior level nursing courses to evaluate the student’s clinical competence, interpersonal communication, and patient teaching skills (L. Wilson, personal communication, March 7, 2006).

Among the published few undergraduate nursing studies, nurse researchers Yoo and Yoo (2003) compared the effects of the standardized patient versus the traditional lecture and practice on mannequins in the Clinical Learning Resource Center method on students’ clinical competence. A baccalaureate nursing school in Metropolitan Seoul, Korea was selected for the study. The method consisted of a non-equivalent control group, post-test design; sample size consisted of 40 students for the traditional laboratory method and 36
students for the standardized patient method. The basic hypothesis stated that students in the standardized patient group would have significantly higher scores in clinical judgment, clinical skill performance, and communication skills than those in the traditional group. Each teaching method required 12 hours of instruction and practice on frequently taught clinical skills. All students attended lecture, then students in the traditional method practiced on mannequins with instructor feedback, and students in the standardized patient group practiced on standardized patients with both instructor and standardized patient feedback. A post test consisted of a case study describing a patient with paralysis who required the five most frequently taught clinical skills. Face validity of the post test was obtained from experienced neurosurgical experts. Students in both groups had 20 minutes to read the case study, identify the necessary nursing skills, and had 30 minutes to demonstrate clinical skills. The evaluation criteria included clinical judgment, critical behaviors for each skill performed, as well as a communication category. Data indicated that students in the standardized patient teaching method had significantly higher scores in clinical judgment, skill performance and communication skills than students taught using the traditional method. The data was analyzed using t-tests to compare the two groups on the three major variables. Students in the standardized patient group scored an average of 13 points in identification of relevant data and patient problems, whereas students in the traditional group scored an average of 10, a statistically significant difference (t=4.92, p< 0.001). Also statistically significant, students in the standardized patient group scored an average of 29 of a maximum 30 points
in identifying nursing skills necessary for the case, whereas students in the traditional group scored an average of 27 points, \( t=24.79, p<0.008 \). Students in the standardized patient group also had significantly higher scores in clinical skills performance than those in the traditional group \( t=4.45, p<0.001 \). Students in the standardized patient group also had significantly higher scores in communication skills than students in the traditional group \( \text{mean}=16, t=3.98, p<0.001 \). In the standardized patient teaching group students received feedback from both instructors as well as the standardized patients which may have positively affected their clinical judgment ability. Limitations of the study included the use of one patient scenario in one introductory course, a small sample size \( n=76 \) and the lack of discussion of the rating scale used to assess communication \( \text{(Yoo & Yoo, 2003)} \). In this study, students receiving the standardized patient encounter were able to more accurately identify nursing needs of their patients enabling them to better understand and support their patient. Clinical judgments and implementation of appropriate nursing skills may have been enhanced and should be further researched.

**Simulation Summary**

In summary, simulation education has grown from its early use in aviation and nuclear power plants to its current uses in health-care education. The use of human-patient simulators as well as standardized patients has enabled health care instruction and attainment of competencies to be measured in a structured and objective manner. Simulation research in medicine, nurse anesthesiology, and graduate advanced practice nursing has demonstrated to be a strong
educational tool in the clinical practica; the research literature is quite sparse in the area of simulation use in undergraduate nursing.

The Underpinning Theoretical Assumptions of Social Learning Theory

Bandura’s Social Learning Theory seeks to explain how humans learn within society and incorporates multiple concepts. This study is guided by selected concepts from Social Learning Theory including self efficacy and locus of control. Simulation education research suggests positive outcomes in knowledge, confidence, and skill performance, it is reasonable that simulation education may impact learner efficacy and locus of control.

Over the years, numerous scholars have studied the multiple variables that may influence the performance level of an individual learner. Although research has been published on the social and emotional factors in the classroom environment, fewer scholars have investigated these factors in clinical practica, and virtually none have examined these factors in a simulated clinical practica. Preliminary studies exploring the emotional factors involved in simulation experiences with aviation and with military have shown mixed results, with some studies noting enhanced perceived confidence of the students (Lane & Slavin, 2001; Nehring, Ellis, & Lashley, 2001; Ziv, Small, & Wolpe, 2000).

Self-Efficacy

According to Bandura (1983), self-efficacy (confidence) interacts with locus of control to influence emotions and behavior. Based upon Bandura’s Theoretical assumptions, Jerusalem and Schwarzer (1992) operationalized self-efficacy as the perceived confidence at getting through the daily hassles in life.
and thus developed the self-efficacy scale. The self-efficacy scale measures perceived confidence based upon Bandura’s theory.

Recent studies of self-efficacy of nursing students focus on the traditional clinical environment, in areas such as perceived self-efficacy, knowledge of drug interactions, and transcultural nursing. One study conducted regarding nursing student’s perception of self-efficacy in performing transcultural care, suggests that educational preparation as well as clinical experience is pivotal in providing the development of self-efficacy. This study was conducted in an Australian University and data was collected using a transcultural self-efficacy tool. This study was described as particularly relevant because nurses in the region provide care to multicultural populations. In a sample of 196 nursing students, it was reported that fourth year students who have greater exposure to increased theoretical information and clinical experience such as adult health, pediatrics, and gerontology, had a more positive perception of their self-efficacy in providing transcultural nursing skills than first year students (Lim, Downie, & Nathan, 2004).

Edwards, Smith, Courtney, Finlayson, and Chapman (2004) explored the impact of clinical placement on a student’s perceptions of confidence and competence. A sample of 137 nursing students in their final year in a baccalaureate program were surveyed in order to compare perceived confidence and competence in rural versus metropolitan clinical environments. The results indicated that student selection of clinical environment is based upon perceived
confidence and highlights the need for pedagogies in order to enhance confidence.

In a pilot study, Sadler (2003) investigated the self-reported caring competency of a cross-section of baccalaureate nursing students (n=193). The Coates Caring Efficacy Scale, a 6-point Likert scale measured the students caring efficacy competency; results displayed a mean score of 5.02; a standard deviation of 0.55; and a Cronbach’s alpha of 0.90. There was no statistical difference in mean scores among the groups. Responses indicated that students attributed relationships within their families as the predominant factor in the development of their caring efficacy; while only a few reported the influences of the nursing curriculum as important in the development of caring efficacy. Weaknesses included the lack of a longitudinal view, which may provide evidence of the development of caring efficacy over time within a nursing curriculum; the sample population came from one nursing program and may not be generalized. This pilot study, however, did provided insight into the understanding of caring efficacy abilities of nursing students.

An in-depth review of published studies indicates that there are no studies which explore the concept self-efficacy using simulated clinical practica in nursing education. However, other disciplines of health professions have studied self-efficacy in simulation practica, only a paucity of studies on simulated clinical practica of nursing skills was found.
Locus of Control

The term internal and external locus of control was coined by Rotter in 1966. Attributions of locus of control refer to the belief that actions will or will not have an effect of what happens. Individuals who are more internal, believe that they are individually responsible for as a result or consequence of an action, while people who are more external believe that this consequence is controlled by luck, chance, or powerful others. When a result or consequence of action is seen as due to an individual's actions, that individual will likely repeat that behavior. When the consequences are seen as due to chance, motivation and productivity decrease (Rotter, 1966). Dufault suggested that the nursing profession needs students with a more internal locus of control in that internals have a higher sense of social responsibility (1985).

Maylor and Torrance (1999) studied locus of control as it related to nurse attitudes and approaches to the prevention of pressure sores. These researchers' surveyed 477 nurses in the United Kingdom employed in both hospital and community settings to determine if there was a correlation between knowledge, locus of control beliefs, and prevention of pressure sores. This project was part of a much larger study on wound care. The research team used a questionnaire that included a number of well-established scales to evaluate locus of control as well as a new locus of control scale specific to pressure sore prevention learning theory scale. This new scale showed convergent validity with the multidimensional health locus of control scale and the pressure sore learning theory scale as well as discriminated those issues specific to pressure sore
development. The results indicated a negative correlation between knowledge scores and prevalence rates of pressure sores, and in general, groups with a higher mean knowledge had a lower prevalence of pressure sores. A correlation was found between increased prevalence ($r = -0.11, p = 0.42$), indicating, that pressure sore development may be a low personal priority in this group. Pure internals seem to place less value on pressure sore prevention ($r = -0.16$) than externals. The overall conclusions were that knowledge levels alone do not explain prevalence and that beliefs and values affect what nurses do to prevent pressure sores (1999).

In 1990 study, Adams examined locus of control and achievement motivation theory as predictors for nursing schools graduates’ success. An ex post facto comparison of graduated students’ academic files was surveyed ($n = 182$). From the survey a convenience sample of 41 was used to validate the predictor’s variables of locus of control and achievement motivation. The investigation demonstrated there was no significant difference of performance of graduates on the NCLEX-RN of the predictor variables. Although students with a demonstrated higher internal locus of control achieved a higher motivation scale score, there was no correlation to success on passing the NCLEX-RN.

**Self-Efficacy and Locus of Control**

According to Bandura (1983) locus of control interacts with self-efficacy to influence behavior and emotions. This interaction may seem self-evident, but is more complex than first appears. For example, when individuals judge the environment to be rewarding, and have an internal locus of control belief, failure
is seen as due to those individuals’ shortcomings. Bandura terms this type of failure as efficacy-based futility, which results in the individual feeling depressed and despondent.

A second type of failure is termed outcome-based futility and is due to the expectation that one’s efforts will produce no results. These individuals, who do not feel they have control of consequences, have external locus of control beliefs. Bandura (1983) stated that those with high self-efficacy and external locus of control beliefs will feel resentment or protest an unresponsive environment. Whereas individuals with low self-efficacy will feel apathy and alienation in a non-responsive environment. In other words, when individuals feel they are in control of outcome (internal locus of control), their failure is due to their own incompetence and self-devaluation and depression is the result of this failure (Bandura, 1982). With an external locus of control, outcomes are controlled by others or by external forces. Individuals with low self-efficacy and external locus of control beliefs become resigned to their fate; while high self-efficacious individuals will protest the system and, perhaps grow to resent their situation. As Bandura in 1982 stated “... people are more influenced by how one reads performance successes (and failures) than performance attainment per se” (p. 125).

Locus of control, a conceptual model of social learning theory, is primarily concerned with causal beliefs about outcome determination (Bandura, 1977a; Maibach & Murphy, 1995). An individual may believe that outcomes occur either by chance, or as a direct result of personal effort. Self-efficacy focuses on one’s
belief in the ability to enact a desired behavior. Actual ability or the result of the action is secondary to the perceived ability to affect the behavior (Bandura, 1997).

A study which examined career locus of control and career decision making self-efficacy (SE) found that both career locus of control and SE correlated with career decision making attitude and skills. Regression analysis showed that the strongest predictor of career decision making attitudes was self-efficacy. The results indicated that self efficacy theory is superior to the locus of control model in predicting college students career decision making (Luzzo, 1995). A meta-analysis of four studies has also indicated that the four traits of generalized self-efficacy, locus of control, self-esteem, and neuroticism were strongly related (Judge, Erez, Bono, Thoresen, 2002). Two areas of control in self-efficacy are referenced in the literature: locus of control and self-actualization (Kear, 2000).

Numerous studies have examined the relationship between locus of control and gender. Early studies in the 1960’s indicated that males may have significantly more internal scores of locus of control thank in females (Rotter, 1966). It is important to note that these early studies were done with Midwestern college students. More recent studies on locus of control on gender and age suggest that locus of control is more external in females than in males, which reinforce the early studies of Rotter (Dollete, Steese, Phillips, Matthews, 2004).

Age has also been studied in relation to locus of control and according to Rotter; a person’s locus of control can vary as a function of age. That is to say,
in general, infants and young children display external characteristics, while adolescent and young adults display a more internal locus of control (Rotter 1966). Rotter also believed that as one enters the later middle years, the locus of control shifts back towards a more external view. Recent studies on age and locus of control have supported Rotter's original work and a recent longitudinal study indicated that there is a gradual shift towards a greater internalized locus of control in later years of high school (Chubb, Fertman, & Ross, 1997). Other studies suggest that the relationship between locus of control, gender and age can vary depending upon the samples (Fiori, Brown, Cortina, & Antonucci, 2006).

A number of studies have indicated that there is a relationship between self-efficacy and locus of control in that higher self-efficacy is correlated with internal locus of control (Cicirelli, 1980; Downey & Moen, 1987; Levenson, 1981; Mirowsky & Ross, 1986; Pincus & Callahan, 1994; 1995). The link between an internal locus of control and high self-efficacy has been found in studies of student self management (Burger, 2004), with undergraduate career decision making ability (Luzzo, 1995), with testing taking coping skills (Smith, 1989), and goal orientation of students (Phillips & Gully, 1997).

Numerous studies provide theoretical links between enhanced self-efficacy and increased locus of control. Since simulation in nursing education affords the student the ability to practice skills without hurting a patient or causing error, it can enhance the student's confidence (self-efficacy). Simulation environments are also controlled by the faculty, and may impact the student's locus of control beliefs. While there is a possibility that self-efficacy could be
transferred from one domain to another, the most important factor is the mastery level of the student (Bandura 1997). It might also follow that if a student had the confidence in a simulated environment, it may be transferred into clinical; hence the patient bedside.

To a much lesser extent, the two variables have also have been studied with selected pedagogies of simulation. One researcher found that increased self-efficacy and internal locus of control were strong predictors of achievement in computer assisted instruction simulations (Chan, 1999). Both concepts also have been studied in relationship to numerous health behaviors such as physical fitness programs, weight loss programs, blood pressure self-care practices, and avoidance of passive smoke. These studies indicate that the performance on an individual is improved when there is an increase in self-efficacy and an internal locus of control (Chan, 1999; Nakata, 2004; Reicks, Mills & Henry, 2004).

Research has been published on multiple factors that influence the performance of students in the classroom environment and to a lesser extent, in the clinical environments. However, there has been minimal published research on simulated clinical practica for nursing students (Lane & Slavin, 2001; Nehring, Ellis, & Lashley, 2001; Ziv, Small, & Wolpe, 2000). A review of dissertations in the area of simulated clinical practica in nursing, found studies that looked at simulation for nursing anesthesia students that studied the more technical aspects of skills performance (Sorenson, 2002; Oswaks, 2002; & Hogan, 2004). Another dissertation looked at the effectiveness of gaming simulation pedagogies for teaching nursing diagnosis (Weber, 1993).
Scholars have indicated that four specific traits; self-esteem, generalized self-efficacy, locus of control, and emotional stability are part of a higher order construct that they termed core self-evaluations or, more simply, positive self-concept. A meta-analysis of 135 studies reported a relationship between self-efficacy and locus of control with job satisfaction along with job performance (Judge, Locke, Durham, & Kluger, 1998).

Judge and Bono (2001) conducted a meta-analysis of the results of the relationship of generalized self-efficacy and locus of control with job performance. With respect to job performance, the rho correlations (range -1 to 1 with regards to the correlation affect) were .23 for generalized self-efficacy and .22 for internal locus or control. These correlations suggest that these traits are among the best dispositional predictions of job performance. The meta-analysis also looked at other variables and their relationships to job satisfaction.

Phillips and Gully examined the antecedents of goal setting and its effects on performance on 405 students enrolled in introductory management and psychology courses at a large Midwestern university. They found that ability, learning goal orientation, and locus of control were positively related to self-efficacy (p<.01) (1997). This study suggested that persons who believe their abilities are malleable would be expected to have a more internal locus of control and to more highly value achievement versus persons who believe their abilities are not malleable and are more interested in avoiding failure. Limitations include this study observed a single performance episode which may have attenuated the relationships, as well as the lack of direct measurement of the construct of
motivation, which may have influenced the outcomes. A third limitation is the fact that the undergraduate students who were participating for course credit potentially affected the decision to participate or not. Understanding that self-efficacy exerted a direct effect on performance in this study suggests that this effect needs further exploration as well as the relationships of the social correlates of self-efficacy, locus of control, and skills performance. This direct effect of self-efficacy on basic nursing skills in simulation environments, specifically, the human-patient simulator and standardized patient is one area of exploration for this dissertation's proposed research.

Factors Which Influence Student Performance of Skills

Historically, the responsibility to teach didactic nursing content was based logistically in the schools of nursing, while clinical practice skills were entirely taught in the practice areas (i.e., in the hospitals). As nursing evolved, schools of nursing took a stronger role in the teaching of these skills (Pfeil, 2003). Today most colleges and universities that house baccalaureate-nursing programs have clinical learning resource centers (CLRC). In these CLRC’s, nursing students learn beginning skills, from basic ones such as bathing a patient, to the more complex such as the administration of medication. The acquisition and mastering of procedural skills by students frequently is a priority (Harper, Mayeaux, Pope, & Goel, 1995; Norris, Cullison, & Fihn, 1997; Webb, Rye, Fox, Smith, & Cash, 1996).

Performances of a procedure or a skill on patients are a fundamental aspect of the practice of any health profession. Students must be educated to
perform these skills safely and well, and the process of teaching these skills must be to assure competent practice (Norris et al, 1997; Smith & Klinkman, 1995). Typically, in current nursing education, teaching skills followed by a demonstration, then a supervised performance by the student are how skills are taught. Development of clear, standard, objective measures initial skills and continuing competency of skills performance must also be developed (Norris et al, 1997; Rodney, Richards, Ounanian, & Morrison, 1987; Smith et al, 1995).

A comparison of traditional (lecture and demonstration) skills acquisition and a student-focused method (self-paced study modules practiced in the lab) was conducted to evaluate the effectiveness of these two instructional methodologies by Jeffries, Rew, & Cramer, 2002. Using a repeated measure, experimental design with 120 participants, they reported that there was no significant differences between the two groups’ pre-test to post-test cognitive gains and the students ability to demonstrate the basic skills correctly in the learning laboratory. Also reported was a significant difference in student satisfaction with the interactive, student-centered group more satisfied with their learning methodology. One limitation of the study demonstrates a low Cronback alpha for both the self-efficacy (0.58) and self-reliance (0.30) scales. These existing methods of instruction need to be rethought to include more experiential approaches for teaching such a simulated clinical practica.

Cognitive and non-cognitive determinates as well as consequences of complex skill acquisition have been examined in one research study which investigated air traffic controller trainees (Ackerman, Kanfer, Goff, 1995). The
purpose of this study was to exam the domains of variables as a predictor of performance of skills acquisition. In this study 93 subjects were studied while using a Terminal Radar Approach Controller simulation for air traffic controllers was used to measure task performance. This research measured a wide array of predictors which included ability, personality, vocational interests, and self-estimates of ability, self-concept, motivational skills, and task-specific self-efficacy. Although this study incorporated a complex array of learning theories and measurements, major findings include: prediction of performance, individual differences in abilities play a role, for example, math, spatial, and verbal self-concept measures correlated with the objective ability composites (r= 0.55, 0.51, and 0.55, respectively). Self-efficacy estimates showed significant correlations with complex task performance across task practice. This study concluded that self-efficacy interacts with many other factors such as ability, personality, and self-concept. Understanding if self-efficacy interacts with the factors that influence the acquisition of skills is important in the constructing of the learning environments and more specifically, simulated environments of human-patient simulator and standardized patients and would add to the body of literature.

National Safety Goals for Nursing

Prevalence of Medical Errors

Although education practitioners and researchers have indeed recognized the critical role of safe practice, the impact of unsafe practice is alarming. According to the Centers for Disease Control and Prevention more people die in a given year as a result of medical errors than from motor vehicle accidents
(43,458), breast cancer (42,297), or AIDS (16,516) (Kohn et al, 1999). Errors are also expensive in terms of opportunities cost. Dollars spent on having to repeat diagnostic tests or counteract adverse drug events are dollars that are unavailable for other important purposes. Is it impossible for the nation to achieve the greatest value possible from the billions of dollars spent on medical care if the care given to patients contains errors? Also, not all costs can be directly and accurately measured in currency. For instance the trust that patients have in the health-care system and the satisfaction they have can be lost due to these medical errors. Healthcare professionals also suffer from a loss of satisfaction which they receive from helping others. This loss leads to the loss of morale and added frustration of not being able to provide the best care possible to their trusting patients.

A study conducted at the University Of Pennsylvania School Of Nursing examined close to 400 nurses who were asked to keep a 28-day diary of every mistake they made. The study found that 30% admitted making at least one mistake. Approximately 33% of actual medications errors were because of late administration of drugs to patients, which in some cases was due to inadequate numbers of nurses on duty. As hospitalized patients become more ill and the nursing shortage intensifies, such situations may become more common (Rogers, 2004). The development of a safe practice environment or skills lab is becoming more pivotal.

Researchers also have studied the relationship of hospital nurse staffing, patient mortality, nurse burnout, and job dissatisfaction (Aiken, Clarke, Cheung,
Sloane, Silber, 2003). This research found that “in hospitals with high patient-to-nurse rations, surgical patients experience higher risk-adjusted 30-day mortality and failure-to-rescue rates, and nurses are more likely to experience burnout and job dissatisfaction” (Aiken et al, 2003, p 1987).

**Drive to Reduce Errors**

Research demonstrates that quality nursing care reduces length of hospital stay and decreases the incidence of urinary infections, pneumonia and shock (Needleman, Buerhaus, Mattke, Stewart, & Zelevinsky, 2001). However, there is a growing disparity between the supply and demand of nurses due to multiple factors. The current nursing shortage crisis offers a significant threat to the nation’s health. In 2002, the American Nurses Association’s summit “A Call to the Nursing Profession”, envisioned what nursing should look like, and where it should be, by the year 2010. The summit targets the use of simulation education, human-patient simulators and standardized patients as one way nursing education practice is projected to be different.

Unsafe practice also is costly in ways that are not directly measured. The loss of trust in the health care system and the diminished satisfaction by both the patients themselves as well as health care professionals can result in loss of morale and frustration. Until the landmark report, “To Err is Human: Building a Safer Health Care System”, silence often surrounded the issue of unsafe practice. The report calls for a comprehensive approach to improving patient safety and a break from the cycle of inaction. Specifically, recommendation 7.2 states, “performance standards and expectations for health professionals should
focus greater attention on patient safety” (p 134). One objective of the recommendation calls for the development of curricula on patient safety and adoption into training and certification requirements by professional health licensing bodies and societies. The report recognizes the multiple factors which impact safe health care practice, and is often referred to as the “roadmap” toward a safer health care system. It may be human nature to err; it is also part of human nature to seek solutions (Kohn et al, 1999).

When considering pedagogies to improve patient safety, the incorporation of new technologies, and guidelines which address the issues relating to human factors and systems are key steps (Gaba, 2000; National Patient Safety Foundation, 1997; Raemer, Barron, Blum, Frenna, & Sica, 1998; Small, Wuerz, Simon, Shapiro, Conn, & Setnik, 1999,). The inclusion of patient safety in professional concern within anesthesiology, for instance, is pivotal in beginning to address patient safety; however there is still a long way to go in this important issue (Gaba, 2000; Kurrek, Devitt, Ichinose, & Bhatnagar, 1998).

Stakeholders in patient safety should focus on reshaping nursing education to improve practice, enhance care, and provide better and safer treatments. The quality of and amount of available nurses to provide this care are critically attributed to available faculty that are able to provide qualified innovative teaching that engages students and enhances clinical practice based on sound evidence and result in safe, quality care. Higher workloads, fewer support resources, greater nursing dissatisfaction, and nurse burnout, is making optimal patient care more difficult to obtain and increases negative patient outcomes
The Institute of Medicine Executive Summary, Crossing the Quality Chasm, states that quality issues may be viewed as not only as a gap, but a chasm. The summary recommends a restructuring of clinical education in order to be consistent with the principles of the 21st-century health system throughout the continuum of undergraduate, graduate, and continuing education for medical, nursing, and other professional training programs. To improve patient safety by establishing team training programs that incorporate proven methods of training such as simulation is recommended (Kohn et al, 1999).

Summary

In summary, (1) this review suggests that simulation education has multiple benefits as an educational pedagogy for health professional students. (2) Simulation in nursing is a promising educational pedagogy that can help teach student nurses complex psychomotor skills and which presents no risk to patients. (3) Two simulation pedagogies finding increased application in nursing curriculums include the human-patient simulator and the standardized patient. (4) Research on the human-patient simulator in nursing has looked at the retention of learning (Nehring, Ellis, & Lashley, 2001) as well as student and faculty perceptions of learning (Feingold, 2004). The effectiveness of using the standardized patient indicates that standardized patient’s are highly effective in teaching health assessment skills (Davidson et al, 2001). (5) As evidence by the review of literature, self-efficacy and locus of control are importance constructs in successful mastery of skills. (6) Research also indicates that individuals who
perceive that they have control over a situation also have greater self-efficacy and that locus of control and self-efficacy are related concepts (Phillips & Gully, 1997; Wood & Bandura, 1989). (7) The Institute of Medicine executive summary, Crossing the Quality Chasm, states that quality issues may be viewed as not only a gap, but as a chasm and calls for a restructuring of clinical education in order to enhance the quality of health-care education (Institute of Medicine, 2001) as well as the establishment of simulation programs to promote improved patient safety (Kohn et al, 1999). It is therefore important to study the effect of new simulation methods (HPS and SP) on students’ self-efficacy, locus of control, and performance on nursing skills.
Chapter 3: Methodology

Introduction

This chapter presents an overview of the methodology for the study and is organized into three major parts. The first section discusses the research design, objectives of the study and research questions. The second section discusses sampling, instrumentation, as well as validity and reliability of the instrumentation. The third section contains pilot study protocol, the recruitment procedure, the method used, and the assumptions of the statistics that were to be used to analyze the data from this study.

Section 1

Research Design

Following a review of research designs, in Aday (1989), Babbie (1989), Kerlinger (1973), and Robinson (2001) the pre-test, post-test experimental design with comparison of two treatments (human-patient simulator versus standardized patient clinical practica) was selected because of its appropriateness. Pre-test, post-test experimental design with random assignment to treatment groups allows for causal inference. The sequence of events for the study (pre-test, training, post-test) took place over a short time period, approximately one hour. Thus, this design affords causal inference about a short-term developmental sequence of behaviors (Babbie, 1989; Isaac & Michael, 1981).
Figure 4 Independent and Dependent Variables, and Respective Measurement Instruments

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<tr>
<th>Independent Variable</th>
<th>Dependent Variables</th>
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<td>Type of Practica</td>
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<td>Nursing Student Self-efficacy of Taking:</td>
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<td>Human-patient simulator (HPS) versus</td>
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<td>Standardized Patient (SP)</td>
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<td>II. Radial and Apical Pulse (SES) Scale</td>
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<tr>
<td>Time</td>
<td>Student Locus of Control</td>
<td>Locus of Control (LOC) Scale</td>
</tr>
<tr>
<td>Pre-test</td>
<td>Student Performance of Skills</td>
<td>Procedure Performance Checklist:</td>
</tr>
<tr>
<td>Post-test</td>
<td></td>
<td>I. Blood Pressure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>II. Radial and Apical Pulse</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Socio-Demographic Information Form</td>
</tr>
</tbody>
</table>

Figure 4, illustrates the major variables investigated in the study. Data from the socio-demographic instrument provided information to describe the study sample. The independent variable is the type of training a student receives; more specifically, the design contrasted the impact of the Human-patient simulator and the Standardized Patient. The human-patient simulator used in this study is manufactured by Laerdal and called SIMMAN ©, Model number 226FM116, Product number 3800, and lot number 38SM43010009; where students practice upon as well as demonstrate nursing skills of obtaining a blood pressure and palpating a radial and apical pulse on a mechanical arm and chest, through false skin. The Standardized Patient (SP) actor was educated on verbal
and non-verbal communication, as well as, responses of a patient having their blood pressure taken and their apical and radial pulses palpated. The actor for this study was a 23 year old healthy male. Guidelines of the American Society of Standardized Patient Educators (2005) were reviewed with the standardized patient by a nursing faculty who has expertise in standardized patient education.

The dependent variables investigated were: (a) Self-Efficacy (b) Locus of Control, and (c) Performance of Skills. The instruments used to measure these dependant variables, including sociodemographic data are described in detail in the discussion of instrumentation in section 2.

Objective of Research - Questions/Hypothesis

The purpose of this study was to examine the effect of new simulation methods on students’ self-efficacy (SE), locus of control, and performance on nursing skills. Students were randomly assigned to one of two simulation methods: (1) the human-patient simulator (HPS) and (2) the standardized patient (SP). In both methods, students were taught how to take blood pressure and pulse.

The following eight research questions/hypothesis will frame the analyses.

1. Will there be change in pre-test/post-test self-efficacy scores for students who receive the human patient simulation (HPS) training method?

   Null Hypothesis 1: There will be no change in pre-test/post-test self-efficacy scores for students who receive human patient simulation (HPS) method.
Alternative Hypothesis 1: Students who receive human patient simulation (HPS) method will have improved self-efficacy.

2. Will there be change in pre-test/post-test self-efficacy scores for students who receive standardized patient (SP) training method?

Null Hypothesis 2: There will be no change in pre-test/post-test self-efficacy scores for students who receive standardized patient (SP) method.

Alternative Hypothesis 2: Students who receive the standardized patient (SP) method will have improved self-efficacy.

3. Will there be a difference in pre-test/post-test self-efficacy scores for students who receive human-patient simulator (HPS) as compared to students who received standardized patient (SP) training method?

Null Hypothesis 3: There will be no difference in pre-test/post-test self-efficacy scores for students who receive human-patient simulator (HPS) as compared to students who received standardized patient (SP) method.

Alternative Hypothesis 3: There will be a difference in pre-test/post-test self-efficacy scores for students who receive human-patient simulator (HPS) as compared to students who received standardized patient (SP) method.

4. Will there be change in pre-test/post-test locus of control scores for students who receive human patient simulation (HPS) training method?
Null Hypothesis 4: There will be no change in pre-test/post-test locus of control scores for students who receive human patient simulation (HPS) method.

Alternative Hypothesis 4: Students who receive the human patient simulation (HPS) method will have increased internal locus of control.

5. Will there be change in pre-test/post-test locus of control scores for students who receive standardized patient (SP) training method?

Null Hypothesis 5: There will be no change in pre-test/post-test locus of control scores for students who receive standardized patient (SP) method.

Alternative Hypothesis 5: Students who receive the standardized patient (SP) will have increased internal locus of control.

6. Will there be a difference in pre-test/post-test locus of control scores for students who receive human-patient simulator (HPS) as compared to students who received standardized patient (SP) training method?

Null Hypothesis 6: There will be no difference in pre-test/post-test locus of control scores for students who receive human-patient simulator (HPS) as compared to students who received standardized patient (SP) method.

Alternative Hypothesis 6: There will be a difference in pre-test/post-test locus of control scores for students who receive human-patient simulator (HPS) as compared to students who received standardized patient (SP) method.
With questions 1-6 above analyzed, this study addresses the two following hypotheses:

7. Is there a relationship between performance scores on skill A (Blood pressure performance technique) and change scores of self-efficacy (SE) in students completing the HPS and SP practica?

   Null Hypothesis 7: There will be no relationship between students change score of self-efficacy in the two groups (HPS and SP) on blood pressure performance technique.

   Alternative Hypothesis 7: There will be a positive relationship between students change score of self-efficacy in the two groups (HPS and SP) on blood pressure performance technique. In other words, students who have the most improvement in self-efficacy will have the most improvement in mastery of blood pressure technique.

8. Is there a relationship between performance scores on skill B (Pulse reading performance technique) and change scores of self-efficacy (SE) in students completing the HPS and SP practica?

   Null Hypothesis 8: There will be no relationship between students change score of self-efficacy in the two groups (HPS and SP) on pulse reading performance technique.

   Alternative Hypothesis 8: There will be a positive relationship between students change score of self-efficacy in the two groups (HPS and SP) on pulse reading performance technique. In other words, students who
have the most improvement in self-efficacy will have the most improvement in mastery of pulse taking technique.

Section 2

Sample

The population chosen for this study were baccalaureate nursing students enrolled in freshman and beginning sophomore courses during the spring quarter of 2005 at Drexel University’s College of Nursing and Health Professions, located in Philadelphia, Pennsylvania. Drexel University has three baccalaureate level nursing programs. Two of these programs offered potential subjects for this study. The third program, an on-line degree completion program was deemed inappropriate because all students were practicing nurses and would not have met the primary inclusion criteria (having never been taught and practiced the performance skills of blood pressure and pulse).

The first of these programs is the Accelerated Career Entry (ACE) program. This is an eleven month curriculum that requires students to have a previous college degree as well as 30 pre-requisite credits in selected science courses. The second program is a five year cooperative education course sequence that typically meets the needs for those students who have recently graduated from high school and are interested in the work-study model of cooperative education.

The Dean of the College of Nursing and Health Professions at Drexel University was contacted and permission was obtained to approach nursing instructors to participate in this study (see Appendix A). Nursing faculty who were
teaching one of three beginning nursing courses (Nursing and Society, Health Promotion, and Principles of Nursing Practice) were asked if a research assistant could visit their classrooms in order to recruit students for this study. The students were informed this study required approximately 110 minutes of time and each student would have a chance to win one of three $50.00 Drexel University Book Store gift certificates. Students were informed that participation was entirely voluntary and if they expressed interest they were handed a Volunteer Information Form (Appendix C). This process of student recruitment is described in more detail in the section entitled Recruitment Protocol later on in this chapter. The population of interest is defined as follows: Baccalaureate Nursing students enrolled in freshman and beginning sophomore nursing courses at Drexel University in the spring quarter of 2005. The sampling process identified two subjects that did not meet protocol having learned and practice the basic skills previously and were removed from the study.

The study will have two levels for the independent variable, the human-patient simulator and standardized patient clinical practica, therefore a sample size of sixty was chosen for the study. A sample size of sixty provides the number of cases necessary to use the more powerful parametric model and have the specified probability ($p<.05$) of rejecting the null hypothesis. Sample size was initially estimated based on the central limit theorem. A retrospective power analysis using Cohen’s $f$ standardized mean difference effect size index (Murphy & Myors, 2004) was conducted to assure that the study was adequately powered. Cohen’s $f$ was calculated based on the difference between the two
training group’s self-efficacy scores (see Table 1). Then, to estimate the lowest meaningful effect, 95% confidence intervals of $f$ were calculated. The lower limit of the confidence interval was used as the lowest meaningful effect. The lowest meaning effect for self-efficacy was 0.65 with a significant criterion of 0.05 to have a statistical power of 0.80 or higher, a sample size of 20 subjects or 10 subjects per group was required. Although locus of control is an important trait variable, it is difficult to effect change in the short term. Based on previous literature, locus of control typically has a low effect size (Avtgis, 1998; Bryan, 1999; Clarke, 2004; Emery, 1998; Hans, 2000; Hong, Oddone, Dudley, & Bosworth, 2006; Yousfi, Matthews, Amelang, & Schmidt-Rathjens, 2004); the power analysis for this study was based on the state variable of self-efficacy.

<table>
<thead>
<tr>
<th>Clinical Practica</th>
<th>pre-mean</th>
<th>post-mean</th>
<th>pre-SD</th>
<th>post-SD</th>
<th>$f$</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPS - SE</td>
<td>1.67</td>
<td>2.91</td>
<td>0.65</td>
<td>0.82</td>
<td>1.60</td>
</tr>
<tr>
<td>SP - SE</td>
<td>1.91</td>
<td>2.80</td>
<td>0.66</td>
<td>0.60</td>
<td>1.15</td>
</tr>
<tr>
<td>HPS - LOC</td>
<td>5.97</td>
<td>5.47</td>
<td>3.22</td>
<td>3.20</td>
<td>-0.32</td>
</tr>
<tr>
<td>SP - LOC</td>
<td>5.90</td>
<td>5.80</td>
<td>2.47</td>
<td>2.98</td>
<td>-0.05</td>
</tr>
</tbody>
</table>

**Instrumentation**

The Sociodemographic Data Form and four instruments were used for this study. The instruments consisted of an adapted version of the Self-Efficacy (SE) scale developed by Jerusalem and Schwarzer in the 1980’s; Julian Rotter’s locus of control developed in the 1960’s, and two performance of skills checklist, developed by Patricia Potter and Anne Perry (2001), two well known authors of a basic nursing skills text instruction used widely in nursing colleges and schools.
today. The psychometric properties of the instruments that were used in the study are discussed below.

*Measure of Sociodemographic Data Form.*

The sociodemographic information consisted of items relating to age, gender, and previous experience with the human-patient simulator. Any previous experience with the human-patient simulator would exclude the student from this study. Due to a paucity of published articles on undergraduate nursing students and the use of the standardized patient; and in an effort to keep the form to a minimum, no items pertaining to the SP were included on the sociodemographic form (Appendix D).

*Measure of self-efficacy.*

**DESCRIPTION OF SELF-EFFICACY**

According to Bandura (1983), SE and self-confidence is specific to a behavior or task. That is, an individual may feel strongly confident in one behavior, such as weight reduction, but have minimal efficacy in other behaviors, such as quitting smoking. Hence, it was necessary to adapt an established general SE instrument so that it could measure the efficacy/confidence a nursing student has when measuring blood pressure and taking radial and apical pulses. A review of numerous SE measurements guided the development of this newly derived SES scale (Appendix E). The adaptation of measurement scales from established instruments with permission is an accepted practice (S. Vaidya, Telephone Consult, 2004) and was based on an extensive review of measurement tools.
The SE variable was measured by an adaptation from Jerusalem and Schwarzer’s General Self-Efficacy Scale (GSE). This original GSE instrument was developed in the 1980s to provide information about a person’s sense of self-confidence with daily hassles as well as after experiencing all kinds of stressful life events. The scale is designed for general adult populations, including adolescents. The instrument consists of a 10-item psychometric scale that is designed to assess optimistic self-beliefs to cope with a variety of difficult demands in life. The scale is self-administered and responses are made on a 4-point scale consisting of Likert-type responses.

General Self-Efficacy Scale
1. I can always manage to solve difficult problems if I try hard enough.
2. If someone opposes me, I can find the means and ways to get what I want.
3. It is easy for me to stick to my aims and accomplish my goals.
4. I am confident in my ability to deal efficiently with unexpected events.
5. Thanks to my resourcefulness, I know how to handle unforeseen situations.
6. I can solve most problems if I invest the necessary effort.
7. I can remain calm when facing difficulties because I can relay on my coping abilities.
8. When I am confronted with a problem, I can usually find several solutions.
9. If I am in trouble, I can usually think of a solution.
10. I can usually handle whatever comes my way.

(Scholz, Dona, Sud, & Schwarzer, 2002, p.251)

During the past two decades, this scale has been adapted in 26 other languages and has been used in many published studies (Jerusalem & Schwarzer 1995; Rimm & Jerusalem 1999, Schwarzer & Scholz 2000). The 10 core statements were modified to represent the confidence in blood pressure and pulse technique skills. For example, item number which reads ‘I can always manage to solve
difficult problems if I try hard enough’ was modified to ‘I can always manage to obtain a blood pressure reading if I try hard enough’ (see Appendix F for the adapted scale). The reliability and validity of the original instrument is discussed below and the statistical analysis of the adapted scale used in this study is presented in the section titled pilot study in this chapter.

RELIABILITY AND VALIDITY OF SELF-EFFICACY

The GES is one-dimensional and in samples from 25 nations, reliability measures using Cronbach’s alphas ranged from 0.75 to 0.91 with the majority in the high 0.80 range (Scholz, Dona, Sud, & Schwarzer; 2002). Criterion-related validity is documented in numerous correlation studies where positive correlations were found with favorable emotions, dispositional optimism, and work satisfaction, whereas, negative correlations were found with depression, anxiety, and stress (Scholz et al., 2002).

In a study that investigated the coping mechanisms of 246 cardiac surgery patients, this instrument had a retest-reliability of r=.67 (Schroder, Schwarzer, & Konertz, 1998). In another study of 140 teachers, the GES had a stability coefficient of r=.75 and over the same time period, where 2846 students completed the GES, the retest-reliability was r=.55 (Schwarzer & Jerusalem, 1999).

SCORING OF SELF-EFFICACY

In this study, a nursing student’s SE on taking a blood pressure measurement and taking a radial and an apical pulse was measured by a modified version of the GSE (Appendix E). Each item taps the specific behaviors
of blood pressure and radial and apical pulse taking. Responses for each item within the instrument range from 1 (low self-efficacy) to 4 (high self-efficacy) for the performance of each behavior; whereas the sum of the responses to all 20 items to yield a composite score with a range from 20 to 80, where a composite score of 20 represents a low self-efficacy score, and a composite score of 80 represents a high self-efficacy score. For the purposes of this study, self-efficacy will be scored at 20 to 40 a low self-efficacy score, 41 to 60 a medium self-efficacy score, and 61 to 80 a high self-efficacy score. No item need be reversed. Dr. Schwarzer was consulted and permission to adapt the GSE instrument was obtained (Appendix F).

*Measure of locus of control.*

DESCRIPTION OF LOCUS OF CONTROL

Locus of Control was measured with an established locus of control Scale. A review of numerous locus of control measurements guided the selection of Rotter’s locus of control Scale originally developed in the 1960’s (Appendix G). Julian Rotter, a leading scholar in social learning theory developed a locus of control questionnaire (1966, 1975), that is still in wide use today. More recent researchers (Nakata, Ishikawa, & Tsuda, 2004) are turning to more specific measures of locus of control (e.g., health locus of control). For this study, the locus of control variable was measured by a score on Rotter’s locus of control Scale (Rotter, 1966). The locus of control instrument consists of 23 forced choices (internal versus external statements) and 6 filler statements for a total of 29 paired statements.
Locus of Control Scale – Sample Items

1. Leaders are born, not made.
   Leaders are made, not born.

2. People often succeed because they are in the right place at the right time.
   Success is mostly dependent on hard work and ability.

3. When things go wrong in my life, it’s generally because I have made mistakes.
   Misfortunes occur in my life regardless of what I do.

4. Whether there is war or not depends on the actions of certain world leaders.
   It is inevitable that the world will continue to experience wars.

(Rotter, 1966, p. 185-188)

RELIABILITY AND VALIDITY OF LOCUS OF CONTROL

The scale is a forced choice, self report inventory. Split half and Kuder-Richardson reliabilities of total scores cluster around 0.70 (Anastasi, 1982). The scale has been used with school age children, adolescences, and adults.

Cronbach’s Alpha from published studies ranges from 0.74 to 0.88 (Anastasi, 1982). Validity has been documented in numerous studies during the past three decades (Judge & Bono, 2001; Phillips & Gully, 1997; Rotter, 1975; 1992)

SCORING OF LOCUS OF CONTROL

The instrument consists of a 29-item, forced-choice test including 6 filler items intended to make somewhat more ambiguous the purpose of the test. The range of possible scores was from a 0 to a 23. For the purpose of this study, scores were divided into three categories. A score 0 to 7 is considered internal, a score of 8 to 15 is considered mixed (both internal and external), and a score of 16 to
23 is considered external. Dr. Rotter has been consulted and permission to use the instrument has been obtained (Appendix H).

Skills performance checklist.

DESCRIPTION OF SKILLS PERFORMANCE CHECKLIST

The two nursing skills that were practiced and measured include measuring blood pressure and obtaining radial and apical pulses. These two skills were selected for the study and have established criteria from professional credentialing organizations and are required in all baccalaureate nursing programs. Moreover, these skills are basic nursing skills and would not be performed prior to entry level (freshman and beginning sophomore) nursing courses unless the student had prior learning.

RELIABILITY AND VALIDITY OF SKILLS PERFORMANCE CHECKLIST

Performance of skills of blood pressure (Appendix L) and pulse (Appendix M) attainment was measured with pre-established checklist obtained from known experts in the field of nursing skills textbook titled Fundamentals of Nursing, 5th edition (Potter & Perry, 2001). In order to obtain reliability, two experienced nursing instructors in the instruction of basic nursing skills, evaluated each student’s performance; the interrater reliability established during the pilot study was 0.99 for blood pressure attainment, and 1.0 for pulse attainment.

SCORING OF SKILLS PERFORMANCE CHECKLIST

This checklist has two levels of skills performance which are ‘yes’ or ‘no’ and provides the instructor with a logical step by step procedure evaluation form. One item of the Blood Pressure Skill Checklist is “Greets patient, introduces self,
explains procedure” (Appendix M). For purposes of this study, a score of 80% or higher on both obtaining a blood pressure and palpating a radial and apical pulse was required for inclusion in the study. Permission to use the skills checklist was obtained (Appendix I).

Section 3

Section three includes a discussion of the human subject protection protocol, a brief description of the pilot study, the recruitment protocol used, the procedure protocol for the study, and ends with the statistical protocol – plan for data analysis. The outline of the study protocol is summarized in Figure 5.

Human Subject Protection Protocol

Application for permission to conduct the study was made to the Drexel University Institutional Review Board in January 2005. All interested members of the study (principal investigator, co-investigator, and key personal) were certified to conduct research involving human subjects. All required documents were completed and submitted for consideration. Permission was obtained to proceed with the study in March of 2005 (see Appendix J).

All pre and post test forms as well as socio-demographic information, debriefing, and procedure performance checklist were labeled with a 3 digit identification number starting with 001 and ending with 060. The two instruments (self-efficacy scale and locus of control) sociodemographic forms and optional debriefing forms were placed into an envelope with matching ID numbers and sealed. From this point on, the research assistant was able to identify information by number only, in order to keep subjects’ identities confidential and keep the
### Figure 5 Outline of Study Protocol

<table>
<thead>
<tr>
<th></th>
<th>Human Subjects Protection</th>
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<table>
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<tr>
<th></th>
<th>Pilot Study accomplished</th>
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<tbody>
<tr>
<td>2</td>
<td>Sample size = 30 nursing students (Appendix P)</td>
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<tr>
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<th>Recruitment Protocol</th>
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<tbody>
<tr>
<td>3</td>
<td>a. Research assistant visited beginning level nursing courses and volunteer information form was handed out.</td>
</tr>
<tr>
<td></td>
<td>b. Sample size=60 nursing students</td>
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<tr>
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<tbody>
<tr>
<td>4</td>
<td>a. Consenting</td>
</tr>
<tr>
<td></td>
<td>b. Random assignment</td>
</tr>
<tr>
<td></td>
<td>c. Pre-test and other forms (lottery and results)</td>
</tr>
<tr>
<td></td>
<td>d. Instruction on basic skills</td>
</tr>
<tr>
<td></td>
<td>e. Practice in randomly assigned simulation environment</td>
</tr>
<tr>
<td></td>
<td>f. Return demonstration of skills in randomly assigned simulation environment and completion of procedure skills checklist</td>
</tr>
<tr>
<td></td>
<td>g. Post-test</td>
</tr>
<tr>
<td></td>
<td>h. Debriefing</td>
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<table>
<thead>
<tr>
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<th>Statistical Protocol – Plan For Data Analysis</th>
</tr>
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<tr>
<td>6</td>
<td>a. Statisticians Dr. Laura Roberts and Patricia Shewokis consulted</td>
</tr>
<tr>
<td></td>
<td>b. Data entered SPSS version 13</td>
</tr>
<tr>
<td></td>
<td>c. Data analyzed with paired t-Test, 2x2 Mixed Model ANOVA with repeated measures on last factor, and Pearson Product Moment Correlation Coefficient with 95% confidence intervals</td>
</tr>
</tbody>
</table>

Study results blinded. All forms were stored in a locked filing cabinet (in room 502E of the Bellet Building, at 1505 Race Street, Philadelphia, PA) to be accessed only by the research assistant and the primary investigator, Leland J. Rockstraw, MSN, MSA, RN. The data analysis files are stored in such a way that a password is required to access the information and only the research assistant
and the investigator knows the password. All completed forms were shredded at the completion of the data analysis.

**Pilot Study**

A pilot study was conducted during March 2005, in order to determine interrater reliability of the independent observations of the nursing instructors; the internal consistency of the SE scale (Appendix E) that had been adapted from Jerusalem and Schwarzer’s General Self-Efficacy Scale; and to determine any major flaws in the recruitment, procedure, and overall design of the study. Results of the pilot study are found in Appendix P and include internal consistency for both the SE and locus of control scales. The pilot sample size of n=30 was chosen using the Central Limit Theorem, which states that a sampling distribution of means were normally distributed even if the true population distribution is not normally distributed. The theorem assumes sample sizes of about 30 or greater and is often referred to as the rule of thirty (Gall, Borg, & Gall, 1997; Patten, 2002). The central limit theorem suggests that a sampling distribution always has significantly less randomness than the population it’s drawn from. The sampling distribution will have more of a normal distribution even when the population itself is not normally distributed (Leedy & Ormrod, 2001). For this reason a sample size of thirty cases for each level of the independent variable was chosen.

The results of the pilot study demonstrated no major flaws in the study design. Data from the pilot were entered into the Statistical Program for Social Sciences (SPSS) version 13. Interrater reliability among the nursing instructors
demonstrated a 1.0 for the pulse skill checklist and a .99 for the blood pressure skill checklist. The use of nursing faculty educated in the instruction and evaluation of nursing students performing nursing skills was deemed appropriate. An analysis of the data indicated strong reliability coefficients for both the SES and locus of control scales. The reliability analysis of the SES taken prior to intervention demonstrated a Cronbach’s Alpha of 0.9870 (Appendix P, Table P 2). The Cronbach’s Alpha was selected as the appropriate reliability statistic due to the number of choices within the Likert type scale. The SES demonstrated a Pearson Correlation of 0.864 for the test-retest reliability coefficient (p< 0.0005). The reliability coefficient for the locus of control scale demonstrated an Unequal-Length Spearman-Brown of 0.782. The Spearman-Brown is appropriate to measure the reliability with the forced answer internal versus external locus of control type of responses of the locus of control scale (Anastasi, 1982).

Recruitment Protocol

As compensation for their time, each student was asked if they would like to have their name placed in a lottery for a bookstore $50 gift certificate. Students who chose to enter had their names and mailing addresses placed in a lottery (Appendix O). Participants were associated with a lottery number from L001 – L060. Cards with the associated lottery number was placed into a canister and shaken. The investigator with the assistance of the research assistant randomly picked three cards. The research assistant matched the lottery number card with the lottery roster and mailed the gift certificates to the three winners. At no time did the investigator have access to the lottery roster. The lottery was conducted
on April 22nd, 2005 and the three gift certificates were mailed out. After mailing of the gift certificates, the lottery roster was shredded by the research assistant.

Figure 6 Graphic Outline of Research Procedure Protocol

Study Protocol

A research assistant was instructed by the investigator regarding the intent, purpose, and procedure of the research proposal. Before beginning the study, the research assistant was able to state the intent, purpose, and procedure of the protocol. The research assistant is an employee who works in the Clinical Learning Resource Center and is familiar with undergraduate nursing students as well as the professional expectations of students. The research assistant successfully completed the required certification program regarding human subjects of Drexel University’s IRB as well as the Health Insurance Portability and Accountability Act (HIPAA) certification. Permission was obtained by course nursing instructors of entry level nursing courses to recruit students. The research assistant then visited and described the purpose of the study and the procedures involved in participation at all freshman and beginning
sophomore level nursing baccalaureate classes of Drexel University in the spring quarter of 2005. The research assistant handed out a written description of the study with the investigators’ contact information and instructions on how to volunteer for the study. Students who were interested were asked to contact the research assistant. The volunteer information form included the exclusion criteria statement of “Students who have previous knowledge and experience in obtaining a blood pressure, radial and apical pulses (such as working in a nursing home) are not able to participate in this study” (Appendix C).

Students were asked to come to the Clinical Learning Resource Center (CLRC), New College Building, 3rd floor, 245 N. 15th Street, Philadelphia, PA at a specified time. The students were beginning students and were not known by the investigator, the research assistant, or the faculty. Students were given the choice of one of six time periods. Each time was selected based on the convenience for students as well as nursing instructors who were to evaluate the skills. The time periods accommodated a total of sixty students and each time slot accommodated up to sixteen students. On arrival to the CLRC, students were received into a classroom and randomly assigned to one of the two groups (HPS or SP). The actual process of random assignment included (1) as participants entered the room, they were handed an index card with a numeric value (1-16), (2) when all students were seated, they were informed that as there number was called out, they would be assigned to either group a (HPS) or to group b (SP), the students were also informed about the process of randomization. (3) By using the Table of random numbers (Burns & Grove, 2001,
p 760), the investigator assigned each student to one of the two groups. As one group, the students were handed a packet of forms which included the consent form (Appendix B); students were instructed to carefully read the consent form and ask questions. After signing and returning the consent form, all students were provided a copy to keep. Students were asked if they would like to obtain the results of their SES and locus of control scale after the study was concluded. Those students were separately requested to complete the Score Results Request Form (Appendix K) and place with the consent forms in their respective envelopes. At the completion of the data collection, scores were tabulated by the research assistant and placed on the score results forms. The forms were later mailed to the interested students.

After consenting, students then completed the Sociodemographic Form and pre-intervention SE and locus of control instruments and placed them in an envelope that they were instructed to keep until they had completed the class and post test instruments. Anonymity was maintained by having students return all instruments and forms filled out in an envelope to a research assistant with only identification numbers on the forms which matched the numbers on the envelopes. Students then attended a twenty minute instruction session on obtaining a blood pressure, radial and apical pulse provided by a faculty member. This faculty member was instructed on the intent, purpose and procedure of the research protocol; as well as the objectives teaching content of blood pressure and pulse. Once the instruction was over students had their questions answered, they were spit into their respective clinical practice groups where the size of each
group ranged from no less than 5 and no greater than 8 for each practice area (HPS and SP) and encouraged to practice each skill. The Human-patient simulator clinical practica is a separate unit located in the CLRC and consists of one human-patient simulator on a hospital bed. A picture in Chapter two (figure 3) shows nursing instructors and students in a human-patient simulator clinical practica situation. The human-patient simulator was programmed for both radial and apical pulse and blood pressure. Curtains provided privacy for both student and the human-patient simulator. During the practice with the human-patient simulator, as each student practiced, the other students were able to observe their fellow student and ask questions of the faculty member present.

The standardized patient clinical practice area is a larger unit located in the CLRC and consists of hospital beds and various pieces of medical equipment. Standardized patient nursing practice area refers to “practice” in a standardized patient clinical practica, where the patient is an actor trained to respond as a patient with health care students at one of the bed stations. The standardized patient for this study was educated as to the specific characteristics and behaviors of a healthy young male patient requiring a measurement of blood pressure and pulse. The standardized patient was compensated using the local standard payment scale of $15 an hour. Portable rolling screens and curtains provided privacy for both student practitioner as well as the standardized patient in the hospital bed. During the practice with the standardized patient, as each student practiced, the other students were able to observe their fellow student and ask questions of the faculty member present. Students were allowed to
practice up to 30 minutes the two basic skills of taking blood pressure and taking radial and apical pulse within the clinical practica assigned (HPS and SP). After the 30 minute practice session, students were instructed to complete two basic nursing skills: taking blood pressure on an adult and taking radial and apical pulses. Students were informed that they would be observed while performing a return demonstration and that they should refrain from asking questions of the faculty member. Student performance was observed for accuracy by two nursing clinical nursing instructors in an effort to increase inter-rater reliability, using the Procedure Performance Checklist – Skill 35-2 / Measuring a Radial and Apical Pulses (Appendix L) and Skill 35-5 / Measuring a Blood Pressure (Appendix M). Appendix Q is a list of the return demonstration scores. For this study, scores were evaluated and any students performing at 80% or higher were included. All 60 students meet the minimal 80% inclusion. Of interest to note, all student meet 100% of the blood pressure performance criteria. After practicing the skills and return demonstration, students returned to the classroom and filled out both the SE and the locus of control post intervention instruments. Students were offered the chance to complete an optional Debriefing Form (Appendix N). The Debriefing Form was developed based upon research from simulation team performance in aviation and medicine which indicates that “best practices” in simulation exercise include debriefing (Lighthall, Barr, Howard, Gellar, Sowb, Bertacini, & Gaba, 2003; Tekian, 1999). The debriefing addresses both the positive and negative factors of the experience. The data obtained from the Debriefing Form was reviewed by the primary investigator in order to determine
students’ ideas and feelings about the simulation education process (Appendix R). Envelopes were sealed by the students and handed to the research assistant and raw data was stored in a locked file cabinet in the office of the primary investigator.

Statistical Protocol – Data Analysis Plan

Prior to starting this study, a statistical consultant Laura Roberts, PhD; president and senior analyst of Robert’s Educational Research was conferred with regards the appropriateness of the planned statistical analysis. Following the data collection, the self-report questionnaires were checked for accuracy and completeness by the researcher. The purpose of the data cleaning was to detect errors and inconsistencies. Since quality data is essential for ensuring the accuracy of the study data, the forms were reviewed for completeness twice at one week intervals. No errors, inconsistencies, nor missing data was found.

Data were entered into a computer and statistical operations were performed using the software program Statistical Package for the Social Sciences (SPSS), version 13. All data were reviewed for accuracy and completeness by the investigator as well as Laura Roberts, PhD of Robert’s Educational Research. Analysis of the data was performed in consultation with Laura Roberts and Patricia Shewokis, PhD; of Drexel University College of Nursing and Health Professions.

The major statistical tests used to analyze the data included the paired t-test for research questions 1, 2, 4, and 5; the mixed model analysis ANOVA with repeated measures on the last factor with a significance level of 0.05 was used
for research questions 3 and 6; and the Pearson-product moment correlation coefficients (r) with 95% confidence intervals was used for questions 7 and 8. The paired t-test was considered appropriate because the pre-test/post-test scores used in the analysis were obtained from the same subjects under different conditions and controls for the fact that dispersion for a single group at two time periods is likely to be similar (Fain, 2004; Burns & Grove, 2001). The 2 x 2 mixed model ANOVA with repeated measures on the last factor compares the variance within each group with the variance between groups. The variance from within and between the groups explains the total variance in the data (Burns & Grove, 2001, p. 529). This Pearson’s correlation was the first of the correlation measures developed and is the most commonly used today (Burns & Grove, p. 528).

The statistical tests of paired t-Test, mixed model ANOVA (Analysis of Variance), and Pearson Product Moment Correlation were selected to analyze the eight research questions. The paired t-Test was considered appropriate to determine whether the means of two groups (the simulated environments) are significantly different. If the sample means are far enough apart, the t-Test will yield a significant difference, allowing this researcher to conclude that the two groups have significantly different means. The assumptions on which the t-Test is based are:

1. Sample means from the population are normally distributed.
2. The dependant variable is measured at the interval level.
3. The two samples have equal variance.
4. All observations within each sample are independent.  
(Burns & Grove, 2001, p. 527)

The ANOVA is a statistical technique used to examine differences among two or more groups by comparing the variability between the groups with the variability within the groups. It is considered a more flexible analysis and can examine data from two or more groups. The ANOVA analytical equation for this research is $2 \times 2$ (training method x test) or a mixed model ANOVA with repeated measures on the last factor, the last factor being the self-efficacy and locus of control instruments. The assumptions on which the ANOVA is based are:

1. Homogeneity of variance.
2. Independence of observations.
3. Normal distribution of the populations from which the samples were drawn or random samples.
4. Interval-level data.  
(Burns & Grove, 2001, p. 529)

Lastly, the Pearson’s Product-Moment Correlation allows the researcher to test for linear relationship between two variables. The assumptions for the Pearson’s Product-Moment Correlation are:

1. Interval measurement of both variables.
2. Normal distribution of at least one variable.
3. Independence of observational pairs.
4. Homoscedasticity.  
(Burns & Grove, 2001, p. 486)
Homoscedasticity is a reflection of equal variance of both variables. Data that are homoscedastic are evenly dispersed both above and below the regression line, which indicates a linear relationship on a scatter plot. Prior to the actual ANOVA test, several statistical tests were run to test the assumptions identified above. The statistical test includes frequencies, regression, and factor analysis.

Summary

This chapter has described the research design as well as the major research questions and hypothesis. The sample was recruited from baccalaureate nursing students enrolled in freshman and beginning sophomore courses. Instrumentation analysis, recruitment protocol, and procedure were reviewed. Finally, the statistical analysis procedure was described in detail as to alert the reader to the methods used.
Chapter 4: Data Analysis and Findings

The purpose of this study was to examine the effect of new simulation methods and their impact on students’ self-efficacy, locus of control, and performance of nursing skills. Nursing students were randomly assigned to one of two simulation methods: (1) the human-patient simulator (HPS) or (2) the standardized patient (SP). In both methods, students were instructed how to take blood pressure and pulse. Data were collected from sixty nursing students enrolled at Drexel University’s College of Nursing and Health Professions Baccalaureate Nursing Programs, in Philadelphia, Pennsylvania, in the spring of 2005. This chapter presents the findings from the analysis of the data.

Data Management and Screening

The data were managed and scored using SPSS 13.0 for Windows. This program was used to house and analyze subject data. The data were entered by the investigator and screened to ensure accuracy, tested for the presence of outliers, and used to test the assumptions of univariate statistics. Discussion of the assumptions for each respective statistical test is included in the chapter and will be integrated and presented with the reported findings. Means and standard deviations for all variables were computed and after all data were screened, statistical analyses were performed using SPSS 13.0 for Windows.

Sample-Demographics

Sixty freshman and early sophomore nursing students from Drexel University, College of Nursing and Health Profession participated in the study.
The age breakdown of the sample is displayed in Table 2. The selected age range groupings are 18 to 28 years, 29 to 39 years, and 40 to 50 years of age. The highest percentage (73% of the sample) were between the ages of 18 to 28 years; with 15% falling within the 29 to 39 years of age, and 12% within the 40 to 50 years of age range.

Within the age category of 18 to 28 years of age, 23 or 38.33% of this age population participated in the human patient simulation practica, whereas 21 or 34.99% participated in the standardized patient practica. Within the 29 to 39 years of age category, 5 or 8.33% participated in the human-patient simulator, whereas 4 or 6.67% participated in the standardized patient practica. Of the 40 to 50 years of age category, 2 or 3.33% participated in the human-patient simulator, and 5 or 8.33% participated in the standardized patient practica.

Eighty-three percent were female and seventeen percent were male students. Nationally the population percentage of male nurses in 2004 was 5.7% (Health Resources and Services Administration, 2004). Thus, it appears males were overrepresented in this sample relative to national data.

Of the female population n=50, 27 total or 45% participated in the human patient simulation practica whereas 23 total or 38% participated in the standardized patient practica. Of the male population n=10, 3 or 5% of the total n participated in the human patient simulation practica, and 7 or 12% participated in the standardized patient practica.
Table 2 - Group Demographics (N=60)

<table>
<thead>
<tr>
<th></th>
<th>18-28 Years</th>
<th>29-39 Years</th>
<th>40-50 Years</th>
<th>Gender</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>44</td>
<td>9</td>
<td>7</td>
<td>Female</td>
</tr>
<tr>
<td>Human-Patient Simulator</td>
<td>23</td>
<td>5</td>
<td>2</td>
<td>Female</td>
</tr>
<tr>
<td>Standardized Patient</td>
<td>21</td>
<td>4</td>
<td>5</td>
<td>Female</td>
</tr>
</tbody>
</table>

Descriptive Statistics Pre and Post - Intervention

In order to provide an overview of the data, descriptive statistics related to self efficacy and locus of control will be summarized for the factors: type of practica, gender, and age.

Clinical Practica Descriptive Statistics

Descriptive statistics on the variables of self-efficacy and locus of control are presented in Tables 3 through 6. The scoring for self-efficacy was scored at 20 to 40 a low self-efficacy score, 41 to 60 a medium self-efficacy score, and 61 to 80 a high self-efficacy score. As displayed in Table 3, the pre-self-efficacy total score for the age range 18-28 was a mean of 33.80 (low self-efficacy) with a standard deviation of 11.88; the total score for the age range 29-39 had a mean of 39.67 (low self-efficacy) with a standard deviation of 16.36; and the total score for the age range of 40-50 had a mean of 42.86 (medium self-efficacy) and a standard deviation of 16.34.

The mean pre self-efficacy score for females was 34.80 (low self-efficacy) with a standard deviation of 13.56, while the mean pre self-efficacy for males was 40.40 (low self-efficacy) with a standard deviation of 11.51.
Table 3 - Pre Self Efficacy – by Age and Gender (N=60)

<table>
<thead>
<tr>
<th></th>
<th>18-28 Years</th>
<th>29-39 Years</th>
<th>40-50 Years</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>33.80</td>
<td>39.67</td>
<td>42.86</td>
<td>34.80</td>
<td>40.40</td>
</tr>
<tr>
<td>SD</td>
<td>11.88</td>
<td>16.36</td>
<td>16.34</td>
<td>13.57</td>
<td>11.51</td>
</tr>
</tbody>
</table>

Table 4 shows the post self-efficacy score by age and gender. The post-self-efficacy score for age range 18-28 was a mean of 56.55 (medium self-efficacy) or a 67.31% increase in percent change; the age range 29-39 had a mean of 59.33 (medium self-efficacy) or a 48.44% increase in percent change; and the age range 40-50 had a mean of 57.43 (medium self-efficacy) or a 33.99% increase in percent change. The female post self-efficacy mean total score was 56.60 (medium self-efficacy) or an increase in percent change of 62.64%, while the post self-efficacy total score for males was 59.40 (medium self-efficacy) or an increase in percent change of 47.03%.

Table 4 - Post Self Efficacy – By Age and Gender (N=60)

<table>
<thead>
<tr>
<th></th>
<th>18-28 Years</th>
<th>29-39 Years</th>
<th>40-50 Years</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>56.55</td>
<td>59.33</td>
<td>57.43</td>
<td>56.60</td>
<td>59.40</td>
</tr>
<tr>
<td>SD</td>
<td>14.68</td>
<td>12.75</td>
<td>14.99</td>
<td>14.43</td>
<td>13.76</td>
</tr>
</tbody>
</table>

The scoring of the locus of control instrument was as follows: a score 0 to 7 was considered internal, a score of 8 to 15 was considered mixed (both internal...
and external), and a score of 16 to 23 was considered external. Table 5 illustrates the pre locus of control means and standard deviation by age and gender. The pre-locus of control total score for the age range 18-28 was mean of 6.39 (internal) with a standard deviation of 2.91; the age range 29-39 was mean of 5.11 (internal) with a standard deviation of 2.32; the age range of 40-50 was a mean of 4.14 (internal) and a standard deviation of 2.34. The female pre locus of control mean total score was 6.18 (internal) pre locus of control with a standard deviation of 2.91, while the male displayed a pre locus of control mean of 4.70 (internal) with a standard deviation of 2.21.

<table>
<thead>
<tr>
<th>Table 5 - Pre Locus of Control – by Age and Gender (N=60)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
</tr>
<tr>
<td>Mean</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td>Human-Patient Simulator</td>
</tr>
<tr>
<td>Standardized Patient</td>
</tr>
</tbody>
</table>

Table 6 shows the post locus of control means and standard deviation by age and gender. The post-locus of control for the age range 18-28 had a mean of 6.11 (internal) with a move towards increase internality of 4.38% (percent change), and age range 29-39 had a mean of 5.11 (internal) with no move towards either internal or external, and the age range 40-50 displayed a mean of 3.29 (internal) with a move towards increase internality of 20.53% (percent change). The female post locus of control total score mean was 6.12 (internal) with a move towards increase internality of 0.97% (percent change), while the
male post locus of control total score mean was 3.20 (internal) with a move
towards increase internality of 31.91% (percent change).

<table>
<thead>
<tr>
<th>Age</th>
<th>Gender</th>
<th>Mean</th>
<th>SD</th>
<th>Mean</th>
<th>SD</th>
<th>Mean</th>
<th>SD</th>
<th>Mean</th>
<th>SD</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-28 Years</td>
<td>Female</td>
<td>6.11</td>
<td>2.97</td>
<td>5.11</td>
<td>2.98</td>
<td>3.29</td>
<td>2.98</td>
<td>6.12</td>
<td>3.01</td>
<td>3.20</td>
<td>2.20</td>
</tr>
<tr>
<td>29-39 Years</td>
<td>Male</td>
<td>5.96</td>
<td>3.18</td>
<td>4.20</td>
<td>2.78</td>
<td>3.00</td>
<td>4.24</td>
<td>5.78</td>
<td>3.12</td>
<td>2.67</td>
<td>3.06</td>
</tr>
<tr>
<td>40-50 Years</td>
<td>Male</td>
<td>6.29</td>
<td>2.80</td>
<td>6.25</td>
<td>3.20</td>
<td>3.40</td>
<td>2.97</td>
<td>6.52</td>
<td>2.87</td>
<td>3.43</td>
<td>1.99</td>
</tr>
</tbody>
</table>

Assumptions

As stated in the data management and screening section of this chapter,
discussion of the assumptions for each respective statistical test will be
integrated and presented with the reported findings. The Levene’s Test of
Equality of Error Variances (Table 7) will aid in the discussion of the
assumptions. Levene’s Test of Equality of Error Variances was used to test if the
samples have equal variances. Thus, if the assumption of equal variances is met,
or assumption of unequal variance cannot be rejected; it can be assumed that
variances are equal across groups or samples. Levene’s Test of Equality
demonstrated a non significance of p>0.05 for pre self-efficacy as well as pre and
post locus of control; the assumption of homogeneity of variances is satisfied for
these three variables. Post self-efficacy Levene’s Test of Equality shows a
significance of p=0.036; to correct for this violation, the more conservative result
of “equal variance not assumed” will be reported for self-efficacy post test scores.
Table 7 - Levene’s Test of Equality of Error Variances

<table>
<thead>
<tr>
<th>Dependent Measure</th>
<th>df1</th>
<th>df2</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre – SE</td>
<td>1</td>
<td>58</td>
<td>&lt; 1.0</td>
<td>0.907</td>
</tr>
<tr>
<td>Post – SE</td>
<td>1</td>
<td>58</td>
<td>4.595</td>
<td>0.036</td>
</tr>
<tr>
<td>Pre – LOC</td>
<td>1</td>
<td>58</td>
<td>2.179</td>
<td>0.145</td>
</tr>
<tr>
<td>Post – LOC</td>
<td>1</td>
<td>58</td>
<td>&lt; 1.0</td>
<td>0.949</td>
</tr>
</tbody>
</table>

Table 8 summarizes Fisher’s Skewness and Kurtosis. The skewness and kurtosis were reviewed to ensure normality of distribution of the data. Although any curve that is not symmetrical is considered asymmetrical or skewed, Fisher’s Skewness tolerates a + 2 to – 2 from zero as an acceptable skew; whereas Fishers Kurtosis tolerates a + 3 to – 3. Therefore the data in Table 8 display an acceptable level of skew, excluding the skills attainment of blood pressure and pulse (Polit & Beck, 2004). Fisher’s Skewness test displayed a blood pressure statistic of -7.746 and a pulse statistic of -5.334, which may be attributable to the lack of variance in skills attainment measurement process. The Fisher’s Kurtosis displayed a peaked statistic for both the blood pressure and pulse attainment skill, 60.00 and 27.360 respectively and may be associated to the lack of variance in skills attainment measurement process.

Table 8 – Fisher’s Skewness and Fishers Kurtosis of Major Variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Statistic</td>
<td>Std. Error</td>
</tr>
<tr>
<td>SE - Pre</td>
<td>0.714</td>
<td>0.309</td>
</tr>
<tr>
<td>SE - Post</td>
<td>-0.104</td>
<td>0.309</td>
</tr>
<tr>
<td>LOC - Pre</td>
<td>-0.035</td>
<td>0.309</td>
</tr>
<tr>
<td>LOC - Post</td>
<td>0.232</td>
<td>0.309</td>
</tr>
<tr>
<td>SE Change Score</td>
<td>0.261</td>
<td>0.309</td>
</tr>
<tr>
<td>Blood Pressure Skill</td>
<td>-7.746</td>
<td>0.309</td>
</tr>
<tr>
<td>Pulse Skill</td>
<td>-5.334</td>
<td>0.309</td>
</tr>
</tbody>
</table>
Comparisons of Base Line Data

Table 9 demonstrates the dependant variables at baseline between the groups of the clinical practica (human-patient simulator and standardized patient). The independent t-Test analysis shows no significant differences at baseline.

<table>
<thead>
<tr>
<th>Variables</th>
<th>HPS</th>
<th>SP</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-Efficacy Pre Total</td>
<td>33.30</td>
<td>38.17</td>
<td>0.16</td>
</tr>
<tr>
<td>Self-Efficacy Pre Blood Pressure</td>
<td>17.10</td>
<td>19.57</td>
<td>0.17</td>
</tr>
<tr>
<td>Self-Efficacy Pre Pulse</td>
<td>16.20</td>
<td>18.60</td>
<td>0.18</td>
</tr>
<tr>
<td>Self-Efficacy Post Total</td>
<td>58.17</td>
<td>55.97</td>
<td>0.56</td>
</tr>
<tr>
<td>Self-Efficacy Post Blood Pressure</td>
<td>28.43</td>
<td>28.10</td>
<td>0.85</td>
</tr>
<tr>
<td>Self-Efficacy Post Pulse</td>
<td>29.73</td>
<td>27.87</td>
<td>0.35</td>
</tr>
<tr>
<td>Locus of Control Pre</td>
<td>5.97</td>
<td>5.90</td>
<td>0.93</td>
</tr>
<tr>
<td>Locus of Control Post</td>
<td>5.47</td>
<td>5.80</td>
<td>0.68</td>
</tr>
<tr>
<td>Blood Pressure</td>
<td>12.00</td>
<td>12.00</td>
<td>*</td>
</tr>
<tr>
<td>Pulse</td>
<td>10.00</td>
<td>9.98</td>
<td>0.33</td>
</tr>
</tbody>
</table>

* t cannot be computed - standard deviations of both groups are 0 (zero)

Research Questions

Question 1

Will there be a change in pre-test post-test self-efficacy scores for students who receive the human patient simulation (HPS) training method?

Null Hypothesis 1: There will be no change in pre-test post-test self-efficacy scores for students who receive human patient simulation (HPS) method.

Alternative Hypothesis 1: Students who receive human patient simulation (HPS) method will have improved self-efficacy.
Assumptions and Statistical Test

All data were checked for meeting the parametric assumptions including the normality assumption prior to further analyses. The sample distributions for self-efficacy were normal based on both histograms and scatter plots. Thus the first and primary assumption was met. When assessing pretest – posttest data of a single group (e.g., HPS), one of the major sources of variability is the between subjects variability. By repeating measures within subjects (i.e., using a paired test), each subject acts as their own control, and the between subjects variability is removed. In general this means that if there is a true difference between the pairs the paired t-test is more likely to be appropriate and sensitive. Therefore, the major source heterogeneity of variance is removed. The next assumption was met in that students were randomly assigned to one of the two groups (HPS or SP) using a standard table of random numbers. To assess the change in self-efficacy of the human patient simulation training method from pre-test to post-test, a paired t-test was used. The significance criterion was $p<0.05$ and Cohen’s $f$ is the effect size index used to aid in data interpretation. The effect size according to Cohen’s $f$ (Cohen, 1977); a small, medium, and large effect is 0.10, 0.25, and 0.40 respectively and will be reported within each table. To aid in the data interpretation, the pre and post self-efficacy HPS mean and standard deviation is displayed in table 10.

<table>
<thead>
<tr>
<th>Table 10 - Pre and Post Self-Efficacy HPS Scores (N=30)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>Pre Self-Efficacy</td>
</tr>
<tr>
<td>Post Self-Efficacy</td>
</tr>
</tbody>
</table>
Results:

As displayed in Table 11, there was a significant change (t=-8.733, df=29) in self-efficacy at the p< 0.001 level. These data demonstrate that students who practiced blood pressure and pulse skills attainment with in the human-patient simulator practica had a significant increase in self-efficacy and an increase in percent change of 74.68%. Based on this result, the null hypothesis was rejected and the alternative hypothesis was accepted.

<table>
<thead>
<tr>
<th>Paired t-Test</th>
<th>df</th>
<th>sig. (2 tailed)</th>
<th>f</th>
</tr>
</thead>
<tbody>
<tr>
<td>-8.733</td>
<td>29</td>
<td>p&lt; 0.000</td>
<td>1.6</td>
</tr>
</tbody>
</table>

Table 11 - Paired t-Test, Degrees of Freedom, Significance, and Cohen’s f of Self-Efficacy for Students Who Received the Human-patient simulator Practica

Question 2

Will there be change in pre-test post-test self-efficacy scores for students who receive standardized patient (SP) training method?

Null Hypothesis 2: There will be no change in pre-test post-test self-efficacy scores for students who receive standardized patient (SP) method.

Alternative Hypothesis 2: Students who receive the standardized patient (SP) method will have improved self-efficacy.

Assumptions and Statistical Test

The data were checked for meeting the parametric assumptions including the normality assumption prior to further analyses. The same assumptions listed and reported in research question one also applies to this paired t-test. To assess the change in self-efficacy of the standardized patient training method
from pre-test to post-test, a paired t-test was used. Cohen’s f was the effect size index used to aid in data interpretation with significance criterion \( p < 0.05 \). To aid in the data interpretation, the pre and post self-efficacy SP mean and standard deviation is displayed in Table 12.

Table 12 - Pre and Post Self-Efficacy SP Scores (N=30)

<table>
<thead>
<tr>
<th>Test</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Self-Efficacy</td>
<td>38.17</td>
<td>13.29</td>
</tr>
<tr>
<td>Post Self-Efficacy</td>
<td>55.97</td>
<td>11.91</td>
</tr>
</tbody>
</table>

**Results**

As displayed in Table 13, there was a significant change \( t = -6.313 / df = 29 \) in self-efficacy at the \( p < 0.001 \) level. The students who practiced blood pressure and pulse skills with in the standardized patient practica had a significant increase in self-efficacy and an increase in percent change of 46.63%. Based on this result, the null hypothesis was rejected and the alternative hypothesis was accepted.

Table 13 - Paired t-Test, Degrees of Freedom, Significance, and Cohen’s f of Self-Efficacy for Students Who Received the Standardized Patient Practica

<table>
<thead>
<tr>
<th>Paired t-Test</th>
<th>df</th>
<th>sig. (2 tailed)</th>
<th>f</th>
</tr>
</thead>
<tbody>
<tr>
<td>-6.313</td>
<td>29</td>
<td>( p &lt; 0.000 )</td>
<td>1.15</td>
</tr>
</tbody>
</table>

**Question 3**

Will there be a difference in pre-test/post-test self-efficacy scores for students who receive human-patient simulator (HPS) as compared to students who received standardized patient (SP) training method?

Null Hypothesis 3: There will be no difference in pre-test/post-test self-efficacy scores for students who receive human-patient simulator (HPS) as compared to students who received
standardized patient (SP) method.

**Alternative Hypothesis 3:** There will be a difference in pre-test/post-test self-efficacy scores for students who receive human-patient simulator (HPS) as compared to students who received standardized patient (SP) method.

**Assumptions and Statistical Test:**

Prior to the analyses, self-efficacy scores were checked for meeting parametric assumptions including the normality assumption. The same assumptions listed and reported in research question one also applies to this mixed model ANOVA analysis. The assumption of homogeneity of variance was met by Levene’s Test for Equality of Error Variance (Table 7) which displayed a non significant result ($p = 0.907$) for pre self-efficacy scores, whereas the Levene’s Test for Equality of Error Variance post self-efficacy score displayed a significant result ($p=0.036$). To correct for this violation, the more conservative result of equal variance not assumed will be reported for self-efficacy post test scores. Two additional tests to evaluate homogeneity of covariance were calculated as follows: the Box’s Test of Equality of Covariance Matrices and Mauchly’s Test of Sphericity. Box’s Test of Equality displayed a $p<0.364$ for self-efficacy. Mauchly’s Test of Sphericity displayed a $W=1.000$ and a Green House-Geisser epsilon of 1.000 indicating Sphericity is assumed.

In addition, the assumption of measuring at the interval level data was addressed in that self-efficacy scale allowed responses from 20 (not confident) to
Next, descriptive statistics, including 95% confidence intervals of self-efficacy across groups and time, were calculated (table 14).

Table 14 - Descriptive Statistic and 95% Self-confidence Intervals (CI) for Self-Efficacy

<table>
<thead>
<tr>
<th>Group</th>
<th>Test</th>
<th>Mean</th>
<th>SD</th>
<th>LL</th>
<th>UL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human Patient Simulator</td>
<td>Pre</td>
<td>33.3</td>
<td>13.11</td>
<td>28.47</td>
<td>38.13</td>
</tr>
<tr>
<td>Human Patient Simulator</td>
<td>Post</td>
<td>58.17</td>
<td>16.39</td>
<td>52.93</td>
<td>63.4</td>
</tr>
<tr>
<td>Standardized Patient</td>
<td>Pre</td>
<td>38.17</td>
<td>13.29</td>
<td>33.34</td>
<td>42.99</td>
</tr>
<tr>
<td>Standardized Patient</td>
<td>Post</td>
<td>55.97</td>
<td>11.91</td>
<td>50.73</td>
<td>61.2</td>
</tr>
<tr>
<td>Total</td>
<td>Pretest</td>
<td>35.73</td>
<td>13.32</td>
<td>32.32</td>
<td>39.15</td>
</tr>
<tr>
<td>Total</td>
<td>Posttest</td>
<td>57.07</td>
<td>14.25</td>
<td>53.36</td>
<td>60.77</td>
</tr>
</tbody>
</table>

To assess the effects of training technique on self-efficacy across time, a 2 X 2 (Training Group X Time) mixed model analysis of variance (ANOVA) with repeated measures on the last factor was used. For a significant interaction, Fisher’s Least Significant Difference test was used to locate the differences. The significance criterion for the test was $p < 0.05$ and a partial eta effect size index was used to aid in data interpretation. To aid in the data interpretation, the pre and post self-efficacy HPS and SP mean and standard deviation is displayed in table 15.

Table 15 – Pre and Post Self-Efficacy HPS and SP Scores (N=60)

<table>
<thead>
<tr>
<th>Test</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPS Pre Self-Efficacy</td>
<td>33.3</td>
<td>13.11</td>
</tr>
<tr>
<td>HPS Post Self-Efficacy</td>
<td>58.17</td>
<td>16.39</td>
</tr>
<tr>
<td>SP Pre Self-Efficacy</td>
<td>38.17</td>
<td>13.29</td>
</tr>
<tr>
<td>SP Post Self-Efficacy</td>
<td>55.97</td>
<td>11.91</td>
</tr>
</tbody>
</table>

Results

Table 16 illustrates the results of the 2 x 2 mixed model ANOVA with repeated measures on the last factor which was used to reduce the error or variance within the human-patient simulator and standardized patient.
environments. The results of the ANOVA demonstrated no significant differences on self-efficacy change for the two groups. On the basis of the ANOVA result, the null hypothesis of no group differences on self-efficacy change was accepted and the alternative hypothesis was rejected.

Table 16 - Self-Efficacy ANOVA Summary Table

<table>
<thead>
<tr>
<th>Effect</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F-Ratio</th>
<th>p-value</th>
<th>$\eta^2$ partial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group Assignment</td>
<td>1</td>
<td>53.33</td>
<td>53.33</td>
<td>&lt; 1.0</td>
<td>0.65</td>
<td>0.00</td>
</tr>
<tr>
<td>Error</td>
<td>58</td>
<td>15032.46</td>
<td>259.18</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>1</td>
<td>13653.33</td>
<td>13653.33</td>
<td>113.37</td>
<td>*&lt;0.001</td>
<td>0.66</td>
</tr>
<tr>
<td>Time x Group</td>
<td>1</td>
<td>374.53</td>
<td>374.53</td>
<td>3.11</td>
<td>0.08</td>
<td>0.05</td>
</tr>
<tr>
<td>Error (test)</td>
<td>58</td>
<td>6985.13</td>
<td>120.43</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

When the human-patient simulator and standardized patient practica were combined, a paired sample t-test revealed significant gains in self-efficacy from pretest to posttest and an increase in percent change of 59.73%. Although this was not presented a priori as a formal hypothesis, it is important to note that the sample, as whole, demonstrated self-efficacy gains over the course of the study. This result is reported in Table 17.

Table 17 - Paired Sample t-test for Self-Efficacy Change from Pretest to Posttest

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>t</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-Efficacy Change</td>
<td>-1.07</td>
<td>0.79</td>
<td>-10.46</td>
<td>59.00</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Figure 6 graphically depicts the interaction ($t_{(1,58)}=3.11$, $p=0.08$) of self-efficacy between group assignment (human-patient simulator and standardized patient) and test (pre and post). The human-patient simulator group demonstrated a pre self-efficacy mean of 33.30 and a post self-efficacy mean of 58.17 for a difference of 24.81. Whereas, the standardized patient group
demonstrated a pre self-efficacy mean of 38.17 and a post self-efficacy mean of 55.97 for a difference of 17.80. This graphically depicts a trend towards higher self-efficacy in the HPS group as compared to the SP group.

Figure 6 – Interaction of Self-Efficacy between Group Assignment and Test

Question 4
Will there be a change in pre-test post-test locus of control scores for students who receive human patient simulation (HPS) training method?

Null Hypothesis 4: There will be no change in pre-test post-test locus of control scores for students who receive human patient simulation (HPS) method.

Alternative Hypothesis 4: Students who receive the human patient simulation (HPS) method will have increased internal locus of control.
Assumptions and Statistical Test

Again data were checked for meeting the parametric assumptions including the normality assumption prior to further analyses. The sample distributions for locus of control were normal based on visual inspection of both a histogram and scatter plot, thus meeting the assumption of normal distribution. The final assumption was met in that students were randomly assigned to one of the two groups (human-patient simulator or standardized patient) using a standard table of random numbers. To assess the change in locus of control of the human patient simulation training method from pre-test to post-test, a paired t-test was used. The significance criterion was 0.05 and Cohen’s f is the effect size index used to aid in data interpretation. To aid in the data interpretation, the pre and post locus of control HPS mean and standard deviation is displayed in table 18.

<table>
<thead>
<tr>
<th>Test</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Locus of Control</td>
<td>5.97</td>
<td>3.22</td>
</tr>
<tr>
<td>Post Locus of Control</td>
<td>5.47</td>
<td>3.20</td>
</tr>
</tbody>
</table>

Results

As displayed in Table 19, the results were not significant at the p=0.087 level, meaning that locus of control did not change significantly at the p<0.05 level. The percent change of locus of control was 8.38% towards internality (more internal locus of control). Based on these findings, the null hypothesis was accepted and the alternative hypothesis rejected. Interestingly, p=0.087 suggests a trend toward an increase of internal characteristic traits of locus of control.
Table 19 - Paired t-Test, Degrees of Freedom, Significance, and Cohen's f of Locus of Control for Students Who Received the Human-patient simulator Practica

<table>
<thead>
<tr>
<th>Paired t-Test</th>
<th>df</th>
<th>sig. (2 tailed)</th>
<th>f</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.77</td>
<td>29</td>
<td>p=0.087</td>
<td>-0.32</td>
</tr>
</tbody>
</table>

Question 5

Will there be change in pre-test post-test locus of control scores for students who receive standardized patient (SP) training method?

Null Hypothesis 5: There will be no change in pre-test post-test locus of control scores for students who receive standardized patient (SP) method.

Alternative Hypothesis 5: Students who receive the standardized patient (SP) will have increased internal locus of control.

Assumptions and Statistical Test

The data were checked for meeting the parametric assumptions including the normality assumption prior to further analyses. The same assumptions listed and reported in research question four also applies to this paired t-test. To assess the change in locus of control of the standardized patient training method from pre-test to post-test, a paired t-test was used. Cohen’s f was the effect size index used to aid in data interpretation with significance criterion $\alpha = 0.05$. To aid in the data interpretation, the pre and post locus of control SP mean and standard deviation is displayed in table 20.
Table 20 - Pre and Post Locus of Control SP Scores (N=30)

<table>
<thead>
<tr>
<th>Test</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Locus of Control</td>
<td>5.90</td>
<td>2.47</td>
</tr>
<tr>
<td>Post Locus of Control</td>
<td>5.80</td>
<td>2.97</td>
</tr>
</tbody>
</table>

Results

Table 21 illustrates the paired t-test, degrees of freedom, and significance of locus of control scores for students in the standardized patient practica. Data demonstrates that students who practiced blood pressure and pulse attainment within the standardized patient practica had no significant difference of locus of control. The percent change of locus of control was 1.69% towards internality (internal locus of control). Based on this result, the null hypothesis was accepted and the alternative hypothesis was rejected.

Table 21 - Paired t-Test, Degrees of Freedom, Significance, and Cohen's f of Locus of Control for Students Who Received the Standardized Patient Practica

<table>
<thead>
<tr>
<th>Paired t-Test</th>
<th>df</th>
<th>sig. (2 tailed)</th>
<th>f</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.26</td>
<td>29</td>
<td>p=0.797</td>
<td>-0.05</td>
</tr>
</tbody>
</table>

Question 6

Will there be a difference in pre-test/post-test locus of control scores for students who receive human-patient simulator (HPS) as compared to students who received standardized patient (SP) training method?

Null Hypothesis 6: There will be no difference in pre-test/post-test locus of control scores for students who receive human-patient simulator (HPS) as compared to students who received standardized patient (SP) method.

Alternative Hypothesis 6: There will be a difference in pre-test/post-test locus of control scores for students who receive
human-patient simulator (HPS) as compared to students who received standardized patient (SP) method.

Assumptions and Statistical Test

Prior to the analyses, locus of control scores were checked for meeting parametric assumptions including the normality assumption. The same assumptions listed and reported in research question four also applies to this mixed model ANOVA analysis. In addition, the assumption of measuring at an interval level was addressed in that locus of control scale was analyzed using a composite score with the incorporation of all 23 items, thus meeting the assumption of measuring at an interval level. Two additional tests to evaluate homogeneity of covariance were calculated as follows: the Box’s Test of Equality of Covariance Matrices and Mauchly’s Test of Sphericity. Box’s Test of Equality displayed a p<0.148 for locus of control. Mauchly’s Test of Sphericity / the Greenhouse-Geisser (most conservative test) was met with a test result of 1.0 within subject effect thereby confirming that the assumption of homogeneity of covariance was met and that sphericity is assumed. Then, descriptive statistics, including 95% confidence intervals of locus of control across groups and time, were calculated (table 22).

<table>
<thead>
<tr>
<th>Group</th>
<th>Test</th>
<th>Mean</th>
<th>SD</th>
<th>CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>LL</td>
</tr>
<tr>
<td>Human Patient Simulator</td>
<td>Pre</td>
<td>5.97</td>
<td>3.22</td>
<td>4.92</td>
</tr>
<tr>
<td>Human Patient Simulator</td>
<td>Post</td>
<td>5.47</td>
<td>3.20</td>
<td>4.34</td>
</tr>
<tr>
<td>Standardized Patient</td>
<td>Pre</td>
<td>5.90</td>
<td>2.47</td>
<td>4.85</td>
</tr>
<tr>
<td>Standardized Patient</td>
<td>Post</td>
<td>5.80</td>
<td>2.97</td>
<td>4.67</td>
</tr>
<tr>
<td>Total</td>
<td>Pretest</td>
<td>5.93</td>
<td>2.84</td>
<td>5.19</td>
</tr>
<tr>
<td>Total</td>
<td>Posttest</td>
<td>5.63</td>
<td>30.70</td>
<td>4.83</td>
</tr>
</tbody>
</table>
To assess the effects of training technique on locus of control across time, a 2 X 2 (Training Group X Time) mixed model analysis of variance (ANOVA) with repeated measures on the last factor were used. For a significant interaction Fisher’s Least Significant Difference tests was used to locate the differences. The significance criterion for the test was p< 0.05 and a partial eta effect size index was used to aid in data interpretation. To aid in the data interpretation, the pre and post locus of control HPS and SP mean and standard deviation is displayed in table 23.

<table>
<thead>
<tr>
<th>Test</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Locus of Control</td>
<td>5.93</td>
<td>2.84</td>
</tr>
<tr>
<td>Post Locus of Control</td>
<td>5.63</td>
<td>3.07</td>
</tr>
</tbody>
</table>

Results

Table 24 illustrates the results of the 2 x 2 mixed model ANOVA with repeated measures on the last factor which was used to reduce the error or variance within the human-patient simulator and standardized patient environments. The results demonstrate no significant differences within the measurement of locus of control in the two groups. The degree of freedom = 1, the F = .688, the effect size = .012, and the p<0.410. On the basis of this statistical finding, the null hypothesis of no group differences in locus of control change from pretest to posttest was accepted and the alternative hypothesis was rejected.
Table 24 - Locus of Control ANOVA Summary Table

<table>
<thead>
<tr>
<th>Effect</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F-Ratio</th>
<th>p-value</th>
<th>η² partial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group Assignment</td>
<td>1</td>
<td>0.53</td>
<td>0.53</td>
<td>&lt; 1.0</td>
<td>0.86</td>
<td>0.00</td>
</tr>
<tr>
<td>Error</td>
<td>58</td>
<td>932.83</td>
<td>16.08</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>1</td>
<td>2.70</td>
<td>2.70</td>
<td>1.58</td>
<td>0.21</td>
<td>0.03</td>
</tr>
<tr>
<td>Time x Group</td>
<td>1</td>
<td>1.20</td>
<td>1.20</td>
<td>&lt; 1.0</td>
<td>0.41</td>
<td>0.12</td>
</tr>
<tr>
<td>Error (test)</td>
<td>58</td>
<td>99.10</td>
<td>1.71</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Although a formal hypothesis was not stated a priori, the researcher examined mean change in locus of control from pretest to posttest for the sample as a whole (i.e., human-patient simulator and standardized patient practica combined). The results are given in Table 25. There was no significant change in locus of control from pretest to posttest. The percent change of locus of control was 5.06% towards a more internal locus.

Table 25 - Paired Sample t-test for Locus of Control Change from Pretest to Posttest

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>t</th>
<th>df</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Locus of Control Change</td>
<td>0.30</td>
<td>1.84</td>
<td>1.26</td>
<td>59.00</td>
<td>0.21</td>
</tr>
</tbody>
</table>

Question 7

Is there a relationship between performance scores on skill A (Blood pressure performance technique) and change scores of self-efficacy (SE) in students completing the human-patient simulator and standardized patient practica?

Null Hypothesis 7: There will be no relationship between students change score of self-efficacy in the two groups (HPS and SP) on blood pressure performance technique.

Alternative Hypothesis 7: There will be a positive relationship
between students change score of self-efficacy in the two groups (HPS and SP) on blood pressure performance technique. In other words, students who have the most improvement in self-efficacy will have the most improvement in mastery of blood pressure technique.

Assumptions and Statistical Test

The same assumptions listed and reported in research questions one, three, four, and six for the paired t-test and the 2 x 2 mixed model ANOVA with repeated measures on the last factor apply here. The assumption of homoscedasticity was evaluated using Normal P-P Plots of pre and post self-efficacy. The results of the scatter plots indicated data were evenly dispersed above and below the regression line with the exception of the pre self-efficacy data which reflected a mildly acceptable nonlinear relationship with the regression line. Pearson-product moment correlation coefficients (r) were calculated separately for the two groups (HPS and SP) between the students’ self-efficacy change scores and blood pressure performance technique. To aid in the data interpretation, the performance scores of blood pressure are displayed in table 26.

<table>
<thead>
<tr>
<th>Performance Score (1-12)</th>
<th>N</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>12</td>
<td>60</td>
</tr>
</tbody>
</table>

Results

Pearson-product moment correlation coefficient (r) analysis is displayed in Table 27. The results indicate that there is no significant correlation between
students change scores on self-efficacy and performance of the skill blood pressure attainment. When $r (0.103)$ is squared ($r^2 = 0.010609$) the effect is non-existent. Based on these findings, the null hypothesis was accepted and the alternative hypothesis was rejected. It is important to note that the inclusion for this study was that students achieve a score of 80% or higher to be included within the sample analysis. In this sample, all students achieved a 100% on the skills checklist as scored by two independent observers displaying virtually no variability within this sample group.

**Table 27 - Pearson Correlation of SE Change Score and Blood Pressure**

<table>
<thead>
<tr>
<th>Skill</th>
<th>$r$</th>
<th>Sign.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.103</td>
<td>0.436</td>
</tr>
</tbody>
</table>

**Question 8**

Is there a relationship between performance scores on skill B (Pulse reading performance technique) and change scores of self-efficacy (SE) in students completing the human-patient simulator and standardized patient practica?

**Null Hypothesis 8:** There will be no relationship between students change score of self-efficacy in the two groups (HPS and SP) on pulse reading performance technique.

**Alternative Hypothesis 8:** There will be a positive relationship between students change score of self-efficacy in the two groups (HPS and SP) on pulse reading performance technique.

In other words, students who have the most improvement in
self-efficacy will have the most improvement in mastery of pulse taking technique.

Assumptions and Statistical Test

The same assumptions listed and reported in research question seven also applies to this Pearson-product moment correlation test. Pearson-product moment correlation coefficients \( r \) were calculated separately for the two groups (HPS and SP) between the students’ self-efficacy change scores and pulse reading performance technique. Ninety-five percent confidence intervals of these relationships were calculated to provide information about the likely range of the true population parameter, and coefficients of determination \( r^2 \) will be calculated to aid in interpretation. To aid in the data interpretation, the performance scores of pulse are displayed in table 28.

<table>
<thead>
<tr>
<th>Performance Score (1-10)</th>
<th>N</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>59</td>
<td>9.980</td>
</tr>
</tbody>
</table>

Results

Pearson-product moment correlation coefficient \( r \) analysis is displayed in Table 29. The results indicate that there is no significant correlation between students change scores on self-efficacy and performance of the skill pulse attainment. When \( r (0.01) \) is squared \( r^2 = 0.0001 \) the effect is non-existent. Based on these findings, the null hypothesis was accepted and the alternative hypothesis was rejected. Again, the inclusion for this study was that students achieve a score of 80% or higher to be included within the sample analysis.
Table 29 - Pearson Correlation of SE Change Score and Pulse Skill

<table>
<thead>
<tr>
<th>r</th>
<th>Sign.</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.01</td>
<td>0.94</td>
</tr>
</tbody>
</table>

Retrospective Analysis

Self Efficacy, Skills Attainment, Simulated Clinical Practica

To appropriately consider the effects of the skills on self-efficacy and locus of control, it is necessary to differentiate the complexity of the skills within each comparison group (human-patient simulator and standardized patient), by test (self-efficacy), and by time (pretest and posttest) to make a comparison of skills (blood pressure and pulse). In this retrospective exploratory analysis of skill attainment and self-efficacy, a significant difference was noted in the human-patient simulator post self-efficacy measurement score between skills of pulse and blood pressure (see Table 30) the group human-patient simulator displaying a higher self-efficacy score with the pulse skill as compared to that of the blood pressure skill. With the human patient simulation practica post self-efficacy means were 29.73 for pulse attainment and 28.43 for blood pressure attainment, thus nursing students within the human patient simulation practica had significantly higher self-efficacy for pulse attainment than that of the blood pressure attainment as noted in table 30 (p=0.031). There was no significant difference within the pre measurement of the human patient simulation practica or either the pre or post self-efficacy measurement in the standardized patient practica.
Table 30 - Paired t-Test of Self-Efficacy Blood Pressure & Pulse by Clinical Practica and Test

<table>
<thead>
<tr>
<th>Clinical Practica</th>
<th>Test</th>
<th>Mean</th>
<th>SD</th>
<th>t</th>
<th>df</th>
<th>p</th>
<th>Cohen’s f</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human Patient Simulation</td>
<td>Pre</td>
<td>0.900</td>
<td>3.585</td>
<td>1.375</td>
<td>29</td>
<td>0.180</td>
<td>1.60</td>
</tr>
<tr>
<td></td>
<td>Post</td>
<td>1.300</td>
<td>3.142</td>
<td>2.266</td>
<td>29</td>
<td>*0.031</td>
<td>1.60</td>
</tr>
<tr>
<td>Standardized Patient</td>
<td>Pre</td>
<td>0.967</td>
<td>3.840</td>
<td>1.380</td>
<td>29</td>
<td>0.178</td>
<td>1.15</td>
</tr>
<tr>
<td></td>
<td>Post</td>
<td>-0.233</td>
<td>2.622</td>
<td>-0.487</td>
<td>29</td>
<td>0.630</td>
<td>1.15</td>
</tr>
</tbody>
</table>

* Significant at the 0.05 Level

**Self-Efficacy, Locus of Control, Age, and Gender**

To further understand the possible differences between the statistical measures of self-efficacy and locus of control, the factors of age and gender were examined using a Welch W test for age and t-test for independent samples for gender factors (Tables 31 to 35). The Welch W statistical test is appropriate to use for comparing small unequal variances to control for Type I Errors (Keselman & Wilcox, 1999). When looking at the three age groups, sample size for the respective age range groups were N = 44 for age range 18-28; N = 9 for age range 29-39, and N = 7 for age range 40-50. The Welch W (Table 31) demonstrates there were no significant differences of pre/post self efficacy and locus of control between the three age ranges.

Table 31 - Retrospective Analysis of Age on Self Efficacy and Locus of Control

<table>
<thead>
<tr>
<th>Dependant Variable</th>
<th>df1</th>
<th>df2</th>
<th>Welch W</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-Efficacy Baseline</td>
<td>2</td>
<td>10.75</td>
<td>1.32</td>
<td>0.31</td>
</tr>
<tr>
<td>Self-Efficacy Post</td>
<td>2</td>
<td>12.30</td>
<td>0.16</td>
<td>0.85</td>
</tr>
<tr>
<td>Locus of Control Baseline</td>
<td>2</td>
<td>13.31</td>
<td>2.90</td>
<td>0.90</td>
</tr>
<tr>
<td>Locus of Control Post</td>
<td>2</td>
<td>12.00</td>
<td>2.73</td>
<td>0.11</td>
</tr>
</tbody>
</table>

Tables 32 and 33 demonstrate pre and post self-efficacy by gender at baseline. The independent t-Test analysis shows no significant differences for
pre self-efficacy between genders at baseline. The pre self-efficacy mean for males were 40.40 (low self-efficacy) and 34.80 for females (low self-efficacy).

<table>
<thead>
<tr>
<th>Gender</th>
<th>Male</th>
<th>Female</th>
<th>t(58)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>1.22</td>
<td>.23</td>
</tr>
</tbody>
</table>

The post self-efficacy mean for males were 59.40 (medium self-efficacy) and 56.60 for females (medium self-efficacy). The independent t-Test analysis shows no significant differences for post self-efficacy between genders at baseline (Table 33).

<table>
<thead>
<tr>
<th>Gender</th>
<th>Male</th>
<th>Female</th>
<th>t(58)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.564</td>
<td>.57</td>
</tr>
</tbody>
</table>

In reviewing the independent t-test which compared the pre locus of control between genders of the sample (Table 34), no significant difference at baseline was noted. Males demonstrated a more internal locus of a mean = 4.70 (internal locus), while females displayed a mean of 6.18 (internal locus).

<table>
<thead>
<tr>
<th>Gender</th>
<th>Male</th>
<th>Female</th>
<th>t(58)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>1.52</td>
<td>.13</td>
</tr>
</tbody>
</table>

The independent t-test comparing post locus of control and gender (Table 35) does demonstrate a significant difference at the p=0.005 level. Males demonstrated a more internal locus of a mean = 3.20 (internal locus), while females displayed a mean of 6.12 (internal locus).
Table 35 - Post Locus of Control by Gender / t-Test and Significance 
(N=60)

| Gender | Male   | Female | t(58)=2.91 p=0.005 |

Retrospective Skill and Environment Analysis Across Time

In addition, a post hoc 2 x 2 x 2 (Group X Skill X Time) mixed model ANOVA with repeated measure on the last two factors was conducted to evaluate the potential significant effects of simulation clinical practica, and self-efficacy pretest – posttest, blood pressure and pulse skills. This post hoc analysis was conducted to ascertain what effect the clinical practica (human-patient simulator & standardized patient) and the skills performance (blood pressure and pulse) had on the dependant variables of self-efficacy and locus of control. The Group and Skill variables are considered fixed factors while Time is a random factor. Table 36 demonstrates two significant findings. There was a significant interaction of Test and Skills (p=0.016) a significant main effect of time (p<0.001).

Table 36 - Self-Efficacy & Skill ANOVA Summary Table

<table>
<thead>
<tr>
<th>Effect</th>
<th>df</th>
<th>MS</th>
<th>F-Ratio</th>
<th>p-value</th>
<th>$\eta^2$ partial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>1</td>
<td>26.70</td>
<td>&lt;1.0</td>
<td>0.652</td>
<td>0.945</td>
</tr>
<tr>
<td>Error</td>
<td>58</td>
<td>129.60</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td>1</td>
<td>6826.70</td>
<td>113.40</td>
<td>&lt;0.0001</td>
<td>0.662</td>
</tr>
<tr>
<td>Test x Group</td>
<td>1</td>
<td>187.30</td>
<td>3.100</td>
<td>0.083</td>
<td>0.051</td>
</tr>
<tr>
<td>Error (Test)</td>
<td>58</td>
<td>60.20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skill</td>
<td>1</td>
<td>2.40</td>
<td>&lt;1.0</td>
<td>0.523</td>
<td></td>
</tr>
<tr>
<td>Skill x Group</td>
<td>1</td>
<td>9.60</td>
<td>1.660</td>
<td>0.203</td>
<td>0.028</td>
</tr>
<tr>
<td>Error (Skill)</td>
<td>58</td>
<td>5.80</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test x Skill</td>
<td>1</td>
<td>32.30</td>
<td>6.110</td>
<td>0.016*</td>
<td>0.095</td>
</tr>
<tr>
<td>Test x Skill x Group</td>
<td>1</td>
<td>8.10</td>
<td>1.530</td>
<td>0.221</td>
<td></td>
</tr>
<tr>
<td>Error (Test x Skill)</td>
<td>58</td>
<td>5.30</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Intraclass Correlation Coefficient**

A retrospective test of the Intraclass correlation coefficient (ICC) was conducted to test for this potential carry-over effect for the self-efficacy and locus of control measures. An ICC measures the reliability and magnitude of an effect as well as the correlations between observations pre-test to post-test (Griffin & Gonzalez, 1995; Shrout & Fleiss, 1979). The ICC (3,1) for pre-test to post-test for self-efficacy was 0.34, a minimal effect; that is to say minimal carry-over effect was noted. The ICC (3,1) for pre-test to post-test locus of control was 0.81, a strong effect, or strong carry over; which may indicate the stability of locus of control and will be further discussed in chapter 5.

**Tukey’s Honestly Significant Difference’s**

Lastly, a Tukey’s Honestly Significant Difference’s (HSD) test was conducted in order to determine the locus of group differences for the significant interaction (Table 37). Tukey’s HDS is a moderately conservative post hoc comparison to control for “Type I Errors”. When all possible differences between pairs of means are computed, any difference that yields an absolute value that exceeds HSD will be declared significant (Daniel, 2005, p. 323). The Tukey’s calculation yielded a studentized range value of $Q=4.23$ (with 6 comparisons, 40 df, $p=0.05$) and a Tukeys of 1.32 (Daniel, 2005, p A-52 - 54). In post-hoc multiple comparisons, it is appropriate to use the most conservative estimate of a statistics, thus, the degrees of freedom were rounded down from 58 to 40 degrees of freedom. Reported in Table 38 are the results of the Tukey’s HSD comparisons of the significant Skill X Time interaction. The post-hoc
comparisons yielded four significant differences: pretest blood pressure – posttest blood pressure; pretest blood pressure – posttest pulse; pretest pulse – posttest blood pressure; and pretest pulse – posttest pulse. Thus illustrating in table 37 that the greater difference noted at 11.4 is between pre-pulse and post-pulse; it is reasoned that this greater difference is related that the skills of pulse attainment is less complex and may allow for greater confidence (self-efficacy). Table 37 also reflects that the least significant difference occurred between pre-blood pressure and post-blood pressure (9.94) and can be reasoned that blood pressure is a higher order and more complex skill, which subsumes the skills of pulse attainment as one of steps in accomplishing blood pressure attainment, thus limiting the building of self-efficacy.

<table>
<thead>
<tr>
<th>Table 37 - Tukey's Honestly Significance Post Hoc Mean Differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tukey's = 1.31516</td>
</tr>
<tr>
<td>Self-Efficacy Time and Skill</td>
</tr>
<tr>
<td>Interaction Pairs</td>
</tr>
<tr>
<td>PreBP - PreP</td>
</tr>
<tr>
<td>PreBP - PostBP</td>
</tr>
<tr>
<td>PreBP - PostP</td>
</tr>
<tr>
<td>PreP - PostBP</td>
</tr>
<tr>
<td>PreP - PostP</td>
</tr>
<tr>
<td>PostBP - PostP</td>
</tr>
<tr>
<td>BP = Blood Pressure - P=Pulse</td>
</tr>
<tr>
<td>* = Value exceeds Tukey's HSD and significant at p&lt;0.05</td>
</tr>
</tbody>
</table>

Summary

The purpose of this study was to examine the effect of new simulation methods (human patient simulation and standardized patient) on students’ self-efficacy, locus of control, and performance in nursing skills. Selected demographics of undergraduate nursing students at Drexel University,
Philadelphia Pennsylvania, during the spring of 2005 were reported. The sample consisted of 60 subjects. There were 50 females and 10 males ranging in age from 18 to 50 years of age. The subjects were volunteers who were attending their freshman or sophomore year of nursing courses in an undergraduate program.

The results indicated that self-efficacy significantly increased in the human-patient simulator and standardized patient environment, both at the p<0.05 level; whereas there was not a significant difference of self-efficacy between human-patient simulator and standardized patient. Locus of control scores for students who received the human-patient simulator environment showed a trend towards internality, but not a significant difference. There was neither a significant difference nor a trend in nursing student’s locus of control score in the standardized patient environment. There was no significant difference on change of locus of control between students in the human-patient simulator or the standardized patient environment. This is in keeping with or consistent with current theory which views locus of control as a trait which is more stable or less malleable (Avtgis, 1998; Bryan, 1999; Clarke, 2004; Emery, 1998; Hans, 2000; Hong, Oddone, Dudley, & Bosworth, 2006; Yousfi, Matthews, Amelang, & Schmidt-Rathjens, 2004).

The correlation between students change scores on self-efficacy in the two groups, that is human-patient simulator and standardized patient on blood pressure performance technique was not significant. Within the skills
observation, there was minimal variance in the blood pressure as well as pulse evaluation skills checklist, as evident by the Fisher’s Skewness and Kurtosis.

An exploratory post hoc analysis revealed the following significant differences. (1) There was a significant difference within the human patient simulation clinical practica and self-efficacy when measured post intervention between the skills of pulse and blood pressure attainment, which is that nursing students scored a higher self-efficacy in pulse as compared to blood pressure. (2) Nursing students within the age category of 29 to 50 presented a significantly more internal locus of control, both pre and post measurement, than students in the age category of 18 to 28. (3) Male nursing students displayed a significantly greater internal locus of control when analyzed in the total sample as well as in the standardized patient clinical practica, than female nursing students.

In addition, a 2 x 2 x 2 mixed model ANOVA with repeated measures on the last 2 factors of self-efficacy displayed a significance difference from pretest to post test (supporting the earlier analysis of variance) as well as significant difference between pretest, posttest and skill attainment. Further analysis using Tukey’s HSD revealed significant differences between multiple pairs of means as displayed in table 38. Finally, the students within the human patient simulation practica, displayed a significantly – $t_{(29)} = 2.27$, $p = 0.03$ – higher self-efficacy in pulse attainment than that of self-efficacy of blood pressure attainment.
Chapter 5: Discussion, Recommendations, and Conclusions

This chapter provides an overview of the study, discussion of the research findings, and an interpretation of the findings. In addition, it provides the limitations of the study, recommendations for future studies in nursing simulation, implications for nursing education, summary, and conclusions.

Overview of the Study

An increasing number of nursing programs are beginning to explore the impact of the human-patient simulator and the standardized patient as sound pedagogical techniques to enhance a nursing student’s mastery of clinical skills. Many universities are creating nursing simulation clinical practice settings that mirror a patient environment in the hospital as well as in the outpatient setting. A major benefit of simulated clinical practica is the ability to learn safely in an environment where error and harm to patients are removed. Moreover, feedback is provided immediately in these simulated clinical practica to students who perform an incomplete nursing assessment or an incorrect nursing intervention. Therefore, this study has the potential to contribute to the body of nursing-education knowledge. Also, it is expected that this simulation will provide an effective pedagogical experience in learning environments for nursing students. Furthermore, the impact on nursing-simulated clinical practica will likely be important in terms of the curriculum.

Evidence from the literature suggests that self-efficacy is a central determinant in the educational process. According to Bandura (1997), “[P]eople who believe they have the power to exercise some measure of control over their
lives are healthier, more effective and more successful than those who lack faith in their ability to effect changes in their lives" (p 49). Self-efficacy focuses on one's belief in the ability to enact a desired behavior. Actual ability or the result of the action is less important than the perceived ability to affect the behavior (Bandura, 1997). Bandura (1983) also believes that locus of control interacts with self-efficacy to influence behavior along with emotions.

The literature on simulation, learning, and skill acquisition in the areas of aviation, nuclear power plants, and military training has a long history (McGaghie, 1999). Over the past three decades, the use of the standardized patient has seen increased use and application in medical training (Barrows, 1993; McGovern, Johnston, Brown, Zinberg, & Cohen, 2006; Yudkowsky, 2002). More recently (over the past 10 years), the human-patient simulator has seen increased use and application in anesthesia (Gaba, 2000) and graduate nursing-practitioner programs (Saucier et al, 2000). Undergraduate nursing research that uses the human-patient simulator and standardized-patient clinical practica is sparse. Nevertheless, the research has identified the use of simulation as realistic, valuable, and promising in the augmentation of clinical skills and in the prevention of patient harm. The literature treating undergraduate student clinical practica shows that undergraduate nursing students practicing with the standardized patient show significantly higher scores in clinical performance, as well as communication skills than undergraduate nursing students who practiced in the traditional clinical practica (Arthur, 1999; Colletti et al., 2001; Schwind, Boehler, Folse, Dunnington, & Markwell, 2001).
The purpose of this study was to examine the effect of simulation methods on undergraduate nursing students' self-efficacy, locus of control, and performance on nursing skills. Students were randomly assigned to one of two simulation methods: (1) the human-patient simulator (HPS) and (2) the standardized-patient (SP). Students were then taught how to take blood pressure and a pulse based on their assigned method.

**Discussion of Research Findings**

The major findings of this research showed that nursing students' self-efficacy increased significantly when they performed basic skills of blood pressure and pulse attainment in both the human-patient-simulator – \( t(29) = -8.73, p < 0.001 \) (two-tailed) – and standardized-patient – \( t(29) = -6.31, p < 0.001 \) (two-tailed) – practica. This finding is consistent with the findings of increased self-efficacy in simulated clinical practica noted by Ravert (2004) and Cioffi, Purcal, and Arundell (2005). Higher levels of self-efficacy were noted in the human-patient simulator practicum for the skill of pulse attainment compared to blood pressure. It is plausible that students perceived greater self-efficacy with less complex skills, such as when obtaining a pulse within a clinical practica (human-patient simulator) where the potential for causing discomfort to a live person has been removed. However, when learning more complex skills, such as taking a patient’s blood pressure, such skills may take more time to master and consequently, more time to build self-efficacy. This point is partially supported by Lim, Downie, and Nathan (2004) who found that greater exposure to increased
theoretical information and clinical experience had a more positive impact on the self-efficacy of student nurses.

The present study revealed that locus of control did not significantly change when the students performed the basic skills of blood pressure and pulse attainment in either the human-patient simulator or standardized-patient practica. The t-test – $t(29) = 1.79, p = 0.087$ (two-tailed) – showed that the locus of control did trend toward a more internal locus of control for students who received the human-patient-simulator practica, thus suggesting that students who felt more in control have an increased internal locus of control (Bandura, 1997). Students felt more in control (internal locus) in the human-patient simulator compared to the live patient (standardized-patient). This finding raises the question of why the students felt more in control. It is plausible that removing the possibility of harm to a live patient (human patient simulator versus standardized patient / a live person in a simulated environment) may influence a students’ locus of control.

In this study, the eight following questions posed together with statistical findings and implications regarding the social correlates of undergraduate nursing students practicing basic skills in two simulated clinical practica. The findings of the eights questions of this study are discussed next.

**Question One:** Will there be change in pre-test/post-test self-efficacy scores for students who receive the human-patient simulation (HPS) training method?

Overall, the students who practiced and demonstrated blood pressure and pulse attainment skills in the human-patient simulator training method
experienced a significant increase in self-efficacy, \( t(29) = -8.73, p < .001 \) (two-tailed); the pre self-efficacy mean of 33.30 (low self-efficacy score) and posttest self-efficacy mean of 58.17 (medium self-efficacy score) indicates an increase in percent change of 74.68% from pre to post self-efficacy. This increase in self-efficacy may have been partly due to the students' knowledge that they were performing in a simulated environment and would not cause discomfort or harm to a real patient. A few of the student responses from the optional debriefing form (Appendix Q) indicated that they did not have to worry about how they would make a patient feel in that they would not cause harm, discomfort, or pain to the human-patient simulator. One subject's response included, "SimMan was not real and did not mind if I made a mistake. He didn't mind me touching him or hurting him. It was nice to be able to practice on him" (Appendix Q).

Students' improvement of self-efficacy could also be attributed to the students' positive comments of ease to hear pulses and in locating anatomical landmarks for obtaining blood pressure and pulse. Another reason for this research result could be a "Hawthorne Effect": an internal validity concern that suggests that when subjects are aware of being observed or studied, an increase in productivity and improvement of quality are the results (Franke & Kaul, 1978). In the present study, the students knew that they were being observed; and that they were participating in a research study. These undergraduate nursing students could possibly have an altruistic desire to assist in nursing research and as a result may have performed at a higher effort, thereby increasing their own perceived self-efficacy. Another factor that may have affected the results may be
attributed to that part of the sample of nursing students that participated in this study were enrolled in the accelerated BSN program and tend to want to excel in their classroom and clinical experience, thereby affecting there performance, and ultimately self-efficacy (Bensign, 2006). It is possible that top achiever’s are drawn to an accelerated program and thereby excel in their performance of skills.

**Question Two: Will there be change in pre-test/post-test self-efficacy scores for students who receive standardize patient (SP) training method?**

The students who practiced and demonstrated blood pressure and pulse attainment skills in the standardized-patient practica also experienced a significant increase self-efficacy as measured by the self-efficacy instrument, \( t_{(29)} = -6.31, p < 0.001 \) (two-tailed); the pretest self-efficacy mean of 38.17 (low self-efficacy score) and post self-efficacy mean of 55.97 (medium self-efficacy score) indicates an increase in percent change of 46.63% from pre to post self-efficacy.

As noted in question one, the significant increase in self-efficacy may be related to the student’s knowledge of performing these skills within a simulated environment, in this case, the standardized-patient practica, where they were provided a safe setting to practice and demonstrate the performance of obtaining a patient’s blood pressure and pulse. As discussed within the results of question one, the Hawthorne Effect, as well as the type of student enrolled within the accelerated BSN program, may also have affected the results.

Students’ responses on the debriefing form indicated that the practice of skills on a standardized-patient provided a “real life” experience because the practice on the standardized-patient gave them a chance to work with a real
person and that they could apply these skills in the workplace. Students also commented on the safety of practicing on a standardized-patient. One nursing student’s comments included the following: “It was nice to be able to work on a real person because it provides a better understanding of how to perform these skills in the workplace. It is better because you can ask the person if they are uncomfortable, if they're doing well, etc. to see if you are performing well” (Appendix Q).

**Question Three: Will there be a difference in pre-test/post-test self-efficacy scores for students who receive human-patient simulator (HPS) as compared to students who received standardized-patient (SP) training method?**

A two-way analysis of variance yielded a main effect in self efficacy for both HSP and SP training methods $F(1,58) = 113.37, p < 0.001$ with significant gains $t(59) = -10.46, p < 0.001$ (two-tailed) in self-efficacy from pretest to posttest an increase in percent change of 59.73% was noted. There was no significant difference between the human-patient simulator and standardized patient group gains. This increase of self-efficacy may be attributed to the intervention or practice (Ferguson, 1971), which demonstrates that education through practice promotes learning and knowledge which may increase self-efficacy (Lim, et al, 2004). It is plausible that the simulated clinical practicum, which replaces the sick patient with the human-patient simulator and standardized-patient, may have removed the fear of practicing skills on a real patient.
A low self-efficacy total pretest mean of 35.73 and a medium self-efficacy total posttest mean of 57.07 are reflected in both simulated clinical practica (human-patient simulation and standardized-patient). Hence, as any nursing student practices a nursing skill that is unknown to them, their self-confidence increases. The importance of simulation centers for students to practice basic yet important nursing skills can not be underestimated. It is reasoned that with this increase self-efficacy in basic nursing skills, student nurses will in turn have an increased self-efficacy when learning new, more complex skills in a technological environment. This supports the findings that technological environments afford improvements in patient safety, student’s confidence, and patient care (Lane & Slavin, 2001; Nehring et al, 2001; Ziv et al, 2000).

**Question Four: Will there be change in pre-test/post-test locus of control scores for students who receive human-patient simulation (HPS) training method?**

Overall, the students who practiced and demonstrated blood pressure and pulse attainment skills in the human-patient simulation practica did not experience a significant change in locus of control as measured by the locus of control instrument $t(29) = 1.77, p = 0.087$ (two-tailed). It is important to remember that locus of control is a trait and therefore (1) is difficult to effect change in the short term, (2) is more resistant to influences, (3) remains constant and steady for longer periods (Rotter, 1966). Based on previous studies, locus of control typically has a low effect size (Avtgis, 1998; Bryan, 1999; Clarke, 2004). The human-patient simulator pre locus of control mean of 5.97 and post locus of
control mean of 5.47 demonstrate a small shift towards internal locus of control, or a percent change of 8.38% towards internality. According to Bandura’s framework, when students learn in a safe environment, they have a higher self-efficacy and feel more in control (1997). It is interesting to note that the locus of control scores of the population being examined had locus of control scores (pre intervention and post) were found to be between 0 (internal locus of control characteristics) and 12 (both internal and external locus of control characteristics) and the mean scores for pre locus of control (5.93) and post locus of control (5.63) were found to be in the internal locus of control characteristics range, suggesting that the population under investigation believe to be in control (internal locus) of obtaining basic nursing skills under investigation.

**Question Five: Will there be change in pre-test/post-test locus of control scores for students who receive standardized-patient (SP) training method?**

The students who practiced and demonstrated blood pressure and pulse attainment skills in the standardized-patient practica did not experience a change in locus of control $t(29) = .26, p = 0.78$ (two-tailed). The pre-locus of control mean of 5.90 and post locus of control mean of 5.80 demonstrates a minimal shift towards greater internality, or a percent change of 1.69% towards internality. Although there is no change of locus of control, future research to investigate nursing students’ perception that they could possibly harm a standardized-patient (paid actor) as compared to a human-patient simulator during the practice of skills and therefore perceive themselves with a more external locus. Students’
responses on the debriefing form indicate that the practice of skills on a
standardized-patient offered the student a chance to learn the skill on a person
that was not a real patient, thereby allowing for practice and inquiry in a safe
environment.

**Question Six: Will there be a difference in pre-test/post-test locus of control
scores for students who receive human-patient simulator (HPS) as
compared to students who received standardized-patient (SP) training
method?**

A two-way analysis of variance yielded no interaction or main effects in
locus of control. As there is no significant mean difference in locus of control
between nursing students’ practice of skills within the HPS versus the SP clinical
practica, a shift of 5.06% towards locus of control internality was noted.

According to Rotter (1975), locus of control remains constant from one moment
to the next and may only change over long periods of time. Adolescences tend to
have an external locus of control, and as they experience life in young adulthood,
the LOC may remain external or may develop into a more internal LOC; however,
these changes occur over decades of living, not from just one experience (Rotter,
1975).

A total pretest locus of control mean of 5.93 and a total posttest mean of
5.63 suggesting a slight shift towards a more internal locus of control was noted.
As compared with the range of locus of control 0 being completely internal locus
and 23 being completely external, the undergraduate-nursing students who
participated in this study measured with a more internal locus of control.
Levenson (1981) explains that an orientation of external locus of control should not be considered a maladjustment or characterized as a trait of iniquity, but rather with the knowledge of nursing students with a strong external orientation of locus of control, nursing curriculum and environmental stimuli (the external power) may enhance learning and provide successful outcomes.

**Question Seven: Is there a relationship between performance scores on skill A (Blood pressure performance technique) and change scores of self-efficacy (SE) among students completing the HPS and SP practica?**

In this study, there were no variations in the blood pressure skill performance measurement checklist, and therefore there were minimal findings available to explore if a relationship exists between blood pressure skills and change score of self-efficacy. All 60 students achieved a score of 100 percent accuracy or 12 out of 12 steps on the blood pressure score measurement. The Pearson-product moment correlation reported was \( r = 0.103, p = .44 \) in assessing the relationship between blood pressure performance score and change scores of self-efficacy among students in the combined simulated clinical practica. The recommendation section of this chapter discusses strategies to increase the variance of scores by increasing the difficulty of performance measurement and adding a time measurement component for future studies. The subjects under investigation displayed a locus of control mean within the internal locus range (pre = 5.93 and post = 5.63) performed all steps of the skills verification check list indicating that persons that feel more in control of their
learning perform better which is supported by previous studies (Gordon, 1989; Griffeth & Hom, 1988;)

**Question Eight: Is there a relationship between performance scores on skill B (Pulse reading performance technique) and change scores of self-efficacy (SE) among students completing the HPS and SP practica?**

The data indicated that the relationship of change score on self-efficacy and performance of pulse attainment is nonexistent. The Pearson-product moment correlation reported was \( r = 0.01, p = .94 \) in assessing the relationship between blood pressure performance score and change scores of self-efficacy among students in the combined simulated clinical practica. As stated in question seven, by increasing the difficulty of performance measurement and adding a time measurement component for future studies, a better representation of the relationship between the skill of obtaining a blood pressure and change in self-efficacy maybe elicited.

*Additional Findings*

**Does self-efficacy differ between skills (blood pressure versus pulse) from pretest to posttest in the simulated clinical practica?**

Retrospective analysis’s were performed and revealed that nursing students scored significantly higher self-efficacy \(- t(29) = 2.27, p = 0.03 -\) in the pulse skill attainment when compared to the blood pressure skill attainment within the human-patient simulation clinical practica. This finding may be related to pulse attainment consisting of 10 steps and blood pressure consisting of 12 steps, and that taking a pulse is subsumed within or part of obtaining a blood
pressure. Taking a pulse may be perceived by nursing students as a simpler skill and this may have enhanced effect on self-efficacy. It is interesting to note that within the standardized-patient clinical practica, in exploring self-efficacy between the two skills there was no significance difference between skills scoring of self-efficacy $t(29) = -0.49, p = 0.63$ (two-tailed).

**What effect does age and gender play on locus of control?**

This retrospective analysis found no significance within the factors of age and pre locus of control in gender. With regards to gender and post locus of control, there was a significant difference between male and female subjects. Males at posttest were noted to have a significantly more internal locus ($t(58) = 2.91, p = 0.005$) than females. In the post locus of control survey, locus of control is significantly more internal in males than in females, which is supported in general by Dollete, Steese, Phillips, & Matthews (2004).

**What were the results in the optional debriefing form?**

Other findings that occurred at the conclusion of the study included the results of the optional debriefing form that was completed by 53 (88%) of the 60 participants in the study. Students were asked to list both positive and negative aspects relating to their experience of skills performance in their respective simulated clinical practica. Of the 30 students randomly assigned to the human-patient simulator, 28 students (93%) completed the optional debriefing form, which included both positive and negative comments were received. There were 27 positive comments as compared to 18 negative comments from students. In addition, of the 30 students randomly assigned to the standardized-patient
practica, 25 students (83%) completed the optional debriefing form. There were 23 positive comments as compared to 8 negative comments (see Appendix Q). A positive comment was “Interacting with an actual patient (person) I also developing communication skills and become accustomed to patient’s reactions,” whereas an example of a negative comment was “It was perhaps just a little more a nerving doing it for the first time on an actual person” (Appendix Q).

Limitations of the Study

This study had the following limitations: (1) possible carry over effect, (2) exclusion of control group, (3) lack of variance between students in performance of the two basic nursing skills small sample size, (4) limited type of basic skills examined, (5) design of the demographic collection instrument, (6) a small sample size, (7) familiarity with researchers name, and (8) a lack of random selection of baccalaureate nursing students.

Carry Over Effect

The first limitation was the threat to the stability of the self-efficacy and locus of control post tests as it related to the potential carry-over effect. The carry-over effect may be operationalized as nursing students, who remembered how they answered the pre-test and then chose the same response in the post-test. Within this study, the interval between pre-test and post-test was approximately one hour. Given the lack of change in the order of the questions pertaining to the self-efficacy and locus of control instruments, the lack of change may have added to the potential carry-over effect. A retrospective test of the Intraclass correlation coefficient (ICC) was conducted to test for this potential
carry-over effect for self-efficacy and locus of control. An ICC measures the reliability and magnitude of an effect as well as the correlations between observations pre-test to post-test (Griffin & Gonzalez, 1995; Shrout & Fleiss, 1979). The ICC (3,1) for pre-test to post-test for self-efficacy was 0.34, a minimal effect; that is to say minimal carry-over effect was noted. The ICC (3,1) for pre-test to post-test locus of control was 0.81, a strong effect, or strong carry over. Avtgis (1998), Bryan (1999), Clarke (2004), Emery (1998), Hans (2000), Hong, et al. (2006), Yousfi et al. (2004) supports that locus of control characteristics are stable, a trait that is less malleable and tends to be consistent over time it is possible that the results of the ICC are related to the stable characteristics of the attribute rather than a carry-over effect.

Traditional Clinical Practica

A second limitation could be the lack of a control group, or in this case, the traditional clinical practica for comparison purposes. The literature for undergraduate nursing students’ practice of basic skills while investigating the social correlates of self-efficacy and locus of control is sparse, if nonexistent. The cost of simulated clinical practica (human-patient simulation and the standardized patient) is considerable and the ability to demonstrate increased self-efficacy and locus of control in simulated versus traditional clinical practica would prove beneficial in substantiating the cost. The lack of a control group limited the ability of the researcher to compare the findings of this research with the traditional lab practica.
Performance Skills Variance

A third limitation is a lack of variance within the performance skills. As noted in chapter four, students performed all required steps for both skills as observed by two independent clinical nursing faculty. One possible reason for the students’ performance is the socialization of nursing students by nursing faculty to “do no harm”; students may perceive that if they make a mistake in a clinical setting, or with a skill, they may fail a course or in fact be withdrawn from nursing school. In addition to this socialization, nursing students’ self-determination may also contribute to the lack of variance or near perfect skills performance scores. Nursing students tend to be high achievers, serious about learning, and have high self-expectations (Brown, Alverson, & Pepa, 2001; Rossingnol, 2004; Seldomridge & DiBartolo, 2005). A task analysis of skills to determine skills of comparable difficulty would allow matching of skills complexity in the research design.

Performance Skill Complexity

A forth limitation of this study is that only two basic nursing skills (blood pressure; apical and radial pulse) were practiced. This is a limitation because it is not the typical clinical laboratory experience when practicing vital signs. When the undergraduate nursing student practiced vital signs, the inclusion of respiratory rate and body temperature is also taught. Although students practice a multitude of skills each clinical day, this study did not cover all of the nursing simulated practica that would include critical thinking skills. The study also did not differentiate the other higher order complex nursing skills to determine what
affect the practice of more complex skills (critical thinking, patient assessment) have within the two clinical practica in question.

Demographic Collection Instrument

A fifth limitation is the design of the demographic data from which should be modified to allow for individual inclusion of their respective age, to self-identify which undergraduate nursing program the student is attending, and their previous job experience, if any. This inclusion would have allowed for a clearer understanding of the population’s age distribution as well as prior learning with that of the accelerated nursing student with a previous degree versus a nursing student directly out of high school. It is possible that the perceived self-efficacy of nursing students with previous college and work experience may be different and the ability to correlate this demographic information would have allowed a better understanding of self-efficacy and the demographics of undergraduate nursing students.

Sample Size

A sixth limitation may be the small sample size preventing for cross validation. The Central Limit Theorem (Gall, Borg & Gall, 1997) supported a N=60 (N=30 per clinical practica) as well as the retrospective power analysis using Cohen’s f (Cohen, 1977) detected a large effect (f > 0.40) for all but the locus of control instrument within the human-patient simulator in which there was a medium effect (f = -0.32). A larger sample would have permitted for cross-validation of results specific to the hypotheses in question. Extending the research time frame to incorporate one to two years may increase student
population to over two hundred and may demonstrate findings, such as variance among skills performance to support this research. Consideration to extend the study population to the region and to modify the research design to a cluster randomization design, allowing for multiple sights that examines each class as a cluster rather than focuses on a single student (Burns & Grove, 2001; Pedhazur & Schmelkin, 1991).

*Investigators Name Familiarity*

A further limitation of the study may have been the fact that this researcher’s name who is a Drexel University faculty member was stated on the informed consent form. As all participants were required to complete the forms, and with the inclusion of this author’s name was located on the consent, students may have felt an obligation to answer one way or to continue to participate in the study. As such, this factor may have affected the internal validity of this study.

*Lack of Random Selection*

The final limitation is the lack of random selection of baccalaureate-nursing-student representatives from diverse areas of the country and from various types of nursing programs. This limitation was unavoidable due to the convenience sampling and volunteer participation. This limitation occurred because all baccalaureate nursing students who were present at Drexel University College of Nursing and Health Professions during the Spring Quarter 2005 participated in the study. The lack of random selection could be viewed as a potential bias, in that the nursing students who volunteered to participate may have had a stronger internal locus, thereby making them more apt to volunteer
for research studies that would benefit them in their pursuit of skills mastery. This aspect could, as result, affect the internal validity of the study and may account for some of the data result, such as the negative skew of locus of control scores that demonstrates a more internal locus of control in this sample. The pre-locus of control skew is -0.081 (HPS), 0.034(SP) and the post-locus of control is 0.293 (HPS) and 0.2 (SP), thereby demonstrating a slight negative skew or a distribution of stronger internal locus of control in this sample. Likewise, those students with a higher self-efficacy might have been more willing to participate in a study where new educational strategies and learning new skills were involved.

Summary of Limitations

Within the limitations of this study, the following conclusions may be drawn: self-efficacy among baccalaureate nursing students increases significantly – \( t(59) = -10.46, p < 0.001 \) – when performing mastery of nursing skills as measured by the self-efficacy instrument in both a human-patient simulator and standardized-patient clinical practica. That is, practice within a human-patient simulator or standardized-patient clinical practica of basic nursing skills significantly increases a nursing students’ perceived self-efficacy on clinical environment in this study, while there was no significant difference of self-efficacy gain related to the simulated clinical practica. That is, self-efficacy increased regardless of the clinical practica (human-patient simulation or standardized-patient). It can therefore be supported that educational instruction and support within the practice of nursing skills increase student self-efficacy in the performance of skills mastery.
Implications for Nursing Education

With the rising costs in nursing education today, effective, yet cost-containing measures are paramount in maintaining an affordable nursing program. Although major universities are able to afford the use of innovative technologies for simulated clinical practica, such as the human-patient simulation and standardized-patient clinical practica, rural as well as community nursing schools would find it cost prohibitive. The cost of Laerdal SimMan ©, one model of an HPS costs $28,980 (Laerdal, 2005), whereas the cost of an SP ranges from $40.00 to $ 75.00 per student contact hour (C. Sando, personal communication, May 14, 2005). The cost of the SP experience can be unaffordable when considering the repeated contacts with SP in the undergraduate nursing curriculum. Nursing students have an average of ten contacts or required core skills required to graduate from an average nursing school / college (L. Wilson, personal communication, January 14, 2006). Multiplying the cost per student contact by the ten experiences by the number of students results in an annual cost of $292,500.00 ($75.00 x 10 x 390 = $292,500.00). When comparing the cost of SimMan, a fixed one time cost; to the SP experience, and in light of this study’s finding of no mean difference between the HPS and SP clinical practica, it is logical to promote the attainment of skills mastery in the HPS clinical practica. This study’s findings of a trend toward an internal locus of nursing students who practiced and demonstrated skills attainment the human-patient simulation clinical practica also support the recommendation to practice within the human-patient simulation clinical practica.
The use of human-patient simulator and standardized-patient practica in relation to basic skills performance mastery of nursing students enhance students’ self-efficacy. This enhancement may decrease anxiety and potentially decrease medical errors. Students in both the HPS and SP did in fact have a significant increase of self-efficacy within the two skills investigated. Can other skills as basic as hygiene, mobility, and sterility, to more complex skills as in medication administration, airway suctioning, bedside treatments, patient assessment, and critical thinking in the critical care arena also be applied to the human-patient and standardized-patient clinical practica? One must note that certain nursing skills involving physical penetration of the human body may lend itself better to the human-patient simulator (computerized manikin) where the invasive procedure and potential harm to the simulator can be easily repaired versus an invasive procedure performed on an actual person that would at the very least cause discomfort. It may be said that health care needs to stop practicing on people and start practicing on simulated patients.

**Recommendations for Future Studies**

1. The study population should extend to the region and to modify the study method to a cluster randomization design, allowing for multiple sites that examines each class as a cluster rather than focuses on a single student (Burns & Grove, 2001; Pedhazur & Schmelkin, 1991).

2. Extending the research time frame over one to two years to increase student population to over two hundred which may demonstrate stronger findings to support self-efficacy and locus of control within the simulated
clinical practica. A power analysis based on the lower limits of the confidence interval of the effect for both self-efficacy and locus of control to determine the necessary sample size needed for three simulated clinical practica (traditional, human-patient simulator, standardized-patient) should be accomplished.

3. Plans for future research would be to create variability in the performance of skill, to increase the number of observable items of each skill, and to add a time component of the skill observation. Inclusion of this time component would add variability to each participant as to the speed-accuracy tradeoff performance of skills observed. The actual measurement and recording of the time taken to complete the skill should be invisible to the student and not be included as a passing criterion of skill performance.

4. Future research should initially include the traditional lab practice environment known as the clinical learning resource center to be used as a control group. This would provide the ability to compare the findings between simulated and traditional practicums.

5. Future studies should include additional basic skills, such as respiratory rate and body temperature. This would lay down the foundation to research further higher-order, complex nursing skills, such as patient assessment and critical thinking.

6. Another study recommendation is to explore the qualitative aspects of the faculty’s perceptions to determine their belief about enhancing self-
efficacy and locus of control of nursing students in the simulated clinical practica of human-patient simulation and the standardized-patient.

7. Another area for further research would be to qualitatively analyze data obtained from the debriefing forms in order to build upon the strengths identified by the students as well as to understand student’s perceptions of negative aspects of the experience.

8. A final consideration for future studies would be the financial implications of creating a simulation practica. Purchase cost of HPS systems range from $15,000 up to $250,000 (Jha, Duncan, & Bates, 2001; Gaba, 1997; Issenberg et al, 1999), whereas payment for SP range from $15 up to $40 per hour (K. Schaivone, personal communication, February, 17, 2005). Traditional clinical practica experiences consist of 6 to 8 students; cost of the HPS and SP experience may be prohibitive for smaller institutions with limited financial resources.

**Summary and Conclusions**

This study adds to the empiric literature in simulation education and the nursing community by offering evidence that self-efficacy can be significantly improved in students who practice performance skills in both the human-patient simulation and standardized-patient environments. The study demonstrates that simulation can be highly effective in supporting student learning outcomes at the undergraduate level while enhancing nursing students learning within a safe environment.
This study demonstrated that students who practiced blood pressure and pulse attainment skills in the human-patient simulator training method experienced a significant increase in self-efficacy from pre-test to post-test. In addition, students who practiced blood pressure and pulse attainment skills in the standardized-patient practica also experienced a significant increase in self-efficacy. Simulated clinical practicum may enhance traditional clinical practicum requirements and provide a safer and efficient pedagogy in meeting both curricular and student objectives. The importance of simulation centers in providing additional clinical resources for nursing programs has strong potential. Students who practiced blood pressure and pulse skills within the human-patient simulator trended towards a more internal locus, or believed themselves to be more in control of their environment and learning. With the knowledge that locus of control is a trait and difficult to effect change in the short term; the demonstrated trend indicates some affect to the locus of the students within the human-patient simulator clinical practica. Do these students who practice within the human-patient simulator practica feel more in control of their environment and therefore feel empowered to prevent errors and harm to actual patients in future clinical practica at the bedside?

Although this study demonstrates that there is not a significant difference between self-efficacy, locus of control and skill performance between the clinical practica environments (HPS versus SP), it is still necessary to study the impact of the human-patient simulator and standardized-patient environment for clinical practice skills. The landmark document, “To Err is Human” (Kohn et al, 1999) as
well as the “Nursing’s Agenda for the Future” (American Nurses Association, 2002) calls for specific strategies to enhance safe practice and simulation (Aldrich, 2004; Alinier, Hunt, & Gordon, 2004; Bond, 2002; Fletcher, 1996; Gaba et al, 1987; Garrison, 1985; Gordon et al, 2003: Issenberg & McGaghie, 1999; Johannsson & Bertenberger, 1996; Lowenstein & Bradshaw, 2004; Mackenzie, Graig, Parr, & Horst, 1994; McCausland et al, 2004) and standardized patients (Adamo, 2003; Anastakis, Regehr, Rezinick, Cusimano, Jurnaghan, Brown, et al, 1999; Bromley, 2000; Carney, 1994; Carney & ward, 1998; Collins & Harden, 1998; Gibbons, et al, 2002; Margolis et al, 2003) are strategies that are gaining momentum and use in educational health-care settings. The ability to validate skills practice in simulated environments as a teaching pedagogy, along with the ability to explore the social correlates (self-efficacy and locus of control) of undergraduate nursing students, may further the allocation of funds by university administrations in the development of curriculum in new innovative teaching excellence centers. Planning for and executing a simulation practice environment will be a challenge. Faculty development and substantive administrative support are essential. While the introduction of simulation elements within existing nursing clinical courses is not complicated, it will require creativity, time, and administrative support.
List of References


and gender differences. [references]. Mental Health, Religion & Culture, 9(3), 239-26


assessment in internal medicine: a review of the literature. Academic Medicine, 75(11), 1130-1137.


W. C. McGaghie (Eds.), Innovative Simulations for Assessment Professional Competence: From Paper-and Pencil to Virtual reality (pp. 125-146). Chicago, IL: University of Illinois at Chicago Department of Medical Education.


Assessment Professional Competence: From Paper-and Pencil to Virtual reality (pp. 213-231). Chicago, IL: University of Illinois at Chicago Department of Medical Education.


Schreiber NL. Contribution of explanatory style and other personal attributes to measures of retention and success in baccalaureate nursing students. Dissertation Abstracts International, 56 (03), 334 pages. (AAT 9517202)


Williams, R., (2004). Status of standardized patient assessment: have standardized patient examinations stood the test of time and experience? Teaching and learning in Medicine, 16(2), 215-222.


Appendix A – Letter to the Dean of Drexel University

College of Nursing and Health Professions

December 7, 2004

Gloria F. Donnelly, PhD, RN, FAAN
Dean, College of Nursing & Health Professions
Drexel University
245 N. 15th Street/MS 501
Philadelphia, PA 19102

Dear Dean Donnelly,

This letter is to request permission to conduct a study at the College of Nursing & Health Professions. The proposed research studies the influences of self efficacy and locus of control of nursing students in a simulated clinical practicum of nursing skills.

The study is designed in order that there is no interruption of class time. A research assistant will aid in the distribution and collection of the research tools. The proposed study is being submitted to Drexel University’s Institutional Review Board in January 2005. No student names will be published and an abstract will be mailed to you at the completion of the study.

Please feel free to contact me at 215-762-4115 for further information about his study. Thank you for taking the time to consider this request.

Sincerely

L. J. Rockstraw, MSN, MSA, RN
PhD Candidate, School of Education, Drexel University
Email: lj128@drexel.edu
Phone: 215-762-4115

Approved
J. Donnelly, PhD
12/15/04
Appendix B – Consent Form

Drexel University Consent to Take Part in a Research

1. Subject Name: _______________________________
   (Please Print)

2. Title of Research: A comparison between Self-Efficacy and Locus of Control of nursing students at one university who have a simulated practicum of nursing skills versus those who have a traditional practicum of nursing skills.

3. Investigator’s Name: Leland J. Rockstraw

4. Consenting for the Research Study:
   a. This is a long and an important document. If you sign it, you will be authorizing Drexel University to conduct a study with you. You should take your time and carefully read it. You can also take a copy of this consent form to discuss it with your family member, attorney or any one else you would like before you sign it. Do not sign it unless you are comfortable in participating in this study.

5. Purpose of Research:
   a. You are being asked to participate in a study. The data for this study will be collected from 60 Drexel University Baccalaureate Students who are taking freshman level nursing classes. Students will receive a chance to win one (1) of three (3) Drexel University Bookstore $50.00 gift certificates for their participation. The purpose of this study is:
      i. To compare self-efficacy (confidence) and locus of control of nursing students at one university who have a simulated practicum of nursing skills versus those who have a traditional practicum.

6. Procedures and Duration:
   a. You understand that the following things will be done:
      i. You will be asked to perform two nursing practice skills:
         1. Measuring a blood pressure on a adult
         2. Taking radial and apical pulses on an adult
      ii. You will be assigned randomly to either to a simulated practicum (SimMan) or a traditional practicum.
      iii. You will be asked to complete two instruments. One to measure self-efficacy (confidence) and one to measure locus of control. You will be asked to complete a brief demographic form.
iv. You also will be asked if you wish to complete an optional debriefing form.

v. The total amount of time required by participating in this study is approximately 110 minutes.

7. Risks and Discomforts/Constraints:
   a. It is possible that participating in this study will ask you to reveal information that you feel is private. Should you feel that you need to speak to someone about discomfort as a result of this study, please contact the Investigator, Leland Rockstraw (215-762-4115). You may also contact Dr. Pamela A. Geller, PhD, Director of the Drexel University Counseling Center (215-762-4995).

8. Benefits:
   One potential benefit to you is the chance of winning 1 (one) of 3 (three) $50.00 Drexel University Book Store gift certificates.

9. Alternative Procedures:
   a. None

10. Stipend/Reimbursement:
   a. The research team has arranged that you can have your name placed in a lottery for a chance to win 1 (one) of 3 (three) $50.00 Drexel University Book Store gift certificates.

   b. Should you choose enter the lottery, your name and mailing address will be placed on a confidential lottery roster to be kept by the research assistant (no other member of the research team will have access to your name or address).

   c. Your name will be associated by a lottery number from L001 – L060. In May, 2005, cards with the associated lottery number (and no other identification marks) will be placed into a canister and shaken. The research team with the assistance of the research assistant will randomly pick 3 (three) cards with the lottery number. The research assistant will then match the lottery number card with the lottery roster and mail the gift certificates to the 3 (three) winners. At no time, will the research team have access to your name or mailing address. After selection of the 3 cards and mailing of the gift certificates, the lottery roster will be shredded by the research assistant.

   d. This study will require approximately 110 minutes of your time. For this 110 minutes of time volunteered, you will be offered to have your name placed in the above lottery to have a chance to win one (1) of three (3) Drexel University Bookstore $50.00 gift certificates.

11. Reasons for Removal from Study:
   a. You may be required to stop the study before the end for any of the following reasons:
i. If all or part of the study is discontinued for any reason by the investigator or university authorities.

ii. If you are a student, and participation in the study is adversely affecting your academic performance.

iii. If you fail to adhere to requirements for participation established by the researcher.

iv. If you experience serious feelings of discomfort.

12. Voluntary Participation:
   a. Participation in this study is voluntary, and you can refuse to be in the study or stop at any time without penalty. There will be no negative consequences if you decide not to participate or to stop participation at any time.

13. Confidentiality:
   a. In any publication or presentation of research results, your identity will be kept confidential, but there is a possibility that records which identify you may be inspected by authorized individuals such as the institutional review boards (IRBs), or employees conducting peer review activities. This document consents to such inspections and to the copying of excerpts of your records, if required by any of these representatives.
   b. Administration of all surveys and data entry/analysis will be performed by research assistant Robert Feenan, who is aware of the personal nature of the questions being asked.
   c. You will be allowed to complete the surveys in private, a research assistant will be in the room next door to answer any questions you have. Each participant’s information will be given an identification number as to keep your identity private, and all forms will be stored in a locked filing cabinet to be accessed only by the aforementioned research assistant and the investigator, Leland Rockstraw. The data analysis files will be stored in such a way that a password will be required to access the information, and only the research assistant and Mr. Rockstraw will know the password. Once the study has been completed and the information is no longer needed, documents will be kept for seven years before being shredded.

14. Responsibility for Costs/In Case of Injury:
   a. If you have questions or believe that you have been injured in any way by being in this research study, you should contact Mr. Leland Rockstraw at (215-762-4115). However, neither the investigator nor Drexel University will make payment for injury, illness, or other loss resulting from your being in this research project. If you are injured by this research activity, medical care (including hospitalization) is available, but may result in cost to you or your
insurance company because the University does not agree to pay for such costs. If you are injured or have an adverse reaction, you should also contact the Office of Research Compliance by telephoning 215-762-3453.

15. Other Considerations:
   a. If you wish further information regarding your rights as a research subject or if you have problems with a research-related injury, for medical problems please contact the Institution’s Office of Research Compliance by telephoning 215-762-3453.

16. Consent:
   a. I have been informed of the reasons for this study.
   b. I have had the study explained to me.
   c. I have had all of my questions answered.
   d. I have carefully read this consent form, have initialed each page, and have received a signed copy.
   e. I give consent voluntarily.

______________________________
Participant: Date

______________________________
Investigator or Individual Obtaining this Consent Date

______________________________
Witness to Signature Date

List of Individuals Authorized to obtain Consent

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Day Phone#</th>
<th>24Hr Phone#</th>
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<tbody>
<tr>
<td>Leland J. Rockstraw</td>
<td>Assist. Professor of Nursing</td>
<td>215-762-4115</td>
<td>Same</td>
</tr>
<tr>
<td>Robert Feenan</td>
<td>Research Assistant</td>
<td>215-762-1802</td>
<td>Same</td>
</tr>
</tbody>
</table>
Appendix C – Volunteer Information Data Form

*** PLEASE NOTE: Students who have previous knowledge and experience in obtaining a blood pressure, radial and apical pulses (such as working in a nursing home) are not able to participate in this study. ***

You are being asked to participate in a study. The data for this study will be collected from 60 Drexel University Baccalaureate Nursing Students who are taking freshman level classes. In return for your participation in the study, you can have your name placed in a confidential lottery for a change to win one (1) of three (3) $50.00 Drexel University Bookstore gift certificates.

The purpose of this study is to:

1. Examine attributions of nursing students in various types of training formats.

This study will require approximately 100-110 minutes of your time, in which you will be asked to perform two (2) basic nursing skills and fill out forms at the Clinical Learning Resource Center, room 3108 of the New College Building at 245 North 15th Street, Drexel University, center city campus. The two basic nursing skills are:

1. Taking a blood pressure on an adult
2. Taking a radial and apical pulse on an adult

In return for your participation in the study, you can have your name placed in a confidential lottery for a change to win one (1) of three (3) $50.00 Drexel University Bookstore gift certificates. If you should win one (1) of the Bookstore gift certificates, the certificate will be confidentially mailed to you by the research assistant. If you are interested in participating in this study, please contact research assistant Robert Feenan at (215-762-1802) or email at rhf23@drexel.edu.

1 hour time commitment breakdown
Consenting 20-25 minutes
Blood Pressure 20 minutes
Radial and Apical pulse 20 minutes
Completion of study instruments 30 minutes
Optional debriefing form 10-15 minutes
Appendix D – Demographic Information Form

Sociodemographic Information

1. Please circle your age range:
   a. 18 to 28 years
   b. 29 to 39 years
   c. 40 to 50 years
   d. 51 and above

2. Please circle your gender
   a. Female
   b. Male

3. Have you previously worked with or practiced a skill using a Human-patient simulator (such as SimMan):
   a. No
   b. Yes

If you responded yes, please answer question 4 and 5, if you responded no, please go directly to question 5.

4. My experience with a Human-patient simulator occurred in a:
   a. Work setting
   b. Course
   c. Community project (such as volunteer firefighter program)
   d. Other (please comment) ________________________________
       ____________________________________________________
       ____________________________________________________
       ____________________________________________________
       ____________________________________________________

5. I have heard or have read about the use of Human-patient simulator in nursing education programs, nursing certifications, and/or nursing continuing education:
   a. No
   b. Yes

Thank you for completing this questionnaire
Appendix E – Self-Efficacy Instrument

Directions: This is a questionnaire designed to determine how confident you are that you can perform each of the following behaviors. Read each behavior and then circle the number to the right of the behavior to indicate how confident you are that you can perform the behavior. There are no right or wrong answers. Do not spend too much time on any one statement, but give the answer which seems to describe how you generally feel. Your answers are confidential.

Statements 1 to 10 refer to obtaining a blood pressure.

<table>
<thead>
<tr>
<th>Not at All Confident</th>
<th>Slightly Confident</th>
<th>Moderately Confident</th>
<th>Highly Confident</th>
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<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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</table>

1. I can obtain a valid blood pressure reading.  
   1 2 3 4

2. I can find the means to secure the cuff.  
   1 2 3 4

3. I can focus on the patient and obtain the blood pressure at the same time  
   1 2 3 4

4. I can deal effectively with unexpected events while checking a patient’s blood pressure.  
   1 2 3 4

5. I can handle unforeseen situations while checking a person’s blood pressure.  
   1 2 3 4

6. I can solve most blood pressure problems  
   1 2 3 4

7. I can remain calm when facing difficulties while recording a blood pressure.  
   1 2 3 4

8. When I am confronted with a problem when taking a blood pressure, I can think of several solutions.  
   1 2 3 4

9. If I am in trouble, when taking a blood pressure, I can solve the problem.  
   1 2 3 4

10. I can handle whatever happens when I am taking a blood pressure.  
    1 2 3 4

Please continue on next page
Statements 11 to 20 refer to obtaining radial and apical pulses.

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<thead>
<tr>
<th>Not at All Confident</th>
<th>Slightly Confident</th>
<th>Moderately Confident</th>
<th>Highly Confident</th>
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<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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</tbody>
</table>

11. I can obtain radial and apical pulses.  
   1 2 3 4

12. If there is difficulty in securing a radial and apical pulses, I can find the means to obtain them.  
   1 2 3 4

13. I can focus on the patient and obtain radial and apical pulses at the same time.  
   1 2 3 4

14. I can deal effectively with unexpected events while checking a patient's radial and apical pulses.  
   1 2 3 4

15. I can handle unforeseen situations while checking a person's radial and apical pulses.  
   1 2 3 4

16. I can solve most radial and apical pulse problems  
   1 2 3 4

17. I can remain calm when facing difficulties while taking radial and apical pulse  
   1 2 3 4

18. When I am confronted with a problem when taking radial and apical pulses, I can think of several solutions.  
   1 2 3 4

19. If I am in trouble, when taking a radial and apical pulses, I can solve the problem.  
   1 2 3 4

20. I can handle whatever happens when I am taking a radial and apical pulse.  
   1 2 3 4

Thank you for taking the time to complete this instrument.
Appendix F – Permission to Adapt and Use Self-Efficacy Scale

Rockstraw, Leland

From: Ralf Schwarzer [health@zedat.fu-berlin.de]
Sent: Sunday, December 05, 2004 4:30 AM
To: Rockstraw, Leland
Subject: Re: Self Efficacy Scale

Dear Leland Rockstraw,

Feel free to use all scales that you can find at our websites, see below.
Good luck
Ralf Schwarzer

At 02:22 05.12.2004, you wrote:

Dear Prof. Dr. Schwarzer,

Greetings. I am conducting a small study with student nurses in a simulated environment. The nursing students will be taking radial & apical pulses as well as measuring blood pressure on a computerized realistic patient simulator. I would like your permission to adapt and use your self-efficacy scale in my study. Credit will be given to you as well as Dr. Jerusalem.

Thank you in advance for the attention given to this request.

Sincerely

Leland Rockstraw
Assistant Professor of Nursing
Drexel University
College of Nursing & Health Professions
Philadelphia, PA 19102
215-762-4115
ljr28@drexel.edu
Appendix G – Locus of Control Instrument

The purpose of this questionnaire is to assess your opinions about certain issues. Each item consists of a pair of alternatives. Select the alternative with which you most agree. If you believe both alternatives to some extent, select the one with which you most strongly agree. If you do not believe either alternative, mark the one with which you least strongly disagree. Since this is an assessment of opinions, there are obviously no right or wrong answers.

1. □ Leaders are born, not made.  
   □ Leaders are made, not born.
2. □ People often succeed because they are in the right place at the right time.  
   □ Success is mostly dependent on hard work and ability.
3. □ When things go wrong in my life, it’s generally because I have made mistakes.  
   □ Misfortunes occur in my life regardless of what I do.
4. □ Whether there is war or not depends on the actions of certain world leaders.  
   □ It is inevitable that the world will continue to experience wars.
5. □ Good children are mainly products of good parents.  
   □ Some children turn out bad no matter how their parents behave.
6. □ My future success depends mainly on circumstances I can’t control.  
   □ I am the master of my fate.
7. □ History judges certain people to have been effective leaders mainly because circumstances made them visible and successful.  
   □ Effective leaders are those who have made decisions or taken actions that resulted in significant contributions.
8. □ To avoid punishing children guarantees that they will grow up irresponsible.  
   □ Spanking children is never appropriate.
9. □ I often feel that I have little influence over the direction my life is taking.  
   □ It is unreasonable to believe that fate or luck plays a crucial part in how my life turns out.
10. □ Some customers will never be satisfied no matter what you do.  
    □ You can satisfy customers by giving them what they want when they want it.
11. □ Anyone can get good grades in school if he or she works hard enough.  
    □ Some people are never going to excel in school no matter how hard they try.
12. □ Good marriages result when both partners continually work on the relationship  
    □ Some marriages are going to fail because the partners are just incompatible.
13. I am confident that I can improve my basic management skills through learning and practice.
   It is a waste of time to try to improve management skills in a classroom.

14. More management skills courses should be taught in business schools.
   Less emphasis should be put on skills in business schools.

15. When I think back on the good things that happened to me, I believe they happened mainly because of something I did.
   The bad things that have happened in my life have mainly resulted from circumstances outside my control

16. Many exams I took in school were unconnected to the material I had studied, so studying hard didn’t help at all.
   When I prepared well for exams in school, I generally did quite well.

17. I am sometimes influenced by what my astrological chart says.
   No matter how the stars are lined up, I can determine my own destiny.

18. Government is so big and bureaucratic that it is very difficult for any one person to have any impact on what happens.
   Single individuals can have a real influence on politics if they will speak up and let their wishes be known.

19. People seek responsibility in work.
   People try to get away with doing as little as they can.

20. The most popular people seem to have a special, inherent charisma that attracts people to them.
   People become popular because of how they behave.

21. Things over which I have little control just seem to occur in my life.
   Most of the time I feel responsible for the outcomes I produce.

22. Managers who improve their personal competence will succeed more than those who do not improve.
   Management success has very little to do with the competence possessed by the individual.

23. Teams that win championships in most sports are usually the teams that, in the end, have the most luck.
   More often than not, teams that win championships are those with the most talented players and the best preparation.

24. Teamwork in business is a prerequisite to success.
   Individual effort is the best hope for success.
25. Some workers are just lazy and can't be motivated to work hard no what you do
   If you are a skillful manager, you can motivate almost any worker to put forth
   more effort.

26. In the long run, people can improve this country's economic strength through
   responsible action.
   The economic health of this country is largely beyond the control of
   individuals.

27. I am persuasive when I know I'm right.
   I can persuade most people even when I'm not sure I'm right.

28. I tend to plan ahead and generate steps to accomplish the goals that I have set
   I seldom plan ahead because things generally turn out OK anyway.

29. Some things are just meant to be.
   We can change anything in our lives by hard work, persistence, and ability.

Thank you for taking the time to complete this instrument.
Appendix H – Permission to use Locus of Control Instrument

From: Eleanor Coldwell [mailto:eleanor.coldwell@uconn.edu]
Sent: Tuesday, December 07, 2004 11:09 AM
To: Rockstraw,Leland
Subject: Re: Greetings from Philadelphia

Rocky,
I assist Dr. Rotter (retired) with his correspondence concerning his research. He grants you permission to use his scale; and requests that it be used for research purposes only.
I hope your study goes well,
Lindy

Eleanor (Lindy) Coldwell, Ph.D.
Academic Advisor
Department of Psychology
Bousfield Room 100
University of Connecticut
860-486-2183
e-mail: eleanor.coldwell@uconn.edu
Drop-in Office Hours: 10-3 Monday-Friday
On Dec 7, 2004, at 9:47 AM, Rockstraw,Leland wrote:

Dear Dr. Julian Rotter,

Greetings. I am conducting a small study with student nurses in a simulated environment. The nursing students will be taking radial & apical pulses as well as measuring blood pressure on a computerized realistic patient simulator. I would like your permission to adapt and use your locus of control scale in my study. Credit will be given to you.

Thank you in advance for the attention given to this request.

L. J. "Rocky" Rockstraw, MSN, MSA, RN
CCRN Alumnus
Assistant Professor & Director
Center for Clinical & Electronic Learning Resources
Drexel University, College of Nursing & Health Professions
245 N. 15th St. / MS 501
Philadelphia PA, 19102
Email: rocky@drexel.edu
Office: 215-762-4115
Lab: 215-762-3595
Fax: 215-762-1259
www.drexel.edu
www.cnhp.drexel.edu
Appendix I – Permission to use and Adapt Skills Measuring Checklist

Rockstraw, Leland

From: McIntyre, Nicole (ELS) [N.McIntyre@Elsevier.com]
Sent: Thursday, March 17, 2005 2:48 PM
To: ‘rocky@drexel.edu’
Subject: Permission request
Flag Status: Flagged
Attachments: header.htm; image001.png

Date: March 17, 2005

Mr. Leland Rockstraw
rocky@drexel.edu

Dear Mr. Rockstraw:

PUBLICATION DETAILS: Two skills checklists from Potter: FUNDAMENTALS OF NURSING, S/E, © 2000 Mosby

As per your letter dated March 7, 2005, we hereby grant you permission to reprint the aforementioned material at no charge in a thesis subject to the following conditions:

1. If any part of the material to be used (for example, figures) has appeared in our publication with credit or acknowledgement to another source, permission must also be sought from that source. If such permission is not obtained then that material may not be included in your publication/copies.

2. Suitable acknowledgment to the source must be made, either as a footnote or in a reference list at the end of your publication, as follows:

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5. This includes permission for UMI to supply single copies, on demand, of the complete thesis. Should your thesis be published commercially, please reapply for permission.

Yours sincerely,

Nicole McIntyre
for Elsevier

Your future requests will be handled more quickly if you complete the online form at www.us.elsevierhealth.com,
Appendix J – Permission from Drexel University Internal Review Board

Drexel University College of Medicine
In the tradition of Woman’s Medical College of Pennsylvania and Hahnemann Medical College

Office of Research Compliance

TO: Fredricka Reisman, Ph.D.
School of Education

Mailstop: DREX

FROM: Victor Lidz, Ph.D., Chair
Institutional Review Board (IRB #1)

SUBJECT: PROTOCOL: A Comparison Between Self-Efficacy and Locus of Control of Nursing Students at One University Who Have a Simulated Practicum Versus Those Who Have a Traditional Practicum

Note: 02/24/05 - Approved Expedited Category 10. This study will enroll 60 freshmen from the Drexel University College of Nursing Professionals

SPONSOR: Internal

UNIV. PROJECT #: 1001205

UNIV. PROTOCOL #: 03394 -01

CURRENT APPROVAL PERIOD: 02/24/2005 EXPIRES: 02/23/2006

USE CONSENT FORM DATED: 02/24/2005

DATE: February 25, 2005

On behalf of the Institutional Review Board (IRB), I am pleased to inform you that the subject protocol has been reviewed and APPROVED AS SUBMITTED for the period indicated above. We operate under many Government requirements. As a result, this approval is granted with the following understandings:

1. The attached consent form indicated above must be used unless a subsequent notification is approved in writing by the IRB. Remember that each subject enrolled in the study (and/or their guardian) must sign this consent form; preferably, the signatures are witnessed or acknowledged. You must give each subject a copy of the consent form and you must retain all signed consent forms for three years after project termination. Please keep these forms readily available (NOT in patients’ charts).

2. If this is a sponsored project, then the study may not be activated until the Office of Research Compliance has received BOTH a fully executed sponsored agreement AND appropriate letter(s) of indemnification by the sponsor. If this is not a sponsored study (designated “internal”), the costs of the project must be identified and a cost center designated. Please call 215-762-3453 if you have any questions regarding these procedures.

3. You must advise the IRB of the activation date. Use the attached form for this purpose.

4. Any change in the procedures done to the subjects must be submitted in writing in advance.

5. Any adverse reaction must be reported to the IRB in a timely fashion.

6. Should the IRB decide to monitor your project directly, please cooperate fully. Failure to do so may result in withdrawal of this approval and notification of the sponsor and/or Federal agencies. Specific information regarding monitoring appears in: GUIDELINES - BIOMEDICAL RESEARCH INVOLVING HUMAN SUBJECTS obtained through this office.

7. Whether or not this protocol is activated, the IRB will review its progress on or about the above Expiration Date. Should you fail to respond to this Federally-required progress report, the project may become ineligible for re-approval and the IRB may choose not to consider other projects for approval.

8. A final progress report must be submitted to the IRB in format similar to that of a periodic report.

The IRB welcomes your research project into the list of approved protocols. Your compliance with the above conditions will help to protect the continuation of all research activity at the University. With your project and others like it, we look forward to additions to knowledge of human health and benefits to science, our patients and society.
Appendix K – Scores Results Request Form

This form is optional, and may be completed at each student’s discretion. By filling out this form, the research assistant will mail only your results of the Self-efficacy Scale and Locus of Control Scale to you. This will be accomplished at the end of the data collection and prior to data analysis. Only the research assistant will have access to this form.

Name: ____________________________

Mailing Address: ____________________________

City, State, Zip ____________________________

**Your Self-Efficacy Scale Results:**

The construct of Perceived Self-Efficacy reflects an optimistic self-belief. This is the belief that one can perform a novel or difficult task, or cope with adversity – in various domains of human functioning. Perceived self-efficacy facilitates goal-setting, effort investment, persistence in face of barriers and recovery from setbacks.

**Before Intervention:** Blood Pressure ______ Pulse ______

**After Intervention:** Blood Pressure ______ Pulse ______

The scale has a range from 10 to 40. In general, a score of 30 or greater reflects a strong confidence.

**Your Locus of Control Results:**

A person's Locus of Control belief about themselves is also know as an “attribution”. Attribution refers to how people explain events that happen to themselves and others. Different kinds of attribution styles have been found to characterize and explain why people react quite differently, but predictably to events and how they explain the causes of those events.

Before Intervention: __________

After Intervention: __________

To interpret the result, the higher the score, the more you have an external locus of control. The lower the score, the more you have an internal locus of control. A score of 11 or 12 is in the middle.
Appendix L – Measuring a Pulse Checklist

Directions: As the student completes each criterion. Please check the appropriate level.

Yes = If behavior occurred  No = if behavior did not occur

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>1. Greets patient, introduces self, and explains procedure.</td>
<td></td>
</tr>
<tr>
<td>2. Wash hands.</td>
<td></td>
</tr>
<tr>
<td>3. Provide privacy.</td>
<td></td>
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<tr>
<td>4. Obtain pulse measurement for a radial pulse:</td>
<td></td>
</tr>
<tr>
<td>(a) Place tips of first two fingers of hand over groove along radial or thumb side of client’s inner wrist.</td>
<td></td>
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<tr>
<td>(b) Lightly compress against client’s radius, obliterate pulse initially, Then relax pressure.</td>
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</tr>
<tr>
<td>(c) After pulse can be felt regularly, look at watch’s second hand and begin to count rate.</td>
<td></td>
</tr>
<tr>
<td>(d) If pulse is regular, count rate for 30 seconds and multiply total by 2.</td>
<td></td>
</tr>
<tr>
<td>(e) If pulse is irregular, count rate for 60 seconds. Assess frequency and pattern of irregularity.</td>
<td></td>
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<tr>
<td>5. Obtain pulse measurement for apical pulse:</td>
<td></td>
</tr>
<tr>
<td>(a) Place diaphragm of stethoscope over point of maximal impulse at the fifth intercostal space at the left midclavicular line and auscultate for normal S1 and S2 heart sounds.</td>
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<tr>
<td>(b) When S1 and S2 are heard with regularity, look at watch’s second hand and begin to count rate.</td>
<td></td>
</tr>
<tr>
<td>(c) If apical rate is regular, count for 30 seconds and multiply by 2.</td>
<td></td>
</tr>
<tr>
<td>(d) If rate is irregular count for 60 seconds.</td>
<td></td>
</tr>
</tbody>
</table>

SOURCE: Potter/Perry: Fundamentals of Nursing, ed 5. Copyright © 2001 Mosby, Inc. All rights reserved. Adapted with permission. NOTE: A student must complete 80% or better of the above criteria in order to successfully measure blood pressure.
### Appendix M – Measuring a Blood Pressure Checklist

Directions: As the student completes each criterion. Please check the appropriate level.

**Yes** = If behavior occurred  
**No** = if behavior did not occur

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
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1. Greets patient, introduces self, explains procedure  
2. Wash hands.  
3. Palpate brachial. Position cuff 2.5 cm above site of pulsation.  
   Center bladder of cuff above artery. With cuff fully deflated, wrap cuff evenly and snugly around upper arm.  
4. To determine baseline BP, palpate brachial or radial artery with fingertips of one hand. While inflating cuff rapidly to pressure 30 mm Hg above point at which pulse disappears. Slowly deflate cuff and note point when pulse reappears.  
5. Deflate cuff fully.  
6. Relocate brachial artery and place bell or diaphragm chest piece of stethoscope over it.  
7. Inflate cuff to 30 mm Hg above palpate systolic pressure.  
8. Slowly release valve and allow mercury to fall at rate of 2 to 3 mm Hg/sec.  
9. Note point on manometer when first clear sound is heard.  
10. Continue to deflate cuff, noting point at which muffled or dampened sound appears.  
11. Continue to deflate cuff gradually, noting point at which sound disappears. Note pressure to nearest 2 mm Hg.  
12. Deflate cuff. Remove cuff from clients arm unless measurement must be repeated.
Appendix N – Debriefing Form

This form is optional, and may be completed at each student’s discretion. The purpose of this written communication is to address the positive and negative factors of simulation education. This information will remain anonymous and confidential.

1. Did you perform the two nursing skills on (please circle one):
   a. SimMan
   b. On a person in a bed in the nursing lab

If you marked “a”, please answer 2 and 3. If you marked “b”, please answer 4 and 5.

2. Were there any factors in taking a blood pressure, radial and apical pulses (SimMan) that you view as positive?

3. Were there any factors in taking a blood pressure, the radial and apical pulse (SimMan) that you viewed as negative?

4. Were there any factors in taking a blood pressure, radial and apical pulses (person in a bed) that you view as positive?

5. Were there any factors in taking a blood pressure, the radial and apical pulse (person in a bed) that you viewed as negative?

Thank you for taking the time to complete the debriefing form.
Appendix O – Lottery Entry Form

- This form is optional, and may be completed at each student’s discretion.
- By filling out this form, your name will be entered into a confidential lottery to win one (1) of three (3) $50.00 Drexel Bookstore gift certificates.
- If you should win one (1) of the Bookstore gift certificates, the certificate will be confidentially mailed to you by the research assistant.
- Please Print

Name: ____________________________________________

Mailing Address: _________________________________

City, State, Zip ________________________________
Appendix P – Pilot Study

Context:
In this pilot study, participants were students who were enrolled in Drexel University’s undergraduate nursing program, and who had no experience with simulation education or previous practice with the basic nursing skills being investigated. Participants completed a demographic survey, pre and post measures of self-efficacy and locus of control. Subjects were randomly assigned to either the human-patient simulator (HPS) or the standardized patient (SP) practica.

Objectives:
The purpose of the pilot study was to determine interrater reliability of the independent observations of the nursing instructors; the internal consistency of the self-efficacy scale (SES) (Appendix E) that had been adapted from Jerusalem and Schwarzer’s General Self-Efficacy Scale; and to determine any major flaws in the recruitment, procedure, and overall design of the study.

Design:
A pre-test post-test design with a convenience sample was used. Undergraduate students were asked to volunteer for this pilot study and were informed that by participating, they would have a chance to win a book store certificate worth $50. The research assistant completed the Drexel University’s online Human Subject Certification Examination, and was instructed on the intent, purpose, of the proposed pilot and main study. Before beginning the pilot study, the research assistant was able to express the pilot protocol. Participating students were informed of the aim of the study and consented (Appendix B).
After consenting, students completed the self-efficacy (Appendix E) and locus of control (Appendix G) pre-test. Students then attended a 20 minute session on blood pressure and pulse skill attainment and then divided into their randomly assigned groups (human-patient simulator or standardized patient). Participants were able to practice both skills and then demonstrate those skills. Each student was observed by two nursing instructors and observations were documented on a checklist that listed specific behaviors required to successfully demonstrate skill attainment. For this study, skill attainment will be reached when students are able to demonstrate a score of 80% or higher on the two skills checklist.

Permission was obtained (appendix I) to use the two skills checklist (Measuring a Radial and Apical Pulse, Appendix L; and Measuring a Blood Pressure, Appendix M). All nursing instructors were informed of how to complete the checklist. After demonstration of the skills, students completed the self-efficacy and locus of control post-test. Students were also offered the opportunity to complete a debriefing form (Appendix N).

**Sample and Population:**

Permission was obtained from nursing instructors for a research assistant to attend freshman and beginning sophomore level classes to announce the pilot study and invite students to participate. The research assistant handed out Volunteer information data form (Appendix C) and informed the students of the intent of the pilot study. Students were also informed of the dates, times, and location of the pilot test. The first 30 students who volunteered to participate in this study and who meet criteria for the study were included. The researcher
chose a pilot sample of 30 subjects based on tenets of the Central Limit
Theorem. According to the Central Limit Theorem, if a sample is large enough
(i.e. 30 or more) a sampling distribution of means will be normally distributed
even if the true population distribution is not normally distributed. The theorem
assumes sample sizes of about 30 or greater and is often referred to as the rule
of thirty (Gall, Borg, and Gall, 1997; Patten, 2002). The central limit theorem
suggests that a sampling distribution always has significantly less randomness
than the population it’s drawn from. The sampling distribution will have more of a
normal distribution even when the population itself is not normally distributed
(Leedy and Ormrod, 2001).

Results:

A pilot study was conducted during March 2005, in order to identify
problems in the design, as well as to examine reliability and validity of the
research instruments. The overall recruitment and procedure occurred without
notable incident. Time spent informing students of the pilot study in classrooms
were less than 5 minutes and was acceptable to nursing instructors. Scheduled
time within the Clinical and Learning Resource Center (CLRC) was supported
from the administration of the college as well as the staff within the CLRC.
Selection of two nursing instructors for each student environments (HPS and SP)
was accomplished to establish interrater reliability. Interrater reliability for the
pilot study was 1.0 for the pulse skill checklist (Appendix L) and .99 for the blood
pressure skill check list (Appendix M). According to Burns and Grove (2001, pg
375), interrater reliability must be reported in a study in which observational data
are collected. In this study, two nursing instructors independently observed and recorded the same event using the protocol developed for the study, the nursing instructors observed 30 participants on both blood pressure and pulse attainment. An interrater reliability of .80 or less should cause concern regarding the reliability of the observations (Burns and Grove, 2001). The interrater reliabilities for both the blood pressure and pulse scale were deemed acceptable. Of interest to note, no students that participated in the pilot study elected to complete a Score Results Request Form (Appendix K). The results of the pilot study demonstrated no major flaws in the study design. Data from the pilot were entered into the Statistical Program for Social Sciences (SPSS) version 13.

An analysis of the data indicated strong reliability coefficients for both the Self-efficacy and Locus of Control scales. The Cronbach’s Alpha was selected as the appropriate internal consistency statistic due to the number of choices within the Likert type scale. The reliability analysis of the SES demonstrated a Cronbach’s Alpha of .99 and .98 for pre-post measures, respectively. Internal consistency was .78 and .74 for pre-post locus of control scales. The SES demonstrated a Pearson Correlation of .86 for the test-retest reliability coefficient (p<.0005). The reliability coefficient for the locus of control scale demonstrated an Unequal-Length Spearman-Brown of .78. The Spearman-Brown is appropriate to measure the reliability with the forced answer internal versus external locus of control type of responses of the locus of control scale (Anastasi, 1982).
Pilot Study Table 1 - Sociodemographics of Pilot Study Sample

<table>
<thead>
<tr>
<th>Age in Years</th>
<th>Frequency</th>
<th>Valid Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-28</td>
<td>7</td>
<td>23.3%</td>
</tr>
<tr>
<td>29-39</td>
<td>15</td>
<td>50.0%</td>
</tr>
<tr>
<td>40-50</td>
<td>5</td>
<td>16.7%</td>
</tr>
<tr>
<td>51 and above</td>
<td>3</td>
<td>10.0%</td>
</tr>
</tbody>
</table>

Pilot Study Table 2 - Descriptive Statistics of Pilot Study

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Mean</th>
<th>SD</th>
<th>Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>SE Pre</td>
<td>2.94</td>
<td>0.95</td>
<td>0.99</td>
</tr>
<tr>
<td>SE Post</td>
<td>3.35</td>
<td>0.67</td>
<td>0.98</td>
</tr>
<tr>
<td>LOC Pre</td>
<td>1.27</td>
<td>0.15</td>
<td>0.78</td>
</tr>
<tr>
<td>LOC Post</td>
<td>1.27</td>
<td>0.16</td>
<td>0.739</td>
</tr>
</tbody>
</table>

Summary:

With the Cronbach’s Alpha in the high .90’s for the adapted self-efficacy scale and in the mid .70’s for the locus of control scales, there were no modifications made to these two instruments. There was one typographical error noted on the Measuring a Blood Pressure form and corrections were made prior to the actual study. The environments of the human-patient simulator and standardized patient were satisfactory. The lottery for the book store $50 gift certificate was conducted by the research assistant as described in methodology in chapter 3. Incidentally, no students within the pilot study elected to complete the optional debriefing form.

Implications for the Main Study:

Based upon the objectives for the pilot study, the protocol was acceptable and without major incident. The independent observations of the nursing faculty proved reliable and same instructors agreed to participate as observers in the study. The study will have two levels for the independent variable, the human-patient simulator and standardized patient clinical practica, therefore a sample
size of sixty was chosen for the study. A sample size of sixty provides the number of cases necessary to use the more powerful parametric model and have the specified probability ($p < .05$) of rejecting the null hypothesis.

*Adaptation of General Self-efficacy Scale:*

Original version by Schwarzer and Jerusalem (1993).

1. I can always manage to solve difficult problems if I try hard enough.
2. If someone opposes me, I can find the means and ways to get what I want.
3. It is easy for me to stick to my aims and accomplish my goals.
4. I am confident that I could deal efficiently with unexpected events.
5. Thanks to my resourcefulness, I know how to handle unforeseen situations.
6. I can solve most problems if I invest the necessary effort.
7. I can remain calm when facing difficulties because I can rely on my coping abilities.
8. When I am confronted with a problem, I can usually find several solutions.
9. If I am in trouble, I can usually think of a solution.
10. I can usually handle whatever comes my way.

*Adapted Measuring a Blood Pressure:*

1. I can obtain a valid blood pressure reading.
2. I can find the means to secure the cuff.
3. I can focus on the patient and obtain the blood pressure at the same time.
4. I can deal effectively with unexpected events while checking a patient’s blood pressure.
5. I can handle unforeseen situations while checking a person’s blood pressure.
6. I can solve most blood pressure problems.

7. I can remain calm when facing difficulties while recording a blood pressure.

8. When I am confronted with a problem when taking a blood pressure, I can think of several solutions.

9. If I am in trouble, when taking a blood pressure, I can solve the problem.

10. I can handle whatever happens when I am taking a blood pressure.

*Adapted Measuring a Radial and Apical Pulse:*

11. I can obtain radial and apical pulses

12. If there is difficulty in securing a radial and apical pulse, I can find the means to obtain them.

13. I can focus on the patient and obtain radial and apical pulses at the same time.

14. I can deal effectively with unexpected events while checking a patient’s radial and apical pulses.

15. I can handle unforeseen situations while checking a person’s radial and apical pulses.

16. I can solve most radial and apical pulse problems

17. I can remain calm when facing difficulties while taking radial and apical pulse

18. When I am confronted with a problem when taking radial and apical pulses, I can think of several solutions.

19. If I am in trouble, when taking a radial and apical pulse, I can solve the problem.
20. I can handle whatever happens when I am taking a radial and apical pulse.
Appendix Q Narrative Responses of the Students Optional Debriefing Form

Human Patient Practica – N = 28

Were there any factors in taking a blood pressure, radial and apical pulses (SimMan) that you view as positive?

1. Easy to hear pulse-regular pulse too. Also easy to feel pulse.

2. You can adjust so you can feel different thing.

3. Spots for taking the bp and pulses were designated with different materials.

4. I can learn how to do better readings for my clinical.

5. The beats were mostly regular.

6. I could feel the pulse really well.

7. I think it’s great for practicing clinical skills for the first time. I think I would be much more nervous if I had to perform the skills on a human.

8. Taking the radial pulse was easier to feel and comprehend compared to hearing the systolic/diastolic in apical pulse.

9. The patient is not real so takes away feelings of embarrassment. I could ask questions to the instructor.

10. SimMan was not real and did not mind if I made a mistake. He didn’t mind me touching him or hurting him. It was nice to be able to practice on him.

11. I didn’t do both so it is hard to say.

12. You could actually hear and feel the pulse.

13. I thought that the check sheet helped me go step by step so I could record an accurate reading. Also, staying calm and confident helped me to take the blood pressure and pulse without any nervousness.

14. Because it was my first time ever I preferred practicing with SimMan. Also finding the right locations was much easier because it was shown right to you.

15. Don’t worry about discomfort or pain to SimMan. (also bad).
16. With SimMan it was guaranteed to get a pulse.

17. There was no anxiety because it was not a real person.

18. N/A

19. I did not feel uneasy doing it my first time because I did not have to worry how I was making the “patient” feel.

20. Not really; real person would be better.

21. I wasn’t uncomfortable practicing on a Sim. The pulse was easier to find than on myself. I was sure that I had found it appropriately.

22. I felt more confident that I wouldn’t hurt my fellow “patient”. The sounds were much more distinct and loud!!!

23. First he did not complain. Second he didn’t suffer on my second attempt at baseline. I was using left hand for bulb and I am right handed.

24. No, problems

25. Yes, e.g. courtesy

26. The vital signs were easy to identify. I’m not sure if SimMan was programmed this way.

27. It was a great learning experience.

28. Pulse on SimMan very strong, easy to hear little room for error.

Were there any factors in taking a blood pressure, the radial and apical pulse (SimMan) that you viewed as negative?

1. Found it easy after actually doing it.

2. It’s as if the environment is “too” perfect. He’s not moving, talking, or anything like that.

3. The heart beat was really faint.

4. No

5. Couldn’t hear pulses as well.
6. I forgot the SimMan was supposed to be a person and I didn’t greet him right away.

7. The apical pulse was very hard to hear.

8. The systolic/diastolic in apical pulse was difficult to hear because it was faint and counting the diastolic part of the pulse.

9. The SimMan is not the same as real life.

10. He was not real. So it wasn’t like taking a real persons pulse or blood pressure.

11. I didn’t do both so it’s hard to say.

12. It is not anatomical correct, and it is a male so you don’t realize the challenges of pulses with women.

13. There were no negative factors that I could think of when taking the blood pressure or pulse.

14. Because he wasn’t human we didn’t run into any complications that would possibly happen when we are dealing with real patients. Practicing with people in the future will be beneficial.

15. Vitals harder to find. (I believe)

16. No

17. No

18. N/A

19. The bp cuff was stuck to him so I felt weird just flopping it on his chest when I was done. He wasn’t able to give me a patient’s perspective on how I treated him. I know I said almost the opposite on number two. But after the first time, it would be nice to do it on a human who could give feedback.

20. The radial pulse is hard to detect than a real person.

21. I’d like to practice on a real person.

22. None, I would also like to work on a real patient when I’m more confident in my skills. I am excited to work on a real patient in the future.
23. His BP sounded a little froggy (fake).

24. No, none it was very easy to find his pulses and heart rate.

25. Yes, difficulty at time in locating the pulse point.

26. N/A

27. Trying to practicing talking to the patient felt weird.

28. Not necessarily true of live patients. Pulse was really strong, where live people tend to be harder to hear.
Standardized Patient Practica – N = 25

Were there any factors in taking a blood pressure, radial and apical pulses (person in bed) that you view as positive?

1. Pleasant environment, teachers helpful.
2. I was worried that the cuff might be too tight.
3. It was good to actually experience it on an actual person.
4. I could hear/palpate correctly
5. It was closer to a real life clinical experience, and you can apply skills learned to another person.
6. N/A
7. Yes. It was nice to be able to work on a real person because it provides a better understanding of how to perform these skills in the workplace. It is better because you can ask the person if they are uncomfortable, if they’re doing well, etc. to see if you are performing well.
8. It gave me the opportunity to interact with an actual person and deal with their responses.
10. Yes
11. N/A
12. Yes, person was human.
13. Yes
14. Yes, it was a good experience to practice on someone real.
15. A more real life situation, not a “perfect” replication.
16. Steps/Instructions very valuable. Learning to problem solve when not being able to locate pulse. Knowing there are solutions and to remain calm.
17. Yes, real life.
18. I was able to do it!
It was a real person; I have never assessed any skills including CPR and First Aid on a real person, only on dummies.

Interacting with an actual patient (person) I also developing communication skills and become accustomed to patient’s reactions.

Interacting with a live person.

Nurse / patient interaction

When learning a new skill it was easier to evaluate myself by practicing on a person in a clinical setting. I now know how to feel for and take a pulse.

Yes

The pulse of the individual was loud and easy to detect.

Were there any factors in taking a blood pressure, the radial and apical pulse (person in a bed) that you viewed as negative?

1. N/A

2. N/A

3. N/A

4. I could use work on finding apical pulse in 5th intercostal space.

5. A student may inadvertently hurt the “patient” due to lack of knowledge.

6. N/A

7. No, there weren’t necessarily any negative aspects. It was perhaps just a little more a nerving doing it for the first time on an actual person.

8. It made me nervous, but it was a good experience overall.

9. Made me slightly nervous.

10. No

11. N/A
12. No

13. No

14. No, it was good to practice on a live person.

15. More nervous because of the human interaction.

16. No

17. Yes

18. None!

19. It made it a little awkward to me because it was my first time taking a bp and a pulse. It wasn't practicing on a dummy it was a live human and it could be possible for something to go wrong.

20. No

21. Just that they had to sit though so many attempts to take a pulse and BP.

22. I got nervous easily. I feel like I am on the spot, especially with the patient depending on me and waiting on me.

23. No

24. No

25. No
Vita

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Publications