Using simulation: Emergency care for patients with acute Myocardial Infarction

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Using simulation: Emergency care for patients with acute Myocardial Infarction

Abstract
Cardiovascular disease is the leading cause of death in the United States, affecting nearly eighty million people (American Heart Association IAHAI, 2009). Included in this population are those with heart attack or myocardial infarction (MI). Coughlin (2008) estimated that about 1.2 to 1.5 million Americans will have an MI annually. For approximately thirty eight percent of these patients, it is a recurrent event.

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Using simulation: Emergency care for patients
with acute Myocardial Infarction

By

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Submitted in partial fulfillment of the requirements for the degree
Masters of Science in Advanced Practice Nursing, Family Nurse Practitioner

Supervised by

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Wegmans School of Nursing
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Table of Contents

1. Table of contents......................................................................................................................... 2
2. Chapter I Using Simulation........................................................................................................... 5
3. Introduction.................................................................................................................................. 5
4. Importance for Health Care.......................................................................................................... 6
5. Background and Significance........................................................................................................ 7
6. Clinical Problem............................................................................................................................ 10
7. Conceptual Frameworks............................................................................................................... 11
8. Purpose Statement....................................................................................................................... 13
9. Summary....................................................................................................................................... 15
10. Chapter II Literature Review....................................................................................................... 16
11. Historical Background.................................................................................................................. 16
12. Phases of Simulation.................................................................................................................... 17
13. Planning....................................................................................................................................... 17
14. Implementation............................................................................................................................. 17
15. Debriefing and evaluation........................................................................................................... 17
16. Hands on Experience.................................................................................................................... 18
17. Search Methods............................................................................................................................ 18
18. Review of the Literature............................................................................................................... 19
19. Confidence and cognition............................................................................................................ 19
20. Confidence, satisfaction, and knowledge...................................................................................... 21
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>21. Best practices</td>
<td>23</td>
</tr>
<tr>
<td>22. Clinical judgment</td>
<td>24</td>
</tr>
<tr>
<td>23. Figure 1 The Lasater Interactive Model of Clinical Judgment Development</td>
<td>25</td>
</tr>
<tr>
<td>24. Critical thinking</td>
<td>26</td>
</tr>
<tr>
<td>25. Nurse residency program</td>
<td>27</td>
</tr>
<tr>
<td>26. Retention strategy</td>
<td>28</td>
</tr>
<tr>
<td>27. Advantages and Disadvantages</td>
<td>29</td>
</tr>
<tr>
<td>28. Table 1 Simulation as a teaching strategy</td>
<td>29</td>
</tr>
<tr>
<td>29. Additional research</td>
<td>29</td>
</tr>
<tr>
<td>30. Cumulative summary</td>
<td>30</td>
</tr>
<tr>
<td>31. Chapter III Methodology</td>
<td>32</td>
</tr>
<tr>
<td>32. Introduction</td>
<td>32</td>
</tr>
<tr>
<td>33. Method</td>
<td>32</td>
</tr>
<tr>
<td>34. Research Question</td>
<td>34</td>
</tr>
<tr>
<td>35. Design</td>
<td>35</td>
</tr>
<tr>
<td>36. Type</td>
<td>35</td>
</tr>
<tr>
<td>37. Sample</td>
<td>35</td>
</tr>
<tr>
<td>38. Setting</td>
<td>36</td>
</tr>
<tr>
<td>39. Instruments</td>
<td>36</td>
</tr>
<tr>
<td>40. Procedures</td>
<td>37</td>
</tr>
</tbody>
</table>
Chapter I

Using Simulation: Emergency Care for Patients
With Acute Myocardial Infarction

Introduction

Cardiovascular disease is the leading cause of death in the United States, affecting nearly eighty million people (American Heart Association [AHA], 2009). Included in this population are those with heart attack or myocardial infarction (MI). Coughlin (2008) estimated that about 1.2 to 1.5 million Americans will have an MI annually. For approximately thirty-eight percent of these patients, it is a recurrent event.

The statistics are staggering. According to the Center for Disease Control (CDC, 2009), someone has a heart attack every 34 seconds of every day in the United States, and someone dies every minute from a heart disease-related event. The type of MI can be differentiated between non-ST segment elevation myocardial infarction (NSTEMI) and ST segment elevation myocardial infarction (STEMI). In a NSTEMI, there is a partially blocked artery that leads to decreased blood flow to a specific portion of the heart. In contrast, a STEMI has a completely occluded artery caused by a prolonged period of complete lack of blood supply or ischemia that affects a large area of the heart (AHA, 2009). The area of ischemic injury produces ST segment elevation in the indicative leads on the electrocardiogram (Coughlin, 2008). The goal of STEMI treatment is to provide care that can lessen mortality and morbidity, but treatment effectiveness rapidly decreases within the first several hours after symptoms onset (Antman, Anbe, Armstrong, Bates, Green, Hand, et al., 2004).
Importance for Healthcare

When a patient presents to the Emergency Room (ER) with chest pain, time equals muscle (Crowther, 2008). When a patient is diagnosed with STEMI, as time passes, the greater the ischemia and myocardial necrosis. The main difference between injury and infarction is cell death. That is why “time equals muscle” is so important and is the focus of nursing care. This is the time nurses can make a difference, through STEMI recognition and prioritizing patient care.

What is the best outcome for patients having a STEMI? Minimizing ischemia and myocardial tissue necrosis has a direct effect on morbidity and mortality (Hoekstra, 2008; Underwood et al., 2009). One way to do this is when the patient calls 911, EMS personnel obtain a 12 lead electrocardiogram (EKG), and if the patient is having a STEMI, the patient is transported to a percutaneous coronary intervention (PCI) facility. Unfortunately, 50 percent of patients having a STEMI arrive by car to the emergency room (Crowther, 2008). In the rural areas across the country and small communities like Canandaigua, New York, EMS are mandated to bring patients to the closest facility with life threatening illness (Jacobs, Antman, Faxon, Gregory, & Solis, 2007) including chief complaints of chest pain and shortness of breath. In the community hospital in Canandaigua, this adds transport time from Thompson Health to Strong Memorial Hospital, the nearest PCI capable hospital, and can have a negative impact for the STEMI patient.

Patients with STEMI account for one third of the annual 5 million ER visits for chest pain. When a STEMI patient arrives at the ER, rapid reperfusion by either fibrinolytic therapy or PCI provides the best chance for mortality reduction, according to Underwood et al. (2009). Reperfusion is defined as the restoration of coronary blood flow to the affected artery in order to limit tissue necrosis and cardiac cell muscle death (Coughlin, 2008). Up until recently,
fibrinolytic therapy was the treatment of choice in community hospitals that did not have a coronary catheter laboratory onsite. However, PCI has shown to be superior as evidenced by lower mortality rates as compared to fibrinolytic therapy, and has been shown to successfully restore coronary artery blood flow in ninety to ninety five percent of STEMI patients (Antman et al., 2004; Aversano et al., 2002; Jacobs et al., 2007).

The American College of Cardiology (ACC, 2009) in collaboration with the American Heart Association (AHA, 2009) recommended that STEMI patients be treated with primary PCI within ninety minutes or less from the time of arrival at the ER (Underwood, Jordan, Lorenz, Monk, Printz, Starling-Edwards, et al., 2009; Hoekstra, 2008). This timeframe as been termed “Door-to-Balloon-time” (D2B) (Underwood et al.). The Emergency room nurse is pivotal in recognizing patients presenting with STEMI and can directly affect patient outcomes by providing critical cardiovascular care in a timely fashion. In patients diagnosed with acute MI, STEMI outcomes is time dependent which is why the ACC goal of D2B is less than ninety minutes for PCI. Seconds count. For every 30 minutes of duration of ischemia, mortality increases by nearly ten percent (Crowther, 2008). Bradley et al. (2006) and Jacobs et al. (2007) indicated that less than half of these patients are treated within the ACC guideline recommended timeframes. Delays in treatment can lead to significant complications such as MI extension, cardiogenic shock, embolic events, and death (Antman et al., 2004).

**Background and Significance**

There are a number of reasons why the goal of D2B of 90 minutes is difficult to achieve. The American Heart Association has launched a campaign “Mission Lifeline” (AHA, 2009), focusing on improved quality care and outcomes in STEMI patients. They (AHA) have described barriers to timely reperfusion such as EMS guidelines, patients who delayed seeking treatment,
transport delays to PCI capable facilities, and team assembly among others. In addition to this, the nursing shortage is another obstacle. One may wonder how the nursing shortage affects this goal. In an effort to address the serious staffing challenges that occur on a daily basis in hospitals across the country, inexperienced and new graduate nurses are recruited for practice in highly specialized patient care areas, including the emergency department (Valdez, 2008). But are inexperienced nurses ready to respond in emergencies, when time is at the utmost critical? Do they have the confidence, skills, and clinical judgment required for critical STEMI recognition and care?

If area hospitals are going to employ inexperienced and new graduate nurses in the emergency department, one has to look at how they are prepared for providing care for all patients including STEMI patients. The rapid tempo of an ER, combined with the critical skills required for STEMI care, can quickly overwhelm these nurses. This can quickly result in a negative reaction or outcome. So it is essential that the best way to teach inexperienced nurses complex and integrative critical care skills be identified. High fidelity simulation can provide the structure to improve patient care and safety by honing the skills of clinical teams and individuals, according to Gaba (2004).

Therein lays a case for simulation. To master skills required in a high risk population, Hravnak, Beach, & Tuite (2007) discussed using the technology of high fidelity human simulation. Gaba (2004) described simulation as “a technique, not a technology, to replace or amplify real experiences with guided experiences, often immersive in nature, that evoke or replicate substantial aspects of the real world in a fully interactive fashion” (p. i 2). Simulation allows learners to function in a realistic clinical scenario, without any risk to the patient. It allows for repetition, review, and debriefing periods. Hammond (2004) offered many benefits
from using simulation. Simulation can be used to present uncommon or infrequent complex events often referred to high risk, low volume scenarios, allow errors to play out, and it allows students to think through the problems presented.

Novice critical care nurses are nurses who lack experience and the understanding behind the rules and policies of the unit. They focus on skill acquisition and are inflexible in their approach to practice, according to Valdez (2008). Most of their fears stem from worrying about what to do and how to respond appropriately. Often, they are unable to function independently and often need twelve to eighteen months before they are competent (Valdez). Simulation has been defined as an excellent teaching strategy to assist inexperienced nurses, especially in critical care nursing (Cannon-Diehl, 2009; Rauen, 2004; Yaeger, Halamek, Coyle, Murphy, Anderson, Boyle, et al., 2004).

The foundation of high fidelity simulation is active participation with a team approach in realistic patient scenarios. Skill and advanced knowledge is acquired through a hands-on approach that overcomes many of the limitations of traditional education (Yaeger et al., 2004). Cannon-Diehl (2009) indicated that there is increasing evidence that high fidelity simulation is a valid and reliable tool to demonstrate nursing competence. Zekonis & Gantt (2007) found that simulated critical care scenarios were a safe, realistic, and effective teaching tool to assess and hone critical thinking skills of new graduates in the ER. Simulation:

- Facilitates the use of critical thinking skills
- Improves clinical judgment
- Engages the student through interaction, resulting in increased cognition
- Increases confidence levels
- Facilitates learning and remediation without risk to a patient
To educate nurses in a critical scenario, it is often better to provide lecture and simulation together. According to Foster, Sheriff, and Cheney (2008), the use of high fidelity simulation contributed to student self confidence in management of a critical patient with pulmonary embolism. They also found that student knowledge was greater when lecture plus high fidelity simulation (experimental group) was used compared to the lecture only (control group).

According to Valdez (2008), there is little known regarding the experience of new graduate nurses that address the transition from novice to competent in the emergency setting. Cannon-Diehl (2009) stated that more nursing research is needed to define and link high fidelity simulation with improved patient outcomes. Despite the lack of research to prove the link between simulation education, increasing nursing expertise and improved patient outcomes, the literature does suggest that simulation may provide a mechanism to ease this transition.

**Clinical Problem**

Nurses’ knowledge, skill, and clinical judgment are pivotal factors that impact patient outcomes. With the national nursing shortage and nursing retirement movement influencing the availability of critical care nurses, recruiting experienced emergency nurses continues to be an ongoing challenge (Winslow, Almarode, Cottingham, Lowry, & Walker, 2009). This has been true at Thompson Health, a community hospital in Canandaigua NY. Inexperienced and new graduate nurses are recruited for practice in the emergency department at Thompson Health. Inexperienced nurses are not ready to respond in emergencies, because they often lack the confidence, skills, and clinical judgment required for critical care. ED is not part of their entry level programs. Without experience, will the nurse recognize the significant subtleties and complexities of the STEMI patient scenario? Or because lack of knowledge and experience, will he or she be caught by failing to rescue the patient in a critical scenario? When nurses have
Using simulation

anxiety, it alters their ability to make decisions. This directly affects both confidence and clinical judgment, according to Rhodes and Curran (2005). Learning and retaining information can be challenging under these circumstances.

New graduates often feel the incongruity between their education with academic rules and the complex reality of the intuition-driven clinical patient care (Meyer & Xu, 2005). New graduates and inexperienced nurses have to learn that nursing is not black and white like their ideal education has taught them, but rather multiple shades of gray. Instead of feeling welcomed, it is an ‘unwelcome’ to the real world. This is especially true in critical care. This might explain why retention rates of new graduates in critical care areas are quite low. Valdez (2008) reported turnover rates for new graduates as high as sixty percent within the first year of employment. It was unclear whether this statistic is specific to critical care or in general. Hodges, Keeley, and Troyan (2008), suggest the cause for low retention rates in acute care stem from nurses’ lack of resilience. The new graduate often has a ‘failure to thrive’ in an unpredictable health care environment. This ‘unpredictability’ is intensified in critical care.

Conceptual Frameworks

Theory provides context for understanding a problem and rationale for interventions, according to Nichols (2007). The most appropriate theoretical frameworks for using high fidelity simulation in teaching an educational program for new ER staff is Kolb’s theory of experiential learning (Kolb, 1984). An additional framework is utilized regarding the development of clinical judgment.

Kolb (1984) described a process of learning through experience. He suggested that ideas were not fixed or cemented but rather pliable, with the variability of being shaped and remolded through experience. Kolb’s theory of experiential learning supports the framework for using high
fidelity simulation in teaching an educational program (Kolb, 1984). The actual hands-on experience gains meaning through reflection on the experience. Waldner and Olsen (2007) stated the meaningful experience is then conceptualized and incorporated into the knowledge base. It is a perpetual cycle. The learner becomes educated by living or doing the experience and from reflecting on the experience.

This perpetual learning cycle is the building blocks of Benner’s (1984) Model as nurses transition from novice to expert. The constructs of Benner’s model are found in her quote: “Experience is gained when theoretical knowledge is refined, challenged, or disconfirmed by actual clinical evidence that enhances or runs counter to the theoretical understanding” (p. 294). This implied that clinical evidence confirms and strengthens theoretical knowledge. In terms of learning, it doesn’t matter if the evidence is positive, negative, or a mistake. All three can be a gain in knowledge. As one gains experience, there is a progression from an analytical to an intuitive approach.

Knowledge is cumulative; equaling more than the sum of individual experiences. An old motto of healthcare, “see one, do one, teach one,” was once the key to developing clinical expertise in healthcare, but some have recommended a need for more reliability and safety focused instruction, especially in critical care (Henneman & Cunningham, 2005; Rauen, 2004, Yaeger et al., 2004). There is a Chinese proverb that signifies the whole premise behind patient simulation: “I hear, I forget; I see, I remember; I do, I understand.” This saying highlights the fact that many people learn a new skill or fact poorly if it is only heard. One learns and retains a little better when seeing the fact or a demonstration of how to do something, but the best learning of all comes from 'hands on' experience; actually getting and doing the thing you wish to learn. The involvement of hands on approach of simulation is similar to Kolb’s theory of experiential
learning. Hammond (2004) stated that simulation offers limitless opportunity for experiential learning in high risk areas but in a risk free background.

Caring for patients in emergency care requires strong clinical judgment. The best definition of clinical judgment was arrived by Tanner, Benner, Chesla, & Gordon (1996). Clinical judgment is the nonconscious holistic discrimination and intuitive response which is supported from a reliance on extensive clinical skill and knowledge. Clinical judgment refers to the combination of “knowing the patient”, intuition, and advocacy. Knowing the patient refers to the highly specific, situational knowledge that is derived from an engaged practitioner. It is ways in which nurses come to understand the current, situational, and particularistic concerns of clients/patients, to attend to salient information by using their skill of involvement. “Knowing the patient creates the possibility for advocacy” (p.213). Included in the understanding of the definition is the deliberate, abstract decision-making characteristic of intuitive caring practice.

_Purpose Statement_

The objective of this project is to provide an educational intervention with a 2 part design of lecture and high fidelity simulation, based on the need to enhance the knowledge and skill of the inexperienced ED nurse. One critical incident was selected for this project, which was emergency nursing care for the STEMI patient. The overall purpose of the project is to see if the intervention is beneficial to increase competence in STEMI care of inexperienced nurses in the ED. Inexperienced nurses are defined as new graduates or inexperienced nurses with less than 3 years of critical care experience. Valdez (2008) described an inexperienced nurse who enters a specialty area such as the ED from another unit who functions similarly to the new graduate nurse. Because they do not have a critical care background, they are novice nurses who lack situational context and the understanding behind the rules and policies of the ED.
The lecture portion of the project design integrates the requirements for Emergency Room (ER) care for patients with acute MI as outlined by the Institute for Clinical Systems Improvement (ICSI) guidelines (2008) *Diagnosis and treatment of chest pain and acute coronary syndrome (ACS)*. STEMI care improvements focus on the concept that time equals muscle (Crowther, 2008; Coughlin, 2008). The objectives for the lecture include this concept, along with nurses responding to acute MI with skill and knowledge.

There are three tools used to measure increased competence in STEMI care: Pretest, post test, and simulation competency checklist with arrhythmia and EKG recognition. There will be an investigator constructed pretest prior to implementation of part I of the intervention. See Appendix A. The PowerPoint lecture (part I) will be given by the graduate student; refer to Appendix B. Part II will be the simulation experience. The design of the simulation was scripted based on actual STEMI patients that presented to the ED at Thompson Health. Following the experience, knowledge acquisition was tested using the post test. The same test was used as the pretest, for direct comparison.

The purpose of this educational pilot project is two-fold. The first is to share acquired knowledge and practical experience with a group of new nurses from Thompson Health Emergency Department to determine if simulation is beneficial to increase competence in cardiac care in inexperienced nurses in the ED. The second purpose is the completion of the capstone project requirements needed for the degree of The Masters of Science in Advanced Practice Nursing Program, Family Nurse Practitioner track.

Simulated case scenarios for training eliminated any risk to a patient. This was a recurring theme in the literature. According to Beyea, von Reyn, and Slattery (2007), using
simulation to educate health professionals in critical scenarios holds the largest influence on patient safety.

Summary

The ED nurse is at the forefront of early recognition of a patient presenting with possible acute myocardial infarction (MI) and can directly impact the timeliness of reperfusion therapy (Underwood et al., 2009). Nurses’ knowledge, skill, and clinical judgment are pivotal factors that impact patient outcomes. Inexperienced nurses are not ready to respond in emergencies, because they often lack the confidence, skills, and clinical judgment required for critical care. The process of learning, synthesizing and applying knowledge can be an arduous task, but simulation can be an effective teaching strategy, especially in critical care when time is of the essence. Simulation is an innovative approach, provides patient safety, and is a tool that can be used in critical scenarios. Simulation is an effective technique that promotes the confidence and teamwork necessary to provide STEMI care in emergency nursing.
Chapter II Literature Review

*Historical Background*

High-fidelity Simulation was first used in aviation in the early 1930s (Scherer, Bruce, Graves & Erdley, 2003), and possibly as early as 1910. It provided a safe and controlled setting where flying skills and emergency responses could be practiced, according to Hravnak et al. (2007). Anesthesiology programs adopted the use of simulation in their curriculum to maximize safety. It provided protected opportunities to perform in critical care situations. Is it an educational tool or a technique? Since the 1960’s, simulation has gained popularity. Today, it is still used today in aviation, and has expanded into healthcare, education, military, and automotive industries.

In the report from the Institute of Medicine ([IOM] 2000) *To Err is human: Building a safer health system*, they recommended several improvement strategies to reduce errors in patient care. One of the suggestions included using simulators in the clinical setting. Simulation is one of the best ways to teach inexperienced nurses complex and integrative critical care skills. The technique provides the educator an excellent way to teach specific content. It is used in undergraduate and graduate nursing education programs across the country. More recently, it has extended into new graduate nursing orientation in the hospital setting as a teaching strategy in acute and critical care (Beyea, et al., 2007; Patterson, Bayley, Burnell, & Rhoads, 2009; Zekonis & Gantt, 2007). High fidelity simulation is an effective technique to bridge the practice gap between the academic arena and the hospital setting. It is an innovative approach for role transition in nursing.
Phases of Simulation

Planning.

The planning phase of simulation is termed the ‘presimulation experience’ by Scherer et al. (2003). This phase required extensive planning including development of objectives, scripted case study scenarios (Zekonis & Gantt, 2007), and role delineation. Objectives for simulations can range from learning how to complete a head to toe assessment or caring for a patient with a certain illness. Henneman and Cunningham (2005) used a framework that included the above, with the additional framework elements of programming the simulator, props, student preparation, and the final check. The latter was to “ensure real-life, uninterrupted execution of simulation” (p. 175).

Implementation.

In the implementation phase, the actual scripted scenario is played out. Videotaping or direct observation can be used, but this decision is made during the planning phase. Simulation can be done on an individual basis, but the literature suggests a greater benefit from a team approach, according to Cannon-Diehl (2009); Rhodes and Curran (2005); Zekonis and Ganttt (2007). Mistakes can be made without any harm done. Depending on the structure and time frame, there can be repetition. Sometimes this is more useful after the debriefing phase.

Debriefing and evaluation.

The last phase of simulation, or debriefing, occurs after the simulated scenario. It is a process that allows students to reflect on their experiences, based on the objectives of the simulation. This is time when participants can learn from each other, discuss strengths and weaknesses, and peer review. With active participation and a well structured experience, the debriefing phase can be considered the building blocks for self directed learning. The
instructor's role is to facilitate participation and learning through group work and sharing. Some HPS programs use video graphic technology (Henneman & Cunningham, 2005), while other educators use a "scenario observer" such as an expert clinician, attending physician, or a nurse educator to watch and observe the actions of the participants during the scenario and offer constructive feedback (Zekonis & Gantt, 2007). Henneman & Cunningham found that students expressed dislike about being videotaped or were distracted by observers. Many simulator laboratories have used this discovery to have one way mirrors installed in the control room, like the one used at St. John Fisher College.

*Hands on Experience*

Rhodes and Curran (2005) stated that "in every aspect of patient care, hands-on experience is the best teacher" (p. 258). In the clinical setting, human patient simulation (HPS) provided students and nurses the opportunity to practice complex skill and critical case scenarios in a safe environment. Bremner, Aduddell, Bennett, and VanGeest (2006) viewed patient simulation as a way to potentially decrease medical errors. Hravnak, et al. (2007) described simulator technology as an important tool for knowledge synthesis of mastering both technical and assessment skills in patients with cardiovascular disease. Brannan, White, and Bezanson (2008) tested and found that students with patient simulation instruction had significantly higher cognitive skills using a Likert scale, \( p = 0.05 \).

*Search Methods*

A comprehensive literature review was carried out using CINAHL, Journals @ Ovid database, and the World Wide Web. The following keywords were used: simulation, new graduate nurse, novice nurses, clinical competence, teaching methods, orientation, patient simulator, emergency nursing, critical care nursing, and nursing education. The search was
limited to English and full text from 1998 to 2009. Research studies and journal articles were perused. Some were discarded because they were too specific to other practice areas outside of critical care and emergency nursing. There were a few duplications in the above search, and therefore, deleted. The investigator found that the majority of research focused on the use of simulation and the education of nursing students at the junior and senior levels. There is limited research on the use of simulation and competence of inexperienced nurses or novice nurses in critical care or emergency care. Pilot projects, clinical reviews, and educational programs were also added to the review because of this finding. Simulation is used to teach critical thinking, evaluate clinical judgment, problem solving, and diagnostic reasoning. A discussion of each study with evaluation follows.

Review of the Literature

Confidence and cognition.

Brannan et al. (2008) studied the effectiveness of human patient simulation (HPS) and its effects on junior nursing students' cognitive skills and confidence levels. The design of the study was a quasi-experimental, two group comparison of instructional methods; traditional lecture versus the HPS method. The instruction was limited to specific nursing education content of acute myocardial infarction (MI). They hypothesized that students who received HPS instruction would demonstrate greater confidence and knowledge compared to the control group. The 2 groups consisted of separate semester students. All study participants were juniors, enrolled in the adult health nursing course at Kennesaw State University. Group I (control), took place in the fall semester, was comprised of 53 students non-randomized into the traditional lecture group. Group 2(experimental), took place in the spring semester, and included 54 students that were instructed in the HPS method. The variables in the study included confidence...
levels and cognitive skills. Confidence was assessed using a 34 question confidence level (CL) tool with a 4-point Likert scale format. The CL instrument had a reliability coefficient of 0.89 for the total scale (Brannan et al.) A coefficient greater than 0.80 is highly desirable, critical for accurate data interpretation, and has limited random fluctuations (Polit & Beck, 2004). Cognitive skills were tested pre and post instruction using Acute MI Questionnaire. The test was 20 multiple choice questions that were tested separately to assess reliability, using two forms, A and B. Each group covered content in 4 areas: diagnostic evaluation, pathophysiology and prevention of acute MI, nursing care of acute MI in all phases of illness, and discharge teaching. The results indicated that students with HPS instruction had statistically significant higher scores, \( p = 0.05 \). No significant differences were found with confidence levels among the 2 groups.

Whenever a quasi-experimental design is used, it is imperative that the researcher attempts to control for threats to internal validity, such as history, selection, testing and instrumentation (Polit & Beck, 2004). In this study, even though the groups were not randomized, the demographic characteristics were extremely similar among the 2 groups. The groups looked at ethnicity, gender, age, prior nursing experience, specifically cardiac nursing, and previous GPA prior to the current semester.

If the control group took place in the fall semester, and the experimental group occurred in the spring semester, one must look at the potential factors that place the results of the study at risk stemming from semester differences related to learning. After speaking at length to an expert educator of over thirty years, there are several factors that explain learning differences between semesters. Many students learn better in the spring semester because they have not had several months off. Their counterpart or fall semester students, often take weeks to "get into the groove" of studying and reading. Often, some information that was learned the semester before had not
been retained. Spring semester students are often categorized as "intense" learners because they are near the end of a year, or better, near graduation. All of these factors could affect the results of the study, according to J. Cermak (personal communication, August 30, 2009).

**Confidence, satisfaction, and knowledge.**

Foster et al. (2008) conducted a study to determine if simulation was effectively taught by nonfaculty registered nurses by measuring 3 specific outcomes: self confidence, satisfaction, and knowledge acquisition. They used Jeffries (2005) simulation framework that described how effective teaching and learning are dependent on interactions, expectations, and collaboration. These are blended or woven together in order to promote desired outcomes.

The design was a prospective, quasi-experimental, non-randomized, controlled study in 2 large metropolitan cities in the southwest United States. For the study, 64 nonfaculty RNs were recruited. Thirty four were lost to attrition. The remaining 30 RNs were educated in workshops for simulation training. The instruction (simulation content) was management of a patient with pulmonary embolism (PE). The control group consisted of junior nursing students that were provided lecture only on patients with PE. The undergraduate students in the experimental group (lecture & simulation) consisted of senior nursing students. The authors adapted the instrument "Student Satisfaction and Self-Confidence in Learning" from the National League for Nursing. This is a 13-item instrument designed to measure student satisfaction (five items) with the simulation activity and self-confidence in learning (eight items) using a five-point scale. Reliability was tested using Cronbach's alpha: satisfaction = 0.94; self-confidence = 0.87 (http://www.nln.org/research/nln_laerdal/instruments.htm). Using a sound, reliable tool gave more strength to the findings. Knowledge was tested after completion of the instruction in the control group, and after the simulation in the experimental group. The post test included a 10
item multiple choice test, created by the investigator. Demographics of the students were unknown to the reader, other than their year in college. Data was analyzed using SPSS 14.0 (Foster et al.).

The results from the study showed reported self-confidence (88%), satisfaction with the teaching methods (96%), and significant knowledge acquisition. Foster et al. (2008) found significant difference between the mean values on post test between the 2 groups. One of the self reported limitations of the study was there wasn’t opportunity to compare self-confidence results with the control group because it associated only with the simulation exercises (Foster et al.). The study also found that Nonfaculty RNs were effective as teachers using the HPS. This was determined through direct observation by the investigators of the study. Interestingly, this was mentioned as an aside. They focused on the details of the recruited RNs and paid little attention to the students who were placed in either the control or experimental group. They should have placed more emphasis on the latter considering their objective outcomes. The numbers of student participants were not known to each group.

There are a few factors that create potential bias in this study. The sample characteristics of 2 groups differed by 1 year of college; it is therefore fair to question whether the results are attributable to the simulation alone. It is an example of a systematic bias, one that is consistent or uniform. Another potential bias is the investigators determination of the nonfaculty RNs as effective teachers. Although there are advantages to using observational research, the data is subject to bias due to personal interest, emotions, attitudes and values of the observer, according to Polit and Beck (2004).
Best practices.

Bremner et al. (2006) studied the use of human patient simulators (HPS) and the development of best practices with novice nursing students. The purpose of the study was to determine the value of HPS methodology from the student perspective. It was a 2 part quantitative and qualitative study of students’ perceptions, reviewing individual responses and comments for general themes. Participants were 56 novice nursing students in Bachelor program; 41 students completed the questionnaire. The study used a questionnaire format after instruction that looked at 4 areas: teaching/learning, realism of the simulator, the student’s confidence, and the limitations of using the HPS method for instruction.

Part I used a Likert scale to answer five questions. Part 2 asked for comments in written form after completing their clinical experience. It provided an extensive literature review and described the successful use of the HPS. The review described the benefits of using HPS technology such as risk free method of skill development, a way to the prevention of errors, the development of expert reasoning, and the benefit of evaluating student performance.

Results indicated that 68% of the participants found that HPS should be a mandatory part of their education; 61% found to have increased confidence with assessment skills; 42% found that HPS reduced stress related to their first clinical day; 24% found the session very realistic; and 22% said there wasn’t enough time to work with the simulator. The study was limited because of the small number of students, and unable to determine if the questionnaire was a reliable tool.

Bremner et al. (2006) stated that the results of the study established a foundation for best practices related to using the HPS method. For example, a “debriefing session after each HPS experience” (p. 173) is listed in a table under recommendations for best practice. Debriefing is an
important part of a simulation experience (Jeffries, 2005; Lasater, 2007; Henneman & Cunningham, 2005), but is not mentioned within the study. It is difficult to determine how they came to this conclusion based on their results.

Clinical judgment.

The desired outcome of simulation education is the transfer of knowledge to the clinical setting. Lasater (2007) wanted to determine the effects of high fidelity simulation and the development of clinical judgment from the students’ viewpoint. Lasater used a retrospective, observational study, with 39 participants, placed in focus groups. Students at Oregon Health & Science University (OHSU) School of Nursing had simulator sessions 2 mornings per week instead of 1 clinical day in the winter term of an adult nursing care course. This study’s aim was to explore the effects of simulation on the students’ clinical judgment. Discussion sessions were videotaped. Researcher reviewed tapes multiple times, identifying primary themes. Lasater found the following:

- Assessment and reassessment were key to successful clinical judgment
- The simulations helped to fuse the theory from previous classroom lectures and readings
- Simulations required students to think for themselves and intervene accordingly
- Students found that actively working through the issues helped to integrate all of their learning
- Students wanted more feedback from the instructor

The Lasater Interactive Model of Clinical Judgment Development (Lasater, 2007) is a fusion of essential characteristics that evolve over time. Refer to Figure 1. It is helpful as a defining way to present the development of clinical judgment. This is not fully developed as a new graduate nurse. Strong clinical judgment is a common trait of critical care and emergency nurses. It is also a necessity.
Figure 1 The Lasater Interactive Model of Clinical Judgment Development

Note. This model was developed by Dr. Lasater, a professor at the school of nursing in Oregon Health and Science University. Adapted from "High Fidelity Simulation and the Development of Clinical Judgment: Students’ Experiences", by K. Lasater, 2007, Journal of Nursing Education, 46, p. 270. Reprinted with permission of the author (personal communication, March 16, 2010).

Dillard, Sideras, Ryan, Carlton, Lasater, and Siktberg (2009) encouraged students to use journals and reflect on their own decision making during simulation clinical practice. These reflections demonstrated their level of clinical judgment. Dillard et al. described a developing level of clinical judgment by a students’ “ability to notice deviations from the expected pattern, focus priority assessments, seek guidance appropriately, and respond in a well-planned manner” (p. 102). Lasater (2007) reported that patient simulation provided an experience that models
Using simulation

confidence, skill, and experience; and these elements facilitated the development of clinical judgment. Nurses must possess clinical judgment in order to provide competent complex care.

*Critical thinking.*

Scherer et al. (2003) stated that “the heart and soul of critical thinking acquisition is practice” (p. 332); and it is best practice and repetition that leads one to logical analysis. What better way than with simulation? Ravert (2008) studied the effects of patient simulator sessions on critical thinking. The purpose of the study was to determine the difference between 3 groups of Bachelor of Science nursing students and critical thinking. Group 1 participated in case scenarios using HPS; group 2 participated in small group discussions on case scenarios; Group 3 served as the control group that followed the regular education program. A pretest-post test research design was used. 64 undergraduate BSN students in first medical surgical nursing course, enrolled in private university. Due to attrition, only 28 students completed the study. Demographics were averaged as follows: nearly all white females, aged 21 to 25, GPA 3.65, with participants having completed only 1 semester of the nursing program. Critical thinking was assessed twice using the 75 item California critical thinking disposition inventory (CCTDI), using a 6 point Likert scale. The CCTDI is to assess critical thinking in college students based on the expert consensus characterization of the "ideal critical thinker" articulated in the APA Delphi Report (http://www.insightassessment.com/9test-cctdi.html).

The results indicated all groups had a moderate to large effect size in critical thinking scores. Their reported results were confusing to the reader. There was limited power to detect group differences because of the small number of participants; therefore, Ravert found no statistically significant difference between the 3 groups. A power analysis would have been helpful in order to interpret the accuracy of the nonsignificant results (Polit & Beck, 2004).
Ravert (2008) argued that educators believe that simulation experiences will improve students' critical thinking (CT), but, it is an ingrained trait that may change little over time. Lasater (2007) found that new nurses are often not prepared for and do not possess the critical thinking required for the complex roles of the profession. Patient simulations brought cohesiveness to physical assessments and theory learned from previous classroom lectures and readings. Ravert suggested a study replication with a large, diverse sample population, including the use of a more appropriate instrument that focused and measured concepts related to nursing.

*Nurse residency program.*

The nursing shortage has forced facilities to develop cost effective, creative programs to attract, retain, and support staffing in critical care, especially in the emergency department. Winslow et al. (2009) discussed strategies such as “grow our own” referring to scholarship programs designed to assist paramedics in obtaining their nursing license. Other strategies included nurse internships (Valdez, 2008), computer training modules (Zekonis & Gantt, 2007), and ED fellowship programs (Patterson et al. 2009).

Beyea et al. (2007) described a program evaluation of a nurse residency program for competency development. This 12 week program for new graduate nurses utilized HPS and took place at Dartmouth Hitchcock Medical Center with 3 core structures: didactic presentations, weekly simulation case scenarios designed for competency assessment, and clinical time with a qualified preceptor. The number of nurse residents in the program have varied; the initial number in the program, n=42, and have ranged from 8 to 27. The findings were described as preliminary due to the low number of participants, but ongoing evaluation continued with expected larger numbers of nurse residents.
Retirement strategy.

Ackermann, Kenny, and Walker (2007) designed and developed a simulator program called “The Bridge to Practice Program” (BPP) at Vassar Brothers Medical Center in Poughkeepsie, New York. They used it as a retention strategy and it was implemented to augment orientation of the new nursing staff. Simulations were implemented during their second week of orientation. Multiple patient problems could occur simultaneously which would require the nurse to synthesize the information. Simulator program objectives were to assist the new graduate nurses in critical thinking, specifically addressing prioritization and time management. Ackermann et al. focused on the importance of decision making skills, incorporating the nursing process from assessment through evaluation. During these simulations, nurses would receive a report on their ‘patient’ and the nurse would be expected to prioritize patient care, respond to a scenario, and document accordingly. Each learning session was concluded with a group discussion.

Program evaluation was simple. They used open ended questions, looking at the positive or negative experiences had, and determining how the simulation facilitated learning. Ackermann et al. (2007) self reported that the program had maintained a high level of staff nurse retention. Other than open ended questions, their evaluation was limited and did not capture job retention. This may not be feasible. One nurse remarked that she would “never forget a severe hypoglycemic episode” (p.137). This comment demonstrated the connectedness of retaining and understanding something through practice. However, full comprehension of any matter in acute care is achieved by accumulation, integration, and synthesis of learned knowledge (Rauer, 2004). Suggestions from faculty for program creation was outlined as followed: keep it simple, allow for ample time, and ‘practice, practice, practice.’ The latter is significant to make the
simulation more realistic and to increase comfort levels of everyone involved, according to Ackermann et al. (2007).

**Advantages and Disadvantages**

There are several advantages and challenges when deciding to use simulation as part of a teaching strategy according to Rauen (2004). Refer to Table 1 for a comparison.

<table>
<thead>
<tr>
<th>Advantage</th>
<th>Disadvantage</th>
</tr>
</thead>
<tbody>
<tr>
<td>No harm to patient safety</td>
<td>Simulator and maintenance is expensive</td>
</tr>
<tr>
<td>Action can be paused for reflection and review</td>
<td>Technical support must be met</td>
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<tr>
<td>Interactive learning with immediate feedback</td>
<td>Requires large physical space for effectiveness</td>
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<tr>
<td>Practice problem solving, critical thinking skills</td>
<td>Performance anxiety of faculty and learners</td>
</tr>
<tr>
<td>Leadership and communication skills</td>
<td>Faculty preparation can be lengthy</td>
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<td>Confidence and team building</td>
<td>Accommodates only small groups of learners</td>
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<tr>
<td>Learner focused, not instructor focused</td>
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<tr>
<td>Repetition allows for several approaches</td>
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<tr>
<td>Sessions can be videotaped</td>
<td></td>
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<tr>
<td>Mistakes can occur and be corrected</td>
<td></td>
</tr>
<tr>
<td>Learning from others’ successes and mistakes</td>
<td></td>
</tr>
<tr>
<td>Excellent bridge to clinical practice</td>
<td></td>
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</tbody>
</table>


**Additional Research**

The majority of the research indicated that HPS has many benefits as an educational technique for the instructor and the learner. Simulation allows for synthesis and requires the learner to “think it through to conclusion”, according to Rauen (2004). As nurses, it is important
to have strong clinical judgment, but the literature questions whether the critical thinking required for practice is an ingrained trait. Fostering these skills in the new graduate nurse is desired for optimal patient outcomes. These are essential skills that are difficult to teach; ones that require an innovative approach. More research is needed in this area.

Further research is needed to study the effectiveness of simulation as it relates to role transition in the new graduate nurse. Also, more complete, in-depth program evaluations, similar to the BBP in New York (Ackermann et al., 2007), would be beneficial to determine the relationship between simulation use in clinical orientation programs and retention.

**Cumulative Summary**

There is no question that HPS is an effective technique that has been used for decades with many different applications. Simulation is valuable as a model for rehearsal, repetition, and reaction within a master-apprentice atmosphere. It removes any risk to the patient; a recurrent theme in the literature. HPS replaces the traditional practice standard of “see one, do one, teach one”, which is currently accepted for both nursing and medical education (Yaeger et al., 2004). The highlighted reasons to use simulation have well been explained. Most of the research used both lecture and simulation (in their experimental groups) and not simulation alone. The Chinese proverb 我听见 我忘记; 我看见 我记住; 我做 我了解。translated literal meaning is “I hear and I forget; I see and I remember; I do and I understand” (http://en.wikiquote.org/wiki/Chinese_proverbs). Learners gain understanding by doing themselves. The process of simulation is interactive and engages the learner. It is a process that focuses on the student learner and not the instructor. When students are actively engaged and interactive, the results are that they will have better understanding, have longer retention of the
information, and be more successful in evaluation, according to Lasater (2007). This can only lead to benefit for patient outcomes.
Chapter III Methodology

Introduction

There are many benefits that have been documented in the literature regarding simulation. The repetition allowed in simulation aids in increased problem solving skills, confidence levels, and teamwork in critical scenarios (Beya, von Reyn, & Slattery, 2007). According to Rauen (2004) simulation allows learners to function in an atmosphere that mimics and creates actual real-life clinical experience. As with any educational strategy, the case scenarios for simulation must be well thought and planned for by the instructor, according to Lasater (2007). This project will enhance participants’ knowledge base, especially critical thinking and reasoning. Additionally, it will also advance the graduate student’s experience in the development, conduct, and analysis of the capstone project. This educational project could be used in part to teach critical care content in the undergraduate curriculum at St. John Fisher College.

Method

In order to determine competency in cardiac care, a quasi experimental design method was used; similar to the design used by Brannan et al. (2008), and Foster et al. (2008). Competency is often the first goal of any educational project. Nurses were asked to voluntarily participate in this educational project: Simulated competencies in cardiac care and acute MI recognition.

Simulation provides the experience of decision making and critical thinking; skills that can be applied at the bedside to improve patient care and outcomes (Ackermann et al., 2007). For the purposes of this study, human patient simulation was used and programmed to depict a patient experiencing an acute interior or anterior wall MI, and then, participants would have to
recognize rhythms and intervene accordingly. The simulator was programmed to simulate changes such as cardiac rhythm, voice prompts and physiological changes such as nausea, vomiting, shortness of breath, and vital signs. They would intervene appropriately, as if they were in the ER. There were scripted programs for each type of MI. The patient simulator would “react” to medication administration, by becoming hypotensive after receiving nitroglycerin. Throughout this time, the investigator observed the nurse’s decision making in action; without any prompting or cueing during the scenario. The educational intervention was provided to all nurses and all received the same tests, educational lecture, and simulation for competencies. The lecture portion of the project focused on the care of the patient having a ST-elevation acute myocardial infarction (STEMI). The power point lecture was formatted and written by the graduate student, see Appendix A. The lecture portion of the project design integrated the requirements for Emergency Room (ER) care for patients with acute MI as outlined by the Institute for Clinical Systems Improvement (ICSI) guidelines (2008) *Diagnosis and treatment of chest pain and acute coronary syndrome (ACS)*. STEMI care improvements focused on the concept that time equals muscle (Crowther, 2008; Coughlin, 2008). The objectives for the lecture included this concept, along with nurses responding to acute MI with skill and knowledge. The objectives were written as follows:

- List causes of acute MI and define STEMI

- Describe the nursing management of:
  - anterior-wall MI (A-MI)
  - inferior wall MI (I-MI)

- Differentiate cardiac arrhythmias associated with acute MI and identify ECG patterns
Compare and contrast complications and treatment options of anterior wall and inferior wall MI

Discuss medications most commonly used in acute MI

The competency portion of the project design used simulated patient case scenarios to enhance the nurses’ knowledge base and to raise performance standards (competencies). Once the simulation was completed, time was allotted for debriefing activity. This design incorporated ideas from a simulator program for new nurse’s orientation by Ackermann, et al. (2007). They stated that the use of a patient simulator is objective and provides an excellent way to measure clinical competence within an acute care setting. A simulator program facilitates the use of critical thinking skills that can be used at the bedside to improve patient outcomes; allows for learning and remediation without a negative impact to a patient; improves clinical judgment and increases nurses’ confidence levels (Ackermann, et al., 2007; Beyea, et al., 2007; Bremner, et al., 2006; Ravert, 2008).

Research Question

Understaffing is commonplace in emergency departments across the country. New graduate nurses are used to fill these vacancies, but at what cost? They lack key skills, have little knowledge or insight, and potentially be ill prepared for these positions. Not all nursing students have critical care experiences. Some schools assign students to a critical care or emergency department rotation only if it is requested, and, they must be in good academic standing. This only deprives undergraduate nursing students of the chance to experience critical care and emergency nursing. The average cost of new graduate nurses’ ED orientation is between fifty to sixty thousand dollars (Personal communication, V. Hebda RN, MSN, February 1, 2010). If turnover rates of new graduates are high, this adds even more to the cost of orientation. The
dilemma of hiring staff results in a new dilemma of educating inexperienced and new graduate nurses. Patterson et al. (2009) discussed new graduate nurses' perceptions in the ED as “intimidating”, “working conditions made it difficult to provide safe patient care” and even new graduates felt inadequate staffing. Short staffing is the last reason to expedite the orientation of new graduates in any setting. This will just exacerbate the problem.

Global advisor bodies such as the IOM have described using simulators in the clinical setting as a way to improve patient care. Several studies have shown that simulation is an effective training tool in skill and knowledge acquisition. Many simulator programs are content specific. The focus of this educational project is to increase the knowledge base of inexperienced nurses in the ED on emergency care of the patient with MI. Specifically; this study seeks to determine if a high fidelity simulation exercise will increase competence in cardiac care in less experienced nurses in the ED.

**Design**

**Type.**

In this educational project, 4 inexperienced nurses from Thompson Health Emergency Department volunteered to participate in this pilot study. A pretest-post test research design was used in this study. The choice of design is most appropriate for this project because it is a measurement of change. A pretest-post test method can determine differences between groups and/or change within groups (Polit & Beck, 2004). The latter was the rationale used for this particular project because of its small number of participants. In a larger study, there could be a control and an experimental group.

**Sample.**

The participants were volunteer inexperienced nurses from Thompson Health ED, a small community hospital in Canandaigua, New York. An inexperienced nurse is defined by having
less than 3 years of critical care experience. The expected sample size is approximately 5-8 nurses. A total of 7 nurses volunteered, 6 female, 1 male; 2 dropped due to "personal reasons", one was excluded because she had more than 5 years of ED experience. Inclusion criteria were simple: ED nurses with less than 3 years of critical care. This number equaled to twenty percent of the staff mix. The sample was considered a convenience sampling, according to Polit and Beck (2004) because these participants were most readily available as the investigator is currently a staff nurse in the ED at Thompson. Because of the small sample size, this could be considered a pilot project; small scale versions are sometimes done in preparation for larger ones (Polit & Beck).

Setting.
The project took place at St John Fisher College, on the evening of February 18, 2010. The lecture was presented by the investigator. The simulation took place in the college simulation laboratory. The lab uses a full body mannequin that is a high-functioning robot. It can simulate different conditions, including different types of MIs. It is run by computer or PDA. A graduate student assistant ran the computer, while the investigator observed the students.

Instruments.
There was not a tool readily available that would be a reliable measure of information learned from the lecture presentation and simulation intervention. So, it was decided to develop an instrument that fit the learning objectives. It was best thought to keep the testing simple but structured; limiting it to a 10 item multiple choice test. Refer to Appendix B for the pretest/post test questions.

A classical tool that is used in critical care nursing is the Basic Knowledge Assessment Test (BKAT), according to Toth (2006). It is a test of knowledge that is beyond the level needed
for RN graduates. There are many different forms such as the one used for emergency
department (ED) nursing or ED BKAT. An example question from this test is as follows
(http://www.bkat-toth.org/ED-BKAT_Sample_Qs.html):

Question 2: The classical ECG change in acute myocardial infarction (AMI) is a:

1) wide Q wave
2) ST segment elevation
3) frequent PVCs
4) prolonged P-R interval

The BKAT instruments had a reliability coefficient ranging from 0.81 to 0.90 demonstrating
reliability and internal consistency, according to Toth. Of note, the BKAT tools are often used
with a pretest post test design (Toth). For the project, the created tool resembled the ED BKAT
in the types of questions asked, and the depth of information required. In order to control for
internal validity, several senior ED nursing staff members at Thompson Health were asked to
review the test. Their average length of years of ED nursing was greater than 16 years. Based on
their expert opinions, the tool created was reliable and "fair".

Procedures

The project was presented in an ED staff meeting at Thompson Health. Individuals who
met the criteria were contacted by email. Contacts were made by the investigator. This was done
prior to the formal invitation because of scheduling. The investigator met with the time
committee at Thompson, and simultaneously, arranged a date to coincide with the simulation
schedule at St. John Fisher College. The graduate student provided a formal invitation letter that
was sent to participants in January 2010. Individual consents were obtained; see Appendix C.
After several discussions with the time committee at Thompson and the director of the
Using simulation lab at the college, a date was set for February 18, 2010. The length of their commitment to participate in the project was one evening for approximately 3 hours. The entire project would be concluded during this time.

The investigator (and graduate assistant) spent time learning from the simulator director in the simulation laboratory for training purposes. The investigator scripted patient scenarios of acute MIs, using real examples from patients seen in the ED at Thompson. Scenario development is of focal importance and an integral role in HPS. How was the simulation created? A scenario was written from the triage information of actual ED patients that arrived with complaints of chest pain. Participants were told the history of the patient, medical history, allergies, and current medications. The scripted scenario was part of the information that was inputted into the simulator's computer. Vital signs were displayed on the monitor along with telemetry rhythms and the simulator was started. Copies of 12 lead electrocardiograms (EKGs) were given to participants once they indicated that the EKG was obtained. Participants were initially oriented to the "patient", and then were able to interact with the simulator. In the session, they were asked to perform as they would in the ED and the investigator tried to create a scenario as real as possible. The investigator observed the group during the simulations.

**Human Subjects' Protection**

This study was approved by the Institutional Review Board (IRB) at St. John Fisher College in Rochester, New York. The investigator received notification on November 30, 2009, that the IRB approved the Expedited Review project, "An educational project: Simulated competencies in cardiac care and acute MI recognition." Documented within this proposal was a letter of agreement of project permission and support, signed by the Emergency Department Administration at Thompson Health in Canandaigua, New York. The approved proposal #1043-
Using simulation

111909-06 can be retrieved from the IRB. Refer to Appendix D for the signed letter of agreement.

Reliability and Validity within Study

Tool reliability comes in different forms, but by definition it is the extent to which a tool delivers the same result consistently. Nichols (2007) stated that reliable tools augment the power of a study to derive significant relationships or differences that truly exist in the group being studied. For this study, however, the tool was created by the investigator. There was an attempt to create a simile of the ED-BKAT, which had a Cronbach’s alpha from 0.81 to 0.90, which is above the acceptable criteria for homogeneity.

There are several types of tool validity. In general, validity is the degree to which the research tool measures what it was intended to measure (Nichols, 2007). Polit and Beck (2004) described face validity as to whether the tool looks as though it is measuring the appropriate construct. Face validity is not considered strong evidence because it is based on subjective observation. Face validity should only be claimed if the author or originator is an expert in emergent cardiac care. The author has over twenty two years of experience as a nurse, with 12 of those in emergency care; she is considered an expert in cardiac emergency nursing care.
Chapter IV Analysis

Data Analysis

The pretest and post test consisted of 10 multiple choice questions with four possible answers, and only one correct answer. Although there was not a time limit for testing, the process took approximately 15 minutes. The average pretest score was sixty percent; the average posttest score was eighty percent. As stated in the original project proposal, no individual results would be identified. Therefore, each question shows the percentage of correct responses. Refer to Table 2 for pretest/post test results.

Table 2 Testing results

<table>
<thead>
<tr>
<th>Question</th>
<th>Topic</th>
<th>Pretest results</th>
<th>Posttest results</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Acute MI is the most likely diagnosis in patients with chest pain and EKG changes such as:</td>
<td>Definition of STEMI</td>
<td>75%</td>
<td>50%</td>
<td>-25%</td>
</tr>
<tr>
<td>2. Beta adrenergic antagonists such as Metoprolol are used early in treatment of acute MI because:</td>
<td>Pharmacology: reduction of myocardial oxygen demand</td>
<td>0%</td>
<td>75%</td>
<td>75%</td>
</tr>
<tr>
<td>3. Nitroglycerin can cause hypotension and must be used in extreme caution in:</td>
<td>Pathophysiology of inferior wall MI</td>
<td>25%</td>
<td>75%</td>
<td>50%</td>
</tr>
<tr>
<td>4. In acute MI, the nurse should expect that the provider may order all of the following except:</td>
<td>Contraindications of calcium channel blockers</td>
<td>25%</td>
<td>25%</td>
<td>0%</td>
</tr>
<tr>
<td>5. A 54 year old female patient comes into the ED complaining of chest pain. After triage, the first step the nurse should take in caring for this patient is:</td>
<td>Importance of rapid EKG obtainment and assessment</td>
<td>75%</td>
<td>100%</td>
<td>25%</td>
</tr>
</tbody>
</table>
6. True or False: Anterior wall MI results from occlusion of the right coronary artery.  
Anatomy and pathophysiology of Anterior wall MI  
50%  75%  25%

7. ECG changes that reflect Inferior wall MI show damage with indicative changes in leads:  
EKG lead interpretation of Inferior wall MI  
100%  100%  0%

8. Occurrence of complete Heart Block (HB):  
Prognosis of complete HB in acute MI  
75%  75%  0%

9. The annual prevalence of acute MI in the United States is:  
Statistical prevalence  
100%  100%  0%

10. What is the drug that alone has one of the greatest impacts on the reduction of MI mortality?  
Importance of aspirin use  
50%  100%  50%

It was surprising that the results for question 1 showed a negative change. The topic for question 1 was to define STEMI. During the lecture, STEMI was well defined. There may have been confusion because the two of the answers were worded “ST segment elevation”, even though STEMI was spelled out as ST segment elevation myocardial infarction in the PowerPoint. The wording could have been changed to STEMI, instead of ST segment elevation, for consistency and clarity. The results indicated that no one answered the second question correctly on the pretest. Referring to question number 4, the participants were asked, “In acute MI, the nurse should expect that the provider may order all of the following except:”, the choices were A) Nifedipine, B) Lasix, C) Aspirin, or D) Lopressor. Considering only twenty five percent of the group chose the correct answer on both tests, this may indicate that the question created confusion, or that the participants did not read the word “except”. If question four was thrown out or removed, the averages did not change significantly. For question number 5, it is assumed that the patient is conscious, breathing and has stable vital signs. Emergency assessment always
starts with ABCs or airway, breathing, and circulation. An EKG would not be done first if there
was any compromise in the primary assessment.

Debriefing

After the case scenarios were played out, several points were discussed in an informal
debriefing group session. The following were attributes of the discussion that could be used in
almost any critical care debriefing discussion.

- Situation awareness and patient response
- Recognition of rhythm changes
- Anticipation and management of hypotension
- Importance of clear communication with a team approach
- Correct interpretation of 12 lead EKGs

Evaluation Methods

Competency was evaluated using a checklist created by the investigator. Refer to
Appendix E. Since there was a small sample, participants were grouped in 2 groups of 2. One
first simulator group received IWMI content; the second simulator group received AWMI
content. The checklist was the same for both groups. Each group successfully demonstrated each
step of acute MI recognition, nursing care, and treatment. They were able to identify and
correctly interpret the 12 lead EKG, and verbally recognized changes in cardiac rhythms.
Participants were not individually tested; this could be seen as a weakness of the project.
Chapter 5 Interpretation and Discussion

Limitations

This pilot project was conducted with a very small sample size. Because of this fact, findings were not able to be generalized. Several benefits could come from using a larger sample. First, the results could be generalized to other community hospitals that shared a common geographical size compared to Canandaigua, New York. Secondly, a larger sample would allow for an experimental and a control group; determining differences between these groups. In this study, the twenty percent difference between the pretest and post test results cannot be said that it was from simulation alone, but from both lecture and simulation. If we truly want to determine the former, the project would require a control group.

Throughout the literature, positive attributes occur when simulation is used. Students are more confident, have increased knowledge, and demonstrate higher levels of clinical judgment. Repeating this project on a larger scale, it would be important to incorporate an attitudinal survey to determine how participants perceive themselves. Do they feel more confident and competent in STEMI care? Why or why not? This would allow for consistency with the simulation methods used and the evaluation: both focused on the learner and not the instructor.

Implications

One of the most important lessons learned when using simulation as a teaching method is it must be well planned. Both teacher and student can have performance anxiety. Rehearsal is beneficial and there is improvement with practice. There must be predetermined goals for the simulation scenario and a structured debriefing. If using a competency checklist, having a well qualified assistant would be helpful. According to Jeffries (2005), effective instruction and learning using simulation are dependent on teacher and student roles and expectations. Effective
teaching occurs when students combined what they have learned. Skills are mastered and scenarios replayed for correction and reinforcement. When students make "essential connections" and are able to apply the skills learned in class to real life, then what they have learned is effective, according to Dillard et al. (2009). This cannot be fully achieved in one simulator session.

During the debriefing phase, an unexpected benefit occurred. The group discussed the practice of STEMI care in great detail. One of the complaints discussed was not having all of the medications required for STEMI care in one "easy access" space in the pyxis at work (in the ED at Thompson). Discussion ensued about having a "STEMI kit" that would included all the necessary medications required for STEMI care. As a group, it was felt it would save time (and potential affect patient outcome) if the medications were all in one drawer location in the medication room pyxis located in the ED. This idea was taken back to the ED administration at Thompson, and is currently being reviewed by the directors of pharmacy and the emergency department. A policy change will occur in the near future.

Competence

One of the assumptions of nursing orientation of new graduate nurses (GNs) implies that after completion of the training period, competence has been achieved in all skills required for successful clinical practice, according to Yaeger et al. (2004). What does it mean to be competent? Epstein and Hundert (2002) defined professional competence as the "habitual and judicious use of communication, knowledge, technical skills, clinical reasoning, emotions, values, and reflection in daily practice for the benefit of the individual and community being served" (p. 226). It takes time to develop this level of competence and this should not be the
expectation of the new graduate after finishing an orientation program. This level of competence is basic and is a stepping stone towards successful clinical practice.

Teaching with a clinical scenario through simulation is truly a specialty. It is useful in the development of professional competence. Although Nonfaculty RNs can successfully teach using simulation, it is a process that requires advanced training. Importance of proper preparation cannot be overstated. Specialty courses are offered for techniques to improve each phase of simulation. For example, Centers in California offer training to provide beginning to advanced instruction in the use of simulation technology (http://www.csuchico.edu/nurs/SimCenter/events.htm). Advanced simulator training is important to improve outcomes. These training sessions focus on the phases of simulation. Designing scenarios is a process. One class teaches fundamentals of how to evaluate the impact of scenario design. Others included ways to use debriefing to link simulation events with clinical application improvement. Advanced training supports the fundamental ideals of simulation: how to create the best connection for the learners.

Recommendations

The preparation of the new graduate and their competence in their new roles in critical care should include the use of HPS. This could be incorporated into orientation to help narrow the distance between clinical preparation and their new role as a graduate nurse. After a simulation experience, nurses could write about their reflections on the critical care material presented. Preceptors could help by pointing out their strengths and weaknesses on each area of learning. This evaluation could direct learning and help to modify learning goals. However, there lacks a standardized curriculum (Bremner, et al. 2006) and evaluation method for learning using...
Using simulation


There is work to be done in bridging the gap between educational roles and prospective employers. After synthesizing the literature, it was found that more research is needed to study the effectiveness of simulation as it relates to role transition in the new graduate nurse, especially in critical care. In an ideal setting, critical care experience should be learned in a supportive and safe environment across a continuum. This suggests the use of simulation that is well supported in the literature. This also suggests that obtaining critical care experience starts in undergraduate education and continues on into critical care employment. Embedding simulation into an educational program or a hospital critical care orientation program requires the right mix of traditional learning, simulation, and clinical time (Gaba, 2004). Employers cannot assume that GNs have critical care experience. Many schools and universities offer complex acute care or critical care courses, but many are not required for degree completion. This has inference for both faculty and educators and on prospective employers. This critical care initiative would impose more collaboration between hospitals, health care institutions, colleges, and universities.

Summary

What do we know about simulation? It has been used for decades to perfect skills in a variety of controlled settings with a safety component. The upshot is that not only does one need proof that simulation is effective as a teaching strategy, but that patient outcomes are benefited with its use. The evidence base is lacking whether clinical outcomes are improved by HPS educational methods (Hravnak, et al. 2007). Additional research would be beneficial and help to fuse the many positive learning aspects of HPS.
References

American College of Cardiology (2009) (http://www.acc.org/)


American Heart Association (2009) (http://www.americanheart.org/)


Center for Disease Control (2009) (http://www.cdc.gov/)


Appendix A: Pretest/post test

1. Acute MI is the most likely the diagnosis with patients in chest pain and ECG changes such as:

A. 1 mm ST segment depression in leads V₁ through V₄.
B. Q waves in leads I, aVF, and aVL.
C. 2 mm ST segment elevation in leads II and III.
D. T wave inversion in leads I, aVL, V₅, and V₆.

2. Beta adrenergic antagonists such as Metoprolol are used early in treatment of acute MI because:

A. They help to reduce afterload by reducing the work of the heart.
B. It can be given PO or IV to increase myocardial oxygen demand.
C. It can help to reverse heart block.
D. It can be given PO or IV to reduce myocardial oxygen demand.

3. Nitroglycerin can cause hypotension and must be used in extreme caution in:

A. Anterior wall MI
B. Lateral wall MI.
C. Anterior-lateral wall MI.
D. Inferior wall MI.

4. In acute MI, the nurse should expect that the provider may order all of the following except:

A. Nifedipine
B. Lasix
C. Aspirin
D. Lopressor

5. A 54 year old female patient comes into the Emergency Department complaining of chest pain. After triage, the first step the nurse should take in caring for this patient is:

A. Administer oxygen at 3L NC per minute.
B. Insert an 18gauge IV, and obtain blood work simultaneously.
C. Obtain 12 lead ECG for interpretation.
D. Establish continuous NIBP, ECG, and O₂ saturation monitoring.
6. True or False: Anterior wall MI results from occlusion of the right coronary artery.
   A. True
   B. False

7. ECG changes that reflect Inferior wall MI show damage with indicative changes in leads:
   A. Leads II, III, aVR
   B. Leads II, III, aVF
   C. Leads I, II, aVL
   D. None of the above

8. Occurrence of Complete Heart Block:
   A. Does not occur in setting of inferior MI
   B. Usually progresses from less AV blocks, and is worse than Wenckebach.
   C. Is a grave prognosis in the setting of anterior MI.
   D. Both B & C.

9. The annual prevalence of acute Myocardial Infarction (MI) in the United States is:
   A. 500-700 thousand people.
   B. 700-900 thousand people.
   C. 1.2-1.5 million people.
   D. 1.3 million people, all were fatal.

10. What is the drug that alone has one of the greatest impacts on the reduction of MI mortality?
    A. Morphine
    B. Oxygen
    C. Nitroglycerin
    D. Aspirin
Appendix B Power Point Lecture

STEMI PROJECT

- This is an educational project to determine if a high fidelity simulation exercise will increase competence in cardiac care in less experienced nurses in the Emergency Department (ED).
- The project includes:
  - 45 minute lecture in cardiac care
  - followed by a high fidelity simulation exercise in STEMI care
  - Participants will be RN's from Thompson ER with less than 3 years of critical care experience
  - Evaluation: pre/post test and a practice simulation exercise

LECTURE OBJECTIVES

- List causes of acute MI and define STEMI
- Describe the nursing management of:
  - anterior-wall MI (AMI)
  - inferior wall MI (IAMI)
- Differentiate cardiac arrhythmias associated with acute MI and identify ECG patterns
- Compare and contrast complications and treatment options of anterior wall and inferior wall MI
- Discuss medications most commonly used in STEMI

VALUE

- In the US, 1.3 million cases of nonfatal MI were reported in 2006
- Incidence: 600 per 100,000 people
- Deaths: 500,000 to 700,000 from heart disease annually in the United States
- Greater than 5 million ER visits for chest pain

TIME EQUALS MUSCLE

- With the passing of every 30 minutes of ischemia, mortality increases by 8-10%

The ED nurse is at the forefront of early recognition of a patient presenting with a possible acute myocardial infarction (MI)

QUALITY INDICATORS

* Failure to rescue
  - The initial focus should be on identifying patients with STEMI

* An ECG within 10 minutes of ED arrival

* Percutaneous Coronary Intervention (PCI)
  - The goal for patients with STEMI should be to achieve a door-to-balloon time of within 90 minutes

PATIENT HISTORY

* History of present illness (HPI)
  - Chest pain and SOB
  - Nausea with and without vomiting
  - Diaphoresis or sweating
  - Syncope or near syncope
  - Elderly present with mental status changes, fatigue, syncope or weakness
  - Anxiety

  * As many as half of MI are clinically silent

CIRCULATION

* The left main coronary artery divides into the left anterior descending (LAD) artery and the left circumflex artery.

  * The LAD supplies blood flow to the anterior two-thirds of the interventricular septum, the anterior left ventricle, the lateral left ventricle, bundle of His, and bundle branches.

  * The left circumflex artery wraps around to the posterior wall of the heart and supplies blood flow to the right atrium, the papillary muscle in 45% of hearts, the atrioventricular node in 10% of hearts, and the lateral and posterior wall of the left ventricle.

  * The right coronary artery supplies blood to the right atrium, right ventricle, inferior left ventricle, and posterior interventricular septum.

  * The coronary veins deliver oxygen-poor blood to the right atrium.

LEADING CAUSES OF DEATH IN THE U.S.

In the United States, someone has a heart attack every 34 seconds

[http://www.cdc.gov/nchs/fastats/lead.htm](http://www.cdc.gov/nchs/fastats/lead.htm)

CORONARY ARTERY CIRCULATION

ACUTE CORONARY SYNDROMES

* ACS includes:
  - ST-elevation MI (STEMI)
  - Non ST-elevation MI (NSTEMI)
  - Unstable Angina

[https://nursingworld.org/ACOS/info564/article.pdf](https://nursingworld.org/ACOS/info564/article.pdf)
**PATHOPHYSIOLOGY**
- ACS is caused by secondary reduction in myocardial blood flow due to
  - coronary arterial spasm
  - disruption of atherosclerotic plaques
  - platelet aggregation or thrombus formation at site of atherosclerotic lesion

**CAUSES OF ACUTE MI**
- Most frequent cause is rupture of an plaque lesion within coronary wall
- Coronary artery vasospasm
- Ventricular hypertrophy
- Hypoxia
- Coronary artery emboli

**STEMI VS. NON-STEMI**
- **Non-STEMI**
  - Non-ST-elevation myocardial infarction
  - Partially blocked artery
  - Decreased blood flow to a portion of the heart
- **STEMI**
  - ST-elevation myocardial infarction
  - Completely blocked artery
  - No blood flow to a portion of the heart
  - Substantial risk of death and disability
  - Critical need for quick reperfusion
  - Restoration of blood flow by reopening the blocked artery

**READING THE 12-LEAD ECG**
- **T wave changes as MI progresses**
  - T wave changes as MI progresses
  - These five waveforms show the progression of an MI as reflected by the T wave.
  - Before infarction
  - Q wave
  - T wave
  - Q wave

**EKG IDENTIFICATION OF STEMI**
- Analyze shape of one QRS complex in each lead
- Find J point
- Look for ST or J point elevation (1mm)
- ST segment elevation (STEMI) must be present in 2 contiguous leads

**STEMI PROGRESSION**
- **Ischemia**
  - Produces symmetrically inverted T waves in the indicative leads and tall T waves in the reciprocal leads
- ** Injury**
  - Produces ST-segment elevation in the indicative leads and ST-segment depression in the reciprocal leads
- **Infarction**
  - Produces pathologic Q waves (waves that are 0.4 second wide or one-quarter of the R-wave height) in the indicative leads and tall R waves in the reciprocal leads.


**SUMMARY**
- ACS is caused by secondary reduction in myocardial blood flow due to various factors.
- STEMI versus Non-STEMI: STEMI refers to complete blockage of an artery with significant consequences, while non-STEMI involves partial blockage with lesser urgency.
- EKG identification of STEMI involves analyzing waveforms for specific changes.
- STEMI progression through ischemia, injury, and infarction is critical for timely medical intervention.

THE REALITY

- Not all STEMI patients call 9-1-1
  - 50% of STEMI patients present to their local emergency department (ED)
- "Walk-in" patients hinder:
  - Registration
  - Quick triage to electrocardiograms (ECG) for diagnosis
  - ECG privacy
  - Advance warning to activate hospital staff to prepare for reperfusion

**MI LOCATION AND ECG CHANGES**

<table>
<thead>
<tr>
<th>Location</th>
<th>Anterior wall</th>
<th>Lateral wall</th>
<th>Inferior wall</th>
<th>Posterior wall</th>
</tr>
</thead>
<tbody>
<tr>
<td>posterolateral</td>
<td>Left anterior wall (LAD)</td>
<td>Left circumflex</td>
<td>Right coronary artery (RCA)</td>
<td>RCA or left circumflex</td>
</tr>
<tr>
<td>anterior</td>
<td>V1 - V4</td>
<td>II, III, aVF</td>
<td>II, III, aVF</td>
<td>None, Posterior leads or right sided ECG</td>
</tr>
<tr>
<td>inferior</td>
<td></td>
<td></td>
<td></td>
<td>V4 - V6</td>
</tr>
<tr>
<td>posterior</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**INFERIOR WALL STEMI**

[Heart monitor chart]

**51 Y.O. MALE**

[Heart monitor chart]

**60 Y.O. MALE**

[Heart monitor chart]
REPERFUSION STRATEGY

- Have a well thought-out strategy that fits the patients' needs to the resources of your institution
- Communicate strategy to all care givers
- Minimize branch points/ decision points
- Empower decision makers
- Anticipate needs

http://www.americanheart.org/downloadable/heart/119705490421126255.pdf

BARIERS TO TIMELY REPERFUSION

- The patient
  - Failure to promptly recognize symptoms
  - Hesitation to seek medical attention
- Time to transport
  - Mandated delivery to the closest hospital, regardless of PCI capabilities
  - Long transport in rural areas
- Decision process on arrival
  - Clot-busting drugs vs. PCI
  - Off hours
  - Transfer to PCI facility
- Time to implement treatment strategy
  - Procedural factors
  - Team assembly

2008 DOOR TO CATH LAB

STEMI 2008

2009 DOOR TO CATH LAB

STEMI 2009
CAUSES/DELAYS
- MI completed on arrival, cards consulted 1st
- VF arrest at FFTH, successfully treated
- Required resuscitation due to hypotension and bradycardia
- Medically managed due to age and dementia
- Some VT
- Cards consulted by phone 1st
- Mis-diagnosed, patient sent to waiting room
- Initial STEMI for new FFTH MD, learning curve
- Mis diagnosed, wrong treatment

DOOR-TO-BALLOON TIME VS. MORTALITY

<table>
<thead>
<tr>
<th>Time (min)</th>
<th>Mortality (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-40</td>
<td>4.2</td>
</tr>
<tr>
<td>41-90</td>
<td>4.6</td>
</tr>
<tr>
<td>91-120</td>
<td>5.1</td>
</tr>
<tr>
<td>121-150</td>
<td>6.7</td>
</tr>
<tr>
<td>151-180</td>
<td>8.5</td>
</tr>
</tbody>
</table>

ACUTE MI
- CP
- SOB
- Pain radiation
- Nausea, vomiting
- Sweating
- Syncope
- Anxious

INFERIOR WALL MI
- Affects the right coronary artery (RCA)
  - Supplies blood to the right atrium, right ventricle, inferior left ventricle
- Leads II, III, aVF
- Vagal stimulation: bradycardia or AV blocks
  - 2nd AVB type I
- Use nitrates with extreme caution
- Classic symptoms:
  - Nausea and vomiting
  - SOB

http://hubpages.com/Graphics/angiographyofartery.png
ANTERIOR WALL MI
* Affects the left anterior descending artery (LAD)
  - Supplies blood to the anterior 2/3s of the interventricular septum, the anterior left ventricle, the lateral left ventricle, bundle of His, and bundle branches

* Leads V_{6}, V_{7},

* Classic symptoms:
  - Deep substernal cp, aching or pressure
  - Pain radiation-left arm, back, jaw, or neck

* Most occur within 3 hours of awakening *

* Arrhythmias: 2nd degree AVB, VT/VF

* In the setting of anterior wall MI, bradycardia or heart block is very poor prognostic sign

MI COMPLICATIONS
* VT/VF 5-15%
* Sinus bradycardia and AV Blocks
* Mitral regurgitation *
* Pericarditis 10%
* Right Ventricular Infarcts (RVI) 40%
* Ventricular aneurysms and wall motion abnormalities 5%
* Extension/reinfarction 5-25%
* embolic events 2%
* LVT/Cardiogenic shock* 1-13%
  - Killip classification I-IV


PERICARDITIS
* Occurs in 10-20% of post-AMI pts
* More common with transmural MI
* Usually occurs 2-4 days after AMI
* Pericardial friction rubs
* Pericardial effusions may also be present

RIGHT VENTRICULAR INFARCT (RVI)
* Usually seen as a complication of an inferior MI
  - Approximately 30-50% of inferior wall MI involve the RV
* Patients with RVI become very dependent on their preload to maintain cardiac output
* Important sign is JVD
  - (+) JVD, hypotensive, clear lung sounds

* RVI is associated with significant increase in mortality and cardiovascular complications

AMI VS. MI COMPARISON
* Leads V_{6}, V_{7},
  - Crushing CP with radiation
* Arrhythmias
  - 2nd AVB type II
  - Complete heart block
  - VT/VF
* Prognosis
  - New BBS indicates larger area infarct
  - Bradycardia or heart block is poor prognostic sign

* Leads II, III, AvF
  - Nausea, vomiting
  - SOB
* Arrhythmias
  - 1st AVB
  - 2nd AVB type I
* Prognosis
  - Complicated by RVI (30-50%)
COMPARISON

- First degree and Mobitz I (Wenckebach)
  - more common with inferior AMI
  - intermittent during the first 72 hrs after infarction
  - rarely progresses to complete block or pathologic rhythm
- Mobitz II
  - usually associated with anterior AMI
  - does progress to complete heart block

HEART BLOCK

- Complete Heart Block
  - occurs in setting of inferior MI
  - this form is usually stable & should resolve
  - Mortality is 15% in absence of RV involvement & increases to 30% when RV is affected
  - Complete block in setting of anterior MI results in grave prognosis

RECIPIROCAL CHANGES

- Reciprocal ST segment changes predict:
  - a larger infarct distribution
  - an increased severity of underlying CAD
  - more severe pump failure
  - a higher likelihood of cardiovascular complications
  - increased mortality

BUNDLE BRANCH BLOCK

- New LBBB
  - occurs in 5% of pts with AMI
  - associated with high mortality
  - represents larger area of infarction

A LIFE-SAVING INITIATIVE

- National, community-based initiative
- Goals
  - Improve quality of care and outcomes in heart attack patients
  - Improve health care system readiness and response

WHAT DO WE DO NOW?

http://www.americanheart.org/presenter/jsp/siteHTTPS/identifier-3064526
PCI

- Standard is a “door to balloon” time of 90 minutes
- PCI can successfully restore coronary blood flow in 90 to 95% of MI patients
- PCI definitive advantage over lytic therapy

STEMI TREATMENT

- Initial evaluation with Vital Signs (VS)
  - 12 Lead ECG with interpretation
  - Establish IV access, with 18 gauge
  - Establish continuous ECG monitoring
  - Continuous NIBP, O2 sat monitoring
- Blood work: CBC, Chemistries, cardiac markers
- Aspirin 325mg- chewed, or determine status
- Oxygen 3L NC
- Complete cardio-pulmonary assessment
- Pain management
- 2nd IV access
STEMI by MD - MD notifies cath lab
- Begin to prepare for ambulance transfer

CODE STEMI

- Prehospital (or ED) activation of STEMI Team
- Defined roles for ED MDs, RNs, Techs
- Cardiology tech, Nursing Supervisor
- Goal <=30 min. stay in ED for evaluation
- STEMI pharmacy box with all needed medications to expedient patient care
- Labs, XR, etc only if time permits
- No infusions unless medically necessary

ASPIRIN

- Dosed at 160 mg to 325 mg; administered immediately to patients with MI signs and symptoms
- Prevents additional platelet activation
- Interferes with platelet adhesion / cohesion
- Benefits all patients with acute coronary syndromes (ACS)
- Greatest impact on reducing MI mortality
**PLATELET ADHESION**

![Diagram of platelet adhesion](image)

**BETA BLOCKERS**

- Metoprolol or Esmolol
  - Reduces ventricular ectopy
  - Slows progression of infarction
  - Decreases myocardial oxygen demand

  **Relative contraindications:**
  - HR < 60 bpm
  - SBP < 100 mm Hg
  - Moderate or severe LV failure
  - Signs of shock
  - PR interval > 0.24 second
  - Second- or third-degree AV block
  - Active asthma, or reactive airway disease

  [Source](http://www.acc.org/guidelinesclinical/guidelines/stem/guidelines/clinicalrecognition. html#3.1.4)

**NITROGLYCERIN**

- Recommended for patients with MI, congestive heart failure, persistent ischemia, hypertension, or large AMI
- The primary benefit is coronary artery vasodilation
- Reduces cardiac preload, afterload, and the myocardial oxygen demand
- Reversal of the vasocircstriction associated with thrombosis and coronary occlusion
- Common side effects: Low BP, headache, and nitrate tolerance
- Extreme caution while administering to patients with AMI

[Source](http://www.clevelandclinicmeded.com/medicalpubs/diseasemanagement/cardiology/acute-myocardial-infarction)

**PLAVIX (CLOPIDOGREL)**

- Binds to platelets
- Inhibits platelet activation
- Loading dose: 300mg vs. 600mg
- Daily dosing 75mg

[Source](http://www.ercm.org/publications/manothenaps/accp/2006/jwh_accp2006.pdf)

**MORPHINE**

- Morphine sulfate
- 2 - 4 mg IV with increments of 2 - 8 mg IV (repeated at 5- to 15-minute intervals) is the analgesic of choice for management of pain associated with STEMI
- Pain relief is important in the early management of the patient with STEMI
- Under-dosing in the ED

[Source](http://www.acc.org/guidelinesclinical/guidelines/stem/guidelines/clinicalrecognition. html#3.1.4)

**AMIODARONE**

- Amiodarone 150 mg over ten minutes
  - Using a 20 cc syringe dilute with Normal Saline and administer 2 ml/min
  - If arrhythmia is suppressed, initiate an:
    - Amiodarone Drip 1 mg/min
    - 100 mg into 100 ml NS

[Source](http://www.ercm.org/publications/manothenaps/accp/2006/jwh_accp2006.pdf)
INTEGRILIN
- Unstable angina
- NSTEMI

ER COMPETENCIES
- 12 lead interpretation
- Recognize
  - Myocardial injury
  - Myocardial ischemia
  - Myocardial infarction
  - Electrolyte imbalances

SIMULATION?
- Facilitates the use of critical thinking skills
- Improves clinical judgment
- Interaction and involvement engages the student; results in increased cognition.
- May increase confidence levels
- Learning and remediation without risk to a patient

SIMULATION
- Replaces the practice of
  "see one, do one, teach one"
- Simulation values a model of rehearsal, repetition, and reaction within a master-apprentice atmosphere
- Eliminates any risk to the patient

I hear, I forget;
I see, I remember;
I do, I understand.
-Chinese proverb

ANY QUESTIONS?
ROLLER COASTER SIMULATION
REFERENCES


REFERENCES

Agency for Healthcare Research and Quality (AHRQ) retrieved at http://www.ahrq.gov/research.htm


Appendix C: Consent-Invitation Letter to Nurses

Dear __________________:

As you know, I am a graduate student at St. John Fisher College in the Family Nurse Practitioner track at the Wegmans School of Nursing. In order for me to fulfill my degree requirements, I am completing my capstone project. I am working under the guidance of Dr. Dianne Cooney-Miner, and this project will be conducted at St. John Fisher College. My educational project is to determine if simulation is beneficial to increase competence in cardiac care in nurses with less than 3 years of experience in the Emergency Department (ED).

I would like to invite you to participate in my project at St. John Fisher College on (date) __________. I will be giving a 45 minute based lecture in cardiac care, followed by a 30 minute simulation experience for competency demonstration. Time spent at St. John Fisher will be paid by the Emergency Department at Thompson Health, as arranged by Kate McGahey RN, FNP student. Participants will include RN's who are new graduates or inexperienced nurses as defined by having less than 3 years of critical care experience. Competency will be evaluated by a short written multiple choice test and a practice simulation with a competency checklist. Project participation is voluntary and can be withdrawn at any time. Findings are strictly for educational purposes only. The benefits include additional learning and skill on cardiac care with focus on acute MI. Any information obtained from this project will only be shared in group format, and will not be shared with administration at Thompson Health.

I thank you in advance for your willingness to participate in my project. Please sign and return this letter as your consent to participate in my project. If you have any questions about the project, please contact Dr. Dianne Cooney-Miner at dcooney-miner@sifc.edu or Kate McGahey at kmcgahey@sifc.edu.

Thank you.

Kate McGahey, SJFC Graduate Student

By signing, I agree and consent to participate in this project.  

X
Appendix E

ACUTE MI COMPETENCY CHECKLIST

<table>
<thead>
<tr>
<th>Name: ___________________________</th>
<th>Date: ___________________________</th>
</tr>
</thead>
</table>

Rating Scale:
**Yes** - nurse is able to demonstrate step and/or provide correct verbal response.
**No** - nurse is not able to demonstrate step or fails to provide correct verbal response.

### Acute MI recognition, nursing care and treatment

<table>
<thead>
<tr>
<th><strong>Initial evaluation</strong></th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>With Vital Signs (VS)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 Lead ECG with interpretation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Establish IV access, with 18 gauge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Establish continuous ECG monitoring</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Establish continuous NIBP, O2 sat monitoring</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blood work: CBC, Chemistries, cardiac markers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aspirin 325mg- chewed, or determine that it has been taken</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oxygen 3L NC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complete cardio-pulmonary assessment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pain management</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Inferior wall MI</strong></th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequent VS- every 15 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observe for hypotension and 2nd degree AV Block Type I</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Administer IVF wide open</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Position patient in trendelenburg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continue to monitor patient: VS, Rhythms, medications as ordered</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Anterior wall MI</strong></th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observe for 2nd degree AV Block Type II</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prepare for external pacing- place pads on</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pt complains of SOB- reassess lung sounds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observe for CHF or Cardiogenic shock</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continue to monitor patient: VS, Rhythms, medications as ordered</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Report to Paramedic/EMS</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### RHYTHM recognition and Interpretation of Arrhythmias

<table>
<thead>
<tr>
<th><strong>3rd Degree AV Block</strong></th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ventricular tachycardia (VT)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sinus bradycardia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ventricular fibrillation (VF)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd degree AV Block</td>
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</tr>
</tbody>
</table>
Acknowledgement

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