Using Web-based Guided Reflection With Video to Enhance High Fidelity Undergraduate Nursing Clinical Skills Education

Abstract: The United States is currently facing a crisis in health care and health professions education. Various studies (Committee on Quality of Health Care in America 2000; 2001; General Accounting Office, 2001) have documented astonishing death rates from medical errors as well as nursing and physician shortages. Thus it is obvious that the traditional "hands on" model historically used to teach and assess clinical judgment competence is or has become inadequate. New advances in simulation and web-based technologies can, if leveraged well, help educators address these challenges. Thus far, high fidelity simulation (HFS) clinical skills education sessions have been primarily conducted and debriefed in real time and the use of any related video recordings has been confined to faculty regarding its review. The goal of this project was to pilot test the impact of providing students the opportunity to review the video of their simulated session while reflecting on their performance within a structured format. The live debriefing that is a part of HFS sessions is also a form of reflection. The guided reflection prompt exercise used in this pilot is a secondary form of reflection. This paper describes the theoretical basis for this exercise, the findings of its initial evaluation and post study research that illuminates its limitations.

BACKGROUND LITERATURE AND INSTRUMENTATION

A substantial number of researchers have indicated that reflection on clinical practice supports the development of professional self-efficacy and expert clinical reasoning (Schön 1987; Benner, Tanner & Chelsa 1996; Tanner 1998, 2006; Kuiper, 2002; Papa, 1999; Pesut & Herman, 1999; Murphy, 2004; Kautz, Kuiper, Pesut, Knight-Brown & Daneker, 2005). Clinicians who engage in quality reflection build schemas or mental libraries of prototypical cases that researchers consider key to acquiring problem solving expertise. However, fostering reflection is often not an explicit part of instruction (Kaakinen, & Arwood, 2009; Downing & Yudkowsky, 2009).

The web-based post-high fidelity simulated clinical experience reflection exercise created for this project was based on the work of carefully selected researchers. A series of articles published by O'Neill & Dluhy (1997; 2000) and O'Neill et al (2004; 2005) served as an excellent theoretical foundation by providing an in-depth comparison between critical thinking and diagnostic reasoning, outstanding models of: cognitive nursing practice maturation, novice clinical decision making patterns, expert clinical decision making patterns and guidelines for developing effective decision support.

Further, Pesut & Herman (1999), Kautz, et al (2005) and Kuiper, Heinrich, Matthias, Graham & Bell-Kotwall (2008) created an effective reflection-based approach to promote clinical reasoning in undergraduate nursing students. These authors tested their instructional method successfully with students in both live and (HFS) clinical experiences. Unfortunately, this particular strategy is complex and proved difficult to adopt. Thus, it did not prove useful as a support for live debriefings or as a web-based post HFS session reflection tool. However, an earlier variation designed by Kuiper (2002) did lend itself to an online implementation. The earlier variation, a generic guided reflection prompt was adapted to be condition specific for use in this project (see Table 1.)

Since the initial pilot was conducted an additional study has been published that offers further insight into the challenges of teaching clinical reasoning. Recently, Pelaccia, Tardif, Triby & Charlin (2011) synthesized the work of various cognitive science researchers. Pelaccia, et al (2011) proposed that clinical reasoning is better understood by comparing two different research-based reasoning processes. One process is represented well in the articles published by O'Neill, et al (1997, 2000, 2004 and 2005). It is heuristic and intuitive and based on pattern recognition. The patterns are best understood as mental frameworks or filters that experts impose over their knowledge of a subject. The development expert filters, was referred to as automation by Kirschner, Sweller & Clark (2006). Automation frees limited working memory and allows individuals to consider novel situations.

The other process is analytical and rule-based, it is generated by data or facts that are gathered and examined in context and it is slower because it is cognitively demanding. In clinical settings this includes physical assessment, gathering patient history and lab and test results (condition pathophysiology). In addition to the descriptions of the two or dual processes, Pelaccia, et al (2011) also highlighted that the research on both reveals that they are each prone

to lead to errors in judgment. The heuristic, intuitive process can be negatively impacted by "lack of time, concurrent involvement in several cognitive tasks, fatigue, sleep deprivation, inattentiveness" and psycho-affective factors such as self-deception and complacency (pp 2-3). A few years ago, Davis, Mazmanian, Fordis, Harrison, Thorpe & Perrier (2006) conducted a study comparing the self-assessments of practicing physicians with an external observation of their performance to inform continuing education programs and found that physicians did not make accurate evaluations of their own competence, the authors of this study found that this was due to over confidence.

Pelaccia, et al (2011) also made note of what type of situations individuals were likely to engage in the heuristic or analytical processes and proposed that good clinical reasoning instruction needs to consider both because expert clinical reasoning likely involves the use of both. The two processes appear to work as a checks and balances system.

RESEARCH METHODS

A variety of literature on the use of simulation, across the spectrum of types, including high fidelity assert that in effective learning outcomes require educators to choose appropriate learning theory and plan instructional experiences in a structured manner (Papa & Harasym, 1999; Kaakinen & Arwood, 2009; Sinclair & Ferguson, 2009; Downing & Yudkowsky, 2009; Colloquium on Educational Technology: Recommendations and Guidelines for Medical Educators 2007).

Considerable debate continues to surround the obvious need for undergraduate nursing curriculum revision, including the best use of new technologies, however, high fidelity simulation (HFS) is particularly effective for teaching unusual presentations of common illnesses and rare diseases (Forbes & Hickey, 2009; Adamo, 2003). Sepsis, septic shock and multiple organ dysfunction syndrome (also known as systemic inflammatory response syndrome [SIRS]) was chosen as the topic for this project, as incidents of this condition have been on the rise by 9% since 1979 and it is elusive to diagnosis as well as life threatening (Nelson, LeMaster, Plost & Zahner, 2009). Non intensive care nurses are often the first to encounter a potentially septic

patient and thus are, if adequately educated, in a position to help identify the condition while it can still be successfully treated.

The O'Neill, et al (2005) novice clinical reasoning model delineated a variety of barriers both cognitive and emotional that impact clinical competence. These authors assert that: 1) the novice possesses primarily theoretical knowledge and tends to lack self-confidence 2) support/input from experienced nurses during practice enables novices to develop increasingly accurate perceptions of clinical situations.

Loving (1997) refers to this particular phenomena from a somewhat different angle in a study that examined the impact of learner perceptions of educational contexts, both in a learning context and an evaluation context, i.e., whether students were motivated to take actions because they were seeking a grade or to pass an exam, or whether they were patient centered; cognitive rigidity vs. cognitive flexibility. He re-tested the findings of other researchers who had found that open-ended questioning by faculty helped students to think through patient problems and found that it supports cognitive flexibility.

In order to provide quality control measures for this pilot two nursing faculty with years of critical care practice, formally trained in simulation facilitation and debriefing techniques were chosen to run the pilot sessions. Further, to ensure consistency of the HFS sessions, a script for the case scenario was agreed upon, discussed and rehearsed without students.

The simulated clinical experiences conducted as part of this project provided students with the opportunity to role-play out a real case. Faculty who facilitated HFS sessions cued students to filter out non-salient clinical information, prioritize patient care and work as a team. Each student was assigned a specific role as a member of a typical health care team. The live debriefing that followed each HFS session provided the students with expert feedback. The web-based reflection exercise was intended as a method to reinforce or amplify the initial reflection prompted by the faculty during live debriefing.

In 2010, Clendinneng proposed a model for HFS debriefing that includes 4 stages of reflection: Phase 1: Debriefer guided overview, Phase 2: Affective participant discourse, Phase 3: Objective group analysis and Phase 4: Introspective performance appraisal. The web-based guided reflection prompt exercise used in this pilot fits into Clendinneng's (2010) Phase 4. She defines this phase as intrapersonal reflection that encompasses: skill performance, knowledge, judgment, critical thinking, resolution, internalization and method – such as reviewing video and

through discourse as well as journaling (pp 148). Clendinneng (2010) asserted that deeper interpersonal refection should be placed aside until latter for a variety of reasons: time constraints, open discussion among participants during live debriefing in order to gain the perspectives of all of the team members and to allow each participant to personalize the HFS. Further, she found video review of HFS sessions along side of open-ended journaling and/or field note taking to be very useful as a method to track her own HFS professional development as well as her students progress. The authors of the pilot described by this paper propose that guided reflection provides a better scaffold for student learning than open-ended journaling.

Institutional review board approval was obtained from the University of _____; this study was considered exempt, participation by students was voluntary and informed consent was not required. Six student groups (of 4 to 5) participated in the initial pilot. These 6 groups represented a convenience sample of 32 nursing students drawn from the 20 simulated group sessions projected for 65 senior level nursing students in a Clinical Course taught at a NLN (National League of Nursing) accredited College of Nursing during a typical semester. The students who participated were asked and expected to study the pathophysiology of the condition prior to their HFS session. Their preparation was to be guided by: a set of objectives with a related a set of questions, required readings (Wood, Lavieri & Durkin, 2007; Robson & Daniels, 2008) and a brief patient history posted in the course learning management system, Desire2Learn (D2L).

The HFS Sepsis case had 4 patient states. The patient begins in the Emergency Room with vital signs that are intended to prompt the student to administer fluids and oxygen, the patient improves slightly if he is given these treatments within the first 10 to 12 minutes of the scenario. During patient improvement in State 2 students must contact the health care provider, follow through on his/her orders and initiate the patient's transfer to intensive care (ICU). After the patient is transferred, during State 3, his condition deteriorates and progresses toward death despite additional treatments and nursing interventions. The student's are given a second set of health care provider orders specific to the ICU. The HFS session ends with the patient's death in State 4; the scenario is constrained to stay within 30 to 45 minutes. The objectives that were posted for students (in D2L) were as follows.

At the end of this assignment, the student will have:

1. used the patient's history and assessment data in the early identification of and management of those at risk for or with septic shock and multisystem organ dysfunction.
2. formulated, prioritized and individualized a plan of care based on assessment findings.
3. anticipated diagnostic orders and therapies, including medications for the management of patients with sepsis, septic shock and multisystem organ dysfunction.
4. discussed the possible sequel and consequences of unrecognized and untreated sepsis.
5. evaluated and documented the patient's response to therapies and identified follow-up intervention based on patient assessment data.

Each group of students was provided with the link to an online environment that included a video of their simulated clinical experience and a survey tool containing the guided reflection prompt reflection exercise in Table 1. All 32 students who were asked to participate in this pilot completed the exercise by recording his/her reflections in writing. The students were assigned group and individual numbers so that the numbers could not be matched to their names; thus all student responses were recorded anonymously.

The video segments used in this pilot were recorded with B-Line Medical's SimCapture System. SimCapture was designed specifically to capture high fidelity simulation sessions and the data generated by high fidelity equipment, such as trend lines for physiological data and log files for events and drug interactions.

Table 1.

Self-regulated Learning Guided Reflection Prompt (*Adapted from Kuiper, 2002*)

The following statements and questions were designed to help you reflect on your clinical performance during your simulated clinical experience with a septic patient. Studies have shown that this type of exercise can help students develop clinical expertise. To help foster open, honest reflection your responses are being captured anonymously.

1. I think I can solve a clinical problem related to a septic patient because…
2. As I look back on the sepsis patient simulation, I should have spent time on…
3. When I felt anxious, nervous, frustrated or felt like leaving the simulated clinical experience with a septic patient, I think I…
4. When I try to remember or understand important facts to solve a problem or prepared for a clinical experience with a septic patient, I think I...
5. When I prepared to carry out a nursing activity for the septic patient, I...
6. When I was distracted during the sepsis clinical simulation by noise, activity or by lack of concentration, I...
7. When I worked with others or needed help during the simulated clinical experience with a septic patient, I…
8. My impression of the potential consequences of my performance had the simulation been with an actual septic patient this week was…
9. I made sure I prepared for the simulated clinical experience with a septic patient by…
10. Reactions to the clinical simulation:
    a) My reaction to what I liked about the clinical simulation with the septic patient was…
    b) My reaction to what I did not like about the clinical simulation with the septic patient was…
11. Other strategies I used during the clinical simulation were…
12. The video of my simulated clinical group experience with a septic patient and the reflection prompts in this exercise helped (did not help) me to respond and to reflect on my performance…

A rubric developed by Lasater (2007) based upon the seminal work Benner, et al (1996) & Benner & Tanner (2006) & Schön (1987) proved useful as a data analysis tool. Lasater's rubric has a total of 4 phases: noticing, interpreting, responding and reflecting and 4 levels of clinical judgment: exemplary, accomplished, developing and beginning. This pilot did not employ Lasater's rubric in its entirety. The noticing and interpreting dimensions may be said to relate to knowledge of pathophysiology, which proved difficult to assess through student reflections. (Please refer back to Pelaccia, et al's (2011) analytical and rule-based reasoning process mentioned earlier.) Further, qualitative methods are not considered to be the best method to assess this type of knowledge (by the authors of this pilot). Critical Action Checklists are the standard tool currently employed by many Downing & Yudkowsky (2009) (See Appendix A). However the responding and reflecting phases proved useful to gage student performance related to emotional barriers and the quality of their reflections.

PILOT RESULTS

Due to technical problems with the SimCapture only 22 students were provided with videos of their sepsis, septic shock and multiple organ dysfunction syndrome simulated clinical experience. To date, of these students, only 12 chose to review the video. However, in response to Question 12 from Table 1 (*The video of my simulated clinical group experience with a septic patient and the reflection prompts in this exercise helped [did not help] me to respond and to reflect on my performance*), 20 of the 22 students indicated that the video either was helpful or would be helpful as a resource to evaluate their own competence.

The data from this pilot project was analyzed using qualitative script analysis techniques. The emerging themes and patterns from the data indicated/revealed: continued gaps in clinical knowledge specific to sepsis, septic shock and multiple organ dysfunction syndrome (pathophysiology), levels of self-confidence and attitudes towards teamwork.

The nursing interventions in the case scenario required that the students make judgments and initiate treatments based on their knowledge of the pathophysiology (cardiovascular, hematologic, hepatic, metabolic, neurologic, pulmonary, renal parameters) of the condition as well as follow health provider orders. Whether or not students took action within certain time frames pointed to potential gaps in their pathophysiology knowledge. The faculty who led the HFS sessions talked students through these discrepancies the HSF during the live debriefing.

The students had a secondary opportunity to indicate their understanding of pathophysiology in their responses to the guided reflection exercise (See Table 1, questions 1, 2, 4 and 5). However, most students did not include this information in their responses. In regards to sepsis pathophysiology knowledge the exercise did not appear to be fruitful. Gaps in pathophysiology hamper the student's ability to recognize salient cues and choose hypothesis-drive nursing actions. This knowledge is a key component of schemas of prototypical cases and needs to be cultivated. The authors of this pilot have continued to search the literature for methods to prompt deeper learning of pathophysiology without imposing cumbersome requirements on students. Several suggestions are noted at the end of this paper.

However, as previously stated, correlation of the pilot data to the responding and reflecting phases of Lasater's (2007) clinical judgment development assessment rubric did provide an excellent overall snap shot of student performance related to emotional barriers and

the quality level of their reflections (see Tables 2-4). Approximately 50% of the students that participated could be rated at the accomplished level. The Lasater (2007) Tables are shown in conjunction with related reflection prompt pilot data separately for readability.

Student Responses: Emotional Barriers

Table 2.
Lasater Clinical Judgment Rubric (2007)
Effective responding phase: calm, confident manner dimension

Exemplary level	**Accomplished level**	Developing level	Beginning level
Assumes responsibility; delegates team assignments; assesses patients and reassures them and their families	**Generally displays leadership and confidence and is able to control or calm most situations; may show stress in particularly difficult or complex situations**	Is tentative in the leader role; reassures patients and families in routine and relatively simple situations but becomes stressed and disorganized easily	Except in simple and routine situations, is stressed and disorganized, lacks control, makes patients and families anxious or less able to cooperate

Two questions in the guided reflection prompt (See Table 1.) are directly related to emotional states and or emotional regulation, Questions 3 and 6. The following paragraphs restate each question and detail the type of responses students made with sample of quotes.

Regarding Question 3, twelve students stated that they experienced anxiety, 8 students asserted that they were confident or that they actively managed their emotional state and 2 students made assertions about what they would do in the future. Selected student quotes are as follows for Question 3: *"When I felt anxious, nervous, frustrated or felt like leaving the sepsis HFS patient, I think I…"*

"[…] shut down, forgot everything."

"[…] could not think fast enough."

"[…] said a prayer."

"[…] chose to work through my anxiety."

"[…] kept working hard at problem solving."

"[…] (I chose to fight) in flight or fight, I definitely fight."

Regarding Question 6, nine students stated that they were able to remain focused, 11 students asserted that they were able to actively manage their emotional state and 2 students

made assertions about what they would do in the future. Selected student quotes for Question 6: *"When I was distracted during the sepsis HFS by noise, activity or by lack of concentration, I..."*

"[…] took control of the situation."

"[…] shut out, blocked out the distractions, refocused…"

"[…] reminded myself that the simulation was an imitation of real life."

"[…] stopped, rethought and prioritized."

"[…] redirected my attention to the patient…vitals…(ect)."

"[…] reminded myself that distractions are a part of life."

Student Responses: Quality of Reflections

Table 3.
Lasater Clinical Judgment Rubric (2007)
Effective reflecting phase: self-evaluation/analysis dimension

Exemplary level	**Accomplished level**	Developing level	Beginning level
Independently evaluates and analyzes personal clinical performance, noting decision points, elaborating alternatives, and accurately evaluating choices against alternative	**Evaluates and analyzes personal clinical performance with minimal prompting, primarily about major events or decisions; key decision points are identified, and alternatives are considered**	Even when prompted, briefly verbalizes the most obvious evaluations; has difficulty imagining alternative choices, is self-protective in evaluating person choices	Even prompted evaluations are brief, cursory, and not used to improve performance; justifies personal decisions and choices without evaluating them

Table 4.
Lasater Clinical Judgment Rubric (2007)
Effective reflecting phase, commitment to improvement dimension

Exemplary level	**Accomplished level**	Developing level	Beginning level
Demonstrates commitment to ongoing improvement; reflects on and critically evaluates nursing experiences; accurately identifies strengths and weaknesses and develops specific plans to eliminate weaknesses	**Demonstrates a desire to improve nursing performance; reflects on and evaluates experiences; identifies strengths and weaknesses; could be more systematic in evaluating weaknesses**	Demonstrates awareness of the need for ongoing improvement and makes some effort to learn form experience and improve performance but tends to state the obvious and needs external evaluation	Appears uninterested in improving performance or is unable to do so; rarely reflects; is uncritical of her/himself or overly critical (given level of development); is unable to see flaws or need for improvement

The analysis of the student's clinical judgment reflections/responses revealed 17 of 32 participants were confident in the face of distractions or problems, 10 students made positive self-judgments about their clinical performance and all 32 students stated that they were committed to working to improve their clinical competence. Selected student quotes from a variety of the other guided reflection prompt responses give an overall snap shot of the quality level of student reflections are presented below.

> "I second-guessed myself or I looked to the instructor for confirmation. I realize now that I will not always have the time to second guess or the privilege to have a peer with me in an emergent situation."
>
> "Code Blue matters--when to call it, reading monitors and recognizing critical values, which (hopefully) would have afforded the patient swifter response to his deteriorating condition."
>
> "I think I should have thought a little bit quicker and maybe put the patient on a monitor. It seemed as though I spent like 5 minutes taking the poor guys vital signs. I needed to just remember to follow the ABCs - Airway, Breathing, and Circulation. I mean if he isn't responsive, I need to be doing more than taking his respirations."
>
> "I will think back on the sim lab and remember things that I did wrong so that I don't do them again and I will also remember the things I did right so that I can continue doing them."
>
> "I attempted to delegate authority to other team members so that one single person in the healthcare team would not be overwhelmed."
>
> "I tried to delegate as much as I could to provide myself with a better opportunity to focus on my patient's problems. I looked for help a lot because there are so many key things to remember and I feel that it is good to utilize your peers because they may have the insight that you might overlook (during a) stressful event."

CONCLUSIONS

The College of Nursing where this pilot study was conducted has integrated high fidelity simulation (HFS) into their curriculum by including it in undergraduate clinical courses at each level. Thus far, it has been used to address conditions as described by this pilot and instead of paper cases as preparation for National Council Licensure Examination for Registered Nurses

(NCLEX-RN). During critical care rotations students have the opportunity to see live examples of HFS cases; in 2009 there were 1706 individuals discharged from two local hospitals that were treated for sepsis (OK2SHARE). The college strives to schedule HFS sessions prior to live clinical rotations so that students start their rotation having seen simulated cases that they will potentially see again in a real patient.

HFS has also been used to supplement live clinical experiences where clinical opportunities are limited such as labor and delivery and pediatrics. For example, using Noelle and Hal every student sees a birth of some type before graduating. During any given semester an OB clinical student rotation may not allow a student to see a live birth for a variety of reasons, for example a higher number of deliveries by cesarean section during a particular clinical rotation.

Correlation of the pilot data to the applicable dimensions of Lasater's Clinical Judgment Rubric (2007) strongly suggests that providing students with the video of their HFS experience in conjunction with a guided reflection exercise helps student to engage in quality reflection. Further, it shows that the web-based format was well received.

LIMITATIONS AND FUTURE DIRECTIONS

The literature on effective uses of HFS indicates that exposure to multiple cases representing variations of the same condition are necessary for students to learn (Papa & Harasym, 1999; O'Neill, et al 1997, 2000, 2004 and 2005; Downing & Yudkowsky, 2009). Unfortunately, scheduling multiple HFS sessions on the same case within a course in any given semester has proven to be difficult. This is due in part to faculty shortages, but it is also the case that HFS sessions often directly compete with other curricular requirements. The authors of this pilot propose that providing students with an opportunity to view the video of their HFS sessions in conjunction with structured reflection is one method that can be used to partially offset these limitations.

In order to further strengthen one case shot HFS presentations of particular conditions a well-designed multiple-choice pre-test, post-test specific to the condition could be administered

to students. The pre-test would be most effectively administered before the HFS session and the post-test several weeks latter at a convenient time.

In addition, a caveat in regards to the Sepsis case run in this pilot is that faculty could also use formal hospital protocols to help to reinforce student knowledge on this topic after the live debriefing phase of HFS sessions. (See Appendix B for a sample sepsis screening tool common in most hospital Emergency Departments).

Further, consideration could be given to running a separate learning vignette using the Sepsis Palm Tool from Handhelddoc.com as a complementary informatics learning object/module (See Appendix C). A robust web resource for this condition already exists and could be leveraged to a greater extent then it currently is – the Surviving Sepsis Campaign can be found online at: http://www.survivingsepsis.org/Pages/default.aspx.

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Appendix A
Sample of Standard Evaluation Tool

Critical Action Checklist			
Critical Action	**Yes**	**No**	**Time**
Recognition of confusion-initiate			
Recognition of adequate airway-pulse oximetry			
Recognition of circulatory dysfunction-hypotension and tachycardia			
Basic respiratory support with 100%oxygen therapy			
Basic circulatory management (venous access, normal saline bolus)			
Implementation of altered mental status protocol-check FSBS			
Order lab to include CBC, Chemistry, VGB, UA, Blood cultures, serum lactate			
Order x-rays to include CXR and CT head			
Access response to fluid bolus, adjust therapeutic intervention and continue fluid-consider antibiotic admin			

Appendix B
Generic Adult Sepsis Screening Tool

1. Suspected Infection (1 or more)

Yes	No		Results	Yes	No
		Suspected Infection			
		Recent Procedure	**WBC here ^**		
		Antibiotic therapy			

2. Systemic Inflammatory Response Syndrome ** (2 or more)

Yes	No		Yes	No
		Temp < 36^0C (96.8^0F) or 38.3^0C (101^0F)		
		RR > 20		
		HR > 90		

2. Organ Dysfunction (1 or more)

Yes	No		Yes	No
		BP (systolic <90 mmHG or >40 mmHg Drop from baseline)		
		New, acute mental status changes		

If YES to all 3 questions, notify physician ASAP- patient may have sepsis.

(Note: a more lengthy protocol or set of standing orders is also usually present; it details out a plan of treatment including nursing interventions.)

Appendix C
Screen Shot of Sepsis Palm Tool from Handhelddoc.com