JNSD Journal for Nurses in Staff Development • Volume 28, Number 6, 260–269 • Copyright © 2012 Wolters Kluwer Health | Lippincott Williams & Wilkins

Use of High-Fidelity Simulation for Staff Education/Development

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A Systematic Review of the Literature

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Currently, high-fidelity simulations (HFS) are widely used in nursing education and are being introduced into acute care to assist with orientation programs, continuing education, certification courses, and staff development. In a review of the literature, many articles were found that describe HFS and its advantages and how to use the technology. But, there are few research studies to support the use. Upon completion of a review of the literature and an analysis of utility, the data do not clearly show that HFS is the best practice for the orientation and education of staff nurses. Overall, HFS is recognized as a safe way to learn, and most nurses like participating in HFSs. However, before the healthcare industry continues on this journey of widespread adoption of HFSs, more research needs to be done to show that the increased skills and knowledge of the nurse obtained through simulation does translate into safer patient care and better patient outcomes.

To provide high-quality, safe care, nurses need to be highly skilled, competent practitioners who can think critically and respond quickly to changing conditions. Historically, other occupations whose members needed similar skills, such as the military, aviation, and medicine, have used high-fidelity simulations (HFSs) to better prepare members to respond appropriately in diverse situations. In nursing education, simulations started in 1911 with the introduction of "Mrs. Chase," the very first life-size manikin (Nickerson, Morrison, & Pollard, 2011). In 1999, the Institute of Medicine's report (Kohn, Corrigan, & Donaldson, 1999) recommended that nursing also increase the use of simulation to both train and ensure competency in nurses.

Currently, HFSs are widely used in nursing education and are being introduced into acute care and other healthcare settings. HFSs are used for orientation programs, continuing education, certification courses, and staff development. In nursing professional development, it is being used for high-risk, low-volume scenarios (such as codes), to work on team building (such as in the operating room), and to help nurses develop leadership skills as well to assess areas that need improvement. Jeffries and Rogers (2007) listed four major outcomes of simulation: gained knowledge, increase in skill competence, increase in learners' satisfaction, and improved critical thinking. "There are few endeavors where simulation has no role, but it is perhaps best incorporated in meeting the needs of learner who has theoretical information, and needs to understand how best to apply this to actual practice" (Nickerson et al., 2011, p. 88).

HFS is defined as "…the use of mannequins that have features such as visible respirations, measurable blood pressure, vocal sounds, and open orifices, all of which are programmed by an computer" (Cato & Murray, 2010, p. 44). Gaba (2004) defined 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. i2). To date, no systematic literature review has been published focusing on the use of HFS in the acute care setting for staff development and education of nurses. The purpose of this article is to fill this gap to enable those who are considering the use of HFS for education to make informed decisions.

LITERATURE REVIEW

A literature search was initiated using CINAHL to find articles about the use of HFS in the acute care setting. The search criteria included articles published in nursing and peer-reviewed publications within the last 5 years, in English, about the use of HFS and with a focus on nurses. Exclusion criteria were articles that focused on nursing students or other health professionals. In addition, no dissertations or unpublished documents were included in this review. Although much has been written about the use of simulation in nursing education, only 14 articles were initially found that met these search criteria.

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The author has disclosed that she has no significant relationships with, or financial interest in any commercial companies pertaining to this article.

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DOI: 10.1097/NND.0b013e31827259c7

An additional six articles were identified by referring to the citations in these original articles. Three articles focused on the history of simulation and, therefore, were not included in this review. Sixteen articles were found to be research based and were used for this review. Six articles were found that described HFS and its advantages and how to implement the technology but were more "how to" articles. These articles have been included as expert opinion. Most of the articles (8) that were research based were descriptive studies. Four studies used a pretest/posttest design, and a fifth study used chart audits with a pre-posttest. There was one exploratory qualitative study and one randomized control study (see Table 1). Research was evaluated using the Research Quality Review Rating Scale developed by Gaspar at the University of Toledo (2009). This scale guides the reviewer to examine the research article with regard to ethical considerations (were they addressed), the sample (size and description), setting (described), variables (instrument appropriate, validity and reliability adequate), design (appropriate for the hypothesis and standardized), data collection (described, blinding), and results/analysis (sample size adequate, appropriate statistics, and any obvious inaccuracies present). The resultant ratings vary from free of major flaws, to mostly free, to moderately free, and to somewhat free, with the worst rating being not at all free.

Concept Analysis

Nickerson et al. (2011) conducted a concept analysis of the word simulation. The authors identified three major attributes for simulation: (1) knowledge acquisition, (2) fidelity, and (3) outcomes. In order for simulation to have effective outcomes, they stated that it was essential for faculty to be trained in the use of simulations, that participants needed to be actively engaged, that the use of simulation had to be a right fit with the identified learning needs, and that there needed to be a time for reflection and debriefing after the simulation.

Expert Opinion

Galloway published an article describing "…simulation techniques currently being used in healthcare education and identify[ing] future directions for the use of simulation in healthcare" (2009, Abstract). Although much of the article focuses on the use of HFS in the education of nursing students, there is a section on continuing and inservice education. Galloway identified several of the gaps in the present research and the need for increased training of faculty to be able to properly implement HFS and concluded that HFS is beneficial in training nurses while ensuring patient safety. Galloway also compared the use of HFS to instruct pilots on how to fly a plane (a machine) with the use of HFS to help nurses work with patients (a complex, living being).

An overview of the use of simulation for a critical care orientation program was the focus of articles by Day (2007) and Cato and Murray (2010). Whereas Cato and Murray stated that HFS was an effective tool allowing the educators to increase both the complexity and number of patients for the new orientee, Day questioned the substitution of simulation for clinical time. Challenges that were identified in both articles included cost, scheduling issues and the time commitment, lack of assessment tools, and the difficulty of developing realistic scenarios. Day also pointed out that nursing is a "…relational practice in which meaning is created in the interactions that take place between and among participants" (p. 505)—that meaning is lost or diminished when the patient is a manikin.

Leigh (2011) pointed out that the newly graduated nurse comes to healthcare settings expecting simulations to be a part of their continuing education, so the use of simulation by staff development is no longer an option. The learning needs of the Baby Boomers, Generation Xers, and Millennials are all addressed by HFSs. Leigh identified the benefits of simulation as not only assisting with orientation and certification courses such as advanced cardiac life support (ACLS) classes but also as a way to cross-train staff and improve patient safety by reenacting adverse or near-miss events in a safe environment.

The article by Broussard (2008) described simulation-based learning. The author advocated for the use of HFS to help ensure safety in the high-stress, high-stakes maternity environment. She identified that simulation-based learning can assist with "… annual competency skills training, orientation of new graduates as well as nurses new to the maternity area, and neonatal resuscitation programs" (Broussard, 2008, p. 524). Unfortunately, the references in Broussard's article are those about the use of HFS for training nursing students or medical students.

Sportsman et al. (2009) described an innovative program where a hospital, university, and community college developed an HFS center to be used by both nursing students and staff nurses. The intent was to limit costs by combining resources and still meet the learning needs of nursing students as well as use the center to assist with orientation and competency testing for the hospital nurses. The authors found that the hospital staff believed that the HFS scenarios were some of the best educational opportunities they had experienced. In addition, the collaboration required educators to develop scenarios based on evidence-based guidelines, which resulted in changes in practice at all three institutions. But, the major goal of the collaboration was not met. Using discounted cost-flow analysis, the project coordinators found that the savings in instructional costs were not sufficient to offset the investment costs.

TABLE 1 Summary of Articles

Author/Year	Sample & Setting	Design	Instrument	Results	Research Quality Review	Level of Evidence
Ackermann, Kenny, & Walker, 2007	21 new nurses; orientation program for an acute care setting.	Report on the implementation of the use of HFS for orientation.	No instrument identified.	Increased confidence in dealing with emergencies; improved socialization to the setting.	Not a research-based article; more of a description of what they did. Not at all free of flaws.	Level VI: single descriptive study
Breyea, Slattery, & von Reyn, 2010	17 cohorts; total of 260 recent graduate nurse residents at an academic medical center.	Descriptive study: pretest and posttest.	Global confidence, competence, and readiness for independent practice measurement instrument and Readiness for Entry-Into-Practice (Self-Efficacy) Instrument.	New residency program which included simulation-increased confidence, competence, and readiness to practice significantly ($p < .001$) as well as improvement in readiness to enter practice. Also, have seen an increase in retention and decrease in orientation time.	Somewhat free of flaws.	Level VI: single descriptive study
Broussard, 2008	Maternal-child unit	Discussion on the use of simulation, its advantages, and challenges in a maternal-child unit.		Improved communication and teamwork; improved safety for maternity patients.		Level VII: expert opinion
Cato & Murray, 2010	ICU	Discussion on why simulation should be used in the ICU.		Enhanced learning, improved patient safety, assisted with recruitment and retention strategies, and addressed quality and risk-management concerns.		Level VII: expert opinion
Day, 2007	Critical care units	Discussion of the use of HFS for orientation and staff development.		Improved preparation of the beginner nurse but may actually delay the process by moving the novice away from the bedside.		Level VII: expert opinion

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Galloway, 2009	Undergraduate nursing programs, continuing education programs, interdisciplinary team training, and ompetency assessment.	Description of simulation techniques used in healthcare education.		Assist with developing expertise in new settings, correctly identify situations where a patient is deteriorating rapidly. Provide for interdisciplinary team training and accurately assess competencies.		Level VII: expert opinion
Gordon & Buckley, 2009	50 medical–surgical nurses enrolled in a graduate course at an Australian University.	Descriptive study: pre and post questionnaire.	Questionnaire with 14 questions rating participants' perceived ability in their responding to technical and nontechnical aspects of an emergency.	Increased confidence in recognizing an unstable patient and identify priorities. Increased confidence in interventions needed related to airway, breathing, circulation, and defibrillation. Increased communication skills.	Mostly free of flaws.	Level VI: single descriptive study
Hoadley, 2009	53 healthcare providers (including physicians, nurses, respiratory therapists, midlevel providers, and medics) attending an ACLS course at a medical center.	Experimental, two-group design.	ACLS written test and skills performance score.	No statistically significant differences were found between the group trained using HFS from the group that had low-fidelity simulations. Also, both groups were equally satisfied with their training and felt it had increased their confidence.	Free of major flaws.	Level I: one large, well-designed, randomized controlled trial
Kaddoura, 2010	10 new BSN nursing graduates employed to work in the ICU at an academic medical center.	Exploratory qualitative descriptive design.	Content analysis	Themes identified: Just-in-time learning of cognitive and psychomotor skills. Fostering critical thinking and leadership skills through feedback. Safety in a nonthreatening learning environment.	Mostly free of flaws.	Level VI: single qualitative study

Continued

TABLE 1 Continued

Author/Year	Sample & Setting	Design	Instrument	Results	Research Quality Review	Level of Evidence
Kuhrik, Kuhrik, Rimkus, Tecu, & Woodhouse, 2008	12 experienced nurses working in a bone marrow transplant unit at a medical center.	Pre-post evaluation form	Evaluation form based on the goals set for the simulation.	Increase in scores on areas related to confidence, competence, and knowledge about role. All participants felt they would recommend HFS to others as a way to learn.	Somewhat free of major flaws	Level VI: single descriptive study
Leigh, 2011	Staff development	Discussion of the implications for the use of HFS in staff development.		Allows for the development of targeted clinical experiences to meet nurses' learning needs.		Level VII: expert opinion
Paige et al, 2009	38 members of the OR team (surgeons, residents, anesthesiologists, nurses, and surgical techs) at an academic medical center.	Descriptive study: pretest and posttest	Questionnaire consisting of 15 Likert-type items measuring self-efficacy in teamwork competencies.	Statistically significant improvement in role clarity, anticipatory response, cross monitoring, and team cohesion and interaction ($p < .01$).	Moderately free of flaws	Level VI: single descriptive study
Sportsman, Bolton, Bradshaw, Close, Lee, Townley, & Watson (2009)	Development of a regional simulation center.	Discussion of the process of development and the advantages of the partnership for both the hospital and the nursing programs.		Developing a regional simulation center enabled both hospitals and nursing schools to maximize the use of HFS to provide in-depth learning opportunities and to validate competencies.		Level VII: expert opinion
Stefanski & Rossler (2009)	30 nurses (both new graduates and experienced nurses) enrolled in a ''Preparing the Critical Care Nurse'' course.	Descriptive study: post-participation questionnaire and a 6-month follow-up survey	Nurse Satisfaction and Self-confidence in Learning (modified NLN tool)	Simulations provided the nurses with a variety of learning materials and activities to promote their learning. From 6-month surveys (only nine returned), course was beneficial to their practice and simulation activities increased their confidence.	Somewhat free of flaws	Level VI: single descriptive study

Continued

Williams & Chong, 2010	Nine nurses from two campuses of a healthcare facility in Australia.	Discussion of the implementation of a program to train nurses to recognize patients who were deteriorating and appropriately calling an early response team alert.	No instrument	Staff satisfied with the education. Improvement in patient outcomes in post-critical events. Increased nursing confidence and increased confidence of medical staff and nurse.	Not a research-based article; more of a description of what they did. Not at all free of flaws.	Level VI: single descriptive study
Wolf, 2008	13 emergency department nurses completed a course in Severity Index triage (only 6 of the 13 completed the simulation portion) at a community hospital.	Descriptive study: chart review and pre-posttest	Pre-posttest on triage determination; chart review: to determine if the patient had been accurately triaged.	20-point increase in test score after didactic portion of class. Increase in accuracy of triage from 10% to 40%. Greatest improvement occurred in new nurses who also participated in the chart review.	Not at all free of flaws.	Level VI: single descriptive study

Descriptive/Qualitative Studies

In the development of a Bridge to Practice program for new nurse graduates, the nurse education faculty at an acute care facility identified the potential for improvement by adding HFS (Ackermann, Kenny, & Walker, 2007). Upon evaluating the use of simulation with 21 nurses, the authors found that all of the nurses believed that the HFSs facilitated their learning and appreciated the opportunity to learn with no risk to a live patient. Ackerman, Kenny, and Walker also stated that the use of simulation enhanced the process of socialization into the professional role of the nurse and had the potential of increasing retention, but no data were given to support these statements.

Breyea, Slattery, and von Reyn (2010) reported on an orientation program that used simulation experiences in a nurse residency program at a rural academic medical center (n = 260). By ensuring that all new nurses had exposure to the same clinical situations and then evaluating their performance, orientation time was decreased and productivity increased. In addition, the new program increased recruitment and decreased turnover. However, the increase in retention and recruitment could have been because of societal factors occurring at the same time (increased number of new graduates and decreasing nursing positions). Also, other factors in the orientation, such as frequently meeting with the orientees, could have been the cause for the decrease in the orientation time.

A current issue, internationally, is preventing cardiac arrests through early recognition of deterioration. Williams and Chong (2010) discussed the use of simulation as part of a training program to prepare medical–surgical nurses in Australia to intervene appropriately when a patient starts to deteriorate. They stated that HFS not only is effective in task training but that it also assisted with communication, leadership, and team building. After the program, which included lecture, they found that the staff perceived themselves better prepared and more qualified to manage emergency situations. Furthermore, Williams and Chong wrote that the hospital experienced dramatic improvements in managing deterioration because of the initiative; the whole program included extensive education over a 12-month period as well as other changes in the system and HFS. Therefore, the effect of the HFS alone could not be determined.

Gordon and Buckley (2009) conducted a study (in England) that included 50 medical–surgical graduate students (equivalent to new nursing graduates in the United States) who completed questionnaires before and after participation in an HFS. There was significant improvement in the nurses' confidence in their ability to recognize an unstable patient ($p = .02$), identify priorities ($p < .001$), and initiate emergency interventions ($p < .001$) after the

simulation. The most valuable part of the experience to the participants was the debriefing that occurred after the simulation.

One study used HFS for continuing education on a bone marrow transplant unit (Kuhrik, Kuhrik, Rimkus, Tecu, & Woodhouse, 2008). The researchers found that all of the scores were higher on the posttest than on the presimulation scores, but the small sample size (n = 12) limited the strength of the findings about the benefits of simulation. A second study (Wolf, 2008) used a retrospective chart audit to determine the effects of a training program (that was a combination of simulation and didactic content) on the accuracy of training. Although the combined training did increase accuracy, because of a lack of tracking, the author had no way to determine if the nurses who completed the simulation scenarios had higher accuracy rates than those who only took part in the didactic sessions.

HFS is often cited as a method to increase interdisciplinary collaboration and team building. Paige et al. (2009) conducted a study in a simulated operating room to assess the effectiveness of HFS on members' confidence in their ability to work as a team. Four of fifteen items measuring confidence in teamwork skills had statistically significant increases following interdisciplinary HFS exercises: role clarity, anticipatory response, cross-monitoring, and overall team cohesion and interaction.

A collaborative approach to preparing critical care nurses resulted in the development of a Preparing the Critical Care Nurse program in a community in Louisiana (Stefanski & Rossler, 2009). The course included didactic lectures with corresponding simulation activities. Participants were given a modified "Student Satisfaction and Self-Confidence in Learning" questionnaire on the last day of the course. The majority, 96%, believed that the teaching methods used in the simulation were effective and promoted learning. Also, a 6-month follow-up survey was distributed, and 9 out of 28 surveys were returned. Overall, the respondents believed the course was beneficial to their practice and provided them with increased confidence. Although these findings are suggestive that HFS is a good learning tool, this study has several flaws. No precourse questionnaire was given to compare with the postcourse survey. Also, the course included didactic lecture as well as simulations, so it is difficult to attribute the benefits solely to the simulations. In addition, the authors found that developing the simulation scenarios was "…an arduous, time-consuming task" (Stefanski & Rossler, p. 449).

The final descriptive study reviewed was conducted by Kaddoura (2010). Ten new baccalaureate nursing graduates had simulation included in their orientation program. Data were collected using demographic questionnaires and interviews. Content analysis was employed to determine if the use of simulation enhanced these nurses' critical thinking abilities. Three main themes emerged: (1) simulation is an interactive teaching–learning process that allows for the development of both cognitive and psychomotor skills, (2) feedback or debriefing assisted with the development of critical thinking and leadership skills, and (3) HFS is a nonthreatening environment. "Participants reported that simulation prepared them well to care confidently for critically ill patients" (Kaddoura, p. 506) and enhanced collaborative learning.

Randomized Control Study

Although most research related to the use of simulation in the acute care setting was descriptive studies, one study provided higher levels of evidence. A research study conducted by Hoadley (2009) was a randomized trial where participants were assigned to either a control group or an experimental group. The control group learned ACLS using a low-fidelity simulator, whereas the experimental group used HFS. There was no statistically significant difference in posttest scores or skills between the two groups. Both groups were equally satisfied with their simulation experiences and the overall course design. The only difference was in the verbal responses of the participants: the students in the HFS group "…stated that learning using HFS was enjoyable and adamantly recommended that ACLS should only be taught using HFS" (Hoadley, 2009, p. 91). Although the author's research hypothesis that HFS would improve performance and increase participant's satisfaction was not supported, the author concluded that simulation would likely decrease training time and training costs, strengthen learning, and improve patient care. However, these suppositions were not within the scope of the study and should be viewed with caution.

ANALYSIS OF UTILITY

In conducting an analysis of utility for the use of HFSs in the acute care setting for the orientation and training of nurses, several areas must be considered, including regulatory and ethical issues, ergonomics, social and political aspects as well as financial considerations.

Regulatory Issues

The Joint Commission (2009) requires healthcare agencies to assess staff competencies using a systematic and measurable method. Although the Joint Commission does not determine what method a healthcare agency must use, the expectation is that the method must be thorough and focus on the clinical competencies needed by the nurse to care for a specific patient population (Joint Commission). Self-assessment and skills checklist are not acceptable. Observation of skills, such as those performed in a simulation, is acceptable. HFS would meet the requirements of the Joint Commission needed for an acute care facility to maintain its accreditation.

Ethical Questions

Using the Code of Ethics for Nurses (American Nurses Association [ANA], 2010) as the structure for assessing the ethical considerations in using HFS, several issues need to be addressed. First of all, a nurse's primary responsibility is to the patient (Provision 2, Code of Ethics for Nurses, ANA), with an additional commitment to protect the patient's health, safety, and rights (Provision 3, ANA). HFS, by substituting a manikin for the patient, enables the nurse to practice his or her skills with no danger to the patient. Provision 5 states that "the nurse owes the same duties to self as to others, including the responsibility to…maintain competence and to continue personal and professional growth" (ANA, p. 1). HFSs enable the nurse to experience low-frequency, high-risk situations and learn how best to respond. The nurse is expected to collaborate with other health professions to meet health needs (Provision 8). HFS has the potential to improve collaboration. Furthermore, privacy and confidentiality (Provision 3) are ethical concerns that are not an issue with HFS. The scenarios, although realistic, are constructed. The only privacy and confidentiality issues to be considered are those of the participants. If the scenarios are videotaped, the participants must be made aware of the intended use before they participate in the simulation.

Political and Social Factors

The impetus for the use of simulation contains both political and social factors. In addition to the Institute of Medicine, many national organizations are encouraging the use of innovative teaching methods to improve competency and decrease adverse events. These organizations include "…the Agency for Healthcare Research and Quality, American College of Surgeons, American Council for Graduate Medical Education, National League for Nursing, American Nurses Association, and the American Association of Critical Care Nurses" (Cato & Murray, 2010, p. 44). Nurses who have used simulation in their undergraduate programs are coming to the acute care setting expecting the same kind of learning activities that they had in nursing school. Many nursing education programs now have HFS laboratories.

Ergonomic Issues

HFSs are designed to help nurses improve on care to enhance patient safety, but there are some ergonomic issues for the nurse participating in the simulations that need to be considered to ensure the trainee's safety. Proper equipment that is ergonomically designed is essential in the simulation environment. This includes having beds for the simulator that are easy to move and raise and appropriate workspace and desks/locations for the computers and the faculty who run the simulators. The cost of the manikins may lead facilities to try to compensate by neglecting ergonomics and safety.

System Concerns

Further consideration of the use of HFS must look at some of the system issues. Staff development departments need to determine the best location for the simulators to ensure ready access. In addition, individuals need to be hired to run the simulations as well as to maintain the simulators. Although many authors state that HFS is an excellent way to enhance collaboration in multidisciplinary teams, system barriers need to be overcome to get all of the players present. In addition, simulations are very time consuming, and the involved departments need to commit to make that time available for the nurses and other team members to participate.

Financial Issues

Finally, financial issues must be addressed. HFS' manikins are very costly; they can range from $20,000 for just the simulator to $60,000 with accessories. In addition to the expense of the initial purchase of the manikin, there is also a need for space, training of personnel, technical support, development of scenarios, and maintenance (Broussard, 2008; Leigh, 2011). Most simulation laboratories have a simulation coordinator (Broussard) who will need to receive ongoing training to keep up with the latest advances in simulation technology. And, unlike nursing students who participate in simulation, acute care facilities using HFS for continuing education must pay the nurses to participate in the simulations, which are time consuming. According to Stefanski and Rossler (2009), "simulation laboratories are expensive to implement and operate with total estimated costs ranging from $200,000 to $1.6 million" (p. 444).

RECOMMENDATIONS FOR FURTHER RESEARCH

Overall, the research related to the use of HFS with practicing nurses is very limited, with currently only one randomized study having been published. Numerous authors refer to research that was conducted on the use of simulations for training physicians (Sportsman et al., 2009) or for nursing students (Broussard, 2008; Hoadley, 2009) and apply those results to the use of simulation for practicing nurses. Although these studies with physicians and nursing students do show that simulation is an effective way to learn new technical skills (how to perform a surgery, how to do a patient assessment), there is little research that supports the use of HFS to further the development of critical thinking skills for the experienced nurse. Gordon and Buckley (2009) also point out that, although many nursing education programs are developing simulation laboratories, there

is limited research on how it should be used, even in nursing education. In addition, further studies are needed to show that the knowledge gained in simulation can be transferred to the bedside by the participants and that this ultimately affects patient' outcomes.

CONCLUSIONS

Use of HFS in both orientation programs and staff development activities has the potential to meet many learning needs. HFS has been identified as a way for "…healthcare professionals to hone the clinical skills that are needed to provide safe care without harming patients as they develop these skills" (Galloway, 2009). Unfortunately, there is a lack of evidence to support the claim that HFS alone makes a difference. Is it HFS that is the best tool to use to refine nursing skills, critical thinking, and collaboration, or is it the quality of educational experience that is the factor of interest? Time is required to prepare a quality simulation. If the same effort was invested in a low-fidelity simulation, such as suggested by Hoadley (2009), or in a case study, would the results be the same? Currently, the research studies available are insufficient to answer these questions.

In the analysis of utility, do the benefits of HFS outweigh the financial costs as well as the workflow difficulties involved in its use for the orientation and training of nurses? Certainly, HFS has the potential to meet the requirements of accrediting bodies such as the Joint Commission. Ethically, it is an excellent tool because of increased safety to patients and no need to maintain the privacy of the simulator patient. Political and social factors are also pushing for the use of more HFS in the acute care environment, but there are negatives associated with this technology: systems issues such as space, staff, and time required as well as the financial cost of the manikin itself and the ancillary equipment. Although the data do not clearly show the cost-effectiveness of HFS, there may be nonmonetary benefits that can be realized such as an increase in safety and quality.

Although the research is limited to support some of the claims about the benefits, indicators point to HFS as a tool to assist with the acquisition of knowledge, confidence, and, possibly, critical thinking skills by both new graduates and experienced nurses in a risk-free, experiential learning environment (Kaddoura, 2010). However, before the healthcare industry continues on this journey of widespread adoption of HFSs, more research needs to be done to show that the increased skills and knowledge of the nurse obtained through simulation do translate into safer patient care and better patient outcomes. As the study conducted by Hoadley (2009) seemed to indicate, low-fidelity simulations may be just as effective as the HFSs. Day (2007) also had concerns that time spent in a simulation laboratory may actually slow down the process of skills acquisition by newly graduated nurses because time at the bedside is being replaced with time in the simulation laboratory outside of the patient–nurse relationship.

Unfortunately, careful study of the outcomes of simulation may not happen. There is a major push from both national agencies and newly graduated nurses to see more simulations in use. In an environment where healthcare dollars are limited, precious revenue is being spent on incorporating this new technology into educational systems and healthcare agencies both nationally and internationally based on limited supporting data. Nurses in staff development must determine the best way to spend limited dollars; the money spent on HFS might be better spent carefully planning case studies, developing scenarios to use with low-fidelity simulators, or other less-expensive but equally effective learning activities.

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