Hawai'i State Center for Nursing
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Simulation Use in Nursing Education
Review of Recent Literature as of *October 16, 2020*

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Summary of Findings

Hawai`i State Center for Nursing invited schools of nursing across Hawai`i to contribute to this annotated bibliography. Simulation directors and nursing instructors and professors provided journal articles and annotations of the articles' findings. A summary of findings is below with the articles and their annotations, categorized by Efficacy of Online or Virtual Simulation, Comparison of Virtual Simulation to High Fidelity Simulation, and Regulation or Accreditation Standards for Use of Simulation.

Virtual simulation is found to have high quality outcomes as it relates to student experience and satisfaction with the learning environment, acquisition and retention of knowledge related to clinical concepts, and development of performance based skills including performing procedures with improvements in ability to complete the procedure and efficiency during the procedure. Findings also identified that virtual simulation supported knowledge and skill development with regards to patient interaction, time management, and navigating difficult situations. Virtual simulation also provided learning opportunities for situations that may not occur during site-based clinical learning like situations rarely encountered on the job and with cultural exposure that may not be prevalent in a student's geographic setting.

When virtual simulation is compared to high-fidelity simulation, it was found that performance outcomes were not statistically significant as it relates to learning curves, procedure time and confidence, recognizing critical events, knowledge or confidence in the subject matter, or satisfaction with debriefing and reflective practice processes. Statistically significant outcomes for virtual simulation included improved performance on skills-based procedures, enhanced attainment of cognitive objectives based on student self-reported surveys, and improved post test scores when used as a component of three-dimensional learning as opposed to two-dimensional learning. Students also reported they felt it complemented lecture though findings also indicate that students with difficulty navigating technology may not prefer virtual simulation as a learning experience.

The National Council of State Boards of Nursing (NCSBN) published a self-funded study conducted by researchers employed by the NCSBN that provides substantial evidence-based criteria for identifying quality indicators of successful nursing education programs. Additionally, warning signs for high-risk education programs were identified for boards of nursing and nursing academic programs to ensure quality of education is maintained with the use of simulation. However, the recommendation from the NCSBN to not exceed 50% simulation is generated from an NCSBN study. Notably, both guidelines are not restricted to any one kind of simulation, but instead focuses on the quality of the activity.

The study that resulted in the NCSBN recommendations that schools of nursing do not exceed 50% simulation replacement for live clinical education is based on a self-funded study that was conducted by researchers employed by the NCSBN. This study compared a control group with no more than 10% simulation used, a study group with 25% of simulation, and a study group with 50% simulation; no test groups beyond 50% were

studied. There were no statistically significant differences between any three of the groups studied.

Recent surveys of schools of nursing find that prelicensure nursing education programs in the U.S. increased the use of high-fidelity simulation use in undergraduate courses substantially between 2010 and 2017, and decreased computer-based simulation for all courses except for psychiatric/mental health nursing. However computer-based simulation was still used by up to 50% of programs, depending on degree type and course. Simulation was used the least by LPN programs. Though the 2017 survey found most nursing programs substitute simulation for clinical hours using a 1:1 ratio of simulation to clinical hours, newer research identifies that the intensity and efficiency of virtual simulation was demonstrated through the completion of more activities in higher levels of difficulty in significantly less time than clinical. This study findings serve as emerging evidence toward a 2:1 clinical to simulation ratio.

Definition of Virtual Simulation

From Lopreiato J O. Healthcare Simulation Dictionary. Rockville, MD: Agency for Healthcare Research and Quality; October 2016. AHRQ Publication No. 16(17)-0043.

> "The recreation of reality depicted on a computer screen" (McGovern, 1994); and "A type of simulation that injects humans in a central role by exercising motor control skill (for example, flying an airplane); , decision skills (committing fire control resources to action), , or communication skills (such as members of an air traffic control team). (Hancock et al, 2008).

From Simulation Canada. (2020). Virtual Simulations & Virtual Patients. https://www.sim-one.ca/content/virtual-simulations-virtual-patients#footnoteref2_4p91wc2

> Virtual simulations, also called screen-based simulations or virtual simulation games, are "the recreation of reality depicted on a computer screen" that "injects humans in a central role by exercising motor control skills, decision skills, or communication skills."[1] This includes virtual patient simulators, which are "a computer program that simulates real-life clinical scenarios in which the learner acts as a health care provider obtaining a history and physical exam, and making diagnostic and therapeutic decisions." This is distinguished from virtual reality simulations, which require the use of specialized head-mounted displays.

Annotated Bibliography:

Efficacy of Online or Virtual Simulation

Aebersold, M., Voepel-Lewis T, Cherara, L, Weber, M. Khouri, C., Levine, R., &

Tait, A. R. (2018). Interactive Anatomy-Augmented Virtual Simulation Training.

Clinical simulation in nursing, 15 34-41. https://doi.org/10.1016/j.ecns.2017.09.008

Overall the AR module was better received compared with the control group with regards to realism, identifying landmarks, visualization of internal organs, ease of use, usefulness, and promoting learning and understanding.

Chan, G., & Burns, E. (Unpublished). Quantifying and Remediating the New Graduate

Nurse Resident Academic-Practice Gap Using Online Patient Simulation. *Journal of*

Continuing Education in Nursing.

A pre-test, post-test quasi-experimental study using an online patient simulation program was implemented in a convenience sample of newly graduated nurse residents over 16-months to quantify the academic-practice gap through the pre-test by evaluating the case scenario pass rates with a subanalysis on the highest readmission conditions, number of medication and sentinel errors, and failure-to-rescue rates and to close the academic-practice gap through the use of an online simulation program and evaluate that closure through post-test measurement of the same pre-test metrics. As compared to the pre-test, the post-test showed overall performance improvement from 24% pass rate up to 76% with improved knowledge use across clinical conditions ranging from 19 to 86 percentage points. The use of online simulation led to a reduction of patient safety sentinel errors from 100% to 21%, reduction in medication errors by 80%, and reduction of failures-to-rescue in new graduates from 81% to 23%. The study also indicated that online simulation enables "actual clinical performance", not only "knowledge about clinical performance" thus indicating that simulation facilitates development of more complex competencies than knowledge alone.

Foronda, C. L., Fernandez-Burgos, M., Nadeau, C., Kelley, C. N., & Henry, M. N.

    (2020). Virtual simulation in nursing education. *Simulation in Healthcare: The Journal*

    of the Society for Simulation in Healthcare, *15*(1),

    4654. https://doi.org/10.1097/sih.0000000000000411 .

    As virtual simulation is burgeoning, faculty and administrators are asking for
    evidence of its effectiveness. The objective of this systematic review was to identify
    how virtual simulation impacts nursing student learning outcomes. Applying the
    Preferred Reporting Items for Systematic Reviews and Meta-analyses guidelines, 80
    studies were reviewed. Results indicate that most research (n= 69, 86%) supported
    virtual simulation as an effective pedagogy to support learning outcomes while
    highlighting gaps and areas of bias.

Goldsworthy, S., Patterson, J. D., Dobbs, M., Afzal, A., & Deboer, S. (2019). How

    does   simulation impact building competency and confidence in recognition and

    response to the adult and paediatric deteriorating patient among undergraduate

    nursing students? *Clinical Simulation in Nursing, 28*, 25-32.

    doi:10.1016/j.ecns.2018.12.001 https://doi.org/10.1016/j.ecns.2018.12.001 .

    The ability to recognize and respond to a deteriorating adult or pediatric patient is
    critical to prevention of poor patient outcomes. Simulation is used to prepare nursing
    students as they plan to transition to practice. A hybrid approach that includes virtual
    simulation and high-fidelity simulation is effective at teaching undergraduate nursing
    students to recognize and respond to a deteriorating adult or pediatric patient. A new
    measure, Clinical Self-efficacy, was piloted in this study and showed a high internal
    consistency (0.91). Significant improvement in all items on the Clinical Self-efficacy
    tool was seen in the treatment group after the intervention.

Lee, Y., Kim, S., & Eom, M. (2020). Usability of mental illness simulation involving

    scenarios with patients with schizophrenia via immersive virtual reality: A mixed

    methods study. *PLoS ONE, 15*(9), 1-13. https://doi-

    org.ezproxy.chaminade.edu/10.1371/journal.pone.0238437

The study suggests a new form of mental health virtual reality simulation that is user-friendly and engaging to improve education of mental health nursing students and thereby improve the treatment of patients. A mixed-methods study was conducted with sixty nursing students using 360-degree videos of five scenarios reflecting the clinical symptoms of schizophrenia patients and related treatment tasks. Students were administered a qualitative and quantitative questionnaire post virtual simulation program. Students reported a high realism increasing student engagement and that the program was useful and engaging. The study shows that virtual reality simulation could serve as an effective alternative form of clinical training in mental health nursing and education can be enhanced by its benefits.

Marby, J., Lee, E., Roberts, T., & Garrett, R. (2020). Virtual Simulation to Increase

Self-efficacy Through Deliberate Practice. *Nurse Educator, 45*(4), 202-205,

https://doi.org/10.1097/NNE.0000000000000758

Virtual simulation was introduced prior to a complex high-fidelity simulation with aim to increase student self-efficacy. Students completed virtual simulation scenarios until a specific score of mastery was obtained, then the same scenario was repeated with a high-fidelity laboratory. A pre- and post-simulation (modified) self-efficacy scale survey was administered. The study found that the virtual simulation increased self-efficacy allowing students to engage in the experience and achieve higher levels of mastery through deliberate practice.

Padilha, J. M., Macado, P. P., Ribeiro, A., Ramos, J., & Costa, P. (2019). Clinical Virtual

Simulation in Nursing Education: Randomized Controlled Trial. *Journal of Medical*

Internet Research, 21. https://doi.org/10.2196/11529

Innovations in technology have translated to the use of virtual clinical simulation in nursing education and have become a pedagogical strategy to facilitate development of motor control, decision making skills, and communication skills. In a randomized controlled trial of 42 students, the experimental group was given access to a clinical virtual simulator while the other group had access to a low-fidelity simulator and realistic environment. Via a pretest and two posttests, it was shown the group with access to the virtual clinical simulation had significant improvements in their knowledge after intervention showing clinical virtual simulation as a potential to improve knowledge retention and clinical reasoning.

Redmond, C., Hardie, P., Davies, C., Cornally, D., Daly, O., & O'Sullivan, C. (2020). Increasing
      competence in wound care: A cross-sectional study to evaluate use of a virtual patient by
      undergraduate student nurses. *Nurse Education in Practice, 44.* https://doi-
      org.ezproxy.chaminade.edu/10.1016/j.nepr.2020.102774.

      The aim of this study was to describe the development and educational evaluation of a
      virtual patient to supplement undergraduate learning of wound care. Evaluation of the
      virtual patient by 148 penultimate year nursing students where students reported perceived
      increase in confidence and ability to meet wound care competency outcomes and allow
      students opportunities to utilize wound care theory repetitively in a safe environment. The
      study found the use of virtual patient simulation is perceived as effective in increasing wound
      competency, can overcome the difficulty of declining resources, and provides students with
      structure for their care.

Sapiano, A. B., Sammut, R., & Trapani, J. (2018). The effectiveness of virtual simulation in
      improving student nurses' knowledge and performance during patient deterioration:
      a pre and post test design. *Nurse Education Today, 62*(3), pp. 128-133.
      https://doi.org/10.1016/j.nedt.2017.12.025

      The study explores the use of virtual simulation to help nursing students gain the
      skills to navigate the complex situations of a rapidly deteriorating patient via three
      virtual scenarios. One hundred sixty-six students were given pre- and post- tests
      which show virtual simulations to be effective learning tools to prepare students for
      difficult situations, especially situations that are not frequently seen on the job.

Smith, P. C., & Hamilton, B. K. (2015). The Effects of Virtual Reality Simulation as a
      Teaching Strategy for Skills Preparation in Nursing Students. *Clinical Simulation in
      Nursing, 11*(1), pp. 52-58.

      This study set out to explore the use of simulation as a new instructional strategy to
      teach basic nursing skills, specifically, to support Foley catheter skill proficiency. An
      after-only experiment evaluation was administered to evaluate the skill performance,
      perceived perception, and practice time. The students exposed to the virtual
      simulation all performed the catheterization on the first attempt and spent less time
      conducting the procedure than the students without exposure to the virtual
      simulation.

Smith, S., Farra, S., Ulrich, D., Hodgson, E., Nicely, S., & Matcham, W. (2016). Learning and Retention Using Virtual Reality in a Decontamination Simulation. *Nursing Education Perspectives, 37*(4), pp. 210-214.

This study sought to examine the longitudinal effects of virtual reality simulation on learning outcomes and retention with respect to teaching nursing students the skills of decontamination. A quasi-experimental design was used with two groups of nursing students. Results indicated that virtual simulation was superior in some aspects when compared to traditional methods of education and can be a valuable option to promote skill development and retention.

Tilton, K. J. & Hoglund, B. A. (2015). Non-Acute-Care Virtual Simulation: Preparing Students to Provide Chronic Illness Care. *Nursing Education Perspectives (National League for Nursing), 36*(6), 394-395. https://doi-org.ezproxy.chaminade.edu/10.5480/14-1532

This pilot study demonstrated the potential for virtual simulation in nursing education regarding chronic care management in community settings. Observations of faculty characteristics associated with the ability to effectively facilitate simulation experiences and debriefing sessions were consistent with prior studies.The introduction of clinical virtual simulation in nursing education has the potential to improve knowledge retention and clinical reasoning in an initial stage and over time, and it increases the satisfaction with the learning experience among nursing students.

Weideman, Y. L., Young, L., Lockhart, J. S., Fridline, M. M., & Panas, M. (2016). Strengthening Cultural Competence in Prenatal Care with a Virtual Community: Building Capacity through Collaboration. *Journal of Professional Nursing,* S48-S53. https://doi.org/10.1016/j.profnurs.2016.03.004

A virtual simulation experience was designed, implemented, and evaluated with aims to facilitate student access to diverse cultures and strengthen their ability to provide culturally-congruent care. The Jeffreys' Transcultural Self-Efficacy Test (TSET) was administered showing significant increases in overall and subscale TSET scores showing that virtual simulation experiences are effective in transcending global barriers, gaining insight to diverse cultures, and strengthening students' cultural competence.

N.Fogg,C.Wilson,M.Trinka,etal.,Transitioning from direct care to virtual clinical experiences

during the COVID-19 pandemic,Journal of Professional Nursing (2020)

,https://doi.org/10.1016/j.profnurs.2020.09.01

When the COVID-19 pandemic forced university campuses and healthcare agencies to temporarily suspend both undergraduate and graduate direct care educational experiences, nursing programs had to formulate alternative plans to facilitate clinical learning. Texas Woman's University used this opportunity to assemble a faculty group tasked with creating a set of college-wide guidelines for virtual simulation use as a substitution for traditional face-to-face clinical. The process included completing a needs assessment of both undergraduate and graduate level programs across three campuses and identifying regulatory requirements and limitations for clinical experiences. The task force utilized the information gathered to develop evidence-based recommendations for simulation hour equivalence ratios and compiled a list of virtual activities and products faculty could use to complete clinical experiences. Undergraduate and graduate student surveys were conducted to determine the effectiveness of the transition to virtual clinical experiences. Overall, the majority of survey results were positive regarding virtual simulation experiences providing students with valuable opportunities to enhance their learning. Negative comments regarding the impact of COVID-19 on a personal level included issues involving internet access and web conferencing logistics, lack of motivation to study, family difficulties, and faculty inexperience teaching in an online environment. Undergraduate pre-licensure students were provided with opportunities to successfully complete all remaining required clinical hours virtually, while graduate students were allowed to complete non-direct care hours as applicable using virtual clinical experiences.

J. Francisco, (2017). Using Virtual Patient Simulation in Substitution for Traditional Clinical Hours

in Undergraduate Nursing, *Shadow Health Inc*. (1-16). Florida, Gainesville.

https://www.dropbox.com/s/92jhpi7nf7wfkgt/GWU_19_Jimenez_Wilson_poster.

pdf?dl=0

Virtual patient simulations can help students develop a critical understanding of the core concepts behind prioritization and interprofessional communication in nursing as
well as the opportunity to apply key leadership knowledge, skills, and competencies needed prior to entering the workforce. Bedside clinical nurses must apply clinical leadership skills to ensure safe, high-quality patient care as well as positive patient outcomes. Using these types of scenarios can help educators to teach safe, patient centered care leadership skills and hospital and health system leaders with better prepared new graduates that can contribute to best patient care and outcomes.

Comparison of Virtual Simulation to High Fidelity Simulation

Bayram, SB, & Caliskan, N. (2019). Effect of a game-based virtual reality phone application

on tracheostomy care education for nursing students: a randomized controlled trial.

Nursing Education Today, 79, 25-31. https://doi.org/10.1016/j.nedt.2019.05.010

A game-based virtual reality phone application was utilized in a study of first-year nursing students as a simulation to teach psychomotor skills. In a single-blind, randomized controlled trial, 86 students were split into two groups with the experimental group being the students who had access to the virtual reality application on their phones during the trial. The experimental group scored higher than the other students in suctioning a tracheostomy and peristomal skin care teaching skills on average on their final test showing game-based virtual reality can be effective in psychomotor skill training.

Hanson J, Andersen P, Dunn PK. (2019). Effectiveness of three-dimensional visualisation

on undergraduate nursing and midwifery students' knowledge and achievement in

pharmacology: A mixed methods study. *Nurse Education Today*, Oct;81:19-25. doi:

10.1016/j.nedt.2019.06.008. Epub 2019 Jun 30. PMID: 31306850.

This study included 202 second year undergrad and midwifery nursing students who participated in a mixed methods study comparing effectiveness of three-dimensional immersive visualization vs two dimensional visualization teaching methods to improve knowledge of pharmacology. Results: statistically significant improvement in post test scores using three dimensional virtual learning.

East L, Hutchinson M. (2015) Evaluation of a filmed clinical scenario as a teaching resource

    for an introductory pharmacology unit for undergraduate health students: A pilot

    study. *Nurse Education Today*, 35(12):1252-6. doi: 10.1016/j.nedt.2015.04.009. Epub

    2015 Apr 27. PMID: 25979800.

    Pilot study with 32 subjects. Evaluating use of a filmed simulated clinical scenario as a teaching resource. The use found teaching resource complemented lecture and enhanced attainment of cognitive objectives based on student self reported surveys.

Hanson J, Andersen P, Dunn PK. (2020). The effects of a virtual learning environment

    compared with an individual handheld device on pharmacology knowledge

    acquisition, satisfaction and comfort ratings. *Nurse Education Today*, 92:104518. doi:

    10.1016/j.nedt.2020.104518. Epub 2020 Jun 29. PMID: 32629336.(LW)

    Comparison between two virtual reality methods (3 dimensional facility – CAVE2) versus handheld devices with stereoscopic lenses attached. Students preferred the CAVE 2 3d experience but no difference was found in satisfaction with debriefing and preflective practice processes.

Erlinger LR, Bartlett A, Perez (2019) A. High-Fidelity Mannequin Simulation versus

    Virtual Simulation for Recognition of Critical Events by Student Registered Nurse

    Anesthetists. *American Association of Nurse Anesthetists*, 87(2):105-109. PMID:

    31587722.

    Comparison of use of high fidelity manikin vs virtual reality simulation in Nurse Anesthesia training. No significant differences were found in the ability for 3rd year students to recognize critical events when using both methods.

Jiang B, Ju H, Zhao Y, Yao L, Feng Y. (2018). Comparison of the Efficacy and Efficiency

of the Use of Virtual Reality Simulation With High-Fidelity Mannequins for

Simulation-Based Training of Fiberoptic Bronchoscope Manipulation. *Simulation in*

Healthcare, 13(2):83-87. doi: 10.1097/SIH.0000000000000299. PMID: 29621098.

Compared efficacy of Virtual reality simulation with high fidelity manikin simulation
during training of bronchoscope training. Subjects: 46 anesthesia residents. Results:
Virtual reality simulation was more efficient than high fidelity simulation. No
significant difference in learning curves, procedure time and confidence between
Virtual simulation and high fidelity simulation.

Cobbett S, Snelgrove-Clarke E. (2016) Virtual versus face-to-face clinical simulation in

relation to student knowledge, anxiety, and self-confidence in maternal-newborn

nursing: A randomized controlled trial. Nurse Educator Today. 45:179-84. doi:

10.1016/j.nedt.2016.08.004. Epub 2016 Aug 9. PMID: 27537670.

Comparison between two maternal newborn clinical simulation scenarios using
virtual clinical simulation and high fidelity simulation. Subjects 53 third year BS in
Nursing students. Measures included, knowledge, self confidence, and anxiety.
Results: no statistically significant differences in knowledge or self confidence.
Anxiety higher with virtual simulation than high fidelity simulation. Those that
noted they did not like virtual simulation had problems with technology.

Wong DT, Mehta A, Singh KP, Leong SM, Ooi A, Niazi A, You-Ten E, Okrainec A, Patel

R, Singh M, Wong J. (2019) The effect of virtual reality bronchoscopy simulator

training on performance of bronchoscopy-guided intubation in patients: A

randomised controlled trial. European Journal of Anaesthesiology, 36(3):227-233.

doi: 10.1097/EJA.0000000000000890. PMID: 30234669.

Comparison of use of high fidelity virtual reality bronchoscopy simulator training ,
train on fibere-optic intubation, with no simulation training. Subjects: Anesthesia
residents, medical students and anesthesia assistants. Measures were pre/post
training intubation time and checklist scales. No significant differences found in

intubation time and checklist ratings though the simulation group had improvement over the group without simulation.

Regulation or Accreditation Standards for Use of Simulation

Alexander, M., Durham, C. F., Hooper, J. I., Jeffries, P. R., Goldman, N., Kardong-

Edgren, S. "Suzie," Kesten, K. S., Spector, N., Tagliareni, E., Radtke, B., &

Tillman, C. (2015). NCSBN Simulation Guidelines for Prelicensure Nursing

Programs. *Journal of Nursing Regulation*, *6*(3), 39–42.

https://doi.org/10.1016/S2155-8256(15)30783-3

Evidence based guidelines meant to help: 1) boards of nursing (BONs) in evaluating the readiness of prelicensure nursing programs in using simulation as a substitute for traditional clinical experience; 2) nursing education programs in the estab- lishment of evidence-based simulation programs for the undergraduate nursing curriculum.

INACSL Standards of Best Practice: SimulationSM Simulation Design. (2016). *Clinical*

Simulation In Nursing, *12*, S5–S12. https://doi.org/10.1016/j.ecns.2016.09.005

International Nursing Association for Clinical Simulation and Learning (INACSL) is the global leader in transforming practice to improve patient safety through excellence in health care simulation. INACSL has developed 11 evidence-based criterion and required elements to meet identified criterion. INACSL considered this list to be a living document as new evidence is identified.

Hayden, J. K., Smiley, R. A., Alexander, M., Kardong-Edgren, S., & Jeffries, P. R.

(2014). The NCSBN National Simulation Study: A Longitudinal, Randomized,

Controlled Study Replacing Clinical Hours with Simulation in Prelicensure

Nursing Education. *Journal of Nursing Regulation*, *5*(2), S3–S40.

https://doi.org/10.1016/S2155-8256(15)30062-4

A longitudinal, randomized, controlled trial using nursing programs across the United States conducted by employees of the National Council of State Boards of

Nursing. Students participating in the study were enrolled throughout the entire 2 years of their undergraduate nursing program and were then followed for the first 6 months in their first clinical positions to determine long-term effects of simulation and whether replacing clinical with simulation impacts entry into professional practice. Students were put into three groups: study groups with 25% or 50% of required clinical hours were spent in the simulation laboratory and a control- group where students were allowed up to 10% of their clinical hours in simulation.There were no significant differences among study groups regarding end-of-program nursing knowledge, clinical competency, or overall readiness for practice. NCLEX pass rates were statistically equivalent, and managers gave all new graduates similar ratings in critical thinking, clinical competency, and overall readiness for practice. All evaluative measures produced the same results: Educational outcomes were equivalent when up to 50% of traditional clinical experience in the undergraduate nursing program was replaced by simulation.

Smiley, R. A. (2019). Survey of Simulation Use in Prelicensure Nursing Programs:

Changes and Advancements, 2010–2017. *Journal of Nursing Regulation*, *9*(4), 48–61.

https://doi.org/10.1016/S2155-8256(19)30016-X

The rise of simulation in nursing education programs is due to technological advancements and limitations in the number of clinical placements available for students. Building off the National Council of State Boards of Nursing's National Simulation Study, this evaluative follow-up study sought to update the current simulation landscape in prelicensure programs, compare results between 2017 and 2010, and determine the impact of the National Simulation Study and and National Council of State Boards of Nursing's National Simulation Guidelines. Results of a survey sent to all prelicensure nursing education programs in the U.S. indicate high-fidelity simulation use in undergraduate courses increased substantially during the 7-year period, and computer-based simulation use decreased for all courses except for psychiatric/mental health nursing. Across all types of programs (LPN, ADN, BSN and prelicense MS), high fidelity simulation reportedly used by 35-100% of programs, computer-based simulation by 0-50% of programs, and task trainers used by 28-86% of programs, varying by degree type and course. Simulation was used the least by LPN programs and only community/public health nursing for the prelicense MS program did not use computer-based simulation; 16% to 86% of all other programs reported use of computer-based simulation by course. Most nursing programs substitute simulation for clinical hours using a 1:1 ratio of simulation to clinical hours.

Spector, N., Silvestre, J., Alexander, M., Martin, B., Hooper, J. I., Squires, A., &

    Ojemeni, M. (2020). NCSBN Regulatory Guidelines and Evidence-Based Quality

    Indicators for Nursing Education Programs. *Journal of Nursing Regulation*, *11*(2), S1–

    S64. https://doi.org/10.1016/S2155-8256(20)30075-2

This mixed-methods study consists of a comprehensive literature review; a national Delphi study providing data on consensus of experts in nursing education, regulation, and practice; a study analysis of 5 years' worth of BON annual reports of nursing programs; and a study analysis of 5 years' worth of BON site visit documents. This study provides substantial evidence-based criteria for identifying quality indicators of successful nursing education programs as well as warning signs for high-risk programs. The quality indicators and warning signs can serve as the basis for legally defensible and evidence-based guidelines for nursing education approval.

This study identifies that warning signs of unsatisfactory nursing education program performance include "limited clinical experiences that do not prepare the students for practice" and "over-reliance on simulation to replace clinical experiences for the nursing program's students". Quality indicators for satisfactory nursing education program performance includes "clinical experiences with actual patients that prepare students for the reality of clinical practice", "systematic process is in place to address and remediate student practice errors", "collaboration between education and practice to enhance readiness for practice", and "quality simulation is used to augment clinical experiences."

Sullivan, N., Swoboda, S. M., Breymier, T., Lucas, L., Sarasnick, J., Rutherford-

    Hemming, T., Budhathoki, C., & Kardong-Edgren, S. (S.) (2019, May). Emerging

    evidence toward a 2:1 clinical to simulation ratio: A study comparing the

    traditional clinical and simulation settings. Clinical Simulation in Nursing, 30(C),

    34-41. https://doi.org/10.1016/j.ecns.2019.03.003.

This multicenter observational study compared traditional clinical to simulation on the type, number, and level of educational activities as determined by Miller's Pyramid. Results: Forty-two students' experience revealed that skills, physical assessment, teaching, and critical thinking activities occurred more frequently in simulation, with safety interventions more common in clinical. In addition, in

simulation, students performed a greater percentage of activities in higher levels of Miller's Pyramid, ''Knows How''; 12.8% as compared with 8.6% in clinical, and ''Does''; 66.3% as compared with 46.2% in clinical. Notably, the activities in ''Does'' were completed in approximately 1/ 5 of the time in simulation; 440 minutes, as compared with clinical; 2,137 minutes. Conclusion: The intensity and efficiency of simulation was demonstrated through the completion of more activities in higher levels of Miller's Pyramid in significantly less time than clinical providing emerging evidence toward a 2:1 clinical to simulation ratio.