

Benchmarking Health Sciences Simulation and Training Facilities

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In the following report, Hanover Research presents the results of a benchmarking analysis of health sciences simulation and training facilities, specifically highlighting thirteen institutions in the nation.



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Recommendations

Based on an analysis of health sciences simulation and training facilities at thirteen institutions in the nation, Hanover recommends:

- 1

Build a simulation center around the needs of interprofessional education. A review of relevant literature and national state-of-the-art facilities indicate that interprofessional education is commonly understood to be a best practice in clinical simulation.
- 2

Consider a facility that allows for multiple rooms and accommodates equipment. Simulation centers usually include at least several labs and/or simulation sites, a debriefing room, a classroom, as well as a computer lab and/or monitoring room. Low and high-fidelity simulators (transparent anatomical manikins) and part task trainers, as well as technological equipment (e.g., computers, monitors, and cameras) are standard among reviewed simulation centers.
- 3

Recruit staff with expertise in simulation education and technology. Simulation centers usually require personnel that are well-versed in simulation education and that understand the technological and technical needs of such a facility.

Fast Facts



3-45K

Smallest and largest size in square feet of reviewed simulation centers



\$450,000

Average cost to start a well-equipped center



5

Number of centers accredited by the Society for Simulation in Healthcare (SSH)

Key Findings

Healthcare practitioners consider simulation centers beneficial to students and patients. Researchers and practitioners in health sciences-related fields highlight that simulations can demonstrably enhance students’ skills and competencies, as well as improve patients’ safety and well-being. Especially in nursing education, simulation is becoming a standard teaching strategy.

Reviewed simulation centers emphasize interprofessional learning. Hanover selected 13 national simulation centers that offer learning opportunities for students from a range of health sciences-related fields, such as nursing, medicine, pharmacy, and physical therapy. This scope is deliberate as centers see it as important to foster interdisciplinary communication and learning.

Many reviewed centers are housed in Schools of Nursing, while a few are also integrated in a College or Center of Medicine. University of Tennessee’s Center for Healthcare Improvement and Patient Simulation (CHIPS), the most recently established (2018) and largest facility, is housed across six colleges (dentistry, graduate health sciences, health professions, medicine, nursing, and pharmacy).

The sizes of centers’ facilities and staff vary. Facilities’ spaces range from 3,025 to 45,000 square feet. Larger centers include multi-purpose classrooms, debriefing rooms, a computer/monitoring lab, hospital bays, and simulation sites. Most centers have a staff of five or more, including a director, an assistant director, a simulation technology specialist and technician, as well as a program administrator or coordinator. Large centers also employ trainers for standardized patients, certified healthcare simulation educators, and teaching assistants. All centers offer standardized patient programs which requires the inclusion of volunteers or professional actors who play the roles of patients.

Standard equipment includes low and high-fidelity simulators (transparent anatomical manikins), part task trainers, and technology. Manikins usually represent infants, children, and adults and various medical scenarios. Part task trainers are crucial for hands-on skills training (e.g., airway management, vascular access) while cameras, computers, monitors, and other equipment are needed to monitor and record simulations. Some centers also include equipment that allows for the inclusion of virtual reality simulations.

Methodology

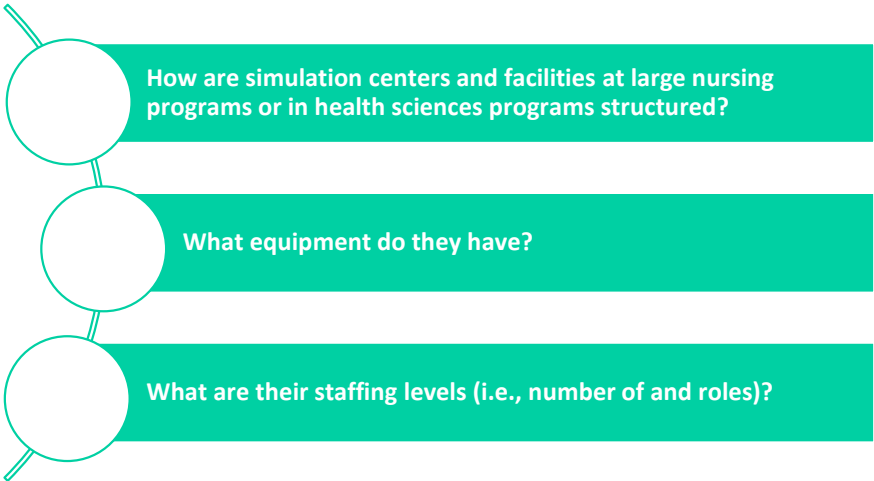
To assist institutions in learning about the facilities, simulation centers, simulation technology, and staffing trends at large nursing schools, Hanover conducted a benchmarking study to determine the ways in which schools have generally structured facilities and organized personnel.

The following analysis is based on a review of information drawn from institutional websites, as well as relevant secondary literature. Hanover selected the thirteen institutions included in this analysis based on their state-of-the-art health sciences simulation and training facilities and their commitment to interprofessional education (i.e., their promotion of interactive learning of students from various health sciences which is aimed at improving interdisciplinary collaboration and patients' well-being).

Selected Institutions

Institution	Location	Facilities
Drexel University	Philadelphia, PA	Center for Interprofessional Clinical Simulation and Practice
Duke University	Durham, NC	Center for Nursing Discovery
Johns Hopkins University	Baltimore, MD	Clinical Simulation Center
Loyola University Chicago	Chicago, IL	Walgreen Family Virtual Hospital / Center for Simulation Education
Oregon Health & Science University	Portland, OR	Simulation and Clinical Learning Center
Pennsylvania State University	Hershey, PA	Clinical Simulation Center
Quinnipiac University	Hamden, CT	Center for Interprofessional Healthcare Education
University of Mississippi Medical Center	Jackson, MS	Office of Interprofessional Simulation, Training, Assessment, Research and Safety
University of Rhode Island	Kingston, RI	Interdisciplinary Health Delivery Simulation Laboratory
University of South Florida	Tampa, FL	The Center for Advanced Clinical Learning
University of Tennessee	Memphis, TN	Center for Healthcare Improvement and Simulation
University of Washington	Seattle, WA	Simulation Center
West Virginia University	Morgantown, WV	David and Jo Ann Shaw Center for Simulation Training and Education for Patient Safety

Research Questions



Rise of Simulation and Training Facilities

Highlighting the manifold benefits, a growing number of universities consider establishing simulation centers and training facilities.



Research has found that simulation-based training can [“improve health care quality and reduce errors.”](#) A recent study states that simulation “has now moved to [center stage in nursing education](#)” and that nursing programs “realize that they can no longer afford to consider simulation as merely an ‘add-on.’”



The market for medical simulations is growing, speaking to [“increasing concerns over patient safety.”](#) Industry insiders expect the global medical simulation market to reach a value of [\\$2,526 million](#) by 2023.



Observers state that the “average cost to start a well-equipped lab is estimated at [USD \\$450,000](#) (ranging from USD \$100,000 to several million dollars).” The [costs](#) stem from “costs of development, acquisition costs, the costs of maintenance, and the costs of operations,” as well as related labor costs.



In the United States, “each state Board of Nursing (BON) is enacting legislation and rules to [regulate the use of simulation](#) in prelicensure nursing education.” Such regulations concern curricular integration, “variability of permitted use within and between states,” and “consistency of outcomes that learners can achieve.”

Current Trends and Best Practices

A range of professional associations have developed guidelines for best practices informing health sciences simulation and training.



The National League for Nursing ([NLN](#)) states that simulation “has been increasingly adopted as a teaching methodology in nursing education and staffing development learning environments, and is [rapidly gaining ground as a standard teaching strategy.](#)”



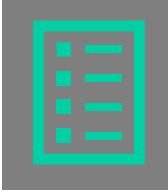
Since its establishment in 2004, the Society for Simulation in Healthcare ([SSH](#)) has been a leading organization seeking “to improve performance and reduce errors in patient care through the use of stimulation.” The SSH is also an [accrediting](#) body that reviews simulation programs worldwide.



Since 1999, the International Nursing Association for Clinical Simulation and Learning ([INACSL](#)) has developed [standards of best practice for simulation programs](#). The most recently published standards ([2016](#)) entail criteria concerning design, outcomes and objectives, facilitation, debriefing, interprofessional education, and other topics.



Since 2010, the Global Network for Simulation in Healthcare ([GNSH](#)) has organized meetings and published white papers on the potential and [merits of simulation practices](#).



Most recently, [virtual reality](#) and its role in [nursing](#) and simulation education has been widely discussed. In 2019, [University of Minnesota](#)’s School of Nursing participated “in a new transgender patient simulation [...] to learn how to better care for transgender patients.”

General Features

The improvement of competencies among healthcare professionals and the promotion of patient safety are central purposes of simulation facilities.



All of the reviewed centers have published mission and/or vision statements in which they emphasize their commitment to improving patients' outcomes and safety, as well as promoting interprofessional and interdisciplinary learning and collaboration (e.g., [PSU](#); [Drexel](#); [Loyola](#); [WVU](#)).



Many of the reviewed centers are housed within Schools of Nursing, while a few are also integrated within a College or Center of Medicine. University of Rhode Island has included its simulation lab within the [College of Pharmacy](#). University of Tennessee's [CHIPS](#) is housed across six colleges.



Most facilities provide opportunities in line with the learning needs of students in nursing, medicine, pharmacy, physical therapy, and kinesiology. Moreover, some centers also provide learning opportunities for practitioners.



Staffing sizes vary among the reviewed centers but usually include at least one director, a simulation technologist and/or technician, and a program coordinator or manager. Bigger centers also employ coordinators for standardized patients and certified healthcare simulation educators.



The facilities' spaces range between 3,025 and 45,000 square feet ([URI](#); [CHIPS](#)). Debriefing and exam rooms are critical spaces. Essential equipment includes low and high-fidelity simulators (manikins) and part task trainers. All centers offer learning with standardized patients.

Additional Simulation Facilities



- In comparison to the benchmarked institutions in this report, **University of Arizona** and **University of Kansas** have fairly small nursing programs. However, their simulation centers showcase an impressive scale in available resources ([Center for Simulation and Innovation](#)) and speak to the growing commitment to interprofessional learning in the health sciences ([Center for Interprofessional Practice, Education and Research](#)).



- Some national universities are currently either in the midst of building a new simulation center, or have launched new centers and programs in 2019. These institutions include [Tri-College University](#) (and Sanford Health), [University of Illinois-Chicago](#) (whose College of Nursing will also receive a [childbirth simulation lab](#)), [Colorado Christian University](#), [George Washington University](#), and [Miami Dade College](#).



- South Carolina is an example of a statewide network of collaborating simulation centers. Established in 2006, [Healthcare Simulation South Carolina](#) includes Clemson University's and University of South Carolina's Colleges of Nursing, as well other postsecondary institutions and Greenville Hospital System.



- In addition to universities, a range of national hospitals have simulation centers to promote interprofessional learning and patient safety. They are usually accessible to students of designated universities. Centers that reflect this trend include [Central Virginia Center for Simulation and Virtual Learning](#), [Methodist Hospital Clinical Simulation Center](#), and [Valley Children's Interprofessional Education Simulation Program](#).

Program Analysis: Infrastructure

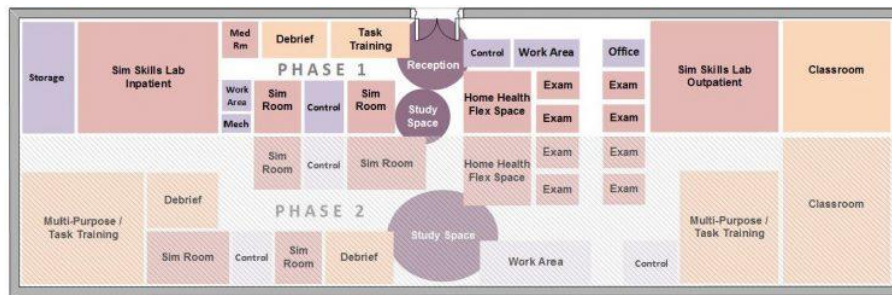
Benchmarking Health Sciences Simulation and Training Facilities

Facilities and Equipment

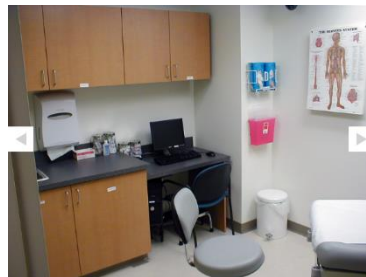
The reviewed centers have established spacious training facilities that allow students in nursing, medicine, pharmacy, and related health sciences to gain hands-on experience and *simulate* real-world scenarios.



Larger centers have included multi-purpose classrooms, debriefing rooms, a computer/monitoring lab, hospital bays, and simulation sites. The figure below shows the current (Phase 1) and projected (Phase 2) layout of [University of Washington's](#) simulation center.



Simulation suites like the one shown to the right at [Drexel University](#) “replicate realistic practice settings with enhanced technology to aid and assist in the student’s understanding of various healthcare competencies.”



Among all reviewed centers, University of Tennessee’s [CHIPS](#), which opened in 2018, is by far the largest (45,000 square feet). It includes not only the standard skills labs for clinical skills and assessments but also a simulated home environment “where students can practice in-home patient care” and a simulated community pharmacy.



Manikins (used for high-fidelity simulation) constitute essential equipment at the reviewed centers. Full-bodied manikins represent different age groups (newborn, child, or adult) and medical scenarios which allow students to practice a range of procedures. Loyola University Chicago uses eight manikins which appear to be relatively common, including a birthing simulator, a newborn, a cardiopulmonary patient simulator, and [others](#). While not reviewed in this report, the University of Colorado recently made headlines for its development of lifelike silicone masks that “allow nursing students to simulate [geriatric care](#).”



Part task trainer are indispensable for [hands-on skills training](#). For example, West Virginia University has purchased trainers that facilitate the simulation of pediatric airway management, intravenous therapy, vascular access, and other treatments.



Equipment like cameras, computers, monitors, headphones, and speakers are needed to observe and record simulations. The University of Florida has installed an integrated system that “allows for the collection of a [360° evaluation](#) on each of our learners for a comprehensive educational experience.”



In recent years, [virtual reality](#) has become increasingly popular in simulation centers for the training of nurses and other health professionals. Oregon Health and Science University offers its students [virtual reality simulators](#) with which they can practice laparoscopic techniques, endoscopies, and other procedures.

Staff: Size and Roles

Staff sizes at the profiled centers vary but all employ personnel responsible for directing, managing, and administering operations.



Eight out of 13 centers list a staff of five or more people. The most common roles include:

- ☐ Director;
- ☐ Assistant director;
- ☐ Simulation technology specialist;
- ☐ Simulation technology technician;
- ☐ Program administrator / coordinator.

Additionally, large programs, such as [CHIPS](#) or [University of South Florida](#) may also employ an educator, coordinator, and/or trainer for standardized patients, certified healthcare simulation educators, and teaching assistants.



Source: [Penn State](#)

While not part of centers' actual staff, simulation centers need individuals who can fill the roles of standardized patients. These individuals may be lay persons, volunteers, or professional actors who are "[carefully coached to simulate an actual patient.](#)"

All of the reviewed centers have established standardized patient programs. Duke University's Center for Nursing Discovery includes role-playing among its [educational strategies](#).

An SP is attended to as part of an Ebola virus drill. The simulated patient was "admitted" to the ICU for a full 24 hours of patient care by providers dressed in appropriate protective gear.

Programming

The centers' general structures and training activities reflect standards of best practice as issued by leading researchers and organizations.

The International Nursing Association for Learning and Clinical Simulation and Learning (INACSL), the Society for Simulation in Healthcare (SSH), and other researcher-practitioners have outlined guidelines and recommendations for best practices in simulation.



The INACSL formulated [eight standards of practice](#):

- 1) **Simulation design** (to provide "a framework for developing effective simulation-based experiences),
- 2) **Outcomes and objectives** (which should be measurable),
- 3) **Facilitation** (which requires a facilitator who can "assist participants in achieving expected outcomes"),
- 4) **Debriefing** ("which has been found to be [most significant](#) to learning"),
- 5) **Participant evaluation**,
- 6) **Professional integrity**,
- 7) **Interprofessional education** (which "enables participants from different professions to engage in a simulation-based experience to achieve shared or linked objectives and outcomes"), and
- 8) **Operations** (which concerns systems and infrastructure).

Competitor Programs Benchmarking Summary

Benchmarking Health Sciences Simulation and Training Facilities

Overview of National Health Sciences Simulation and Training Facilities

Benchmarked programs are institutions located in the nation, offering health sciences simulation and training facilities.

Institution	Center(s) and Facilities	Equipment	Staffing		Notable Features
			Role	Size	
Drexel University Philadelphia, PA	Center for Interprofessional Clinical Simulation and Practice (at College of Nursing and Health Professions)	22,000 square feet Clinical skills labs (pediatric and adult manikins) Creative arts therapies lab Exercise lab Health assessment lab Modalities lab Simulation labs, incl. standardized patient encounters (actual humans) and human patient simulation lab (computerized)	- Director - None further listed	1+	Drexel also operates the Independence Blue Cross Medical Simulation Center which “allows and encourages interactive curriculum development, teaching and assessment of skills between learners of every health care discipline such as therapists, nurses, respiratory therapists, pharmacists and physicians [...]”
Duke University Durham, NC	Center for Nursing Discovery (at School of Nursing)	- Computerized adult and pediatric manikins - Procedural task trainers - Standardized patient program	- Core staff includes director, assistant director, simulation technology specialist, and assistant 10 certified healthcare simulation educators	5+	- Accredited by Society for Simulation in Healthcare (SSH) - Center of Excellence Award in 2016 - Highlight benefits to health professions other than nursing
Johns Hopkins University Baltimore, MD	Clinical Simulation Center (at School of Nursing)	3,296 square feet - Standardized patients program	Director, coordinator, adv. practice simulation coordinator, simulation specialist, simulation technologist	5	Interprofessional collaborative, including online simulation and debriefing
Loyola University Chicago Chicago, IL	Walgreen Family Virtual Hospital and Center for Simulation Education (at School of Nursing)	7,000 square feet - High fidelity simulators (total of eight manikins; adult, obstetric, and pediatric) - Virtual reality simulators, computer lab, eight hospital bays, and three simulation sites Procedural Training Center & Bedside Teaching Lab (including equipment)	Directors, simulation specialist, program administrator and coordinators, simulation education coordinator, standardized patient educator and coordinator	9+	- Accredited by Society for Simulation in Healthcare (SSH) - Dedicated to “promoting interprofessional education” - Clear explanation of clinical and surgical skills

Source: Institutional Websites (see embedded hyperlinks)

Competitor Programs Benchmarking Summary

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Benchmarked programs are institutions located in the nation, offering health sciences simulation and training facilities.

Institution	Center(s) and Facilities	Equipment	Staffing		Notable Features
			Role	Size	
Oregon Health & Science University <i>Portland, OR</i>	Simulation and Clinical Learning Center (includes Mark Richardson Interprofessional Simulation Center at School of Nursing)	27,000 square feet - Multi-purpose classrooms, debriefing rooms, 8-bed skills-training lab, 8 simulation suites, audio and video systems 7 manikin simulators, skills-training with task trainers and tissue-based simulation (with body donation program), virtual reality, standardized patient simulation	None listed		Offer simulation programs for medicine (various specializations), physician assistant, nurse anesthesia, and pharmacy
Pennsylvania State University <i>Hershey, PA</i>	Clinical Simulation Center (at Milton S. Hersey Medical Center)	9,500 square feet (incl. Simulation Center, Resuscitation Sciences Training Center, and Standardized Patient Program) Simulator equipment, incl. full-bodied manikins, part task trainers, and virtual reality system Clinical equipment	Various directors and managers, associate dean of clinical simulation, simulation technologists and technicians, simulation educator, coordinators	7+	- Founded in 1992 - Learning opportunities for practicing and resident physicians, nurses, respiratory therapists, paramedics, pharmacists, and other health professions, as well as students in medicine, nursing, and physician assistant schools. - Accredited by Society for Simulation in Healthcare (SSH)
Quinnipiac University <i>Hamden, CT</i>	Center for Interprofessional Healthcare Education (Schools of Health Sciences, Nursing, and Medicine)	High-fidelity simulation with mannequins and standardized patients	- Director - None further listed	1+	- Launched in 2011; caters to students from health sciences, nursing, and medicine - Student ethics committee
University of Mississippi Medical Center <i>Jackson, MS</i>	Office of Interprofessional Simulation, Training, Assessment, Research and Safety (ISTARS)	- Simulation and Interprofessional Education Center includes computer-based and high-fidelity simulations Clinical skills center, incl. standardized patients	Managing director, medical director, manager of operations	3	- Provisionally accredited by Society for Simulation in Healthcare (SSH) - Interprofessional education for medical students, residents, nurses, pharmacy students and many other healthcare professionals - Responsible for Mississippi Academy for Simulation Training (MAST) "to provide statewide simulation educator training," especially for the nursing workforce

Source. Institutional Websites (see embedded hyperlinks)

Competitor Programs Benchmarking Summary

Benchmarking Health Sciences Simulation and Training Facilities

Overview of National Health Sciences Simulation and Training Facilities

Benchmarked programs are institutions located in the nation, offering health sciences simulation and training facilities.

Institution	Center(s) and Facilities	Equipment	Staffing		Notable Features
			Role	Size	
University of Rhode Island Kingston, RI	Interdisciplinary Health Delivery Simulation Laboratory (at College of Pharmacy)	3,025 square feet - Low and high-fidelity mannequins, standardized patients, and virtual reality - Debriefing room, 3 private ICU rooms. 2 ER triage rooms	Co-directors	2	Primarily for pharmacy students but also offers pharmacology-focused simulations for nursing, physical therapy, and kinesiology students
University of South Florida Tampa, FL	The Center for Advanced Clinical Learning (at College of Medicine)	6,038 square feet 12 examination rooms, 1 simulation room, enhanced classroom, and conference room, low and high-fidelity simulators, and other equipment 12 person video-monitoring station room Standardized patients program	Executive director, program manager, standardized patient coordinator, technology and systems analyst, technology student assistant, teaching lab specialist	7	- Established in 2005 - Accredited by Society for Simulation in Healthcare (SSH) and American College of Surgeons - Enhanced learning and simulations in medicine, nursing, pharmacy, physical therapy and athletic training
University of Tennessee Memphis, TN	Center for Healthcare Improvement and Simulation (CHIPS) (at Colleges of Dentistry, Graduate Health Sciences, Health Professions, Nursing, Medicine, and Pharmacy)	45,000 square feet 24 exam rooms - Standardized patient program - High-fidelity patient simulators (manikins), and virtual reality settings - Skills labs for clinical skills and assessments - Simulated home environment to practice in-home patient care - Simulated community pharmacy	- Exec. director, director of edu., assistant director for edu. for standardized / simulated patients, standardized patient training manager, standard./ - simulated patient trainer, simulation operations lead, simulation specialists, simulation technologist, admin. specialist, and program administrator	10+	- Centralized training site that opened in 2018, “fully dedicated to simulation education” - Cost \$39.7 million
University of Washington Seattle, WA	Simulation Center (at School of Nursing)	Some features are still in planning phase 7,500 square feet (will add additional 10,000 square feet) - Debriefing room, exam rooms, control room - Inpatient skills lab	Projected and employed staff include director, assistant director, nurse educators, simulation technologist, 2 teaching assistants	6+	Occasional simulation training focusing on interprofessional education
West Virginia University Morgantown, WV	David and Jo Ann Shaw Center for Simulation Training and Education for Patient Safety (STEPS) (at Health Sciences)	19,000 square feet 4 like-like manikins and additional simulators, task trainers, two 10 bed open lab spaces, 12 patient exam rooms, a room for OB and pediatric practice, 1 large surgical skills unit	Director, assistant director, office administrator, lead simulation specialists, coordinators, program and advanced computer assistants, simulation technician	8+	- Offers simulation certificate program - Enhances individual and interprofessional healthcare education using simulation - Caters to undergraduate and graduate students, as well as practitioners

Source: Institutional Websites (see embedded hyperlinks)

