

# CAROLINAS SIMULATION CENTER

SIMULATION HIGHLIGHTS 2016



Carolinas HealthCare System

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## WELCOME

Dear Colleagues,

Carolinas Simulation Center (CSC) has experienced remarkable growth and success over the past year. Working collaboratively with our System partners, we are transforming the experience of education and, as a result, realizing enhanced patient outcomes.

This document was designed to update simulation stakeholders on these efforts and share CSC's many recent highlights including the following:

- A significant expansion of CSC usage by an increasingly diverse group of interprofessional learners.
- Design and launch of new programs in nurse education, graduate medical education and mobile simulation.
- Expansion of educational programs offered to our regional residency programs at CMC-NorthEast, AnMed and Blue Ridge.
- Implementation of three national level institutional review board approved surgical research studies to enhance resident and practicing physician education.
- Successful completion of the international Certified Healthcare Simulation Educator (CHSE) and Certified Healthcare Simulation Operations Specialist (CHSOS) examinations by our CSC teammates.
- Recipient of two Touchstone Awards at the 2016 Quality & Patient Experience Sharing Day.
- Design and development of novel moderate fidelity simulators and production of the Central Venous Access Trainer created at CSC.

The above list is a sampling of the many ways Carolinas Simulation Center is promoting quality and patient safety, enhancing education and developing research for the benefit of the patients and families we serve.

Thank you for joining us in this mission and for all you do to enhance the delivery of healthcare across the Carolinas.



Michael Ruhlen, MD, MHCM, FAAP, FACHE  
Vice President, Division of Medical Education



Mary N. Hall, MD  
Chief Academic Officer; Senior Vice President,  
Division of Medical Education

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## Our Vision

The vision of Carolinas Simulation Center (CSC) is to operate a regionally and nationally prominent, accredited, multidisciplinary center to meet System-wide and regional needs for simulation training.

The center will enhance the quality of healthcare and patient safety through the use of the full spectrum of clinical simulation in the training and assessment of healthcare professionals and the development of cutting-edge educational research, ultimately for the benefit of our patients.

## Our Mission

The mission of Carolinas Simulation Center is to promote quality and patient safety, enhance education, and develop research through excellence in simulation-based training and assessment.

## Quality, Safety and Strategic Alignment

Carolinas Simulation Center continues to partner with diverse clinical departments and care divisions across the System to provide the best in patient experience and care. Through design and delivery of experiential learning offerings and individualized deliberate practice sessions, we optimize the skills of our healthcare providers and the teams within which they work. We strive to strategically align these offerings and sessions with our System's quality and service goals in both inpatient and ambulatory settings.

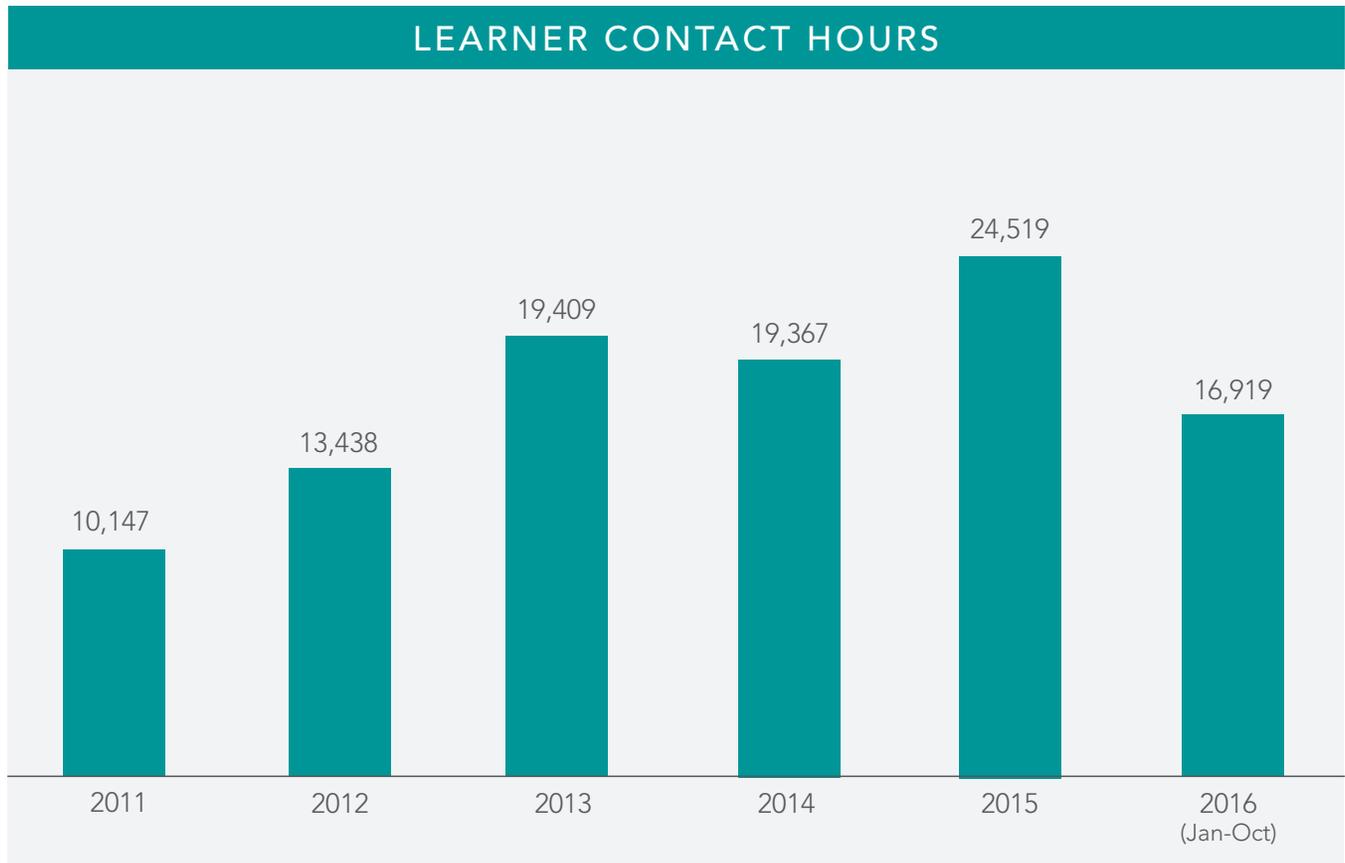
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## EXPERIENTIAL LEARNING

### Learner Contact Hours

Carolinas Simulation Center (CSC) total learner contact hours for 2015 was 24,519.25.

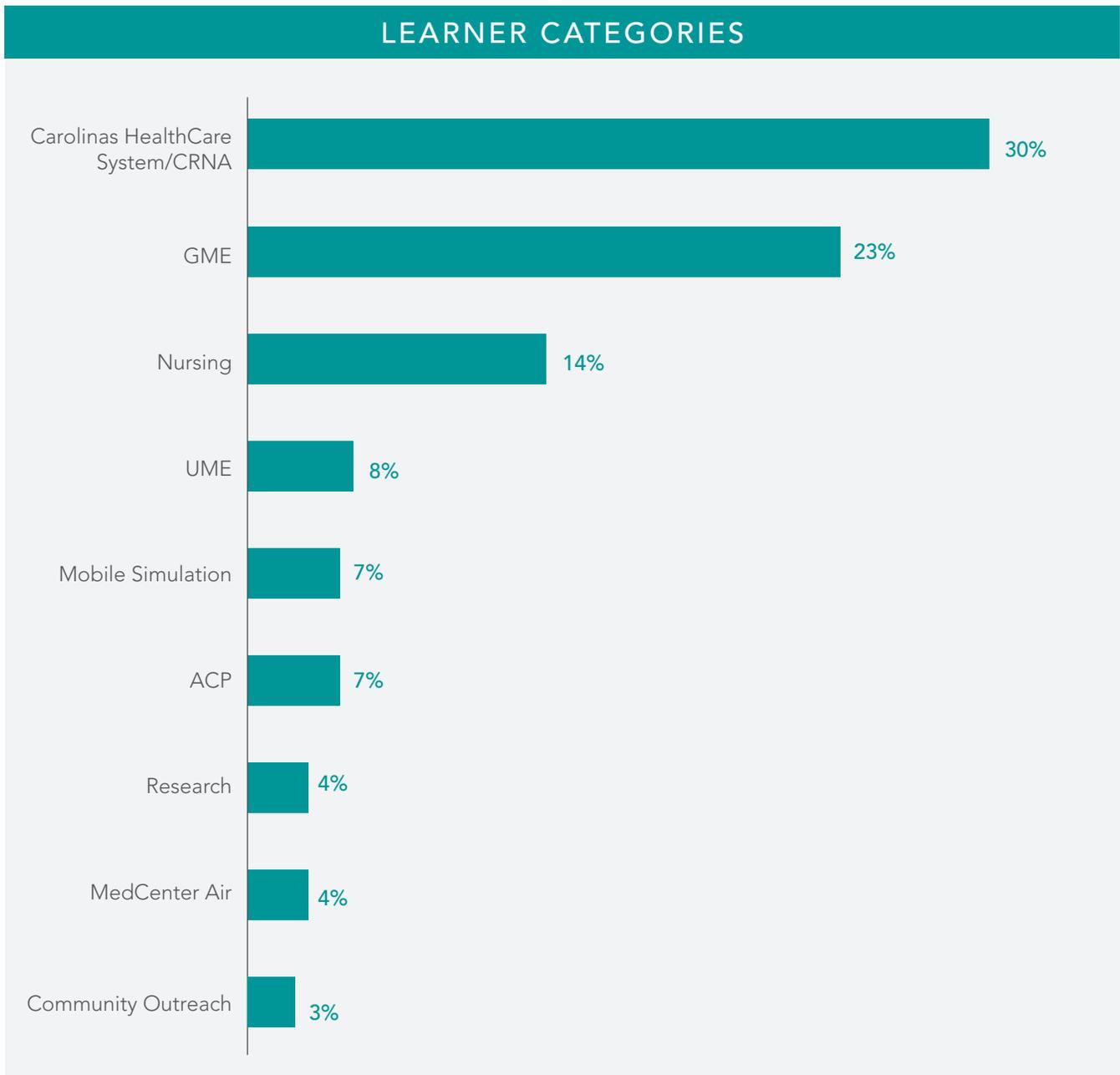
- 26 percent increase from 2014
- 6,631 total participants



*"My favorite part of simulation was the friendliness of the instructors and non-judge mental approach, the instructor explained everything in great detail. The simulator lab was a very effective learning tool."*

## Learner Categories

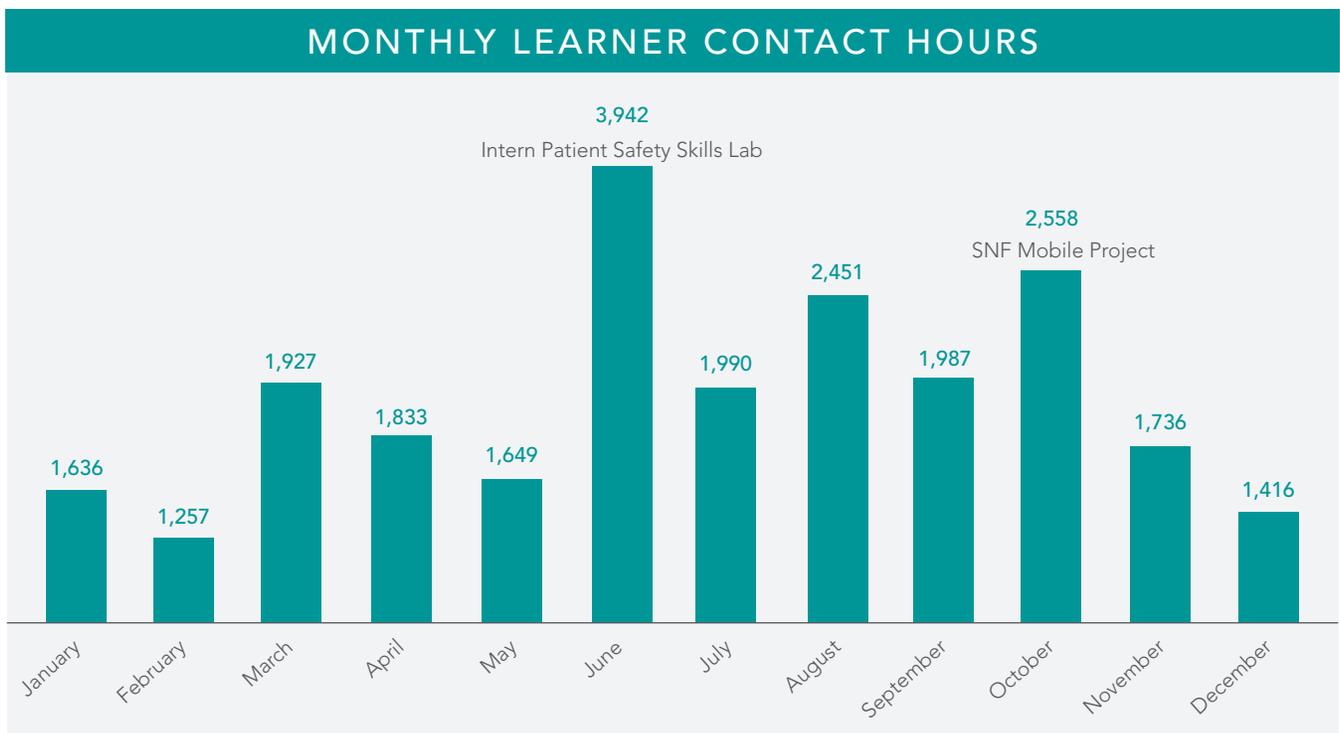
- 30% Carolinas College of Health Sciences
- 23% Graduate Medical Education
- 14% Nursing



## Growth

In June, CSC hosted the System-wide Patient Safety Skills Lab for all Graduate Medical Education interns

- 76 residents participated, including representatives from Carolinas Medical Center, Carolinas HealthCare System-Blue Ridge and Cabarrus Family Medicine
- Over 300 learner contact hours





## ACCOLADES

### ACS Reaccreditation

In 2008, the American College of Surgeons (ACS) accredited Carolinas Simulation Center (CSC) as an Accredited Education Institute (AEI). Carolinas Simulation Center was one of the youngest centers to ever achieve this recognition. This accreditation focuses on the simulation-based education and training of surgeons, surgical residents, medical students and members of the surgical team. Since that time CSC has been through two reaccreditation cycles with the most recent being granted in 2014. To date, there are less than 100 AEIs internationally.

In September 2014, an ACS surveyor visited CSC to meet with the teammates, observe the day-to-day workings of the center, tour the facilities, and review a presentation about CSC and its many programs.

As a result, in December 2014, CSC was awarded a three-year comprehensive reaccreditation as an AEI. All areas were identified as fully compliant and the ACS surveyor reported being impressed with the faculty development and the enthusiasm and engagement of teammates.

The committee however recommended that we focus on expanding the resources at CSC in terms of space and personnel.

### SSH Reaccreditation

In 2010, Carolinas Simulation Center (CSC) became one of the first simulation centers to be accredited by the Society for Simulation in Healthcare (SSH) in four of five areas. In 2015, the center set the goal to become accredited in all five areas. Teammates worked tirelessly to compose the more than 2,000-page document submitted to the SSH review board, for certification in these five areas:

- **Core**, the largest section of the accreditation application, with information such as the center's mission and governance, integrity and security.
- **Assessment**, the area of the accreditation process that highlights the ways a simulation center assesses students and how instructors and resources are assessed.

- **Research**, the section that speaks to the expertise, oversight and compliance of all research projects pertaining to simulation education.
- **Teaching/Education**, this section discusses the qualifications needed to be an educator, how curricula are designed, and how to achieve educational credit for education provided.
- **Systems Integration**, includes information about how CSC partnered with other departments such as Risk Management and Quality. It also highlights how CSC works with the hospital system as a whole to provide overarching simulation education and bring to fruition research opportunities that affect patient outcomes.

In October 2015, members of the SSH review board came to tour the facility, meet with some of the facilitators and participants in simulation education and review our research. This all-day event included a tour of CSC and Carolinas Surgical Skills Center. The review team then met with program and institutional leadership, educators, learners, assessors, research teammates and representatives from risk management and patient safety.

As a result, in November 2015, CSC received a five-year accreditation in all five areas of simulation. Site reviewers noted that CSC was home to “highly competent and diverse teammates who are passionate about the field” and capable of “out of the box ideas/solutions on how to provide/meet increasing need for simulation activities with limited space.”

### **Simulation Certifications**

Carolinas Simulation Center teammates certified by the Society for Simulation Healthcare (SSH):

#### **CHSE – Certified Healthcare Simulation Educator**

- Dawn Swiderski, Director
- Melinda Armstrong, Simulation Education Specialist II
- Crystal Bencken, Simulation Education Specialist II
- Laura Cragg, Simulation Training Specialist

#### **CHSOS - Certified Healthcare Simulation Operations Specialist**

- Tara Johnson, *Technology Manager*
- Scott Wilson, *Medical Education Technologist*

To be eligible for certification, you must have a healthcare simulation role in either education or operations focusing on learners in undergraduate, graduate, allied health or healthcare practitioner education. You must also have a bachelor’s degree and at least two years of simulation experience.

The SSH offers two different types of certifications, the Certified Healthcare Simulation Educator (CHSE) and the Certified Healthcare Simulation Operations Specialist (CHSOS). The CHSE has a strong education focus for those who are involved in delivering, overseeing or administering healthcare related simulation education. More recently developed, the CHSOS certification is better suited for those whose primary job responsibilities focus on the technology and resource management. This can include simulation technicians, specialists, coordinators or technologists.

We believe certification improves healthcare simulation education by providing standardization and identification of best practices; strengthening patient safety efforts through support of simulation modalities; and reinforcing organizational, community, and learner confidence in the quality of education we provide.

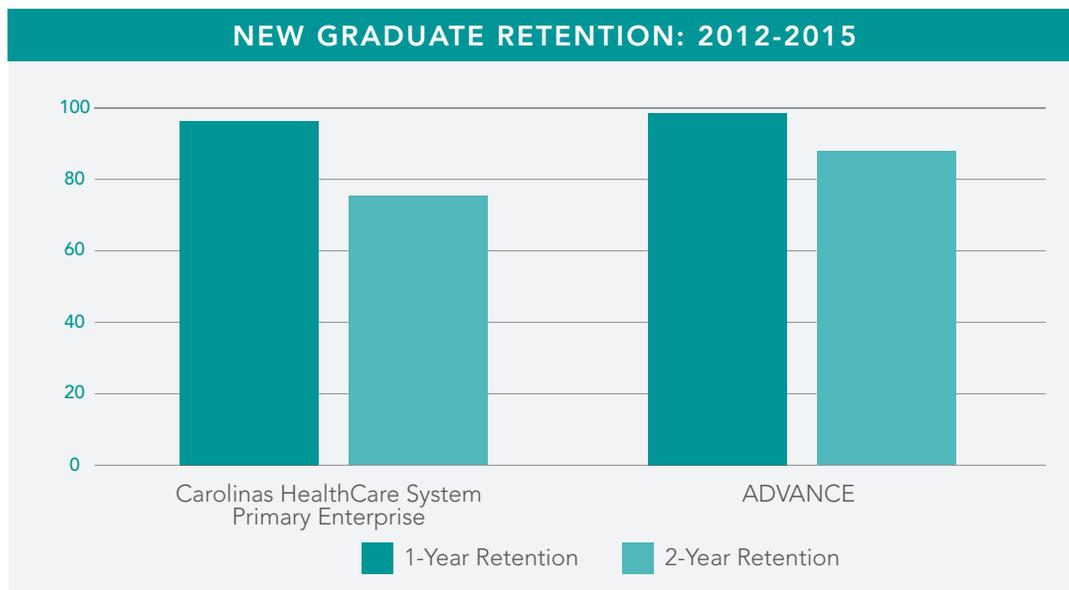


## EDUCATION

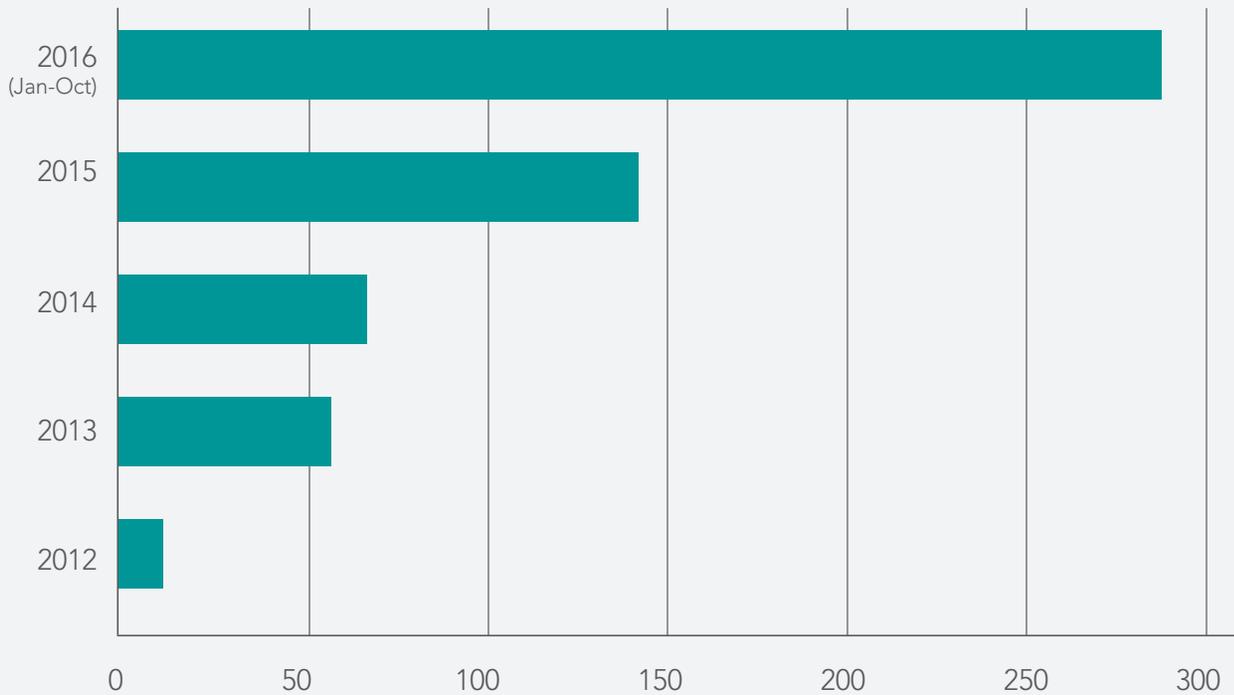
### ADVANCE – Acute Care New Graduate Nurse Residency Program

#### Purpose

We believe new graduate nurses require time and coaching to transition from student into the role of professional direct-care nurse. In 2012, Carolinas Simulation Center in collaboration with Nursing Professional Development created ADVANCE, a program to provide nurses hired to non-critical care settings with the knowledge and skills required for positive patient outcomes. The goal is to decrease new graduate turnover rates and promote quality patient care.



## NEW GRADUATE NURSE RESIDENTS



### Development

ADVANCE is a 16-week nurse residency program supporting Carolinas HealthCare System's emergency departments and acute care settings with an evidence-based curriculum that prepares and engages new graduate nurses. This program is built upon three elements: knowledge, socialization and clinical application including a strong foundation of critical thinking, communication and leadership skills, essential in any acute care setting.

The components of ADVANCE follow education blueprints and practice standards from the National Council of State Boards of Nursing and the American Nurses Credentialing Center, as well as standards of practice within Carolinas HealthCare System. The ADVANCE curriculum supports the unit-based, precepted clinical orientation with didactic classroom activities, case-based high-fidelity simulation and socialization experiences transitioning new graduates to clinically competent, engaged team members who provide excellent nursing care.

## Implementation

Each ADVANCE participant receives 12 hours of experiential learning at Carolinas Simulation Center. Simulation cases are designed to promote critical thinking skills, confidence, technical skills and teamwork for participants. Cases focus on disease processes commonly seen in acute care areas such as sepsis, heart failure, pulmonary embolus and cardiac arrest. Participants hired to an emergency department receive an additional four-hour simulation session focused on pediatric emergencies.

New graduate nurses are provided time during the simulation sessions to review class notes, handouts and use their smart phones to discover the answers to questions or guide the care that they provide the patient. Nursing Masters' degree prepared Simulation Education Specialists facilitate the simulations and provide the foundation for post-simulation debriefings. Debriefings are used to verify and clarify nursing actions, communication and scenario-appropriate treatments. Patient safety and prevention of complications are discussed during the debriefing. The new nurse graduate is encouraged to self-evaluate their performance and develop a plan to improve practice with each simulation experience.



## Outcomes

The Pilot Cohort began in fall 2012 and included 10 new graduate nurses hired and precepted by the Carolinas Nurse Resource Team. The number of participants has steadily grown over the last three years with the number almost doubling from 2014 to 2015 (see graph). To date, more than 250 nurses have attended the program and successfully completed the components. Rapid growth is expected to continue due to increased nursing shortages.

As of January 2016, one-year ADVANCE nurse retention rates are 100 percent and 90 percent at the two-year mark versus 96.2 percent and 76.3 percent respectively for Carolinas HealthCare System (see graph). The ultimate benefits of ADVANCE are increased retention rates leading to reduced cost, improved staff satisfaction and higher quality care.

## Conclusion

We feel that new graduate nurses' opinions of their simulation experience are important to the continued development of the program. At the end of each debriefing session, the participant is surveyed about the experience; what they found helpful and what they would change. According to this feedback, continuous improvements have been made to the program.

*I have to share with you how much I got out of sim lab today. In school they stressed the importance of knowing the early signs of sepsis. I never felt comfortable that I would recognize it. Our sim "patient" was septic. I did NOT recognize it. But, because I was exposed to the scenario, I know what it looks like. I feel comfortable that I would be more sensitive to the signs and symptoms now. Fortunately, I learned this lesson on a dummy rather than a human! I absolutely LOVE this program! Thank you for this opportunity!*

*I have learned much more in the past few weeks than I could have possibly learned on my own. The Sim lab afforded me the opportunity to face a critical situation with a manikin before a real-life event with an actual human. I believe I would actually handle the situation appropriately in the future. I would HIGHLY recommend this program to any new graduate.*

## Medical Student Simulation Use Growth

### Purpose

The University of North Carolina (UNC) School of Medicine-Charlotte Campus has grown rapidly over the past few years. The number of third-year medical students tripled in 2015 through the Charlotte Longitudinal Instructional Curriculum, in addition to fourth-year students coming to Charlotte for specialty rotations.

The Charlotte Campus incorporates an innovative simulation program into the third year curriculum that is designed to provide hands-on learning along with real-time clinical reasoning in a safe learning environment. The students are introduced to a combination of simulation modalities including high-fidelity manikins, standardized patients and procedural task trainers.

Undergraduate Medical Education has embraced the use of simulation in its curriculum over the years and the increased number of students has demanded additional simulation based education. Carolinas HealthCare System, Carolinas Simulation Center (CSC), and the UNC School of Medicine-Charlotte Campus have continued to positively impact future providers through cutting-edge educational opportunities.

### Development

A group of UNC Medical School faculty and administration members collaborated with CSC to develop a strong simulation program to meet the objectives of the medical school curriculum. Planning meetings took place to coordinate schedules and resources, allowing each student to have the opportunity to get multiple experiences in a safe learning environment. CSC and the UNC School of Medicine communicated frequently to ensure requirements were met, along with training and trial runs prior to sessions. Session content was developed based on a review of the core topics from the UNC School of Medicine third-year medical student curriculum and clerkship directors. Each simulation session is focused on a common chief complaint and covers cases and objectives from all of the third-year courses.

### Implementation

Throughout the year, medical students participate in numerous simulation experiences. Students have the opportunity to work with high fidelity simulators and learn ultrasound techniques using task trainers and standardized patients. Additionally, we facilitate other courses that allow medical students to practice examination and procedural techniques with standardized patients in an ongoing manner.



## Outcomes

Simulation-based education begins on the first day of the medical student's third year. Students are introduced to physical exams using standardized patients and then begin using high fidelity manikins and task trainers for scenario-based training. Throughout the year, students have scenario and task training based sessions, ultrasound courses and additional physical exam demonstrations. These frequent educational sessions give the students a strong foundation on which to base their practice.

At the conclusion of their third year, all medical students are assessed in an Objective Structured Clinical Exam, using standardized patients. Family Medicine, Internal Medicine, Obstetrics and Gynecology and General Surgery exams are administered in Charlotte, allowing students to stay local instead of traveling to Chapel Hill.

Now in its fourth year, the simulation curriculum at the Charlotte campus continues to receive very good reviews and remains the highest rated component of the third-year medical student curriculum. Originally offered only to students enrolled in the longitudinal curriculum, this program is now available to all third-year Charlotte campus students. Some of the student comments:



*"The simulations are so important and helpful!"*

*"I love sim sessions. They're engaging and interesting, and I feel like I retained and will remember the information in real scenarios."*

*"The simulations are great!"*

*"Very helpful day of simulation."*

## Conclusion

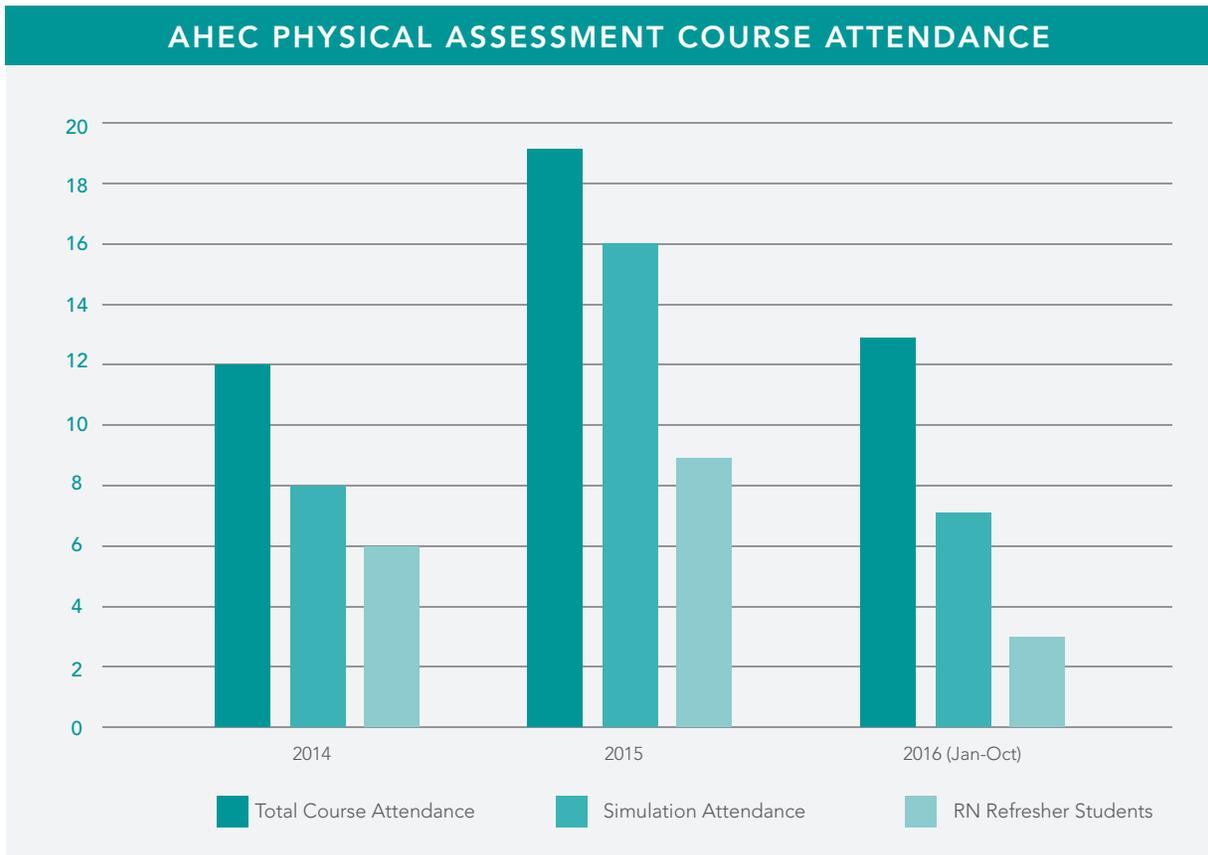
An increase in the number of medical students has led to an increase in simulation experiences. Cathy Wares, MD, Course Director for Simulation, leads the facilitation of an innovative curriculum to include simulation throughout the medical students' education to give students the opportunity to immerse themselves in a safe and realistic environment where they are able to have hands-on experiences with a wide range of clinical scenarios and procedures.

After successful trials with smaller scale simulation sessions as well as with the Family Medicine Objective Structured Clinical Exam in 2014, we are now partnering with the Charlotte campus to offer a full simulation curriculum, including high-stakes testing. Based on feedback, we have found simulation to be an integral part of the students' curriculum so our simulation offerings will continue to expand as the Charlotte campus grows.

## AHEC Physical Assessment Course

### Purpose

As part of the Charlotte Area Health Education Center's (AHEC) Physical Assessment course, participants can choose to supplement their learning by attending a four-hour simulation session at Carolinas Simulation Center (CSC). During this simulation course, participants use high-fidelity simulators to assist in the identification of both normal and abnormal signs and symptoms of multiple body systems. The session gives learners opportunities to demonstrate the practical application of assessment skills in a safe, risk-free environment.



### Development

Charlotte AHEC has been offering the Adult Physical Assessment course for more than 15 years, with a variety of participants including RN Refresher students, nurses working in clinics, home health nurses, new graduate nurses, and nurses working in emergency departments or inpatient settings. In 2014, we added the half-day simulation option for the nurses participating in the Physical Assessment workshop or those who have previously attended the workshop. The goal was to allow participants to use the knowledge and skills they acquired from the Physical Assessment workshop and incorporate it into practical application using high-fidelity simulators and case-based scenarios.

## Implementation

Adult Physical Assessment is a two-day course offered once in the spring and again in the fall. Nursing faculty from the University of North Carolina Chapel Hill School of Nursing provide instruction for the didactic portion of the workshop. The simulation portion of the workshop occurs on the third day and is optional.

The day begins with an introduction to the high fidelity adult manikins, including what can and cannot be assessed. Learners spend time assessing the manikin with round table discussion on findings and typical diagnoses that relate to those findings. The participants are then able to complete several patient care scenarios in which they demonstrate their knowledge. Simulation Education Specialists at CSC facilitate the simulation-based education and debrief the participants after each scenario. The debriefs consist of discussions about physical assessment findings as well as common disease processes. The goal is to help participants build confidence in their physical assessment skills and use these skills in their current practice.

## Outcomes

Since the addition of simulation in 2014, 31 nurses have completed the Adult Physical Assessment simulation workshop. At the end of each debriefing session, the participants are asked to complete a survey about the experience; what they found helpful, and what they would change. We feel the feedback is important to the continued process improvement of the course. The following comments were taken from post-session survey results.

*"The simulation lab experience was extremely helpful to me. I wish I could have spent a couple more days going through more simulations! I do feel better prepared for actual clinical experience after completing even one day in the simulation lab. [The educator] was knowledgeable, patient, helpful and very entertaining. She eased any anxiety I felt in anticipation of the experience, and shared a wealth of insight and knowledge."*

*"The facilitators were outstanding! They were extremely engaging and knowledgeable. The simulation was an excellent helpful addition to the assessment learning! Thank you!"*

*"Loved, loved, loved the class. Instructors were very professional, full of knowledge, and very helpful. I would like more of this type of class."*

## Conclusion

The simulation component of the physical assessment course is a new offering, but it has already seen great response as well as increasing numbers. Carolinas Simulation Center looks forward to the opportunity to continue expanding the partnership with Charlotte AHEC to offer more educational opportunities in the future.



## Orthopaedic Intern Surgical Simulation Program

### Purpose

Beginning in the spring of 2014, Carolinas Surgical Skills Center (CSSC) and Carolinas HealthCare System's Department of Orthopaedic Surgery teamed with the American Board of Orthopaedic Surgeons to develop an intern simulation program for PGY1 residents. The Orthopaedic Intern Surgical Simulation Program offers training in the initial management of injured patients and basic operative skills to ultimately prepare residents for participation in surgical procedures.

### Development

The original curriculum lasted two weeks and was considered a "crash-course" in orthopedics. After reviewing the outcomes of the original curriculum, Department of Orthopaedic Surgery faculty worked with CSSC team members to transform this into a one-month program including daily, four-hour experiential learning sessions for all residents on orthopedic services.

### Implementation

Initially, five orthopedic PGY1 residents were given the opportunity to participate in casting workshops and Sawbones® labs. Wet-labs, using cadaveric specimens, were also provided to practice anatomic dissection, surgical approaches, external fixation, and an introduction to arthroplasty.

### Outcomes

Upon evaluation of the curriculum, both interns and faculty reported high levels of satisfaction. Specifically, residents reported feeling very prepared for basic procedures in future orthopedic rotations during their first year. Additionally, the curriculum provides early exposure and relational development among residents and faculty.

Moving forward, both CSSC and the Department of Orthopaedic Surgery will continue to look for ways to improve and further expand the Orthopaedic Intern Surgical Simulation Program.

The end goal will be to incorporate this training into multiple areas of research and surgical specialties by adding additional opportunities for anatomic dissection and surgical approach labs throughout the year for interns and other residents to improve their technique and soft tissue handling skills.

## Robotic Training Network (RTN)

### Purpose

In 2015, Carolinas Surgical Skills Center (CSSC) began a collaboration with Carolinas HealthCare System's Obstetrics/Gynecology (OB/GYN) department to implement the Robotic Training Network (RTN), a two-phase training program for surgical residents and fellows who desire to build proficiency in the roles of robotic assistant and robotic console surgeon. The goals of the RTN are:

- To create a standard robotic curriculum for surgical residents and fellows
- To create a high yield series of technical skill drills to determine when a doctor can safely sit at the console
- To assess performance using evidence-based methods

### Development

A team of faculty members from the OB/GYN department, including Megan Tarr, MD, MS, FACOG, and Erinn M. Myers, MD, FACOG, in conjunction with CSSC staff, worked together to determine an effective RTN implementation plan including scheduling time with the da Vinci® Surgical System™ at CSSC. In a joint effort, the center obtained additional robotic training instrumentation and resources to ensure the highest level of fidelity and alignment with the RTN original curriculum design.

### Implementation

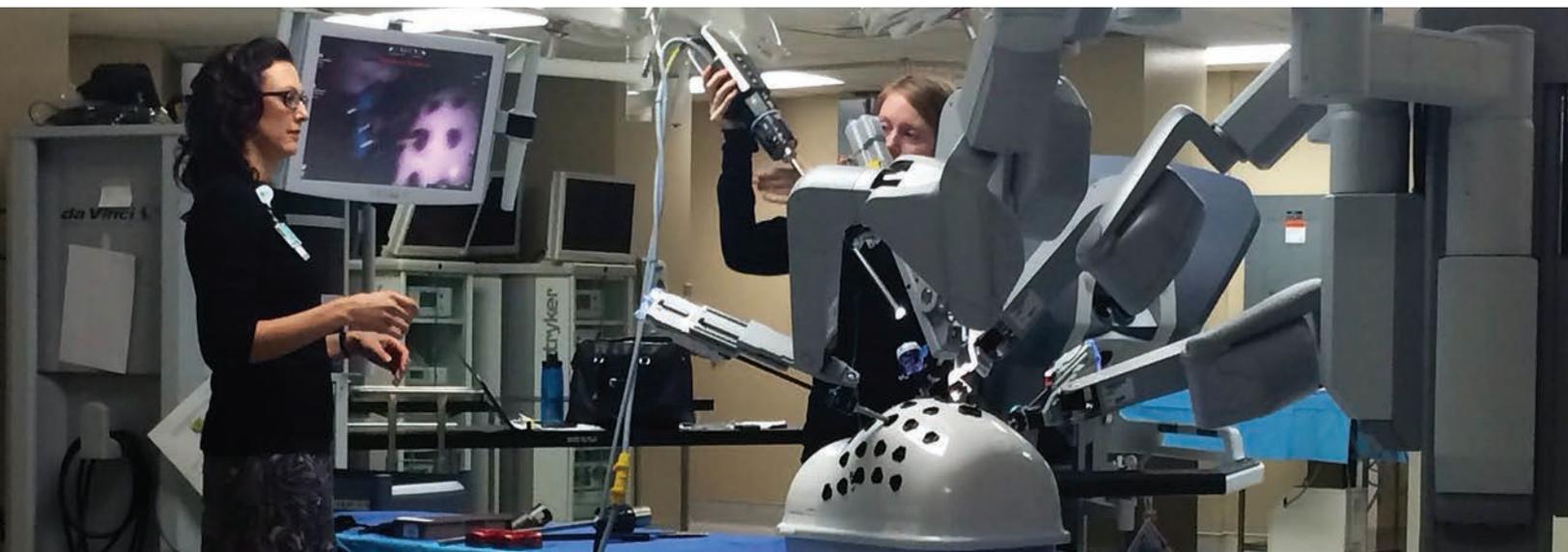
In the latter part of 2015, four Phase I RTN sessions were held at CSSC. During these sessions, two to four OB/GYN residents and/or fellows were trained using the da Vinci® Surgical System™ on how to be proficient and safe assistants. This included obtaining an in-depth knowledge of the many working pieces of the robotic system, as well as proper positioning and docking of the system itself.

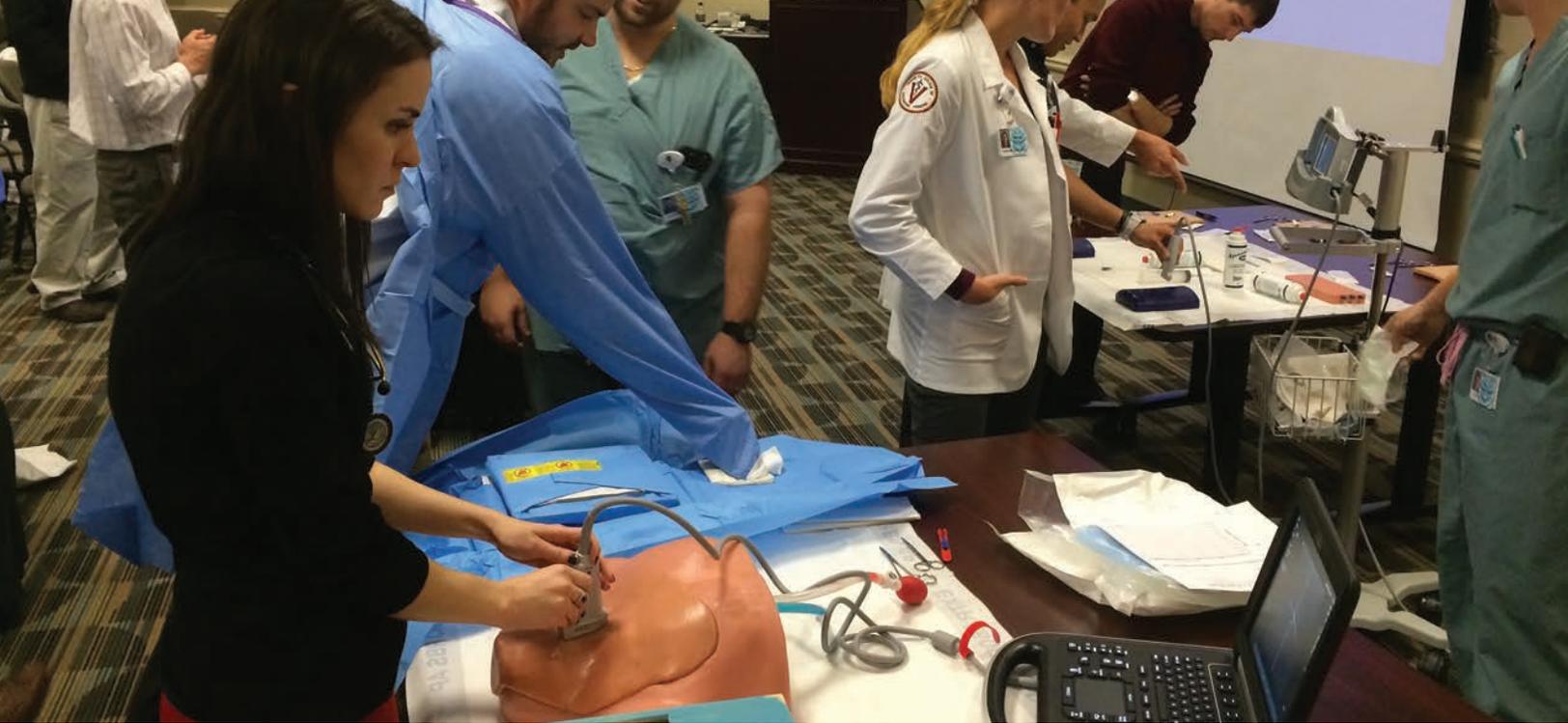
### Outcomes

During Phase I of the curriculum, each trainee completed self-directed learning activities, dry-lab simulation with observation, and supplemental operating room tasks with observation and faculty physician feedback. Currently, 14 of the 24 OB/GYN residents have completed the first phase of the RTN curriculum. As a result of the collaboration between CSSC and the OB/GYN department, residents and fellows are able to increase their familiarity with the robotic surgical system in a low-risk, high-reward, experiential learning environment.

### Conclusion

Moving into early 2017, implementation of Phase I will continue for new surgical residents and fellows, and Phase II of the RTN curriculum will begin, which will include teaching trainees how to safely and efficiently use the robotic console via dry-lab simulation at CSSC.





## System Education Leadership Forum (SELF) Graduate Medical Education (GME)

### Purpose

While Carolinas Medical Center has more than 20 residency programs, other Carolinas HealthCare System facilities also have residency programs. Carolinas HealthCare System Blue Ridge, Carolinas HealthCare System NorthEast and AnMed Health are home to Graduate Medical Education programs.

To bring more awareness to these programs and to ensure continuity in education provided to all Carolinas HealthCare System residency programs, Carolinas Simulation Center (CSC) joined the Department of Medical Education to create the System Education Leadership Forum (SELF). Since its inception, SELF has grown to include education provided at the residency center or at CSC for the offsite residents.

### Development

All three SELF residency programs participate in the Common Critical Care Curriculum (4Cs) hosted at CSC. The 4Cs is a simulation educational opportunity in which all interns participate; giving them hands-on experience with the proper management of situations in the Intensive Care Unit that they may not have been exposed to during their first year. Residents travel from their respective sites to participate in a four-hour high fidelity simulation session in which they practice with difficult cases such as medication errors and delivering bad news.

Interns at Carolinas HealthCare System Blue Ridge and Carolinas HealthCare System NorthEast also come to participate in the Patient Safety Skills Lab as part of their orientation process. Interns travel to CSC for the four-hour interactive orientation in which they rotate through seven brief stations to give them an overview or refresher of tasks that they will be asked to do starting on their first day. Upper level residents from Carolinas Medical Center evaluate the interns' performance on these tasks and results are sent back to residency coordinators to help individualize curriculum offered to each intern.

Because Carolinas HealthCare System's Critical Care Network and the Virtual Critical Care partner with facilities such as Carolinas HealthCare System-Blue Ridge in Burke County, facilitators created an educational simulation program of critical care fundamentals including airways and mechanical ventilation management enabling local physicians and residents to provide better critical care. Carolinas Simulation Center and Virtual Critical Care also started a mobile simulation program at Blue Ridge to assist in this education.

## Implementation

Since SELF residents must travel to receive their 4Cs education, their simulation training is condensed to one four-hour session as opposed to the three that most interns receive. The CSC Medical Director and 4C creator chose the four most important cases for SELF interns to complete. Interns have an opportunity to provide direct patient care while collaborating with a standardized participant, in the role of a nurse. Interns not providing direct patient care watch their peers via live streaming technology in a classroom. All cases are debriefed immediately by a trained facilitator to discuss what happened and answer any questions participants may have.

One of the first experiences SELF interns enjoy is coming to CSC for the Patient Safety Skills Lab. We work closely with program coordinators and directors of the individual residency programs to ensure all stations are interactive and pertinent to the patient care that residents will be providing in their practice.

Two sessions of airway training began in 2015. The success of these courses afforded the opportunity for a Vascular Access course to be brought to Carolinas HealthCare System-Blue Ridge. At the end of 2015, task trainers were taken to Carolinas HealthCare System-Blue Ridge along with ultrasound machines to offer a course on Central Venous Catheter placement. As in the airway course, the learners received didactic education and then practiced on the task trainers under expert facilitator guidance.

## Conclusion

All interactions between the SELF residencies and CSC assist in opening the door for further collaboration and ensuring that all residents at Carolinas HealthCare System receive similar education and training. Efforts continue to expand mobile simulation offered at Carolinas HealthCare System-Blue Ridge, Carolinas HealthCare System-NorthEast and AnMed Health, as well as to offer additional educational experiences for these groups hosted by CSC. With the incorporation of the Virtual Critical Care network at these facilities, the need for simulation education has only increased. We plan to work with Virtual Critical Care providers and the individual residency programs to target initiatives best suited for collaboration.





## INNOVATION

### Central Venous Access Trainer

Carolinas Simulation Center (CSC) created the Central Venous Access Trainer (CVAT) in the fall of 2013. Since then, we have made many changes and improvements to the model. We received such positive feedback from facilitators and user groups, we began to investigate whether other simulation centers could benefit from this product as well.

In conjunction with Edison Nation Medical, we submitted a provisional patent. As a marketing and distribution channel for the CVAT, MedTech Simulators was formed to promote innovation at CSC.

Since its inception, more than 100 have trained using the CVAT. Over the next two years, the CVAT moved toward production and debuted in July 2016 at SimOps, a regional simulation conference hosted by the Society for Simulation in Healthcare in Greenville, SC. Utilizing funds from the Hospital Engagement Network, the Patient Safety department at Carolinas HealthCare System recently purchased 271 CVATs to standardize central line care and maintenance across the System to decrease Central Line-associated Blood Stream Infection (CLABSI) rates.

### External Jugular Cannulation Trainer

After Carolinas Medical Center's Emergency Department changed its policy regarding nurses initiating intravenous sites in the external jugular (EJ) vein, Catherine Wares, MD, Emergency Department Faculty Member, requested a task trainer be created for practice and competency assessments. Using supplies on-hand, we created a model with bilateral veins, allowing users to practice techniques in multiple positions that may be necessary in the clinical setting. The model created at CSC is not only less expensive than the commercially available models but is also more portable. Users and facilitators have given the EJ model extremely high praise and continue to use it for competency assessments.

### Perineal Laceration

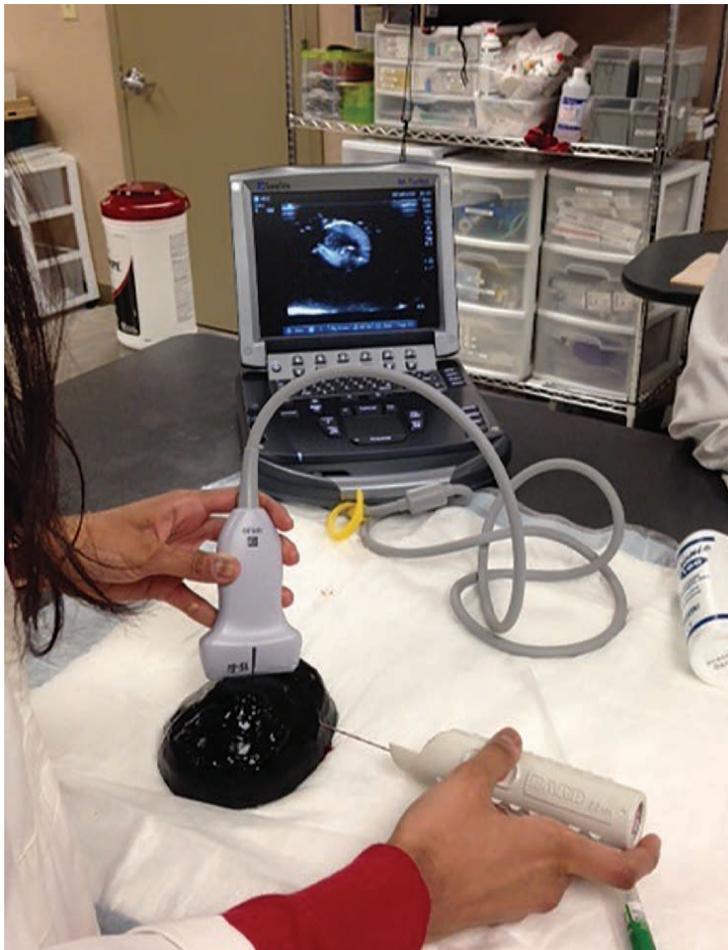
Very few spontaneous vaginal deliveries result in a 4<sup>th</sup> degree perineal laceration and, as such, obstetrics/gynecology (OB/GYN) residents have infrequent opportunities to learn proper perineal laceration repair techniques. The commercial perineal laceration models currently available for simulation training are expensive and do not realistically replicate the perineal anatomy. In order to enhance the simulation experience for OB/GYN residents, a faculty member approached CSC about creating a realistic, low cost perineal laceration model. We obtained a list of supplies and lab preparation instructions from the University of North Carolina- Chapel Hill, OB/GYN residency program, where a low-cost, educationally valuable model was previously used.

Using cow tongue and turkey legs, CSC teammates made models for the OB/GYN residents. As part of orientation, all first- and second-year residents attend a CSC lab using this perineal laceration model. First- and second-year residents were paired together to allow the second-years to assist with the ongoing learning and development of their peers. Basic suturing and knot tying skills are incorporated into the learning experience. Feedback indicates the OB/GYN faculty and residents were impressed with the perineal laceration model and have requested ongoing training sessions and model creation for use in resident education and training.

### Maternity and Neonatal Nursing (Nursing 154)

In order to meet the needs of Maternity and Neonatal (Nursing 154) students, Noelle<sup>®</sup>, our high fidelity birthing manikin, was moved to Carolina College of Health Science's nursing skills lab. Now, Nursing 154 students can gain more scenario-based simulation time while helping us make room for a new high fidelity birthing simulator. We provided training and education for interested faculty members so that Noelle<sup>®</sup> could be used on a regular basis when time and space were limited at CSC. Case development was centered on post-partum hemorrhage and eclamptic seizures which are clinical presentations that students may not experience during their time in the clinical setting.





## Ultrasound Models

General surgery residents practice many procedures at CSC including ultrasound-guided breast mass biopsy. We have expanded upon this training by also creating a neck model for ultrasound-guided thyroid mass biopsy. We made the models of low-cost gelatin. The breasts are realistic in shape and feel with hollow and solid masses for biopsy. The thyroid model is half of a neck with a trachea, thyroid, and vessels; there are nodules added around the thyroid for biopsy. Users are able to visualize the anatomy with ultrasound, enabling them to locate masses and navigate structures to avoid causing damage during biopsy.

While breast and thyroid models are commercially available, they can be cost-prohibitive. We have created suitable replicas of these models, enhancing the educational experience while limiting monetary burden. These replicated task trainers combine realism with the benefit of multiple uses to allow learners to become more proficient in breast and thyroid biopsy.

## Vascular Anastomosis Trainer

Carolinas Simulation Center is frequently approached by users to create new simulation models for specific procedures to be used for educational sessions. One general surgery resident approached us about the possibility of making a low-cost vascular anastomosis simulator that his colleague created. Using supplies purchased at a hardware store for less than \$100, we were able to produce eight of the low-cost simulators.

We tested the model during one of the vascular anastomosis training sessions, facilitated by experienced vascular surgeons. Both the commercial trainer, which had been used for past training sessions, and the new low-cost model were made available to facilitators and residents. After using both trainers side-by-side, facilitators agreed the model made by CSC was preferable to the commercial model as it was more realistic and required participants to perform the procedure in a confined space in different positions or angles. Based on this feedback, we plan to use this new model for all future vascular anastomosis training sessions.



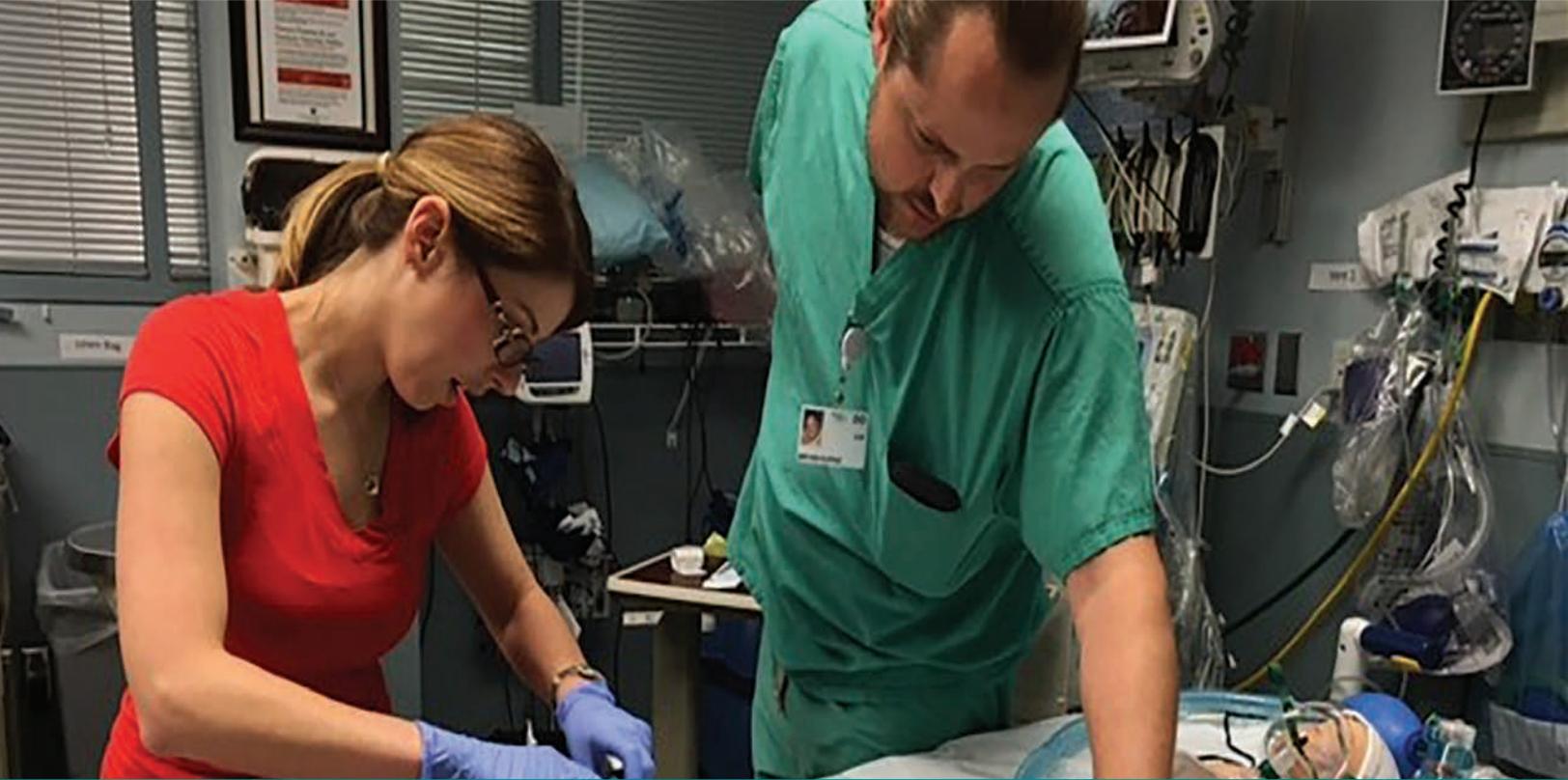


## Performance Excellence Center Lean Education Simulation Space

The Performance Excellence Center (PEC) team delivers strategies that transform the way we do the business of healthcare through lean education and leadership development. We offer a Lean Leadership Development Program and Lean Certification Program throughout Carolinas HealthCare System. We have strategically selected simulation exercises that explore practical applications of lean principles and tools, and are conducted in the center's simulated emergency department.

The PEC has been offering lean education and practical applications since 2008. In addition to classroom facilitator-led courses, participants have the chance to practice process improvements in the simulated emergency department environment. The following course programs are offered by the PEC:

- **Lean Leadership Development Program:** In this 19-week course, leaders learn and practice the basic tenets of the lean philosophy and practice, therefore advancing their problem solving and team coaching skills. Successful candidates are granted "release" from their operational responsibilities to participate in this program, after which they return to their home departments. Participants are nominated by executive leadership and are carefully selected through a rigorous interview process.
- **Lean Certification Program:** The Lean Certification Program is a series of three levels of intense learning and practice: Bronze Level, Silver Level, and Gold Level. Each level represents 25 hours of classroom work in addition to assignments in the participants' home departments. Progression from the Bronze Level to Gold requires mastery of lean thinking, standard work, practical problem solving, simulations, Management for Daily Improvement and an A3 presentation. These courses are open to teammates across the System and can be scheduled through the System's Learning Management System.
- **Facility Engagements:** Creating a culture of lean thinkers is the cornerstone of the PEC's work. Experienced master lean senseis, lean senseis, lean managers and lean practitioners are assigned to facilities and departments through a focused engagement strategy. The engagement process includes directed education for engaged teams, rapid improvement events, value stream mapping exercises, daily huddles and executive participation.



## PATIENT SAFETY

### Neonatal Resuscitation for Free Standing EDs and EDs without OB/NICU support

#### Purpose

Over the last several years Carolinas HealthCare System has increased the number of Free Standing Emergency Departments (FSED) within the system. Unlike Emergency Departments (ED) that are part of a hospital, these EDs do not have staff trained in obstetrics (OB) or neonatal medicine to care for premature or critically ill neonates. This project, designed to impact the care of critically ill neonates, teaches staff about key initial neonatal resuscitation points; how to initiate a “Code Baby” to expedite transfer to a higher level of care; and increases individual and team confidence in caring for neonates.

#### Development

Carolinas Simulation Center (CSC) applied for and received a Children’s Miracle Network grant to provide pediatric/neonatal education to FSEDs. At the same time, a root cause analysis was conducted related to neonatal patients seen at FSEDs. From that root cause analysis, one of the action items was to provide simulation education. A team consisting of the CSC Director, the CSC Operations Manager, a CSC Simulation Education Specialist, a Carolinas Medical Center (CMC) Emergency Medicine Physician and an Emergency Medicine Resident came together to determine how to merge the two projects together. This team developed the overall goal for the project, designed the basic outline of the course and determined the resources necessary. The course included four scenarios designed to incorporate team training and hands-on experience with the actual equipment used at each facility.

As the curriculum was being developed, the Med Center Air Outreach Liaison was added to the team to bring expertise in neonatal care, transport and Code Baby. A neonatologist from Levine’s Children’s Hospital (LCH) joined to serve as a consultant. To ensure that the scenarios would work appropriately, the team did a test run of each scenario in the LCH ED and then again at the simulation center using CMC/LCH emergency staff members.

## Implementation

Four-hour sessions were offered twice a day at 10 different facilities. The facilities included the FSEDs as well as some of the hospital based EDs that do not have OB or Neonatal Intensive Care Unit (NICU) support. One of the originally designated facilities dropped out of the project and Carolinas HealthCare System-Union requested to be included despite the fact that they have OB coverage available.

In each of the four-hour sessions, participants rotated through four different simulation scenarios focusing on different neonatal emergencies such as a precipitous delivery, pneumothorax, septic neonate and congenital heart abnormality. Some of the hands-on experiences included were umbilical vein catheter placement, neonatal intubation, interosseous needle placement, bag-valve ventilations, neonatal medication preparation and IV fluid bolus administration. A benefit of providing the education at each facility was that the staff members from that department could familiarize themselves through simulation with the equipment and supplies present at their ED.

## Outcomes

We provided education at Carolinas HealthCare System-Steele Creek, Carolinas HealthCare System-Huntersville, Carolinas HealthCare System-Waxhaw, Carolinas HealthCare System-Kannapolis, Carolinas HealthCare System-Harrisburg, Carolinas HealthCare System-Kings Mountain, Carolinas HealthCare System-Anson, Carolina Medical Center-Mercy, Carolinas HealthCare System-South Park and Carolinas HealthCare System-Union. Participants included seven respiratory therapists, 16 healthcare technicians, 122 nurses, 42 providers and two others for a total of 189 participants. Survey results are provided in the tables and quotes that follow.

*"Every member of the staff I have spoken to thoroughly enjoyed the day. You all provided a great learning environment that was not intimidating, but helped us think through what we would need to do if we were presented with some of the situations from yesterday."*

*"This session was beneficial and greatly added a real life approach to neonatal resuscitation. Allowed ample opportunity for discussion and skills. Highly recommend and think it needs to be annually reviewed as a high risk, low use topic for outlying ERs."*

*"One of the best simulation courses I have had in my training and very appropriate for the FSEDs and facilities without L&D or neonatal units. It is needed on a recurring basis for new providers and continuous education of staff and providers."*

*"Hands-on experience is most beneficial by far for those of us in the field. You can't beat the chance to run scenarios as one remembers the material much better that way."*

*"This course was amazing. Having the team come on site, working with our equipment was essential. Also, the multidisciplinary approach was priceless."*

*"Best course I have taken in 33 years as an ER doc."*

*"Much more effective than reading a module or watching a power point! Especially having docs and nurses in session together."*

*"Very useful and critically essential component of providing consistent quality care."*

*"Wonderful learning opportunity. Simulation allows for better retention of new or seldom used skills. I would love to see this as part of an annual or bi-annual training opportunity."*

**Table 1. Agreement with understanding of Code Baby and roles during a neonatal resuscitation.**

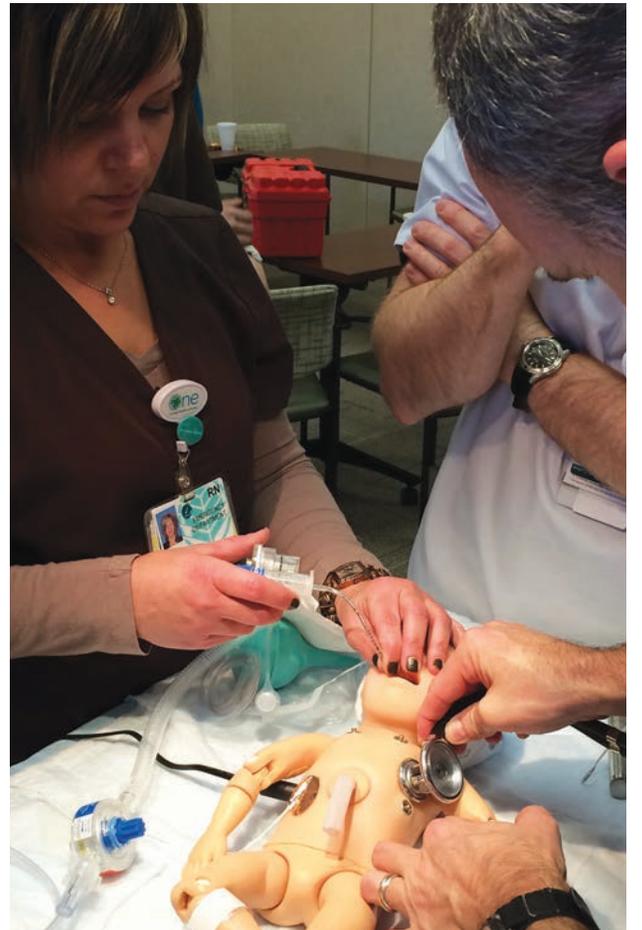
I understand the criteria for initiating a Code Baby.	Pre	Post
Strongly Disagree	8	0
Disagree	36	0
Neutral	53	6
Agree	75	87
Strongly Agree	22	93
I am confident performing my role during a neonatal resuscitation.	Pre	Post
Strongly Disagree	15	1
Disagree	52	2
Neutral	66	22
Agree	55	135
Strongly Agree	6	28

**Table 2. Evaluation of the course.**

This education session increased my knowledge about neonatal resuscitations	# of responses	% of overall
Strongly Disagree	0	0
Disagree	0	0
Neutral	0	0
Agree	22	11.7
Strongly Agree	166	88.3
Compared with other education modalities this simulation experience has better prepared me to care for neonatal emergencies.	# of responses	% of overall
Strongly Disagree	0	0
Disagree	0	0
Neutral	5	2.67
Agree	27	14.44
Strongly Agree	155	82.89

## Conclusion

As evidenced by the survey data presented in tables 1 and 2, this project is considered successful. At the end of training, all participants agreed or strongly agreed that the education session increased their knowledge about neonatal resuscitations and 97.33% agreed or strongly agreed that when compared to other education modalities (lecture, on-line learning, traditional courses CPR/NRP/PALS) this simulation experience better prepared them to care for neonatal emergencies. Understanding of Code Baby and confidence performing neonatal resuscitation also greatly increased after this educational experience.





## NorthEast PICU Continuing Education

### Purpose

Carolinas Simulation Center (CSC) partnered with the Carolinas HealthCare System-NorthEast/Jeff Gordon Children's Hospital Pediatric ICU (JGPICU) to offer simulation education. The JGPICU has worked with CSC for the past two years by offering simulation education to its staff including floaters. This year, the course was designed to support and reinforce education the nurses received in Mini-Core lectures. The simulation curriculum also included team training with a pediatric intensivist who attended the session or was available via teleconferencing.

### Development

Jeff Gordon Children's Hospital's Clinical Nurse Educator for Pediatric Services contacted CSC for assistance offering 12 sessions of simulation over six dates throughout 2015. She worked with a CSC Simulation Education Specialist to develop the scenarios for the first sessions and coordinate the dates. We decided to hold the sessions at JGPICU in order to offer the best learning environment for the participants. This also allowed physicians to participate, either in-person or via teleconferencing. The remainder of the scenarios were developed with the Clinical Nurse Educator for Women's Services, a Pediatric Intensivist, and the CSC Simulation Education Specialist.

## Implementation

Beginning in March 2015, CSC sent a simulation education specialist along with a medical education technologist to JGPICU for 12 two-hour sessions of simulation using a moderate/high fidelity pediatric manikin. Each session included two scenarios with a maximum of six participants including nurses and physicians. After each scenario, we held a debrief session allowing the participants to reflect on their performance and teamwork. The JGPICU nurses were required to attend at least two of the 12 sessions. The nurse participants completed a survey at the end of each session evaluating their level of experience, if the Mini Core content helped them perform in the simulation and their confidence caring for a Pediatric Intensive Care Unit (PICU) patient after the simulation.

## Outcomes

The JGPICU nurses attended two sessions each, which resulted in a total of 23 responses to the post simulation surveys. When asked if the nurse was able to apply knowledge learned in the Mini Core to the simulation session, 68.18% said yes, 13.63% said no, and 18.18% said N/A due to not attending the Mini Core. Several of the nurses reported that they felt confident and competent to care for a PICU patient prior to the simulation, but many reported improvements in this area after the simulation.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Prior to the simulation session, I felt confident and competent caring for a PICU patient.	4.35%	0%	0%	30.43%	65.22%
After the simulation session, I feel <b>more</b> confident and competent caring for a PICU patient.	0%	0%	21.74%	52.17%	26.09%

## Conclusion

More than 75% of the JCPICU nurses reported they felt more confident and competent caring for PICU patients after participating in the simulation, and 65% of the nurses said they would like to participate in more sessions in the future. We also received comments related to including the entire care team in future sessions:

- "It would be nice to include respiratory therapy in our simulation."
- "Enjoy the constant interaction with peers and rotating physicians."
- "Would've been nice to be able to have all the disciplines available."

These sessions allowed the nurses and the intensivist a unique opportunity to practice together. From this experience the participants found value in the team training and requested that training be expanded to include all disciplines in the future.

## Hospital Engagement Network Obstetrical Initiative

### Purpose

Obstetrical hemorrhage is one of the leading causes of maternal morbidity and mortality across the world. Many of the issues associated with an obstetrical hemorrhage, such as organ failure and sepsis, can be prevented if recognized and treated early enough. Hemorrhages are not caught early historically because there has not been an accurate way to measure maternal blood loss during delivery. To decrease complications due to obstetrical hemorrhages at Carolinas HealthCare System, members from the Hospital Engagement Network (HEN) and Perinatal Services partnered with Carolinas Simulation Center (CSC) to strategically develop and implement an Obstetrical Hemorrhage Protocol across the system. This protocol standardizes inpatient obstetric services to assure delivery of evidence-based care regardless of the facility.

### Development

After attending the Florida Perinatal Quality Collaborative Obstetric Hemorrhage Initiative initial meeting, a facility champion from Carolinas HealthCare System-Pineville and Carolinas Medical Center (CMC) and the Outcomes Specialist for Perinatal Services designed the Obstetric Hemorrhage Initiative for Carolinas HealthCare System. From this initiative came an obstetric hemorrhage toolkit that included a hemorrhage protocol template, a massive transfusion protocol, a risk assessment tool, provider and staff education templates, instructions for performing quantification of blood loss, ordering information for all necessary supplies and an Obstetrical Hemorrhage Scorecard with process and outcome measures.

The HEN provided funds to buy obstetric hemorrhage carts for every participating facility as well as a new obstetric simulation manikin, used in the simulation-based mobile experiential learning program that teaches teams how to implement the initiative. Simulation of these new protocols/guidelines allowed for hands-on, real-time practice as well as an opportunity to develop interprofessional teams. Simulation scenarios were created to allow for interprofessional education and a team approach to patient safety and quality outcomes, where teams could practice high-stakes situations in a low-stakes environment, without harm to real patients.





## Implementation

Over a three-month period, we met system educational needs for protocol/guideline implementation using a high-fidelity birthing simulator and a transport vehicle, offering simulation sessions to 16 facilities and more than 300 team members across two states. Carolinas Simulation Center facilitated 46 separate four-hour training sessions in the Labor and Delivery/Post-Partum units at individual sites allowing for adaptation of the simulation sessions depending on the specific needs of a facility.

We provided education on the new obstetrical hemorrhage initiative and quantitative blood loss measuring prior to the simulation sessions. We encouraged coordination with other disciplines at each facility (lab, blood bank, providers, operating room staff, Rapid Response, and emergency department) to ensure an interprofessional understanding of the new initiative and allow an opportunity for a team approach to new best practice process implementation. We reinforced the principles from TeamSTEPPS to create a positive team environment for all of those involved and to enhance communication.

Experiential learning provided in the patient care environment allowed teammates to be fully immersed in the situation and test the system, particularly during transition of care from the Labor and Delivery Suite to the Operating Room and finally to the Post Anesthesia Care Unit.

Interprofessional teams ran through four different obstetrical scenarios and were given the chance to use the newly designed hemorrhage cart, equipment, and medications while implementing the new hemorrhage protocol and quantitative blood loss measurement practices. After each scenario, content and simulation experts led a debriefing to identify areas of success and areas for improvement. This collaborative team approach for improvement was key in assuring quality outcomes for our patients since multiple systems and process issues were uncovered and addressed during these sessions.

## Outcomes

All participating teammates completed a survey at the end of the session. The use of a high-fidelity birthing simulator for protocol/guideline implementation and process improvement was well received by those who participated. An extremely large portion of participants were more comfortable with and had a better understanding of the topics that were introduced during the simulation education session.

We took these lessons learned at each of the participating facilities and used them as a guide when customizing the scenarios to meet goals, protocols and guidelines for the next facility.

The knowledge gained from this project was innovatively shared with multiple audiences across Carolinas HealthCare System as well as the United States. The Florida Perinatal Quality Collaborative selected Carolinas HealthCare System to participate in a multi-state postpartum hemorrhage collaborative. The experience helped to refine the Carolinas HealthCare System postpartum hemorrhage protocol and to pilot a new protocol. Carolinas Simulation Center played a key role in sharing knowledge and developing practical expertise as the team traveled to maternity sites across the System. Our demonstrations, education and opportunities for practice improved participants' retention of knowledge and skills. We shared our PowerPoint presentation about the postpartum hemorrhage protocol and the in-person teaching methodology with the Patient Safety & Perinatal Quality Safety Operations Council (QSOC™).

The Carolinas HealthCare System postpartum hemorrhage protocol development and educational methodology using simulation was also shared with the Centers for Medicare & Medicaid Service's Partnership for Patients - Hospital Engagement Network, a network of more than 2,000 hospitals across the nation. Obstetric hemorrhage continues to be a focus of the Perinatal QSOC™ and the Carolinas HealthCare System Medical Group with subcommittee meetings held bimonthly, scorecard data reviewed quarterly, and monthly reporting of data to the HEN. During the 2016 Quality & Patient Experience Sharing Day, CSC along with the Perinatal Safety Collaborative, Perinatal QSOC™, Carolinas HealthCare System HEN, Carolinas HealthCare System Medical Group, and Evidenced Based Care Team were awarded a Silver Touchstone Award.



## Patient Safety Skills Lab

### Purpose

Every June, Carolinas HealthCare System welcomes a new cohort of resident interns (PGY 1 residents) for a month-long orientation to the hospital system. Carolinas Simulation Center (CSC) hosts an interactive portion of this orientation known as the Patient Safety Skills Lab (PSSL) to orient new residents to best practices in multiple areas of patient safety. This four-hour orientation gives interns an introduction to, or a refresher of, tasks they will be asked to perform during their time as residents. Upper-level residents are used as facilitators for each of the seven stations that comprise the PSSL. These resident facilitators are encouraged to share their experience and knowledge of not only the assigned task, but what it is like to be a resident at Carolinas HealthCare System. All resident facilitators are asked to complete a brief assessment of each intern's performance which is passed on, confidentially, to Program Directors to assist with curriculum development and implementation.

### Development

The PSSL has been an integral part of intern orientation since 2011 and has evolved into the highlight of many new residents' first month at Carolinas HealthCare System. In 2015, the PSSL implemented changes to include criteria from the Core Entrustable Professional Activities for Entering Residency, developed by the Association of American Medical College, to create a stronger orientation experience. Implementing priorities established by the Core Entrustable Professional Activities ensures that Carolinas HealthCare System residents meet the nationally set competencies. In reviewing these core competencies, it was found that the PSSL was meeting the majority of these priorities, but needed activities designed for interns to "give or receive a patient handover to transition care responsibility" and "collaborate as a member of an interprofessional team."



## Implementation

Carolinas Simulation Center, in collaboration with the Department of Medical Education, planned and implemented seven four-hour sessions to accommodate all incoming residents. Interns were divided up into small groups and spent their time at CSC rotating through hands-on training stations which included communication, suturing and foley catheterization. Each 20-minute station gave residents a brief refresher to the task while keeping things appropriately paced and interesting.



## Outcomes

In 2015, 77 interns entering into one of Carolinas HealthCare System's seven residency programs, including programs from Carolinas HealthCare System-NorthEast in Concord and Carolinas HealthCare System-Blue Ridge in Morganton, participated in PSSSL. At the end of the session, interns were asked to fill out a brief survey related to their experience at CSC (see Chart 1-3). The intern comments were extremely positive:

- "I feel much more confident now."
- "Very useful part of orientation."
- "Very organized and appropriate time spent for this."
- "Great stations with pertinent skills needed to refresh and start to get confident."

Interns also said they appreciated having upper-level residents as facilitators to present a more relaxed learning environment and an opportunity to get an insider's view of residency at Carolinas HealthCare System.

## Conclusion

Overall, the PSSSL was received as a great success by interns, facilitators, and program directors. We plan to continue enhancing the PSSSL by using the feedback to improve this portion of resident orientation in the future. Some planned improvements for 2017 include having stations combining tasks and having individual stations more tailored to individual specialties.

## Skilled Nursing Facilities

### Purpose

In 2015, Carolinas Simulation Center (CSC) continued its collaboration with Carolinas HealthCare System's post-acute care division to bring mobile simulation to four skilled nursing facilities (SNF). This year we focused on heightening the assessment skills of the nursing staff and empowering the nurses to communicate with physicians using the SBAR (Situation, Background, Assessment, Recommendations) guide to advocate for patient care. We placed emphasis on decreasing hospital readmissions and early identification of sepsis. Although CSC has worked with the SNFs before, this was the first year we incorporated the use of standardized patients, providing valuable opportunities for participants to practice clinical skills in an environment that is both safe and supportive to the learning process. By practicing their skills with standardized patients, participants could develop and refine their interpersonal skills and professionalism without putting actual patients at risk.

### Development

The Director of Nursing Services for Long Term Care met with the CSC Director and CSC Educators to discuss and develop a plan to use simulation to reinforce the annual education each SNF staff member received before the simulation experience. The nursing staff was required to complete several online modules related to patient assessment of lung and heart sounds. They also received education on how to complete the new SBAR form and use it during conversations with physicians. The group decided that CSC would provide a high fidelity, human patient-simulation station for the SNF nursing staff to practice their assessment and communication skills. The standardized patients would allow participants to practice early sepsis identification and to increase the comfort levels of Certified Nursing Assistants (CNA) using the STOP and WATCH early warning tool.





## Implementation

During July and August of 2015 Cleveland Pines, Jesse Helms, Sardis Oaks and Huntersville Oaks SNFs participated in four-hour simulation sessions for a total of 16 sessions. The nurses were given the opportunity to practice assessment skills before participating in two high fidelity scenarios. One scenario was designed to have a moderately-ill patient who could be treated at the SNF and not require a hospital admission. The other scenario was designed for the nurses to identify the signs and symptoms of sepsis and advocate for admission to the hospital.

At the beginning of each session the nurses completed a pre-quiz to determine their knowledge base after completing the online modules. After completing the simulation sessions, the nurses were asked to complete a post-quiz to determine if there was any knowledge gained from the simulation session.

For CNA education, a standardized patient was trained to portray a SNF resident with multiple symptoms of sepsis. These participants were asked to interact with the resident, determine that a problem existed and then fill out the early warning tool. Afterward, they provided feedback on their communication and completion of the STOP and WATCH form and we noted opportunities for improvement.

## Outcomes

At the completion of the education 64 RNs and 67 LPNs participated across the four SNFs. More than 80% of the nurses reported improvement of their assessment and communication skills. Comparing the pre-quiz to the post-quiz results showed an overall 30% improvement in knowledge after the simulation sessions.

Of the CNAs who participated, 98.5% either strongly agreed or agreed that the scenario-based session helped them better understand the STOP and WATCH tool and 100% either strongly agreed or agreed that the scenario-based session would help them recognize potential problems with their residents. We also identified trends, areas of potential growth, and future areas of education focus which were shared with leadership of the Post-Acute Care Service line.

RN/LPN Post Simulation Self Reflection	Strongly Agree	Agree
The simulation scenarios will help me perform better patient assessments.	83.06%	16.94%
The simulation scenarios will help me improve my SBAR communication with physicians.	82.40%	15.20%

Percent of correct answers related to education from online modules	Pre	Post	% Change
<b>Breath Sounds</b>			
Vesicular	35.56	82.03	130.68
Wheezes	94.81	96.18	1.44
Crackles	76.26	90.70	18.94
Rhonchi	51.11	83.21	62.81
Stethoscope	37.68	44.82	18.95
<b>Heart Sounds</b>			
S1 and S2	69.78	92.37	32.37
Obese Patients	83.33	98.26	17.92
Congestive Heart Failure	54.21	77.34	42.67
<b>Overall</b>	<b>62.84</b>	<b>83.11</b>	<b>32.26</b>

CNA Post Simulation Self Reflection	Strongly Agree	Agree
The simulation scenario helped me better understand the STOP and WATCH tool.	76.92%	21.54%
The simulation scenario will help me to recognize potential problems with my residents	73.85%	26.15%

### Comments from the surveys:

- "Great simulation experience, instructors very thorough in explaining rationales, great depiction of actual scenarios."
- "The simulation has been so beneficial as far as providing excellent care is concerned. After this class there are so many things I feel comfortable doing."
- "Good review listening to lung sounds. Good getting feedback about SBAR & assessments & CPR/AED use. Practice makes perfect!"
- "I enjoyed the simulation scenarios/SBAR. I feel comfortable with situations/learned a lot."
- "I think the skills fair was great in brushing up skills and providing better, more effective ways of taking care of our residents."
- "It was very helpful. Helped me to think about my assessment."



### Conclusion

The Skilled Nursing Facility environment offers an excellent opportunity for education with our healthcare providers who serve one of our most vulnerable patient populations. This is the third consecutive year that simulation education has been provided to nurses at SNFs. In 2015, we were able to show how simulation education can build on previous online education and strengthen SNF nurses' knowledge base. For the first time, we also used standardized patients that replicated the CNAs' residents and patient populations, reinforcing the areas where they can make a tremendous impact since they are the front line in patient care. With improved knowledge and the ability to practice both assessment and communication skills, we anticipate that there will be better patient outcomes related to decreased hospital readmissions and early identification of sepsis.



## RESEARCH

### Fundamentals of Robotic Surgery

#### Purpose

In 2014, the Institutional Review Board approved Carolinas Simulation Center as a participating site in the “Validation of the Fundamentals of Robotic Surgery (FRS) Online and Psychomotor Skill Curriculum” research study. This study, conducted at 15 international institutions, was funded by the Institute for Surgical Excellence to validate the FRS Online and Psychomotor Skills Curriculum and to establish benchmarks for surgeons pursuing certification in robotic surgery.

#### Development

The FRS study consisted of expert and novice participants. Novices were defined as general surgery, gynecology or urology residents; fellows and attending surgeons with 50 or less robotic procedures in which they personally performed more than 50 percent of the procedure. Experts were those who had participated in more than 50 robotic procedures performing more than 50 percent of the procedure. Participants were further categorized based upon their years of surgical experience in robotic surgery and the number of robotic procedures they had performed. Study participants were then randomized to either a traditionally trained group (control) or to one of three intervention groups that included completion of the FRS online curriculum and psychomotor training on the Physical FRS Dome, the virtual da Vinci® Skills Simulator™ (DVSS) or the dV-Trainer® (MiMic®).

#### Outcomes

After completing their assigned online curriculum, participants were assessed on the assigned simulator and on an avian tissue model (pre-test). Participants were then trained to FRS proficiency on their assigned simulator. At the conclusion of the study, participants were post-tested on the same tasks and their performance was compared to the pre-test. By the end of 2015, two experts and eight novices completed the study at Carolinas Simulation Center.

#### Conclusion

We sent data from assessments to the principal site for review and analysis. Although cumulative results for this study are currently pending, the work we did will assist in establishing which online and psychomotor curriculum is the most effective and setting benchmarks for the future certification of robotic surgeons.

## Technical and nontechnical coaching for practicing surgeons

### Purpose

Performance feedback for surgeons most often ceases after training is completed, allowing for stagnation of performance and any existing poor habits to persist. Recognizing technical and nontechnical skills impact the quality and safety of care provided to patients, Carolinas Simulation Center collaborated with Quality and Surgery to develop a coaching program for practicing surgeons at Carolinas HealthCare System. The first objective was to identify any potential technical and nontechnical deficiencies in practicing surgeons. These deficiencies were then used to develop and pilot a coaching mechanism for practicing surgeons with feedback provided based on objective performance assessment.

### Development

The Center for Medicare and Medicaid Services (CMS) Partnership for Patients funded the study as part of five Leading Edge Advanced Practice Topics (LEAPT) projects. A multi-disciplinary team formed to execute this project including a general surgery and gynecology physician champion, a human factors specialist, a research coordinator, multiple videographers and video editors, Carolinas Simulation Center personnel, nurses and numerous operating room staff members. Participating surgeons had their technical and nontechnical skills rated through video assessment by expert reviewers who recorded observed errors and skill deficiencies to determine what type of training might best address each skill deficiency.

### Implementation

This project was implemented across Carolinas HealthCare System between September 2013 and December 2014. Based on the video observations, the team developed a four-hour coaching curriculum which included lecture and simulated practice targeting the areas identified for improvement. After the intervention, the surgeons' technical and nontechnical performance was reassessed.

### Outcomes

Thirty-two practicing surgeons (18 general and 14 gynecologic) from six Carolinas HealthCare System hospitals (Carolinas Medical Center One Day Surgery, Carolinas Medical Center, Carolinas HealthCare System-Mercy, Carolinas HealthCare System-Northeast, Carolinas HealthCare System-Lincolnton, Carolinas HealthCare System-Pineville, and Carolinas HealthCare System-University) were evaluated. Forty-two technical videos and 45 nontechnical videos were assessed by the surgeon experts and the human factors expert, respectively. Seven surgeons volunteered to participate in the group coaching session. An additional two could not attend the group session but participated in one-on-one coaching sessions on technical skills. One surgeon participated in both the group and individual coaching sessions. Technical aspects identified for improvement included suboptimal trocar placement, inadequate visualization of the operative field and poor dissection techniques. Nontechnical aspects identified for improvement included inappropriate response to distraction and interruptions, poor ergonomic positioning and lack of situation awareness.

### Conclusion

This project identified several technical and nontechnical skill sets of practicing surgeons in need of improvement and provides support for the implementation of coaching programs for surgeons on an ongoing basis. Despite the small number of participants, initial results are promising and indicate that Carolinas HealthCare System is starting to make an impact and is paving the way to reducing procedural harm in the operating room across the System. Further, participants perceived the coaching sessions as highly valuable. One participant stated in her evaluation of the sessions, "I wanted to thank you for the learning session yesterday. I found it very helpful. I just finished my first of four [procedures] for today and found myself implementing several things we talked about yesterday. Look forward to continuing to work with you. Thanks for all your hard work on the effort."

## Effects of a Novel Mental Skills Curriculum to Enhance Novices' Surgical Performance

### Purpose

Due to the extensive knowledge, skills and abilities required for successful performance, surgery is an exceedingly stressful domain. Heightened stress can negatively impact performance and lead to errors, which can reduce patient safety. Novice surgeons are particularly prone to stress, as they are inexperienced in the operating room and are unlikely to have developed effective stress-management strategies. Mental skills, designed to help performers consistently achieve their optimal mental state for performance, have been shown to enhance performance and reduce stress for U.S. Navy SEALs, military pilots and elite athletes.

With this in mind, from September 2014 to May 2015, as part of an Agency for Healthcare Research and Quality grant-funded study, we began implementing an innovative mental skills curriculum (MSC) during surgical novices' Fundamentals of Laparoscopic Surgery (FLS) simulation training. We wanted to determine if mental skills training is effective at enhancing the novice's surgical performance while reducing stress. This type of training may help ensure that simulator-acquired surgical skills are better transferred to the clinical environment and retained over time.

### Development

A multi-disciplinary team consisting of a surgical educator, a graduate medical educator, a performance psychologist and a mental performance coach developed the curriculum. We refined the MSC by using participant feedback, lessons learned during a pilot study of the curriculum's effectiveness, and further revisions by the research team.

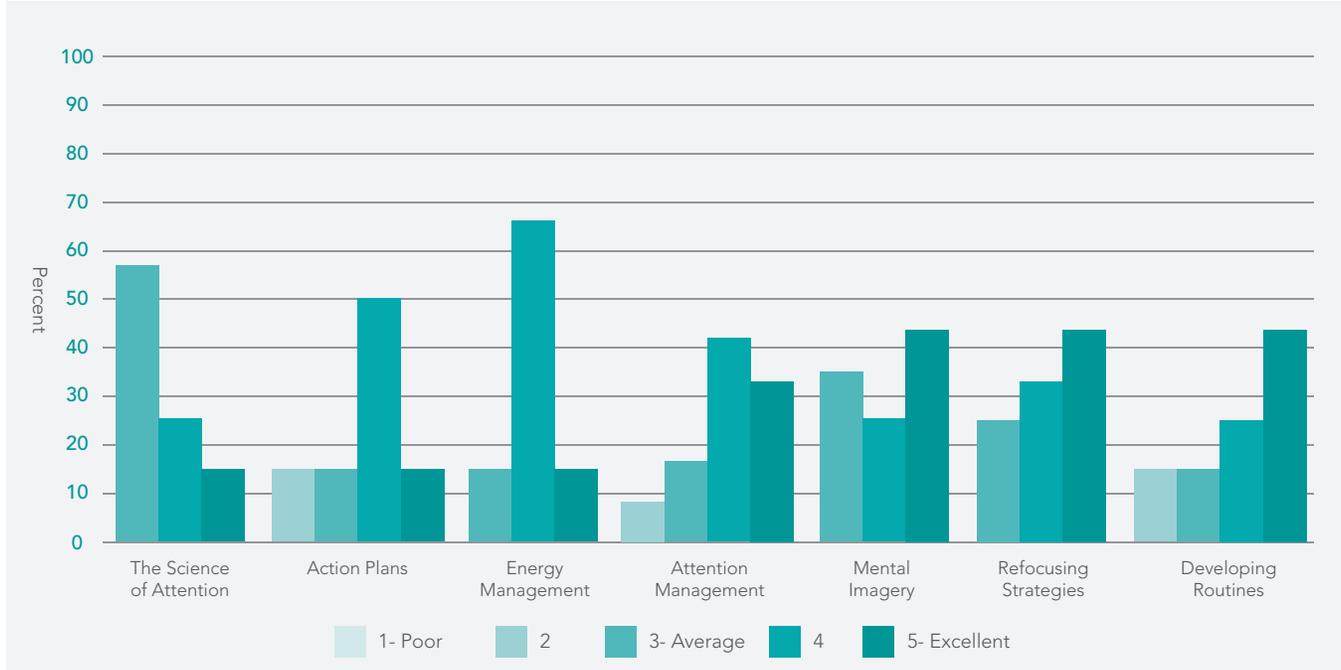
### Implementation

Thirty surgical novices took the MSC and their performance results were compared to a group of 30 novices who did not undergo mental skills training. All participants received FLS skills training during nine bi-weekly sessions. Mental skills participants watched video education modules teaching them several mental skills including mental imagery, relaxation techniques, and attention management among other topics. Participants immediately applied the learned mental skills during their FLS training sessions.

At the conclusion of the training phase, surgical novices participated in a simulated operating room experience to assess the transfer of simulator-acquired skills to the clinical environment. Two months after this test, in the absence of additional structured FLS training, participants were asked to complete a second performance test to assess surgical skill retention.

	Yes	No
Were there specific situations that prompted your use of mental skills outside of the scheduled sessions with your mental skills trainer?	91.67%	8.33%

## RATE THE EFFECTIVENESS OF THE CURRICULUM MODULES



### Outcomes

Fifty-five participants completed training including the transfer test and 46 participated in the two-month retention test. The use of mental skills by the MSC intervention group improved after training, compared with the control group. The MSC group participants specifically increased their use of positive self-talk, relaxation strategies, and mental imagery after training, whereas the control group's use of these skills lowered. Importantly, the MSC group's average suturing performance at the retention test was higher, and the MSC group's performance increased from the transfer test to the retention test significantly more than the control group.

### Conclusion

The results from this study indicate that our novel MSC enhances surgical novices' laparoscopic skill retention under stressful conditions. Thus, surgical trainees, who may not get the opportunity to practice laparoscopy often in the clinical environment early in their careers, may retain simulator-acquired skills more effectively after mental skills training. These findings may apply to other healthcare providers and skills acquired in the simulation lab, but are rarely implemented in performance situations in the stressful clinical environment.

Responses to a post-study survey indicated that for each mental skill, at least 83 percent of MSC participants reported the skills were effective at enhancing performance. Moreover, 92 percent of participants described instances that prompted their use of mental skills outside of the study, and 85 percent planned to use mental skills in future stressful situations to enhance their performance.

For this project, Carolinas Simulation Center and the research team were presented with a Bronze Touchstone Award at the 2016 Quality & Patient Experience Sharing Day.

# COMMUNITY OUTREACH

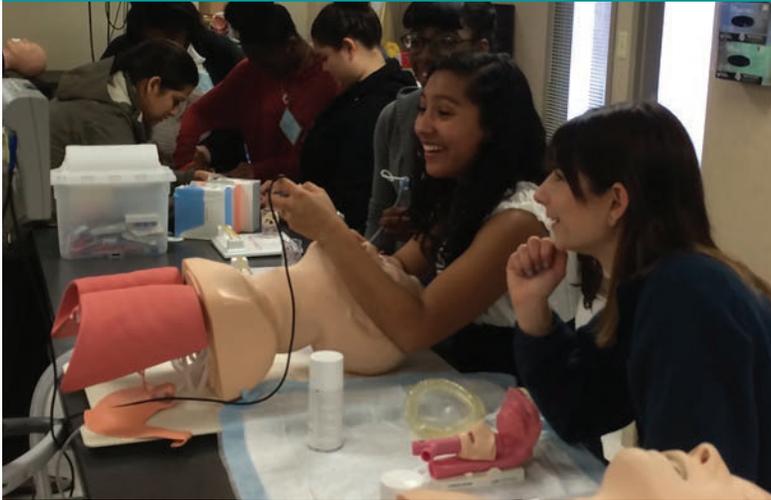
## MCCLINTOCK PARTNERS IN EDUCATION



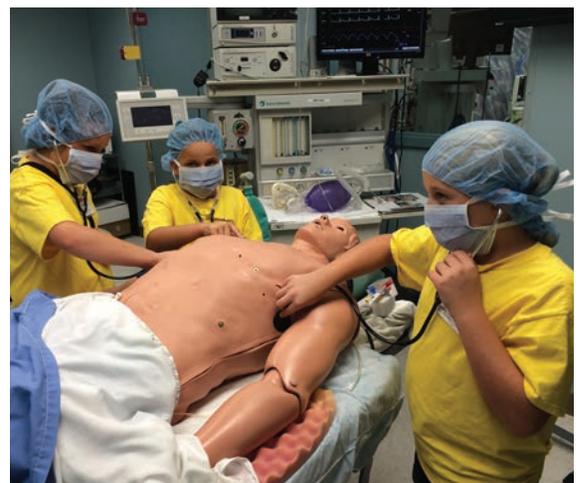
## 75 YEARS OF CAROLINAS HEALTHCARE SYSTEM



PROPELLING ADOLESCENTS TOWARDS CAREERS IN HEALTHCARE

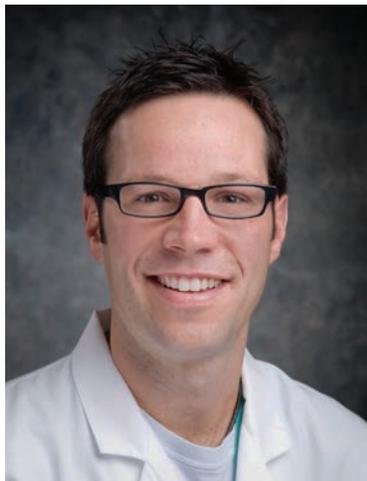


UNC MEDICAL STUDENTS

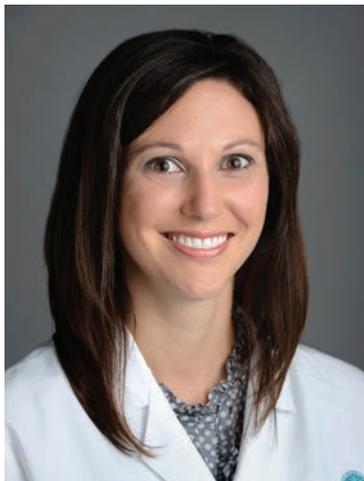


ROTARY SCIENCE CENTER & PLANETARIUM

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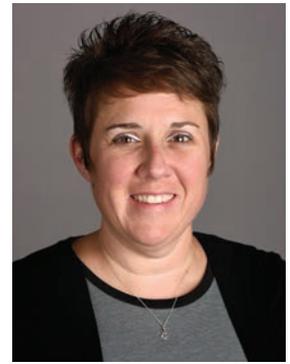
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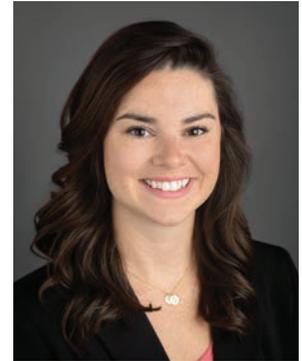
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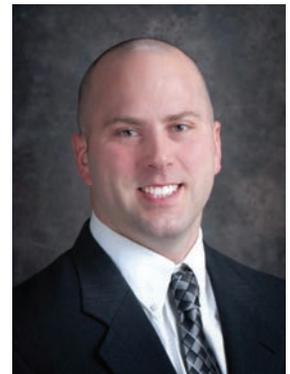
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[CarolinasHealthCare.org/Carolinas-Simulation-Center](https://CarolinasHealthCare.org/Carolinas-Simulation-Center)



Carolina's HealthCare System