

# CAROLINAS SIMULATION CENTER SIMULATION HIGHLIGHTS MAY 2014



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## WELCOME

Dear Colleagues,

Carolinas Simulation Center (CSC) has experienced remarkable growth and success over the past 18 months. 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 our friends 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 inter-professional learners.
- Design and launch of new programs in nurse education, team-based pediatric trauma care and intensive care units.
- Expansion of the common critical care curriculum and the intern patient safety lab to our regional residency programs at CMC-NorthEast, AnMed and Blue Ridge.
- Launch of our mobile simulation division and the INTERACT (Interventions to Reduce Acute Care Transfers) program for several regional skilled nursing facilities.
- Successful completion of our CSC teammates in the international Certified Healthcare Simulation Educator (CHSE) examination.
- Chosen as one of five recipients of the international educational innovator award by CAE Healthcare for our growth, multidisciplinary programs, research and safety initiatives.
- Expansion of our standardized patient program.
- Design and development of novel moderate fidelity simulators, including the patent-pending Central Venous Line Task Trainer Modification.

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.

Lisa D Howley, MEd, PhD

Assistant Vice President, Medical Education and Physician Development

Mary N. Hall, MD

Chief Academic Officer

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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.

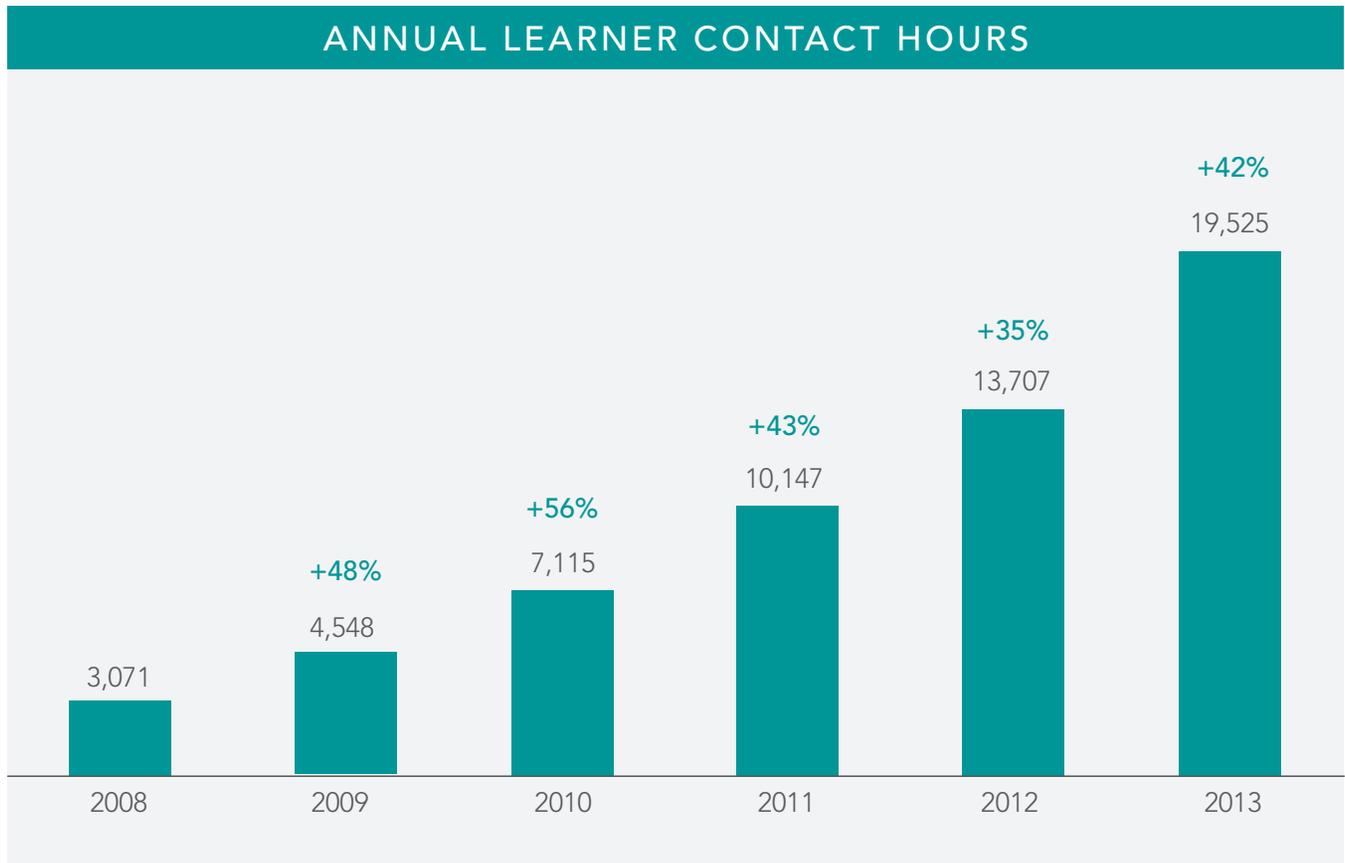
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## EXPERIENTIAL LEARNING

### Learner Contact Hours

CSC total learner contact hours for 2013 is 19,525.

- 42 percent increase from 2012
- 5,665 total participants

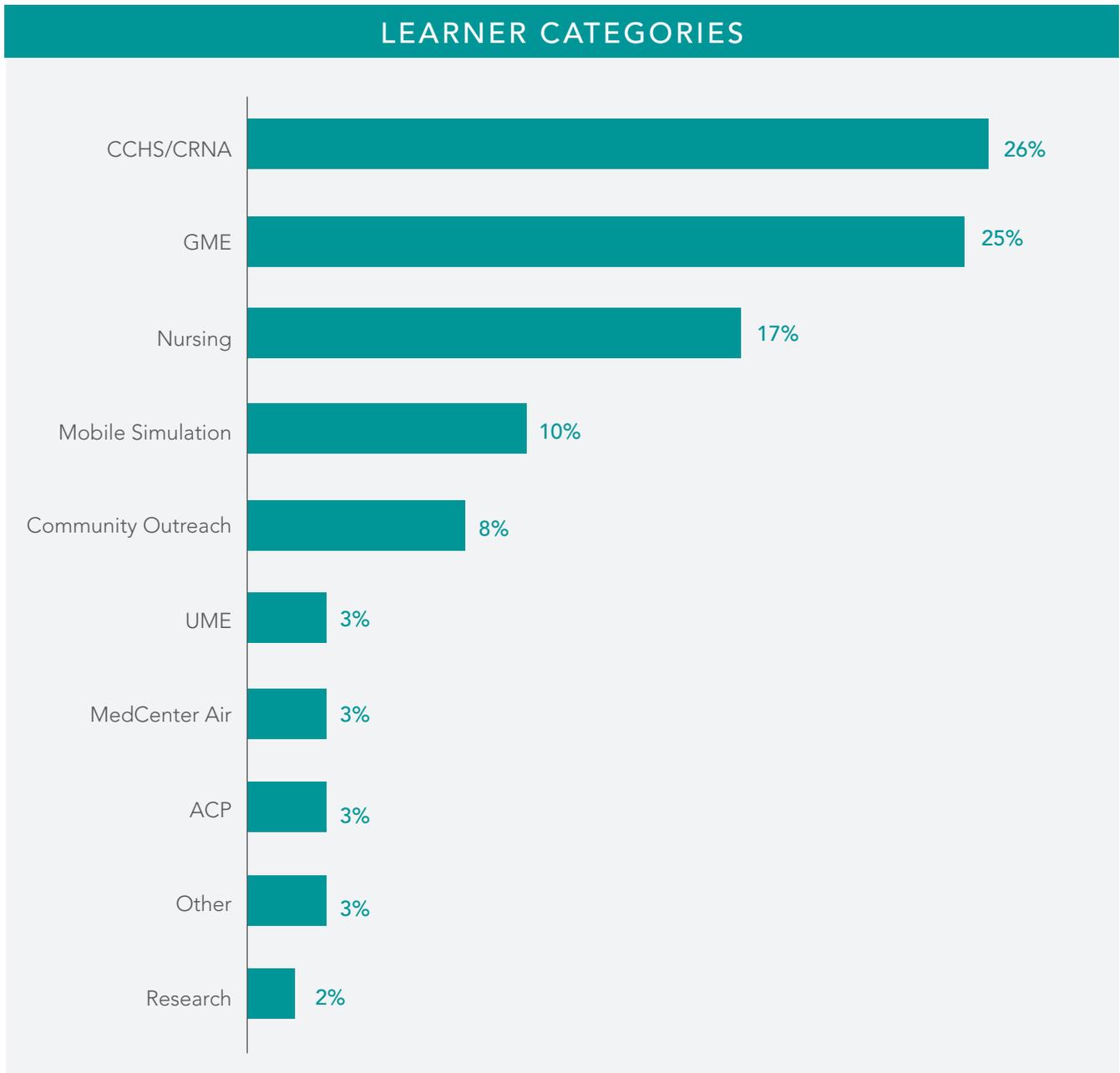


*"I could not resist the chance to pass on a case I had today at my ED. I actually lifted my head at one point in the case and thought to myself, 'Oh my goodness, this was the Sim case that we had two years ago!' What's incredible is I remember doing the simulation case and thinking, 'Can this really happen?' Yes, it can. So, thanks."*

**OMAYRA MARRERO, MD**

## Learner Categories

- 26 percent Carolinas College of Health Sciences
- 25 percent Graduate Medical Education
- 17 percent Nursing



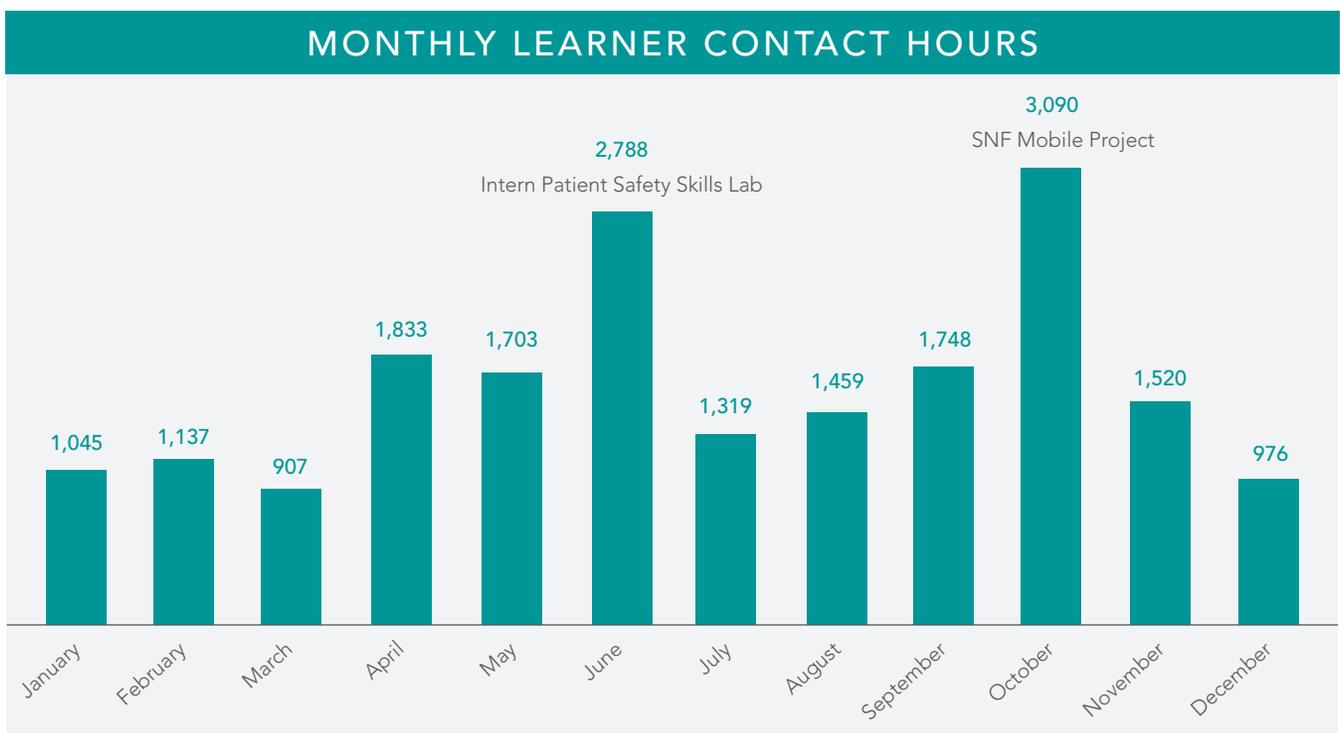
## Growth

In June, CSC hosted the System-wide Intern Orientation Patient Safety Skills Lab

- 85 residents participated, including representatives from Carolinas Medical Center, Blue Ridge, AnMed and Cabarrus
- 365 learner contact hours

In October, CSC hosted a mobile simulation skills fair for four skilled nursing facilities (SNF): Huntersville Oaks Nursing Home, Jesse Helms Nursing Center, Lilly Bennett Nursing Center and Sardis Oaks Nursing Home

- 365 healthcare providers participated (RNs, LPNs and CNAs)
- 1,046 learner contact hours





## PATIENT SAFETY

### Skilled Nursing Facility Excellence in Practice Validation

#### Purpose

Carolinas Simulation Center (CSC) collaborated with Carolinas HealthCare System's post-acute care division to bring mobile simulation to four skilled nursing facilities (SNF). The purpose of the project was to decrease hospital readmission through validation of the project INTERACT – Interventions to Reduce Acute Care Transfers. INTERACT is described as a quality improvement program that helps to improve the identification, evaluation and communication regarding changes in resident status.

#### Development

A team of educators and facility directors of nursing, in conjunction with CSC team members, developed a plan to utilize simulation to reinforce INTERACT. An annual review of skills for SNF staff members using high-fidelity human patient simulation as well as task trainers, met the goals of the curriculum. The facilities visited were Lilly Bennett Nursing Center, Jesse Helms Nursing Center, Sardis Oaks Nursing Home and Huntersville Oaks Nursing Home.

#### Implementation

During October, 19 sessions of four-hour duration occurred at the participating SNF. Skill sets reviewed included urinary catheter insertion and care, wound care, tracheostomy care, PleurX drains, tube feedings and ostomy care. Sessions, operated by simulation educators, product vendors and facility educators, offered hands-on demonstration, practice and return demonstration.

Two of the high-fidelity scenarios used were designed and based on frequently occurring incidents in a SNF identified in the INTERACT Care Paths. Care Paths served as an educational tool and reference for guiding evaluation of specific symptoms that commonly cause acute care transfers. A third scenario allowed participants to refresh knowledge and skills regarding protocol in the first five minutes of a Code Blue (cardiac arrest).

### Outcomes

A total of 365 RNs, LPNs and CNAs participated. Response was positive, both on-site and from survey results.

Healthcare Role	Felt skills fair improved knowledge (strongly agree or agree)	Felt simulation was effective (strongly agree or agree)	All participants, Overall Satisfaction (strongly agree or agree)
CNA I	63 – 93%	95%	
CNA II	50 – 87%	Included in above	92 – 95%
RN/LPNs	87 – 98%	96%	

### Survey Comments

- “This was a great learning experience to refresh and improve my knowledge.”
- “The skills fair was very good. The instructors were very knowledgeable and shared in a way that was easy to understand. Look forward to it next year.”
- “The event was well organized. The instructors were all very knowledgeable and helpful to answer all our questions. A great learning event!”
- “Simulation was effective in teaching how to use SBAR tool related to patient symptoms.”
- “The simulation instructors were very knowledgeable and organized and did a great job with the challenging scenarios. I feel this will make a big difference in helping us retain the information we learned.”

There are plans to continue and possibly expand the program to include hospice service, home health and regional nursing facilities.

## MedCenter Air Simulation-Based Pre-Hire Screening Program

### Purpose

MedCenter Air, a division of Carolinas HealthCare System Mobile Medicine, provides air and ground patient transportation from both interfacility and scene calls. Due to the specialized care required, MedCenter Air has incorporated scenario-based simulation into the interview process to ensure selection of the most qualified candidates. Additionally, simulation has been integrated into MedCenter Air's continuing education curriculum to help assist in competency assessments of its providers.

### Development

With the goal of improving teammate retention and improving quality care, MedCenter Air's hiring committee created scenarios involving cardiac, traumatic and pediatric emergencies. Based on the National Registry for EMS validation checklist, the group also created a checklist for each scenario to assist in applicant assessment. After completing the scenarios, MedCenter Air was better able to compare candidate assessments to help determine who was most likely to successfully complete the MedCenter Air orientation process.

### Outcomes

During the past two years, this simulation-based assessment has been used to hire 46 new teammates, with only two candidates failing to complete the orientation process. MedCenter Air has felt this 95.6 percent success rate speaks to better candidate assessments using simulation prior to hiring providers. Additionally, MedCenter Air has been able to give constructive feedback to those candidates who have been unsuccessful during the simulated patient encounters.



## AHEC Nurse Refresher

### Purpose

As part of the Area Health Education Center's (AHEC) Nurse Refresher Program, participants attend a six-hour simulation course at Carolinas Simulation Center (CSC) prior to beginning their clinical rotations. During this course, the participants refresh their assessment, communication, critical thinking and procedural skills in a high-fidelity simulation environment. The scenarios combined both basic medical and surgical cases with additional Code Blue (cardiac arrest) events. CSC simulation education specialists facilitated and debriefed the participants after each scenario. Debriefings included discussion of best clinical practice and changes in practice that have occurred during the time the participants were inactive in the nursing profession. This curriculum helped participants build on prior skill sets and assured successful return to active nursing practice.

### Development

The AHEC Nurse Refresher Program has been a partnership between Charlotte AHEC and CSC and originated with grant funding for six simulation sessions annually.

The nurse refresher course was designed for those nurses who are presently ineligible for reinstatement of their NC nursing license because it has been inactive five or more years. Additionally, the program meets learning needs of nurses who have not worked in the clinical area in over five years, but maintain an active license. The AHEC RN Refresher Program assists nurses in reviewing common medical and surgical conditions and problems prevalent in the Southeast.

Scenarios and debriefing sessions relate to overall course objectives:

- Discuss current nursing philosophies, social and economic trends, goals and objectives related to providing quality nursing care in today's acute care environment.
- Compare and contrast previously acquired nursing skills with newly learned skills.
- Apply the nursing process and develop a complete nursing care plan for selected patients.
- Incorporate concepts related to nursing diagnoses into planning nursing care.
- Demonstrate knowledge of current diagnostic and treatment regimens, new technical equipment, pharmacology innovations and developing family centered care.
- Demonstrate competence of basic nursing skills.

## Outcomes

Since the program began in 2008, 184 learners have benefitted from a total of 1,104 learner contact hours.

## Survey Comments

- “The experience was exceptional. Dawn has the perfect personality and an expanse of knowledge to share. I hope to have the opportunity again.”
- “This was an excellent alternative to traditional teaching and/or offering a refresher. I got a lot out of the experience and think it was fantastic hands-on approach without fear of a REAL clinical setting where if you made mistake could be life and death. Very beneficial to the nursing/medical profession.”
- “I would very much enjoy more time and scenarios in the simulation center.”
- “I think that more time in the simulation lab would be a great learning tool. I thoroughly enjoyed the lab and thought it was a great learning experience.”
- “I would be good if we could have more situations to ‘play out.’ Maybe several sessions over two or three days would be helpful.”

*“Thank you for Sim! As daunting as the first several shifts have been at times, Carolinas Simulation Center definitely trained us well, and I have to say that I have drawn more from my experiences in simulation than I ever anticipated! I have a new appreciation for Sim, despite how much I dreaded it during residency. It was so valuable and so much like real life now!”*

**CHRYSTAN SKEFOS, MD**



## New Graduate Nurse Residency Programs

### Journey – Intensive Care Nurse Residency Program

#### Purpose

Carolinas HealthCare System has recognized that new graduate nurses (NGNs) require appropriate time and coaching to transition from student to professional direct care nurse. NGNs entering the fast paced, high-tech, high-acuity critical care and progressive care areas are in need of education and training beyond that of initial licensure. In 2009, the Journey Program was created to provide these nurses with the knowledge and skills required to meet this particular need.

Nurse residency programs are supported in the literature for their ability to decrease new graduate turnover rates and promote quality patient care.

#### Program Development

The components of the Journey Program follow educational blueprints and practice standards from Institutes of Health, National Quality Forum, American Association of Critical Care Nurses and the Society of Critical Care Medicine, as well as standards of practice within Carolinas HealthCare System. Teaching strategies include case-based, high-fidelity simulation, bedside precepted experiences, e-learning and didactic classroom activities.

## **Case-based Simulation**

Case-based simulations are completed at intervals throughout the program. NGNs spend between 12 and 20 hours in the simulated learning environment. In keeping with the literature reviews, cases for simulation are designed to promote critical thinking skills, confidence, technical skills and teamwork. Cases focus on disease processes commonly seen in critical and progressive care areas such as: sepsis, pneumothorax, ARDS, mechanical ventilation, heart failure, cardiac arrest, myocardial infarction and other shock states.

A masters-prepared clinical nurse specialist facilitates the simulations and provides the foundation for post-simulation debriefings. Debriefings are utilized to clarify nursing actions, communication and scenario-appropriate treatments. Patient safety and prevention of complications are also discussed in the debriefings. The NGN is encouraged to self-reflect and develop a plan to improve practice with each simulation experience.

## **Outcomes**

The Journey Program matriculates two classes annually. Each class has between six and 21 participants. To date, more than 150 nurses have come through the program and successfully completed the components. In 2013, a total of 39 nurses were in the Journey Program.

Retention rate for nurses within Carolinas HealthCare System has been 95 percent, with retention rate of 92 percent in the initial unit of hire at one year. Physicians have complemented the nurses in the program for their ability to communicate key patient issues and ability to apply critical thinking. This program has allowed NGNs to have confidence to begin CPR and lead the team in code situations. Journey graduates often continue their careers to become certified progressive and critical care nurses, and have even continued their formal education at the masters level.

## **Simulation Experience Evaluations**

NGNs opinions of their simulation experience are important to the continued development of the program. After each debriefing session, NGNs are asked to evaluate their experience and in particular, components found helpful and those that should be changed. This feedback has been useful in optimizing education in this program. According to this feedback, changes have been made in the program.

## **Assessing Confidence**

Learner confidence is assessed both at the start and conclusion of the program. Several key survey questions are utilized to determine effectiveness of simulation within the program. Participants are asked to rate their confidence in multiple competencies required of a new graduate nurse on a Likert scale from one to five.

Extremely confident=5 Very confident=4 Confident =3 Somewhat confident=2 Never confident=1  
 Results are as follows for Cohort Nine, whose orientation ended in July 2013. Overall, the NGNs felt more confident in these four skills after the program’s completion.

Survey Question	Start of Program	End of Program
Identify significant changes in patient condition.	2.4	3.8
Select and implement appropriate nursing interventions.	2.4	3.8
Evaluate a patient’s response to interventions provided.	2.3	3.9
Provide a concise accurate report of patient status when calling provider.	1.5	4.0

### ADVANCE – Nurse Residency Program

#### Purpose

ADVANCE new graduate nurse residency program was built upon three elements – knowledge, socialization and clinical application. The 16-week program integrates unit-specific clinical orientation into an evidence-based curriculum that meets competencies recommended by the National Council of State Boards of Nursing and the American Nurses Credentialing Center. ADVANCE supports Carolinas HealthCare System acute care settings with an evidence-based curriculum that prepares and engages new graduate nurses. ADVANCE builds a strong foundation of the critical thinking, communication and leadership skills required in any acute care setting.



## Development

The ADVANCE curriculum supports the unit-based, precepted clinical orientation with evidence-based classroom, simulation and socialization experiences that effectively transition new graduates to clinically competent, engaged team members who provide excellent nursing care. Each ADVANCE participant receives 12 hours of experiential learning at Carolinas Simulation Center designed around core acute care topics in order to enhance critical thinking skills and ultimately the patient experience.

## Outcomes

The Pilot Cohort began in the fall, 2012, and included ten new graduate nurses hired and precepted by the Carolinas Nurse Resource Team. Since then, 61 new graduate nurses have graduated from the ADVANCE program, for a total of 71. The program is offered twice a year and nurse retention rates as of February of 2014 are 100 percent. The ultimate benefit of ADVANCE is increased retention rates, leading to reduced cost, improved staff satisfaction and higher quality care.

## CMC-NorthEast Pediatric Intensive Care Unit

### Purpose

Due to staffing challenges at CMC-NorthEast's Pediatric Intensive Care Unit (PICU), pediatric floor nurses have been asked to float to the PICU to assist with patient care or take a patient assignment. This project gives CMC-NorthEast pediatric floor nurses an opportunity to gain experience caring for a PICU patient in a simulated environment, thereby increasing knowledge in critically ill patients and confidence prior to caring for PICU patients.

### Development

Prior to implementation of the project, the CSC team conducted an on-site evaluation of the simulation environment and met with the entire planning team for a pilot of the project. Carolinas Simulation Center team members collaborated with the CMC-NorthEast pediatric nurse educator and selected in-situ simulation using a pediatric mannequin, Sim Junior, for this project. Three to five pediatric floor nurses attended one of five possible four-hour simulation sessions covering the most common PICU patient disease processes.

### Outcomes

Twenty-eight learners attended one of the five sessions for a total of 100 learner contact hours. Each session utilized the three PICU scenarios and after debriefing, participants were given the chance to practice high-risk, low-volume procedures such as defibrillation, synchronized cardioversion and pacing Sim Junior.

### Survey Results

Feels Confident Caring for a PICU Patient	Prior to Simulation	After Simulation
Strongly Disagree	18.18%	0%
Disagree	27.27%	0%
Neither	27.27%	9.09%
Agree	18.18%	63.64%
Strongly Agree	9.09%	27.27%



## Pediatric Trauma Alert

### Purpose

All trauma patients at Carolinas Medical Center's Level I Trauma Center are currently treated in the Adult Emergency Department (AED). In order to provide better care to the pediatric patient population as well as alleviate the patient load from the AED, there were plans to conduct pediatric trauma alerts (the lowest acuity traumas) in the Children's Emergency Department (CED) starting July 1, 2013. Carolinas Simulation Center (CSC) assisted by developing and performing pediatric trauma in-situ simulations as a tool to assess the readiness of the CED to accept and safely care for pediatric trauma patients.

### Development

A literature search regarding in-situ simulations for program implementation, quality improvement or assessment revealed several articles discussing the use of ISS for team training, identification of latent safety hazards and knowledge gaps. These articles became the foundation of the planning process for this project.

CSC team members met with a CED MD trauma champion, members of trauma services and the director of pediatric trauma to define the scope of the project. Essential participants were identified as emergency department physicians, residents, nurses, staff, respiratory therapists and child life. The CED MD and CSC team developed four trauma scenarios that included medical, nursing and ancillary staff learning objectives.

CSC provided Sim Junior, moulage, standardized participants and simulator operators. Four dates were scheduled with two sessions per day, at 6 and 7:15 a.m., covering both night and day shifts.



### Outcomes

Seventy-two learners participated for 132 learner contact hours. During the simulation sessions, several deficits involving equipment, supplies, processes and teams emerged. After completing the four dates of in-situ simulation, the leadership of the CED identified several areas needing clarification. In order to ensure that the CED is best prepared to care for pediatric trauma alerts, the start of their new process was delayed until January 1, 2014.

### Survey Results

Seventy-eight percent of participants agree the educational experience was beneficial to their practice.

## Pediatric Mock Code Blue

### Purpose

An in-situ pediatric mock Code Blue curriculum, designed and implemented within Levine Children's Hospital over an 18-month period, was created to improve the confidence in individual roles and code team performance. Starting in July 2010, this curriculum was studied over an 18-month period to advance multi-disciplinary training in pediatric code events at Levine Children's Hospital.

### Development

Approximately 500 healthcare providers are involved in pediatric Code Blue events at Levine Children's Hospital. As part of the educational protocol, bi-monthly pediatric in-situ mock codes (unstable SVT, pulseless VT/VF or PEA) were performed using a high-fidelity mannequin SimBaby, followed immediately by scenario debriefing. All pediatric hospital providers were required to participate in this educational curriculum, however, the prospective survey research evaluating confidence and teamwork was voluntary.

Prior to program initiation, as well as after six, 12 and 18 months, all possible participants were asked to voluntarily complete a survey assessing learner perceptions of confidence and teamwork in pediatric code scenarios using a five-point Likert scale.

Additionally, specific metrics, including those currently thought to be advantageous in cardiopulmonary resuscitation, were collected using recorded video data and analyzed at the completion of the study portion of the project.

### Outcomes

This program has effectively increased in-situ code events for training by 400 percent. Levine Children's Hospital has approximately two real patient floor codes per quarter, and this program includes eight mock codes per quarter. This program also demonstrated statistical improvement in 10 different areas studied:

- Study time to pulse assessment
- Time to chest compressions
- Time to medication administration
- Provider arrival time to pediatric codes improved for:
  - First responders
  - Physicians
  - Attending physicians
- MD confidence in communication skills
- MD and RN confidence in running codes
- Improved perception of teamwork
- Improved global assessment of code performance

Although the study portion of the program completed in 2012, the program's success is highlighted by the fact Levine Children's Hospital has continued twice monthly mock codes due to an overwhelming request.



## EDUCATION

### Center for Advanced Practice ACP Fellowship

#### Purpose

America's healthcare delivery model is changing from physician-only care in both primary and acute care settings. Nurse practitioners (NPs) and Physician Assistants (PAs), collectively referred to as Advanced Clinical Practitioners (ACPs) at Carolinas Healthcare System, play a central role in this change in practice. For new graduates or ACPs who are transitioning to a particular specialty, this level of responsibility can be overwhelming.

Carolinas Healthcare System's Center for Advanced Practice (CAP) has developed a post-graduate program for ACPs who are fully licensed and credentialed to practice. The 12-month fellowship is designed with heavy clinical immersion, focused practical didactics, case conferences and simulation training. The goal of this program is to create a transition to practice in which the ACP is able to ease into his or her profession confidently and competently.

#### Development

The initial fellowship launched in October 2013 in acute care specialty areas of medical critical care, surgical critical care, urology, hospitalist, cardiology, as well as urgent care tracks with 11 ACPs from across the country. The next cohort will begin in April 2014 with the same acute care tracks and the addition of three primary care tracks: pediatrics, family medicine and internal medicine.

This project's curriculum was developed by key experts from each of these specialties within Carolinas HealthCare System. The CAP coordinators teamed up with the simulation center to provide a more enriching experience as well as to perform competency testing. Additionally, fellows were greeted by Sim Junior, who interrupted their first day of orientation with a ventricular tachycardia arrest after being hit in the chest with a softball. This was a great introduction to what awaited them in simulation training at the center.

ACP fellows were assessed in Advance Cardiac Life Support simulated scenarios prior to and at the completion of the curriculum. This assessment allowed directors to continually evaluate the curriculum by monitoring each ACP fellow's performance.

The fellows completed simulation training for specialty procedures and skills, including mechanical ventilation, central line insertion, arterial line insertion and intubation. The medical and surgical critical care ACP fellows also complete a procedure boot camp as part of their specialty training. This three-day boot camp allows ACPs to become experienced in the life-saving procedures they will be expected to perform in day-to-day practice, prior to actually beginning proctoring for hospital privileges.

### **Outcomes**

The use of simulation training and assessment is a crucial component for research being conducted by the Center for Advanced Practice in order to better understand ACP transition to practice. The study, titled, *Bridging the Gap: Understanding the Effectiveness of an Advanced Clinical Practitioner Post Graduate Fellowship Program on Clinical Knowledge*, will investigate the value of the fellowship program in providing ACPs confidence and competence in their specialty clinical settings.

Data will be collected to evaluate how effective the program is in preparing the ACP for practice in his or her specialty, based on subjective perceived preparedness and objective knowledge-based assessment in a simulated environment.

It is hypothesized that by the end of the fellowship year, the ACP fellows will have increased their clinical knowledge in their chosen specialty as well as increased their competence and confidence in the clinical setting. As a result, it is hopeful that the patient experience will improve through decreased error rates and increased efficiency of competent and skilled Advanced Clinical Providers.

## Intern Simulation Common Critical Care Curriculum (4Cs)

### Purpose

To address the need for consistent, safe, efficient and unified critical care training within graduate medical education, Carolinas HealthCare System in collaboration with Carolinas Simulation Center, developed and implemented a longitudinal, interdisciplinary critical care simulation curriculum. Primary curriculum goals were to increase knowledge and confidence in high-acuity, commonly encountered topics with select procedural skills. Secondary curriculum goals were to improve communication skills with a high level of learner satisfaction.

### Development

Developed in 2010-2011 and originally implemented in January of 2012, this simulation-based patient care and procedural curriculum provides simulation-based instruction on high-acuity, commonly encountered, acute care/critical care topics for all interns caring for adult patients within Carolinas HealthCare System. Each intern participates in three four-hour, simulation-based sessions scheduled over a six-month period during the second half of their intern year. Debriefing and topic discussion occurs during sessions along with procedural and interpersonal relation and communication (IPR) instruction. Pre- and post-curricular surveys evaluate self-reported resident confidence in critical care topics, procedures and communication skills over a two-year period. The Debriefing Assessment for Simulation in Healthcare- Student Version-Short (DASH-SV) evaluates facilitator debriefing.

### Outcomes

Pre- and post-curricular surveys collected from 52 interns (2012) and 59 interns (2013) in six programs within the hospitals demonstrated statistically significant improvement in resident confidence in specific critical care topics, procedures and communication skills. DASH-SV demonstrated overall effective facilitator debriefing. More than 80 percent of interns in both 2012 and 2013 requested future educational sessions.

*"We were all amazed at the kind and quality of learning that occurs at Carolinas Simulation Center. We look forward to connecting more in the future as we think through salient ways to use the simulation center in the training of our learners (and ourselves)."*

**DAEL WAXMAN, MD**

*Chair, Department of Family Medicine*



## Charlotte Longitudinal Integrated Curriculum (CLIC): Simulation Thread

### Purpose

The Simulation Center curriculum for the CLIC students is designed to provide hands-on learning, along with real-time clinical reasoning in a safe environment. The learners are introduced to a combination of simulation modalities, including high-fidelity mannequins, standardized patients and simulated procedural mannequins. Sessions include scenario-based cases and group discussions that focus on a variety of topics from multiple specialties. Procedural training is also included within the simulation sessions, along with individualized feedback on medical resuscitation and airway management.

### Development

Session content was developed based on a review of the core topics from the University of North Carolina School of Medicine third-year medical student curriculum, as well as input from each of the third-year course directors. Each simulation session is based on a common chief complaint and covers cases and objectives from all of the third-year clerkships.

### Outcomes

While still within the pilot year of this curriculum, both learners and faculty have expressed enthusiasm for these sessions and have requested continued use of simulation in their curriculum for the coming academic year.

## MEDCENTER AIR – ONGOING COMPETENCY VALIDATION

### Purpose

Ongoing continued competency education for MedCenter Air teams can be very challenging. MedCenter Air employees must be prepared to transport any type of patient via any mode of medical transportation (helicopter, airplane or ambulance). The transporting crew's configuration may be RN/RN, RN/RT, RN/Paramedic, and each of these disciplines must be trained to the same scope of competency. After a needs assessment, a more challenging learning method than role playing or lecturing was recommended. Research indicates evidence-based medical simulation provides a safe, yet challenging, learning environment.

### Development

Approximately three years ago, MedCenter Air began utilizing Carolinas Simulation Center for experiential education. Classes were scheduled quarterly and all employees were required to attend courses at the CSC for scenario-based learning. MedCenter Air's medical director was a strong supporter of experiential learning and provided content expertise for suggested areas for assessment and evaluation that were low-volume, high-risk transports such as intra-aortic balloon pump, direct laryngoscopy, childbirth, post-delivery hemorrhage, neonatal and pediatric. In addition, MedCenter Air quality improvement reports were utilized to identify potential scenario topics.

The scenario-based curriculum was designed to meet learning objectives for a target audience of advanced providers. A standardized template was implemented to ensure each scenario followed a similar process and avoided missing critical learning points tailored to the objectives. A critical action checklist was developed for assessment of performance during scenarios. All of the environmental needs – moulage, splints, spinal immobilization, etc. – were included. Scenarios were designed to include multiple learning objectives to meet MedCenter Air's annual skills requirements.

### Outcome

Over the past three years, the MedCenter Air team has grown from approximately 150 team members to more than 200. The number of out-bases increased from five to 10 and is still growing. As a result of this growth, logistics became an issue and it was no longer possible to get all employees to the CSC. The CSC partnered with MedCenter Air to provide a mannequin named Eli for a mobile simulation unit in an education ambulance. Eli is now a part of a MedCenter Air's mobile simulation education and lives on a stretcher in the ambulance. The education team visits a different base once a week to provide mobile simulation education. The MedCenter Air employees enjoy seeing Eli drive up in the ambulance and he has also participated in simulations involving the System's air transport.

## RESEARCH

Carolinas Simulation Center has been recognized for its excellence in research by the American College of Surgeons and the Society for Simulation in Healthcare due to a very productive research year. Researchers at the CSC have presented at several national and international meetings, published in numerous peer-reviewed journals, and received prestigious grants and awards listed below. Carolinas Simulation Center team is involved in cutting-edge, innovative research, including the development and validation of a mental skills curriculum aiming to enhance surgical performance under stressful conditions, the evaluation of whether video assessment of surgical performance can predict patient outcomes and the value of a visuo-spatial secondary in the assessment of surgical expertise.

Carolinas Simulation Center is engaged in several collaborative research projects that supplement its research expertise and enhance its ability to produce high-quality research. Investigators from local (UNCC), national (Old Dominion University and other institutions) and international institutions (Imperial College of London, UK) are currently involved in several ongoing research projects. Another example is the collaboration with University of North Carolina Charlotte computing engineer professor Jing Xiao, PhD. Dr. Xiao, who heads the National Science Foundation-sponsored Industry-University Cooperative Research Center (IUCRC) in Charlotte, is engaged with Dimitrios Stefanidis, MD, PhD, FACS in a collaborative project that aims to develop a haptic guidance simulator for surgical skills training.

Researchers of the CSC have also provided research mentorship to medical students and nurses. Two summer interns with the Cannon research program spent eight weeks working on simulation research projects under the supervision of Dr. Stefanidis and Mark Bullard, MD, and were able to expand their understanding of research methods through hands-on experience. Dr. Stefanidis also mentored Michelle A. Pfaff, MSN, RN, who is pursuing her doctoral degree in nursing. Michelle has examined the communication skills of nursing students during interprofessional simulations with surgical residents and will be defending her work in Spring 2014.

### International Recognitions

1. Second Place, Research Abstract Category, Scerbo MW, Prytz, Montano, Kennedy, Stefanidis D, Britt R, Davis. "Using A Spatial Task to Measure Laparoscopic Mental Workload: Initial Results", 13th International Meeting on Simulation in Healthcare (IMSH), Orlando, FL, Jan 2013
2. Third Place Technology Innovation, Bullard M, Runyon M. Development of Computer-based Simulation and Gaming for Teaching Emergency Medicine in Tanzania: A Resource Limited Environment. 13th International Meeting on Simulation in Healthcare (IMSH). Orlando, FL.

## GRANTS

### **Can Assessment of Surgical Performance Predict Patient Outcomes? A Leading Edge Advanced Practices Topics (LEAPT) Quality Improvement Project.**

Carolinas HealthCare System was recently awarded a \$4.6 million, 15-month contract by the Centers for Medicare & Medicaid Services (CMS) to complete the LEAPT project, aimed at enhancing and improving patient safety and outcomes. One of the five focus areas of this proposal, procedural harm, is led by Dimitrios Stefanidis, MD, PhD, FACS, in collaboration with Robert V. Higgins, MD, FACOG, FACS, of Carolinas HealthCare System quality division and Carolinas Simulation Center.

This project, coordinated by Manuel Pimentel, BS, aims to determine whether video assessment of surgical performance can predict patient outcomes and will be conducted until the end of 2014. The study proposes an innovative strategy to detect and remediate skill-based deficiencies among practicing general surgeons and gynecologists by analyzing outcomes of several procedures (laparoscopic or robotic cholecystectomy, colectomy and hysterectomy). Technical and nontechnical surgical performance in the operating room will be video recorded and rated by experts and then correlated with patient outcomes. Simulation-based training will be offered to surgeons and the impact of their training on patient outcomes will be assessed.

### **Development and Validation of a Simulation-Based Mental Skills Training Curriculum for Enhancement of Surgical Performance and Improved Patient Safety in the Operating Room. Agency for Healthcare Research and Quality (AHRQ) R18 grant.**

The Research Director of Carolinas Simulation Center, Dimitrios Stefanidis, MD, PhD, FACS and Lisa Howley, PhD, AVP of Medical Education, were recently awarded \$785,000 for a three-year grant by AHRQ to develop a novel, self-contained mental skills curriculum (MSC) that will provide surgical trainees with key performance-enhancement and stress-coping strategies needed to achieve superior performance during challenging situations in the operating room. Dr. Stefanidis, an associate professor of Surgery, is working with Dr. Howley an expert in curriculum development, and Charles Brown, PhD, a sports psychologist with expertise in performance enhancement, to develop this curriculum. The team includes Manuel Pimentel, study coordinator, Cameron Davis, MS, instructional designer, and Nicholas Anton, a mental skills trainer, who are all instrumental to the success of this project. In addition, Nick Sevdalis, PhD, and Sonal Arora, MD, PhD, from the Imperial College of London, UK are international consultants who lend their expertise in performance assessment.

To document the effectiveness of the curriculum after its creation, researchers will compare differences in performance between learner groups that receive mental skills training and groups that do not. The groups will consist of medical students and both general surgery and gynecology resident physicians. Participants' performance will be measured by how quickly, accurately and safely they can perform the assigned tasks using simulation as well as in the operating room under normal and stressful conditions. To determine their stress levels, researchers will monitor participant heart rates and will have them complete a questionnaire to assess workload. The study also aims to examine the impact of this training on patient outcomes. If the study proves positive, the MSC will be made available as a resource within AHRQ's Patient Safety Network and submitted as a peer-reviewed resource within the Association of American Medical Colleges.

### **A Secondary Task for Measuring Laparoscopic Skill. Agency for Health Research and Quality (AHRQ) R18 grant.**

Mark Scerbo, PhD, a human factors expert from Old Dominion University, Norfolk, VA (PI) in collaboration with Dimitrios Stefanidis, MD, PhD, FACS (PI at Carolinas HealthCare System) were awarded a half-million dollar grant in 2012 by AHRQ to evaluate the comparative effectiveness of a novel visuo-spatial secondary task in assessing laparoscopic surgery expertise. The investigators are comparing the novel task to an older version of a secondary task that they have previously demonstrated is able to distinguish between levels of expertise in surgery by assessing the learner's spare attention capacity during laparoscopic performance. The study is underway and will be completed in 2014. Several presentations and publications have been generated so far from this study.

### **Impact of Fatigue on Error Frequency in Simulated Management of Unstable Dysrhythmias. Education Fellowship Grant-Society for Academic Emergency Medicine.**

Jo Anna Leuck, MD, received this prestigious two-year grant for \$150,000 in 2012 by the Society for Academic Emergency Medicine (SAEM) to assess the impact of fatigue on diagnostic errors of emergency medicine residents after call. Dr. Leuck uses simulated scenarios of unstable dysrhythmias to assess the performance of Emergency Department residents before they go home after being on-call overnight. A variety of on-call days, ranging from one to three, are being assessed for their impact on participant performance. Dr. Leuck has been assisted by simulation center staff in the development and running of scenarios and has been able to recruit other institutions to participate in this study. Dr. Leuck has been mentored in this project by Jeff Kline, MD, and Dimitrios Stefanidis, MD, PhD, FACS.

### **Is Night Float a Better Solution than Traditional Call? Society of Gastrointestinal and Endoscopic Surgeons (SAGES) grant.**

Trey Bradley, MD, a Fellow in the division of Minimally Invasive and Gastrointestinal Surgery of the Department of Surgery, received a prestigious, competitive grant by SAGES in the amount of \$15,000 to investigate the impact of fatigue on surgical performance. Under the mentorship of Dimitrios Stefanidis, MD, PhD, FACS, Dr. Bradley put in an excellent simulation-based proposal that aims to examine whether resident performance is inferior after a week of night float compared with traditional 24-hour call. Dr. Bradley is using the Fundamentals of Laparoscopic Surgery (FLS) model to assess general surgery resident laparoscopic performance with a secondary task. Additionally, workload and fatigue assessment tools to capture participant effort and fatigue are also used. The findings of this study may have important implications for the current paradigm of surgery resident call schedule.

### **In-situ Simulation Educational Outreach: Neonatal Resuscitation After Precipitous Deliveries.**

Mark Bullard, MD, Dawn Swiderski, RN, and Crystal Bencken, RN, received a grant from the Children's Miracle Network (CMN) in the amount of \$71,916 to help provide focused education in neonatal resuscitation after precipitous deliveries. Carolinas Simulation Center, in partnership with administration and educators within Levine's Children's Hospital, aim to provide mobile education for Carolinas HealthCare System regional and free standing emergency departments in 2014-2015. This curriculum will look to provide education to facilities without neonatal and obstetric services, while hopefully addressing system issues such as communication and transport of this specific patient population.

# COMMUNITY OUTREACH

## BOARD OF DIRECTORS PRESENTATION



## LEVINE CHILDREN'S HOSPITAL SHOWCASE



## BOY SCOUTS AND GIRL SCOUTS



NC SCIENCE FESTIVAL



MAYOR'S YOUTH EMPLOYMENT PROGRAM



ROTARY CLUB

*"Recently my Rotary Planetarium and Science Center Summer Camp visited the Carolina Simulation Center at the College of Health Sciences. I was absolutely amazed, as well as the children and chaperones that attended, on the uniqueness of your facility. Your staff should be commended on the outstanding job that they are doing to encourage my budding scientists into the healthcare field."*

WENDY P. EFIRD

## CAROLINAS SIMULATION CENTER ACCOLADES

### Accreditation

Carolinas Simulation Center (CSC) is the only facility in the region to be both an American College of Surgeons-accredited Level I Education Institute and a Society for Simulation in Healthcare-accredited simulation center (Assessment, Research and Teaching/Education). These prestigious accreditations designate CSC as a provider of quality education and a partner in advancing patient safety through educational endeavors.

Carolinas Simulation Center is the only facility in the region with certified leaders in healthcare simulation who passed the first international Certified Healthcare Simulation Educator examination.

### Collaboration

In July, Carolinas College of Health Sciences held a one-day interdisciplinary event for students specializing in radiologic technology and in nursing. The college partnered with Carolinas Simulation Center and with the Children's Miracle Network to create a simulated event, focused on the patient experience, that brought together the skills of students, faculty, actors, emergency department physicians and high-tech simulators.

## INNOVATION

### Innovation Award

Carolinas Simulation Center was one of five institutions chosen from around the world as an Education Innovator by CAE Healthcare at the Human Patient Simulation Network (HPSN) World Conference. This award recognizes simulation centers for efforts to advance healthcare simulation over the past year. This honor acknowledges the educational growth, multidisciplinary programs, research and safety initiatives supported by simulation education.

### Mobile Simulation

Mobile simulation offers a unique way for caregivers to receive hands-on practice with high-risk, low-volume patient care situations in their own clinical environments while maintaining patient safety and learner comfort. The ability to bring education to the bedside via in-situ simulation increases the fidelity of simulation experience and is embraced by the learners.

Carolinas Simulation Center (CSC) increased its use of mobile simulation to a new level in 2013. The addition of a new mobile simulation vehicle allows CSC teammates to travel to any of the more than 40 facilities in Carolinas Healthcare System. In fact, mobile simulation created a nearly 300 percent increase in learner contact hours. This vehicle helps supplement a Med Center Air ambulance dedicated to education of flight crews at remote bases. It also serves an instrumental purpose in multiple education curriculums. Examples of mobile simulation's reach this year include an initiative in the Post-Acute Care (PAC) Division to reduce hospital readmissions from skilled nursing facilities,



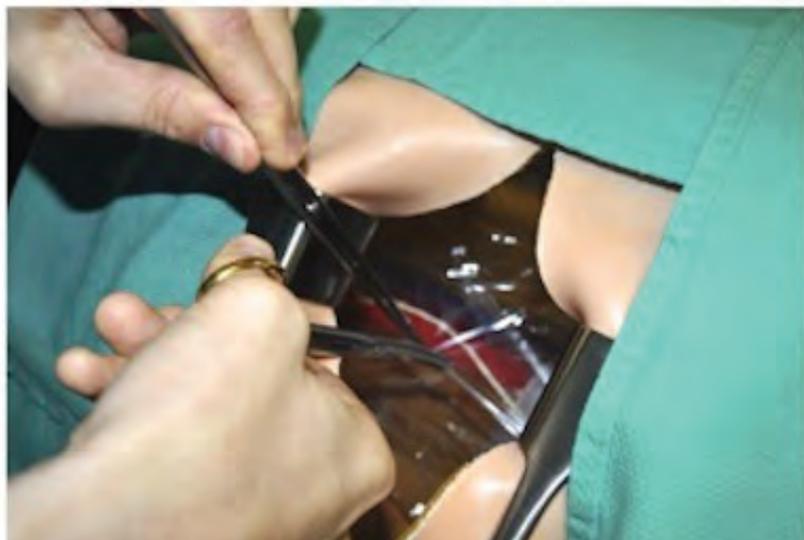
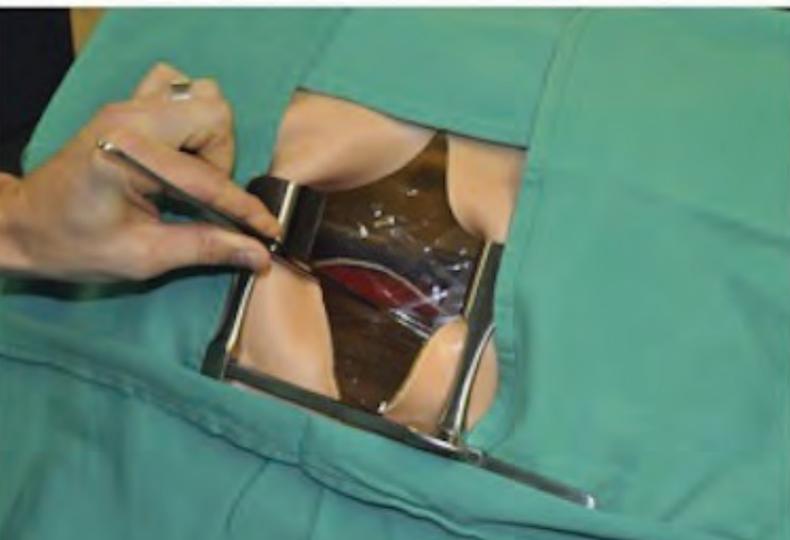
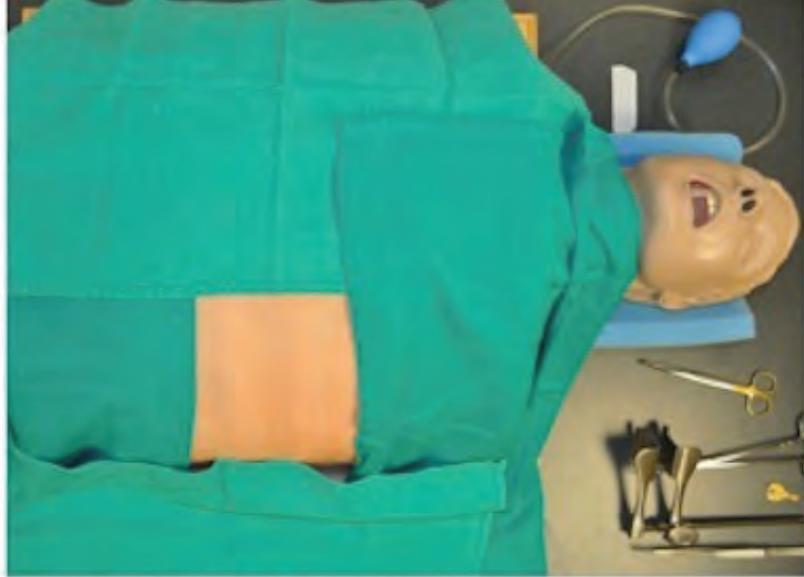
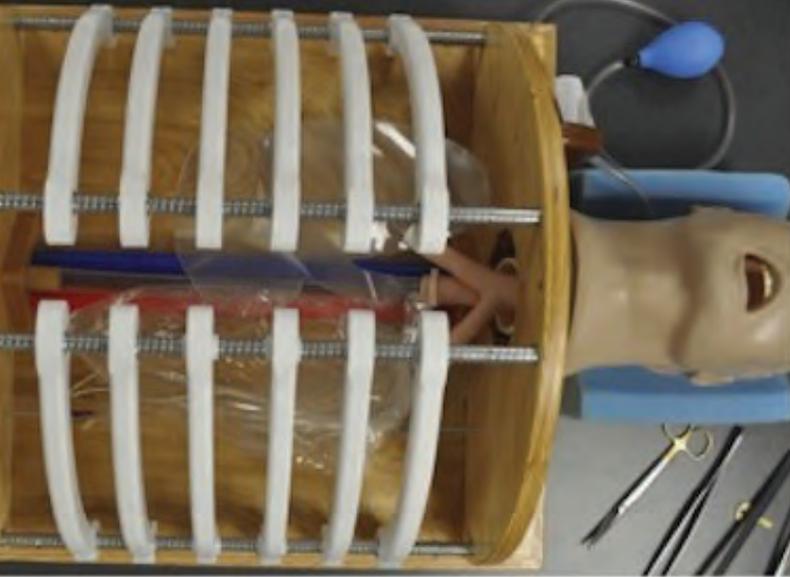
as well as education at an outlying hospital in the pediatric and neonatal ICUs. Additional critical care departments have requested in-situ simulation after learning of CSC's mobile simulation vehicle. Expansion of the PAC initiative to two additional facilities, as well as two new divisions in 2014, is also anticipated.

### Technology Accomplishments

There have been numerous technology accomplishments at Carolinas Simulation Center (CSC) during 2013. The list includes equipment set-ups, equipment fixes, software updates, scenario programming, new audio-visual system, mobile events and website additions. CSC continues to improve technology to enhance the experience for our user groups.

SimMan Essential<sup>®</sup>, used for the first sizable mobile project, required an extensive set-up. This included mannequin router, instructor PC and patient monitor PC configuration. A mobile patient monitor for SimJunior was created for ease of transportation to locations such as the Children's Emergency Department and CMC-NorthEast PICU. Keeping mannequin and task-trainer software current is key in assuring that technology works to its fullest potential. During 2013, we performed software updates to SimMan 3G<sup>®</sup>, Noelle<sup>™</sup>, HPS and the Vimedix ultrasound trainer. These updates provided improvements in functionality and efficiency.

CSC has made significant strides to enhance the website during 2013. The newest addition is the Standardized Patients (SP) tab, which explains the SP program and provides contact information and an application for potential participants.



## THORACOTOMY TASK TRAINER

### Thoracotomy Task Trainer

#### Purpose

Emergency department thoracotomy (EDT) requires immediate, decisive action by emergency providers. Survival rates vary depending on mechanism and literature, however, victims of penetrating thoracic trauma requiring EDT have shown a survival rate of 9 to 38 percent if used in appropriate patients. While indications and timing of EDT continue to be refined and debated, emergent thoracotomy remains a procedure required of emergency physicians. Due to limited indications, invasiveness of EDT, ethical debate surrounding post-mortem procedures, variation of regional and hospital policy and a lack of commercial thoracotomy task trainers, EDT represents a low-frequency, high-risk procedure in even the most active trauma centers. Some emergency medicine (EM) residents graduate training programs without performing or even seeing this unique procedure, despite it being an important skill for EM residents to learn prior to completing residency.

#### Development

Addressing these challenges, we aimed to design and build an inexpensive, reusable thoracotomy task trainer with good conceptual and physical fidelity. This model would allow learners to become

facile with the basic steps involved in an EDT. EDT is not a technically challenging procedure; however, it requires a clinician to decisively use appropriate equipment to gain access into the pleural space, deliver the heart from the pericardium without severing the phrenic nerve and subsequently cross clamp the descending aorta. The left lateral thoracotomy is the most common approach used in the emergency department and addresses the majority of causes of acute deterioration due to penetrating trauma: pericardial tamponade, tension pneumothorax and acute hemorrhage from the left hemithorax. At the same time, left lateral thoracotomy enables the cross-clamping of the descending aorta and subsequent maintenance of perfusion to vital organs.

### Outcomes

We designed a reusable, durable left lateral thoracotomy partial task trainer with the below materials. A recycled airway model was attached to the thoracotomy task trainer to add to the overall fidelity, however, was not felt a necessity for the desired objectives.

The thoracotomy task trainer allows trainees to:

- Intubate
- Incise a layer of artificial skin to gain access to the pleural cavity
- Spread ribs using surgical rib spreaders
- Perform a pericardiotomy (pericardium represented by two apposed layers of Saran Wrap™)
- Avoid severing the phrenic nerve (represented by a string sandwiched between the layers of pericardium)
- Cross-clamp the aorta using a vascular clamp while avoiding the esophagus

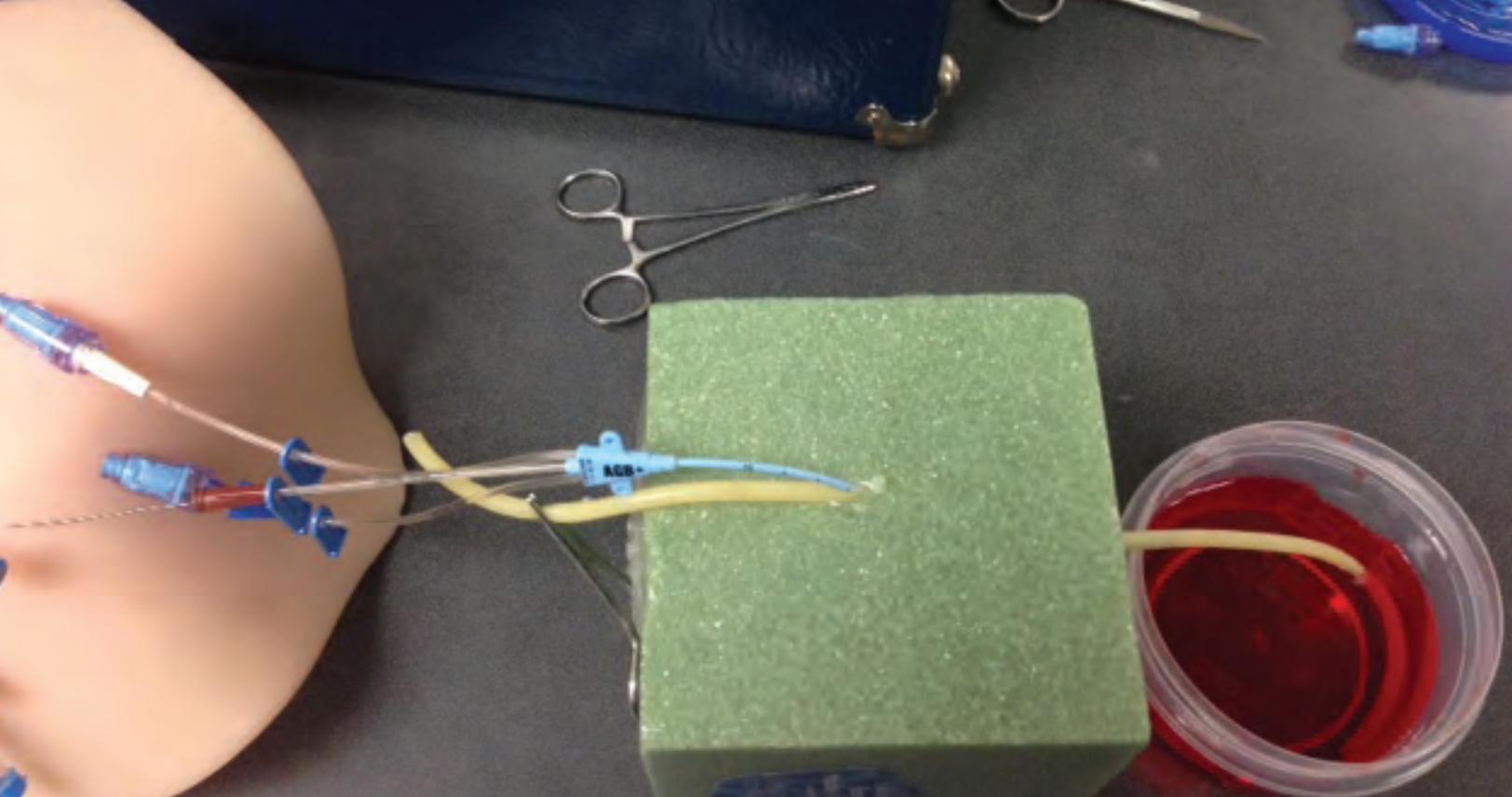
## Central Venous Line Modification

### Overview

Central Venous Line (CVL) task trainers prove to increase the proficiency of learners. Unfortunately, replacement tissues for these products are cost prohibitive and performing the entire insertion procedure from start to finish diminishes the lifespan of the trainers. Additionally, the fidelity of CVL placement and suturing is suboptimal given the current industry models.

### Description

Carolinas Simulation Center (CSC) developed a CVL task trainer modification that allows the entire insertion process to be completed while also increasing the lifespan and conceptual fidelity of the original central line trainer during 2013. CSC has extended the life of the current tissues by only allowing learners to perform certain portions of the procedure (not dilating and securing the CVL), which unfortunately can lead to an incomplete skill set. The Central Venous Adjunct Trainer (CVAT) task trainer modification developed by CSC extends the life of the tissue sets on vendor-purchased CVL trainers and allows the learner to complete the entire procedure with maximum fidelity. The CVAT currently has a patent pending.



## CENTRAL VENOUS LINE MODIFICATION

### Cost Savings

Our model is very inexpensive compared to vendor purchased tissue sets. Market cost of a new tissue set ranges from \$487 to \$1,799. Total supply cost for the CSC CVAT task trainer modification to extend the life of current vendor purchased models is approximately \$35, not including staff cost.

### Model Development

#### Objective

Design and develop task trainer modifications and innovations to enhance the current models that are utilized at Carolinas Simulation Center. Commercially purchased trainers are excellent but have limitations. The replacement tissues are expensive and some do not allow for the full scope of certain procedures. As a result, we have supplemented with less expensive replacement parts or developed new task trainers.

#### Wound Models

The wound models were initially created for use at the Skilled Nursing Facilities (SNF) to effectively demonstrate the KCI Wound Vac System®. CSC created multiple wound models from a purchased Eco-Flex® silicone. Similar models on the market range from \$350 to \$550. CSC models cost approximately \$60 to create, depending on the size and scope of simulated wound.

## Gastrostomy Tube Model

This model was also initially made for our SNF education, with the purpose of practicing caring for and feeding through gastrostomy tubes. The skin on top is EcoFlex silicone and the abdomen is repurposed packing foam. A baby food jar inside simulates the stomach. The learner can withdraw residual food and bolus feed through a tube that is inserted. The learner can also clean and dress the site. Advanced models carry a market price of \$900 or more. The CSC developed model supply costs are approximately \$25.

## Injection Pads

Nursing students commonly use injection pad models to practice administering a variety of medications. Made from EcoFlex silicone these models have three layers to simulate the epidermis and dermis, subcutaneous layer, and muscle tissue. CSC supply cost to develop these pads is approximately \$15, while similar vendor models cost in excess of \$100.

## Pediatric Ostomy

Using a piece of silicone material cut from another model, we shaved to the correct size and shape and painted it for accurate color. Market price for an ostomy care model is \$319. Our model was created from supplies we had on hand at no cost.

*"I have no doubt that we were more prepared as a result of all the diligence, innovation and vigilant education that our departmental and simulation faculty have provided. Simulation has exposed gaping voids in my knowledge base and for this, I am most grateful. I am a believer."*

**PATRICK BURNSIDE, MD**

## CAROLINAS SIMULATION CENTER TEAM



**Mark Bullard, MD, FACEP**  
Medical Director



**Dimitrios Stefanidis, MD, PhD**  
Surgical/Research Director



**JoAnna Leuck, MD**  
Associate Medical Director



**Lisa Howley, MEd, PhD**  
AVP Medical Education



**Dawn Swiderski, MSN, RN, CHSE**  
Simulation Center Director



**Scott Wilson, BA, EMT-P**  
Operations Manager



**Melinda Armstrong, MSN, RN, CHSE**  
Simulation Education Specialist



**Crystal Bencken, MSN, RN**  
Simulation Education Specialist



**Katherine Ingram, MSN, RN, CHSE**  
Simulation Education Specialist



Laura Cragg, BS, EMT-P  
Simulation Training Specialist



John Ehlers, BA  
Medical Education Technologist



Tara Johnson, BA  
Medical Education Technologist



Manuel Pimentel, BS  
Research Coordinator



Nicholas Anton, MS  
Research Coordinator



Kisha Choice, BA  
Staff Assistant

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C. HARRIS

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



Carolina's HealthCare System