WakeMed Simulation Case Study

Human Patient Simulation Boosts Competence and Confidence for Clinicians at WakeMed Health & Hospitals
WakeMed features the counties’ only Level 1 Trauma Center, is home to one of the highest-volume Heart Centers in the state, includes a Level IV Neonatal ICU, has two Women’s Pavilion & Birthplaces, and features North Carolina’s first free-standing Children’s Emergency Department, serving more than 40,000 children each year. The system also includes an Emergency Services Institute, which facilitates disaster preparedness throughout the region.

It’s a Thursday morning in early May in the Emergency Department at WakeMed Raleigh Campus. An experienced pediatric trauma physician is trying to help a young boy who appears to be experiencing serious respiratory distress and is not responding to medication. Looking on anxiously, the frantic mother is bombarding the doctor with questions, when all of a sudden, the boy’s father bursts through the door, demanding to know what’s happening to his son and challenging the physician’s competence. The commotion is interrupting the physician, adding to the difficulty of identifying the patient’s problem. Unfortunately, the young boy arrests and dies in spite of a valiant effort by the trauma team to save him.

Fortunately, the boy is only a human patient simulation mannequin, designed and built to present the physiology of a six-year-old child, and the mother and father are actors hired to add to the realism and stress of the simulation scenario being conducted by a multidisciplinary team in WakeMed’s Center for Innovative Learning.

Healthcare simulation takes many forms, including computer modeling, gaming and role playing. The most impactful form of simulation is human patient simulation, using a computer connected to a life-size mannequin that responds to injected drugs and can be programmed to simulate life-threatening emergencies.
Lessons Best Learned and Not Forgotten

There is a growing body of evidence that clinicians perform better and retain more knowledge after they have experienced a simulation scenario.

In one study at Chicago’s Northwestern Memorial Hospital, first-year residents who received a simulation-based educational intervention plus clinical training demonstrated higher critical care competency than third-year residents who received clinical training alone and did not experience simulation training.1

At Cincinnati Children’s Hospital, one of the busiest pediatric emergency departments in the U.S., a multidisciplinary simulation-based training program focusing on teamwork and communications was shown to be an effective tool in modifying safety attitudes and teamwork behavior in an emergency department.2

“Medical students are not allowed to make the mistakes students in other disciplines can make thanks to the diligence and constant oversight of mentoring physicians. Avoiding medical errors and their sometimes permanent, devastating consequences is good. However, from an education perspective, students are not empowered to learn from their mistakes,” comments Dr. Graham Snyder, medical director for the WakeMed Center for Innovative Learning, adding that the mentoring physician simply can’t let mistakes happen with a live patient, but they can with simulation. “The lessons best learned, and the ones you never forget, are the ones where you make an error or don’t think of a solution and then you and the patient have to suffer the consequences. Simulation provides an opportunity to learn these lessons in a realistic risk-free environment,” says Snyder.
Simulation Graduates to the Professional Workplace

Similar to the military, aviation, shipping, railroading, heavy equipment and automotive industries, to name just a few, simulation is not new to healthcare. What is new, however, is that the use of simulation in healthcare is expanding from what has historically been the academic environment, where education and training are typically delivered separately to individual ‘silos’ such as nurses and physicians, to ambulances, hospitals, and physicians’ offices. Here, silos disappear and clinicians are brought together to focus on interdisciplinary communications and team performance.

According to Dr. Snyder, who is also the associate program director for the University of North Carolina Department of Emergency Medicine and director of Education for Wake Emergency Physicians, it is important that students learn all the medical information in the classrooms and practice in a simulated environment. "Simply having textbook knowledge and being able to recite medical facts doesn’t necessarily translate into being able to actually diagnose problems and perform procedures. Can you implement your knowledge effectively? Can you listen and follow? Can you lead effectively? These skills cannot be determined based on a written multiple-choice test," contends Snyder.

WakeMed is in fact a leading example of simulation being integrated into the clinical provider environment and utilizing simulation to be an effective enabler for achieving a culture of interdisciplinary teamwork, quality care delivery and increased patient safety. For WakeMed, these efforts impact the whole-team—from nursing assistants and physician residents, to medical directors, to executive management and the CEO. A significant factor in the successful achievement of these goals is the use of human patient simulation by a growing portion of the clinical workforce to enhance their education, build greater confidence, and better prepare for the expected and unexpected.

The organization is also using simulation sessions to evaluate professional competence, especially during new-hire orientation. Here simulation provides an effective way to standardize skill sets across the organization and identify knowledge gaps for timely remediation.

Although most clinicians learn how to handle a crisis, many may encounter them only infrequently. Through simulation, they can experience a crisis many times in a single day, so that if they should ever be faced with one, they have a strong chance of being able to handle it confidently and successfully.
Center for Innovative Learning

The WakeMed simulation program is housed in the Center for Innovative Learning, which includes a reception area, an ICU space, an OB/GYN suite, a nurse’s station and two clinical rooms. It also includes two classrooms in which pre-briefs and de-briefs are conducted for each simulation session, including a full audio/video review.

The WakeMed Center for Innovative Learning also has additional simulation labs at WakeMed Cary Hospital, the Wake County EMS training facility and in an ambulance fitted-out for simulating EMS and patient transport scenarios. Plans are also in the works to equip a large transport trailer with a simulation suite to carry the simulation experience to locations throughout the state.

The simulation program is run by a dedicated team of five, including Director Amar Patel, three Simulation Education Specialists, and a Regional Simulation Coordinator. Dr. Snyder also serves as Medical Director and advisor to assistant medical directors who guide the Center’s team in developing and delivering simulation-based education in fields such as pediatrics, emergency medicine, neonatology and more.

The simulation facilities are designed to be exactly like units in the hospital – the same layouts, the same supplies and the same state-of-the-art medical equipment that now goes into all wards also goes into the simulation labs.

While the facilities and operation of the simulation program at WakeMed may be similar to many other simulation centers across the country, the Center is not ‘owned’ by any one particular department. Instead, it reports to the highest levels of hospital management and has been established for the betterment of clinicians and patients on a broad basis.

The simulation group reports directly to the Senior Vice President of Human Resources and belongs to the institution as a whole, which is different from most other organizations, academic or clinical. This reflects the multi-disciplinary nature of the training and sends a clear message that this is something the entire organization is involved in, not just particular departments.

Adding to these sentiments, Director Patel suggests that other simulation centers and programs often miss the mark with respect to multidisciplinary education because they are tied to a single discipline or department. “Our focus is different – I don’t care who you are or where you are from, if a need is there for simulation-based training, we will support it,” promises Patel. “When you’re trying to improve patient safety, you must hit every discipline – anesthesia, nursing, paramedics, emergency medicine, cardiology – everyone!”

Amar Patel
Director of the WakeMed Center for Innovative Learning
Meet PediaSIM & iStan

The Center for Innovative Learning has an extensive roster of human patient simulators, including three mannequins from medical simulation company CAE Healthcare – one PediaSIM and two iStans.

“Each mannequin is selected based on the varying needs identified for each program and on the unique features that need to be used to make the simulation successful,” explains Patel.

For example, the PediaSIM, a six-year-old pediatric mannequin affectionately named Dylan and the patient in our opening trauma scenario, supports a wide range of risk-free clinical interventions and offers full trauma features for both nursing and emergency response. He is used for some of WakeMed’s pediatric training, including critical care ICU scenarios and pediatric intake scenarios, and sports a wireless lavaliere and speaker in his head through which the simulation operator can speak on behalf of the mannequin, allowing it to respond verbally to treatment.

“It’s a great simulator that has the ability for functional input/output, so attending clinicians can free-flow fluids into the mannequin and start IVs, making medication administration and fluid resuscitation more realistic,” explains Patel.

The full-size wireless iStan adult mannequins, also from CAE Healthcare, have internal robotics that mimic human cardiovascular, respiratory and neurological systems. When iStan bleeds, his blood pressure, heart rate, and other clinical signs change automatically, and he responds to treatment with minimal input from an instructor. With a realistic airway, articulated joints and blood on board, iStan has full mobile simulation capability.

“We use iStans for a number of different scenarios – they are really our all-round critical care go-to mannequins because they have a lot of features that others don’t have,” exclaims Patel, citing as one example the fact that the iStans are ‘true physiologic simulators’. He is referring to the fact that when students administer a medication into the mannequin’s body, and that action is mimicked by the simulation operator as an input to the computer, the mannequin’s response – driven by the computer, but transparent to students – is physiologically based on real pharmacology data from the textbooks. It occurs in real time, synchronized with the therapy being rendered by the students.

Among the additional features that Patel describes as being unique to the iStan platform and critical to the scenarios being simulated are:

- The ability to present measurable intracranial pressure is useful in simulations related to traumatic brain injury;
- Cervical spine sensors that track left/right and up/down movement is useful for measuring head and body movement when simulating evacuation of a trauma patient, for example, or transfer of a patient from one location to another;
- A realistic body weight of 160 pounds can be a key factor in simulation, especially when wheeling patients from place to place or resuscitating a mannequin lying in the middle of a hall floor;
- An articulating body that allows the mannequin to be sat upright is useful in conjunction with intracranial pressure measurement during inter-facility air and ground transport simulation cases.

“Because he has extra space in his body, and his chest and hips come apart, we can also make modifications to iStan, such as creating the ability to catheterize him and perform balloon pump insertions,” offers Patel.
It’s Ultimately about Increasing Patient Safety

Along with the use of simulation in support of clinical education, training and evaluating clinical competence, the simulation center is often used as a testing ground for any significant changes to clinical workflow or new procedures or equipment being introduced into the hospital.

“When we get a new piece of equipment in the hospital that people aren’t familiar with, for example, we put it in the Center first and offer training so staff can practice in a risk-free environment,” says Snyder.

The critical central theme for simulation that resonates the loudest with clinicians and hospital management at all levels, is the contribution of simulation to increased patient safety.

That contribution is gaining broad visibility. For the past four years, a project team that includes such notables as Dr. Peter Pronovost and Dr. Bob Wachter conducted an evidence-based assessment of patient safety strategies. The expert panel identified 41 strategies, including the “use of simulation exercises in patient safety efforts,” to be the most important to the largest audience and ready now for adoption.3

A strong catalyst behind the WakeMed focus on patient safety is the WakeMed Center for Patient Safety & Risk Management. Every week, Director Maggie Kane leads a meeting of the Safety Events Review Committee in examining events of the past week arising from local incident reporting, alerts from organizations such as the National Patient Safety Foundation, and things they hear from other hospitals. The Committee is a multidisciplinary group that includes Amar Patel, representing the Simulation Center.

“We use a Root Cause Analysis process to break events down into individual parts to determine the cause of the issues and then come up with a plan to help fix the failures. This often includes new or changed simulation scenarios designed around the use of Dylan, iStan and our other mannequins to further train our multidisciplinary teams and help clinicians overcome problems,” says Patel.

Reflecting on the sharing of ideas between the Patient Safety Center and the Simulation Center, Kane suggests that, “We have a wonderful simulation program at WakeMed and although it has already been a big benefit to the hospital and the community, we’re really just getting started and still have many opportunities ahead of us. Simulation plays a big role in the culture of safety we have developed and in reinforcing it on an ongoing basis.”
Nowhere More Important than in Pediatrics

Pediatric medicine and critical care is a world of low-volume, high-risk events, and as a result, resident physicians, for example, have less opportunity to acquire the deep knowledge and experience required to handle life-threatening situations.

Simulation provides the ideal remedy for this, according to Dr. Mark Piehl, medical director, WakeMed Children’s Hospital and director of the Pediatric Division of WakeMed Physician Practices. He explains that simulation can produce situations that look and feel like real life, including the way the patient appears, the way monitors work, the urgency of the situation, the tension and nervousness clinicians feel when dealing with children and the chaos typical of an emergent situation.

“Because a critically ill child is much more intimidating and anxiety-provoking to clinicians the extra emotion and stress can cloud a provider’s effectiveness, but simulation gets them used to treating children and dealing with both positive and negative outcomes including death,” contends Piehl, who goes on to say that all clinicians in the pediatrics program at WakeMed must go through simulation training. “Nurses routinely tell us they are glad they went through the simulation rotation because when the real code occurred, they knew what to do and were more confident about their role, where they needed to be and where the equipment and meds were.”

Adding to Dr. Piehl’s comments, Amar Patel reports that, “We do a lot of pediatric work using our PediaSIM mannequin Dylan and using a lot of the same case work as in the industry-standard Pediatric Advanced Life Support (PALS) training program, which the majority of people caring for critically ill children need to take to know how to save a child’s life.”

Measuring ROI Still a Challenge

“Although there is a growing body of literature that talks about both the pros and the cons of simulation, our own experience strongly indicates otherwise,” says Sr. Vice President Jeanene Martin. “We see simulation making a difference in the quality of care and safety for our patients and bringing together our clinical workforce from a teamwork perspective.”

Pediatric leader Dr. Mark Piehl sees the benefits that WakeMed is realizing from its simulation program as being especially significant in light of the transformation within the U.S. health system from a “fee for service” model to a “pay for performance” model.

“The shift is toward reimbursement for value, efficiency, quality and safety rather than just productivity and patient throughput,” offers Piehl. He goes on to say that although simulation can be directly related to reducing cost and increasing financial return by reducing risk and by teaching teams to do things more efficiently, the mechanism for measuring the positive impact is not fully in place yet. “It’s also difficult to isolate the effects of simulation as just one of the many contributing factors to cost reduction and return on investment.”

Director Patel knows this challenge all too well since he is charged with reporting annually to the WakeMed Board of Directors on the impact the Center for Innovative Learning and simulation have had across the organization.

“I can’t necessarily correlate that a simulation experience was the direct cause of a change, but what I can share is the direct feedback from clinicians about seeing actual cases that have been handled well or better as a direct result of having experienced the same case in simulation. That’s a definite return on the hospital’s investment – if these clinicians hadn’t taken the training, the outcome might have been considerably different.”

Addressing the ROI measurement challenge, Patel states that, “Our experience has shown us that we can’t sell simulation to the Board based on standard quantitative metrics and a classic business case evaluation, but rather we need to sell the concept of innovation and where we are trying to go, not where we have been.” He concludes by saying, “In an era of increased focus on access, cost, quality and effectiveness, I think a tool such as simulation plays an invaluable role, and we plan to press forward with continued investment in our program.”
About CAE Healthcare

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