WIDI SIMulation

Using Simulation to Identify Knowledge Gaps and Improve Resident Competency in Emergent/Critical Care Imaging

A Quality Improvement & Patient Safety Initiative

Purpose

In 2011, the Department of Radiology in the College of Medicine at the University of Florida in Gainesville created an Emergent/Critical Care Imaging SIMulation (a component of the Wisdom in Diagnostic Imaging [WIDI] program) to assess resident preparedness to proceed to the next level of training - to competently and independently cover Radiology consulting for the hospital on the overnight shift in the reading room - an Entrustable Professional Activity (EPA).

Methods

In 2011, SIM 1 was taken by twelve 1st year and ten 2nd year residents. In 2012, SIM 1 was taken by ten 1st year and eleven 2nd year residents. In 2013, SIM 1 was taken by ten 1st year and nine 2nd year residents.

In 2014, a new version of the simulation (SIM 2), was released. It was taken by thirteen 1st year and ten 2nd year residents.

In 2015, another new version of the simulation (SIM 3), was released. It was taken by ten 1st year and thirteen 2nd year residents.

Each of the three simulations encompassed sixty-five emergent and critical care cases of varying degrees of difficulty, including normals. All emergent/critical care sub-specialties and all modalities were included.

All cases, which were carefully vetted by generalists and sub-specialists, represent typical cases that a resident could expect to see during the overnight shift at a Level 1 Trauma Center.

Preliminary Data

The simulation assesses the multiple tasks required by a Radiologist including image manipulation, observational skills, satisfaction of search, judgement of acuity, communication skills, shift stamina, and the overall application of medical knowledge. Analysis of all UF simulation results in all years taken (2011-2015), exposed both individual knowledge gaps and curriculum gaps in several key areas. These gaps are especially significant considering the case volume and high acuity environment of an emergent imaging shift.

Observing/Assimilating Findings

A detailed review of the data revealed performance deficiencies for several key sub-specialty topic areas. This includes the following specific emergent and critical findings:

- **Neuro: Epidural Abscess** - A CT of a typical case of epidural abscess was missed by 100% of residents on SIM 1
- **MSK: Calcaneal Fracture** - A plain film of a calcaneal fracture was missed by 77% of residents on SIM 2
- **Body: Closed Loop Obstruction** - A CT of a typical case of closed loop obstruction was missed by 65% of residents on SIM 3
- **Chest: Pneumothorax** - A plain film of a pneumothorax was missed by 62% of residents on SIM 2

A re-review of the cases confirmed that they were each representative of standard presentations of the diseases.

Close scrutiny of answers submitted for these cases suggests deficiencies in the ability to make appropriate observations and/or assimilate the observations into the correct (and acute) nature of the findings.

Confidently Calling Normals

A detailed review of the data also revealed instances of higher than expected overcalls of normals which, unlike other testing methods, are included on each simulation.

Overcalls of normals (calling a normal study abnormal) may result in unecessary additional imaging, medications, procedures, and surgeries.

Making a Clear Diagnosis

In addition, a detailed review of the data also highlighted weaknesses in confidently generating a clear and concise report.consult versus only providing descriptive findings. For example:

- **MSK: Septic Arthritis/Osteomyelitis**
  - In an MRI of a shoulder demonstrating joint effusion, bone marrow edema, and soft tissue enhancement, residents described the findings, but did not assert concern for septic arthritis/osteomyelitis.
- **Non-Accidental Trauma (Child Abuse)**
  - A similar, but potentially more life-threatening example is the assertion of non-accidental trauma (child abuse) as a diagnosis. As one of the leading causes of childhood traumatic injury and death in the United States, non-accidental trauma cases were included on all three simulations. Fractures of different healing stages were present on each case. Despite the fractures being correctly identified by some residents, a substantial number of residents did not assert “non-accidental trauma” as the diagnosis.

The ability to synthesize the constellation of findings, especially those in the acute care setting, directly impacts patient management.

Results

UF Radiology is dedicated to quality improvement and patient safety. We have determined that the Simulation is an objective, reliable and effective means to assess resident competence without putting patients at risk. Simulation results have enabled us to identify deficiencies in individual, interpretive skills and knowledge gaps, as well as areas for improvement in the Emergent/Critical Care Imaging curriculum. The use of simulation allows for implementation of educational solutions to remediate these gaps prior to resident assignment to high acuity imaging rotations.

Conclusions

These tools incorporate multiple modern teaching philosophies and learning theories, such as Bloom’s Taxonomy, Androgogy, and Experiential Learning. Key initiatives include:

- Implementation of an asynchronous curriculum delivery tool that facilitates a Khan Academy inspired approach, utilizing micro-lectures and related exercises that allow follow-up “flipped classroom” teaching sessions
- Creation of pre and post rotation-specific simulations for each level of training
- Implementation of report guides that will enable residents to produce clear, concise and consistent reports
- Continued annual assessment by simulation
- Production of remediation videos for each case included on a sim
- Ongoing analysis of educational tools/ methods

Linda Lanier, MD; Robbie Slater, MD; Chris Sistrom, MD, MPH, PhD; Anthony Mancuso, MD; Eric Thoburn, MD; Nupur Verma, MD; Tan Mohammed, MD, FCCP; Alissa Old Crow, MD; Bayar Batsmaan, MS; Brenda Tieden; William Beeman, MD; Michael Slawski, MD; Benjamin Shohet, MD; John Fleischer, MD; John Zaid, MD; Anthony Lococo, MD; Michael Fulwick, MD; and Jennifer Koch, MD

© 2015 Department of Radiology - College of Medicine - University of Florida - Gainesville, FL; PO Box 100374; Gainesville, FL 32610; 352-265-0291; www.xray.ufl.edu