Assessment of Medical Student Performance in Discussing Central Venous Line Placement under Ultrasound Guidance with a Standardized Patient

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Background – Ultrasound in Medical Education

• Expansion of hands-on learning, simulation in education

• Using ultrasound (US) as an adjunct to physical exam skills has been shown to be an acquirable skill for medical students
  – Afonso, et al. (JGIM 2010) demonstrated second year medical students most successful in imaging internal jugular vein after instruction

• Ultrasound technology as part of some residency training programs
Background - Ultrasound in Patient Care

- Ultrasound use supported in many clinical practice guidelines
- Ultrasound guidance for central venous line (CVL) placement one of the top innovations in patient safety recommended by AHRQ
  - Iatrogenic complication rate 6.3-11.8%
  - Based on small study of 4\textsuperscript{th} year medical students demonstrating benefit for US guidance during CVL placement, NNT to prevent 1 arterial stick is 2

Background – Education on Informed Consent

• Ethics, core element of overall clinical competence and amenable to performance-based evaluation

• Informed consent one of most common ethical themes confronting medical students
  – Essential skill in Internal Medicine
  – No consistent education / evaluation of skills across medical student and resident training

• Small studies of medical student OSCE (objective structured clinical exam) in obtaining informed consent for surgical procedures and HIV testing have encouraging results
Objectives

• To develop an end-of-clerkship OSCE to evaluate skills in ultrasonography as relevant to guiding placement of a central venous catheter

• To concurrently assess skills in fully informing a patient about a necessary clinical procedure
Ultrasound in the M3 IM Clerkship

• Taught to use ultrasound as an adjunct to history and physical exam

• Thyroid ultrasound
  – Lecture (1 hour) – Use of ultrasound in thyroid pathology (Endocrine faculty)
  – Hands-on workshop (1 hour)

• Central venous line placement, internal jugular
  – Simulation workshop (3 hours)
  – Blue Phantom™ models
  – Use with residents and faculty in clinical situations
Skills from M1-M2 Years

• Experience from the preclinical years that students bring to the clerkship
  – Ultrasound physics and use of the machine
  – Imaging of
    • RUQ – Kidney, Liver, Diaphragm, M. pouch
    • Bladder
    • LUQ – Kidney, Spleen
    • Neck – IJ, Carotid, Thyroid
    • Heart – Parasternal long axis view – LA, LV, MV
Ultrasound – Assessment of skills

• OSCE (Objective Structured Clinical Exam) is standard testing format with standardized patients, M1-M4
  – designed to test clinical skill performance

• Must demonstrate
  – Understanding of technology
  – Ability to acquire images
  – Knowledge of clinical scenario
    • Ability to interpret findings in context of patient history and physical exam
    • Ability to use findings appropriately in patient care plan
Central Venous Line Placement OSCE

• 2008 – 2009 - Demonstration of placement technique with model
  – Written tasks – questions to demonstrate knowledge of central line placement

• 2009 – present - Standardized patient encounter
  – Sepsis – with focused history and physical exam
  – Discussion of procedure with patient
  – Obtain informed consent
  – Identify landmarks and vessels with ultrasound guidance
  – Written clinical tasks
Methods

• All M3 students since 2009 completed 1 of 2 ultrasound OSCE stations
  – Administered at end of 8 week clerkship
  – Standardized patient evaluation of clinical competence in history-taking, PE, professionalism
  – Faculty evaluation of competence in ultrasonography

• All receive simulation training in ultrasound-guided right IJ CVL placement

• Descriptive statistics of cumulative student performance measured
Results

• N = 47 (average 8-12 students per rotation)
• 96% appropriately examined patient
• 100% mentioned need for CVL; only 53% mentioned hospital admission
• 100% correctly identified vessels
• 74% standardized patients felt adequately informed
  – 85% failed to mention post-procedure chest Xray, most frequent omission
Technical Competency in Ultrasound Skills

• 94% correctly oriented probe marker for procedure (opposite of convention)
• 100% were able to freeze an image with 94% then able to measure the carotid artery in 2 dimensions
  – 77% asked for Valsalva, but not always needed
• 96% were then able to save that image
Professionalism in the Encounter

• 100% introduced themselves and their student role
• 98% considered attentive to patient needs and modesty
• 100% solicited patient questions during the encounter
Limitations

• Small, single institution study

• Descriptive analysis only
  – Future analysis – correlation between overall performance on OSCE and competence / confidence in ultrasonography

• Since 2011, additional lecture hour in informed consent added to curriculum
  – Data not included in this analysis
Conclusions

• Ultrasound knowledge acquisition and technical skill can be assessed using OSCE
• Procedure OSCE allows for assessment of ability to appropriately discuss procedures with patients
  – Necessary skill, rarely taught, less frequently assessed
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