Each year, academic progress made in the form of “Innovations” is presented as part of the Society for Academic Emergency Medicine (SAEM) Annual Meeting. Submission for presentation as Innovations exhibits follows a different format, timeline, and judging process from the scientific abstracts. This year, we received 159 Innovations submissions and accepted 54 for presentation. It is with pleasure that the editors of Academic Emergency Medicine publish in this issue the abstracts of the Innovations exhibits that will be presented at the 2014 SAEM Annual Meeting in Dallas, Texas, May 14 to 17. These abstracts are published as they were received, with minimal editing, corrections, or clarifications; the authors are solely responsible for their content. Note that the figure and table numbers match the abstract numbers.

1 Easy Bedside Positive Pressure Apneic Oxygenation Using A Nasopharyngeal Airway
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Passive apneic pre-oxygenation and positive pressure ventilation adjuncts have become more and more common prior to and during rapid or delayed sequence intubation in the emergency department. Currently available supraglottic and mask-type positive pressure ventilation techniques severely limit direct visualization of the airway and can be cumbersome and time-consuming to apply. Nasopharyngeal oxygenation has long been used in pediatric anesthesia and critical care settings, but has not made the jump to either the adult or emergency medicine world. We propose a novel and simple way to deliver positive pressure apneic oxygenation via a nasopharyngeal airway in the emergency department. Our technique takes advantage of two pieces of equipment common to all emergency departments and allows for easy and safe positive pressure apneic oxygenation. First, a nasopharyngeal airway (NPA) is placed in the standard manner through either nostril. This can be done in both conscious and unconscious patients as it is much better tolerated than an oropharyngeal airway. Second, one end of standard wall suction tubing is connected via the included adapter to the NPA while the other end is directly connected to a high flow oxygen source. This apparatus allows providers to quickly deliver extremely high-flow oxygen directly into the posterior pharynx with positive pressure and without obstructing visualization for concurrent laryngeal intubation. It is non-invasive and has an automatic safety for the release of excess pressure via either the opposite nare or the patient’s open mouth. We have found this technique to be a lifesaving intervention in many different scenarios including angioedema, anaphylaxis, end-stage COPD, severe pneumonia, and trauma patients with anterior-pharyngeal/oral injuries.

2 An Innovative Approach to Simulating Emergent Genitourinary Procedures
Sonal Batra, Nicholas Greek, Claudia Ranniger, and Colleen Roche
George Washington University, Washington, DC

Introduction: Male genitourinary procedures within EM physicians’ scope of practice are limited in number and relatively simple to perform. However, residents often have insufficient clinical exposure to genitourinary pathology, resulting in a high degree of anxiety about performing a procedure in a sensitive area. We describe a simulation model designed to help trainees master techniques and increase confidence in treating two genitourinary emergencies.

Objectives: Increase skill and confidence in performing paraphimosis reduction, penile dorsal nerve and ring blocks, and corpus cavernosum aspiration and intracavernosal injection.
Design: EM physicians collaborated with simulation center staff to create two models of male genitalia. A penis mold was created using a cardboard and clay shell with a mold-max silicone rubber wall. The mold was filled with a small plastic core surrounded by silicone. After the silicone cured, the plastic core was removed leaving a hollow cavity in the final simulators. In the priapism simulator, artificial blood was injected into the core, causing swelling and purple discoloration of the silicone. The "erection" could then be drained via cavernosal aspiration. In the paraphimosis simulator, a silicone foreskin was connected to the hollow core, allowing for injection of saline to create edematous foreskin. Sufficient manual pressure decreased edema allowing for paraphimosis reduction. Dorsal slit technique was reviewed but not performed as the foreskin could not be re-used if cut. Self-sealing silicone mimicked skin; both models were attached to full-body simulators.

Effectiveness: Three residents (PGY1-4) used the simulators, 52% of whom had never performed any of these procedures. No resident had performed them more than 3 times. Ninety-one% and 84% (respectively) of residents felt that the priapism and paraphimosis simulators appeared realistic. All residents reported they would feel more comfortable performing these procedures after this session.

3 A Hand-on Model for Teaching Extensor Tendon Laceration Repair
Kelly Barringer
Regions Hospital/Health Partners Institute of Medical Education, St. Paul, MN

Background: Extensor tendon lacerations of the hand are commonly seen in the emergency department by the emergency physician who has a working knowledge of the complex extensor mechanism anatomy plus basic surgical skills. Although seemingly simple in its anatomy and function, the extensor mechanism of the hand is actually a complex set of interlinked muscles, tendons, and ligaments. Diagnosis and correct therapy hinges on a thorough understanding of the relevant anatomy. There are few options cited in the literature regarding how to provide experience in extensor tendon repair to emergency medicine residents. Some programs use cadaver models, though this may not be feasible for all programs. Our goal was to develop an easy-to-create model that would demonstrate anatomy and give residents opportunity to practice extensor tendon laceration repair.

Data: The hand model was created from a wood block, wire coat hangers, polymer clay, and rubber bands. It took approximately 90 minutes to construct. Approximately 20 emergency medicine residents, rotating residents, and students were taught using the model. Feedback was positive. The learners felt it was a good model, which demonstrated pertinent anatomy and gave the opportunity to practice tendon laceration repairs.

4 The “Cost Affordable” Cric Trainer
Harold Andrew Sloas, Sara Singhal, Roger L. Humphries, and Farhad Aziz
The University of Kentucky, Lexington, KY

We are presenting a novel approach to cricothyrotomy simulation training, synthesizing a low-cost, reusable, high-fidelity model to teach medical students and residents an important but often underpracticed emergency medicine rescue airway procedure. Previous models have incorporated animal structures (such as pig tracheas) to mimic human anatomy, while others have used highly complex and expensive commercially available models to teach this procedure. Other models have a more cost-effective approach at the cost of minimizing the similarity to live models. This model can be used in the mass training of medical professionals in this complicated procedure. This model can be easily reproduced at home with minimal time investment, using materials that are readily available at a hardware store or through an online order. The model is also extremely portable so it can be transported to various sites easily. The reusability of this model magnifies its use in the education of larger numbers of learners, as other models have presented low cost and more life-like/high-fidelity materials without regard to reusability. We will present a video depicting the construction of this model in addition to the actual demonstration of how this model can be used to train large numbers of people in performing cricothyrotomies.

5 Pediatric Intussusception Ultrasound Training Model
Alexander C. Arroyo
Maimonides Medical Center, Brooklyn, NY

Background: Intussusception is a cause of bowel obstruction in kids 3 mo to 6 yrs and a true emergency. If not recognized, blood supply can be compromised leading to bowel necrosis. Ultrasound (US) has become an accepted diagnostic modality for intussusception.

Hypothesis: Can an US training model help pediatric emergency medicine fellows and attending physicians learn how to properly find and diagnose intussusceptions?

Materials and Methods: Water snakes, a toy that is a long water filled balloon with an open internal lumen, were glued to the bottom of a plastic bin measuring 4” deep and 15” long. Single water snakes represented normal bowel, and one larger water snake was stuffed with a smaller one to simulate intussusception. The bin was filled with ingredients for ballistic gel mold and psyllium (to enhance appearance), dyed opaque, and placed in a refrigerator to harden. The mold was used to train pediatric emergency medicine fellows and attendings in the technique to find and diagnose intussusception during a course run by the author for pediatric emergency US in two consecutive years. A lecture on intussusception with images was given prior. After, the model was scanned in transverse and longitudinal planes, students would inform the preceptor when they had thought they found the intussusception.

Results: Students were noted to find the pathology quickly and easily using the model with minimal training. Furthermore, students who work at the author’s institution have gone on to diagnose intussusception via bedside US multiple times on patients with the disease process in real time.

Limitations: While the model simulates intussusception extremely well, there are differences between intussusception and the model. Simulating intussusception multiple layers was difficult, but the model does have four rings. Unlike commercial gel blocks, the model broke down by the end of the day. Making it sturdy is needed. Finding a way to simulate bowel gas would also be beneficial.
Conclusions: The training model for intussusception seems to effectively train students to find and diagnose intussusception during simulation and in real time. Further investigation is needed to confirm its effectiveness.

A Knee’d to Fill: An Inexpensive Model for Arthrocentesis
Michael Cabezon and Theodore Gaeta
New York Methodist Hospital, Brooklyn, NY

Our objective is to introduce an inexpensive, easily constructed partial task trainer that simulates a knee effusion to be used for teaching and assessing procedural skills in arthrocentesis, and to describe its integration into a milestone-based, procedural competency education module. The materials (and costs) per arthrocentesis model are as follows: plastic stacking bin $2.25, wooden toy wheel (patella) $4.00, 20" underwear elastic band $0.64, 20"x10" piece of vinyl (skin) $0.50, 3"x5"x2" piece of foam $0.50, 2 Ziploc sandwich bags $0.10, water-filled latex balloon $0.15, 2" binder clip $0.32. Total cost ~$8.46, as compared to a professional model which lists at $1372.00 per model. The educational session begins with a written self-assessment of the participant’s knowledge of the indications, contraindications, anatomic considerations, equipment, procedure, complications, and aftercare. The assessment tool is a structured open-ended questionnaire. During a brief didactic session participants are encouraged to take notes on their self-assessment form (in red ink). At the end of the lecture participants are asked to review their sheets one last time. Forms are collected and a pre-printed completed procedure overview sheet is provided for the learner to keep. In the practical session learners are paired off one-to-one with an attending physician or credentialed senior resident who reviews again the learners’ understanding from indications to aftercare. Faculty have the opportunity to evaluate senior residents in the “level 5” milestone: teaches procedural competency and corrects mistakes. The goal of the educational model is to incorporate all learning styles (visual, auditory, and kinesthetic) in a simple, inexpensive, and reproducible manner. Resident feedback has been excellent, stating that the anatomy/landmarks are spot-on and the interactive multifaceted learning session improved understanding of the material.

TITUS (Thoracic Intervention Training Unit Simulator) - Making Chest Tube Thoracostomy Training Realistic, Efficient, and Affordable
Andrew Eyre, John Eicken, and David A. Meguerdichian
Brigham and Women’s Hospital, Boston, MA

Background: Procedural competency is a vital component of emergency medicine (EM) residency training and is a dedicated focus in the ACGME and ABEM Milestone Project. Chest tube thoracostomy is an emergent, lifesaving procedure for which competency is expected of all graduating EM residents. Prior simulation mannequins for chest tube thoracostomy include commercially available models, cadavers, and animals. Each is fraught with financial, ethical, and anatomical barriers to providing the trainee with an optimal, life-like learning experience.

Educational Objectives: We aimed to develop a low-cost, reusable, life-like chest tube thoracostomy model for training residents. We sought to create an effective educational device using commercially available porcine ribs to simulate human ribs that could be rapidly reloaded in a timely manner to promote proficiency in chest tube thoracostomy for large groups.

Design: The TITUS frame consists of a plastic mannequin torso secured to a portable base by common hardware supplies. The materials used in the construction of a TITUS cost approximately $50. A single person can easily assemble it in 2 hours. The presence of an axilla and pectoral region simulate the “triangle of safety”. The installed bracket assembly allows for the efficient loading and securing of porcine ribs in under 60 seconds. Trainees practiced on TITUS using a closed chest tray kit.

Impact: Its unique design and rapid loading time allows for multiple trainees to perform chest tube thoracostomies in uncompromised tissue. The porcine ribs provide the tactile feedback critical for proper training. TITUS has been successfully used in training sessions with participants ranging from novice interns to seasoned faculty and received consistent positive feedback. As funding sources for medical education become scarcer, TITUS provides a realistic, low cost alternative to expensive chest thoracostomy simulators.
8 Novel Task-trainer for Lateral Canthotomy Procedure
Kelly Medwid, Maureen Gang, and Robert Rosenwald
New York University/Bellevue, New York, NY

Introduction/Background: Simulation affords residents an opportunity to develop an approach for rapid assessment and treatment of patients presenting with high-acuity, low-frequency clinical events in a safe learning environment. Lateral canthotomy is a procedure that is infrequently performed in the emergency department. Knowledge of the proper indications for the procedure and how to properly perform the procedure can save a patient’s vision. To our knowledge, there have been no simulation models previously designed to help teach this procedure.

Educational Objectives: Our objective was to develop a realistic, low-cost, reusable model to facilitate hands-on learning for the low-frequency, high-acuity procedure of a lateral canthotomy.

Curricular Design: A trauma scenario was developed that involved the assessment of a patient with head and facial trauma. As part of the scenario, the patient required a lateral canthotomy because of proptosis and loss of vision. We designed a task trainer using a Styrofoam manikin head with one eye socket recessed relative to the other, water-filled balloons for eyes, and pinned rubber bands for canthal ligaments. We covered the Styrofoam head with a mask for the skin. High-fidelity simulators were used for initial resident assessment and stabilization of the trauma patient. The residents were then transitioned to the task trainer to learn proper indications for a lateral canthotomy as well as to gain practice in the procedure.

Effectiveness: This low-cost, simulated task trainer was designed to provide valuable procedural experience for our residents and positively affect patient care. Residents who completed a post-simulation survey all agreed that the model was an effective way to learn and practice the procedure.

9 Trephination without Trepidation: A Novel Method for Teaching Burr Holes to Emergency Physicians
Biren Bhatt1, Anthony Rosen2, Sunday Clark3, Osman Sayan1, and Joel Berezow1
1Columbia University Medical Center, New York, NY; 2NewYork-Presbyterian Hospital, New York, NY; 3Weill Cornell Medical Center, New York, NY

There are growing data to suggest that emergency physician-performed burr hole trephination for traumatic epidural hemorrhage improves neurological outcome in patients who deteriorate rapidly after their injuries when immediate neurosurgical backup is not available. Familiarity with the tools and techniques of burr hole trephination is essential for practicing emergency physicians. We describe a new inexpensive model that can be used for teaching burr hole trephination. We use a whole ripe coconut fastened securely to blocks of wood to simulate the cranium on a non-rolling surface. An adhesive decubitus ulcer dressing bandage is affixed to the coconut and is used to simulate the scalp. The tools for trephination can be tailored to reflect the resources available at the trainees’ practice setting, and the model has been successfully trialed with a commercially available neurosurgical kit as well as a handheld power drill that may be utilized in more austere practice environments. The setup costs less than $100, including the cost of a power drill, and can be used for multiple trephination attempts by multiple trainees. Our model presents a safe, realistic method of teaching a life-saving procedure.

10 Patient Experience Training for the Emergency Medicine Resident: Developing Students into Coaches
Sofie R. Morgan, Karim Ali, and Nicole Franks
Emory University School of Medicine, Atlanta, GA

There is a growing focus on improving the patient experience in health care. Emergency departments are vital to this effort. The new emergency medicine milestones recognize the importance of training residents in this arena by devoting an entire category to patient-centered communications. Our institution has not traditionally had a formal mechanism for teaching and providing feedback for residents on this topic. Thus, we sought to fill this gap by developing a resident curriculum addressing patient experience that would offer a lasting skill set. We designed a modular curriculum through our administrative rotation for senior third-year residents. It includes three components: a self-guided, online presentation that ends with interactive questions, a one-hour faculty lecture, and direct observation of junior resident patient experience skills. Didactics feature evidenced-based data on the effect of
improved patient experience, operational information on the compilation of patient feedback, and factual material on payer policies on patient satisfaction. Subsequent direct observation during a shift of junior residents by senior residents using a standardized checklist provides an opportunity to apply skills learned through didactics and facilitates peer-to-peer feedback. Eight senior residents have since completed the module and gone on to evaluate sixteen junior residents. Senior residents completed pre- and post-tests to gauge factual knowledge and opinions on the module. Performance on factual material improved from 82% to 95%. The majority believe education on this topic is valuable, and all but one agree the module should be included in the future. Residents cite the online lecture as the most effective component. Critique centered on difficulties scheduling junior resident observations. The module will continue in its current form for the remainder of the residency year. We plan to revise it thereafter based on resident feedback.

11 The Development of a Longitudinal Curriculum for Calling Consults
Andrew Golden1, Christine Babcock2, Sara Hock3, Sarah Donlan3, Shannon Martin2, Vineet Arora2, Jeanne Farnan2, and Keme Carter2
1University of Chicago Pritzker School of Medicine, Chicago, IL; 2University of Chicago, Chicago, IL; 3NorthShore University HealthSystem, Evanston, IL

Introduction: The importance of interprofessional communication is emphasized by the Liaison Committee on Medical Education and ACGME. An important area of communication is the consultation process. Existing literature suggests formal education in consult communication is lacking at all levels of medical training. We believe a longitudinal curriculum based on the “5 Cs of Consultation”, a validated model, will address this deficiency.

Objectives: We developed a longitudinal curriculum instructing learners at varying levels of training in consult communication. Educational objectives differ by learner experience. Second-year medical students learn to identify quality consult communication. Fourth-year medical students demonstrate proficiency in consult communication. Emergency medicine residents (PGY1s) integrate the curriculum into daily practice and progress through communication milestones. Midlevel providers improve consult skills with other health care professionals.

Curricular Design: Consult communication educational objectives are met through the following curricular designs. All learners are introduced to the “5 Cs” model in didactic training sessions. Second-year students view videos of high- and low-quality consults, followed by group discussion. Fourth-year students practice consult communication in the simulation laboratory. PGY1 clinical consults are recorded and evaluated for quality and milestone proficiency. Midlevel providers participate in a skills-based learning session. (Figure 11)

Effectiveness: This longitudinal curriculum addresses the need for a formalized consult curriculum for all levels of learners. Fourth-year students preliminary data reveals significant improvement after intervention (p<0.001) for all variables measured by the “5 Cs” global rating scale (Table 11). Data collection and analysis of effectiveness for all learner groups is underway. This curriculum provides a standard approach to consultation communication at our institution and ensures exposure at both GME and UME levels.

<table>
<thead>
<tr>
<th></th>
<th>Curriculum (n = 36)</th>
<th>No Curriculum (n = 35)</th>
<th>Difference [95% CI]</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>3.33 ± 0.14</td>
<td>2.27 ± 0.11</td>
<td>1.06 [0.71, 1.42]</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Case presentation</td>
<td>3.54 ± 0.13</td>
<td>2.97 ± 0.12</td>
<td>0.57 [0.22, 0.92]</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Consult objective</td>
<td>3.57 ± 0.13</td>
<td>2.92 ± 0.14</td>
<td>0.65 [0.27, 1.03]</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Case discussion</td>
<td>3.65 ± 0.12</td>
<td>3.00 ± 0.09</td>
<td>0.65 [0.35, 0.96]</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Confirmation and closing</td>
<td>3.53 ± 0.11</td>
<td>2.87 ± 0.11</td>
<td>0.66 [0.34, 0.98]</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Interpersonal skills</td>
<td>3.85 ± 0.12</td>
<td>3.17 ± 0.12</td>
<td>0.67 [0.34, 1.01]</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Global rating</td>
<td>3.39 ± 0.20</td>
<td>2.61 ± 0.18</td>
<td>0.77 [0.20, 1.35]</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Average global rating scale score</td>
<td>3.61 ± 0.10</td>
<td>2.91 ± 0.10</td>
<td>0.70 [0.41, 0.98]</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Figure 11. Golden et al.

12 Flipping the Clerkship Classroom
Stella H. Yiu
University of Ottawa, Ottawa, ON, Canada

Introduction: The flipped classroom is used increasingly in education. In this model, learning is self-paced and lessons are interactive and mastery-based. Multiple flipped classroom methods have been suggested in the education literature, but no specific flipped emergency medicine clerkship curriculum has been published.
Educational Objectives: Flipping our clerkship core tutorials to allow for higher-order classroom discussions.

Curricular Design: Topics from the emergency medicine clerkship curriculum selected by the Clerkship Directors in Emergency Medicine act as the blueprint. Each topic is broken down into short videos lasting 5-15 minutes adhering to multimedia principles. All videos were hosted on a public website. Before class, students watch videos with specific learning objectives and are urged to take notes. During class, students are divided into small groups and are presented with clinical cases. As a group, they determine decisions regarding clinical management for each case. The tutors intervene when the students have questions. The videos remain accessible to students throughout their emergency medicine rotation and beyond.

Impact: Class time is used for discussion about clinical decisions rather than core knowledge transfer. Students are engaged in discussions and identify muddy points quickly. Tutors intervene to clarify only when needed. Students often raise questions not brought up in previous lecture-based tutorials. Students feel they have delved deeper into management rather than reciting facts, and feel ‘this is a better way to learn.’ Tutors feel their roles have changed from lecturer into facilitator and need to prepare differently.

Future Directions: Our next step is to provide online exercises for students before class as a model of deliberate practice. Research measuring knowledge retention and application is under way.

13 An Integrative Approach to Clinical Reasoning in the Pre-Clinical Years
Annette Dorfman
Albany Medical Center, Albany, NY

It has been well-established that students in the pre-clinical years are seeking exposure to skills and procedures, as medical schools move towards the utilization of an integrated curriculum. In addition, there is a shifting focus towards the development of entrustable professional activities and milestones as a measure of clinical competence. As a result, many medical schools have developed changes to the current curriculum to incorporate the changing needs of learners. One way in which this can be accomplished is via an Emergency Medicine Interest Group (EMIG) where students can gain exposure to skills and the introduction of clinical reasoning, while practicing in a small group setting. At our institution, we are implementing a novel approach in our EMIG for making connections from the pre-clinical years to the clerkships, while developing clinical reasoning skills: an integrative curriculum to the study of abdominal pain, using simulation and ultrasound. Our intent is to provide an outline for linking the basic science knowledge obtained during the GI course in the first and second years with a related practicum in the simulation center at the concurrent time. We have designed a pilot skills session focused on the approach to abdominal pain, while maximizing the utilization of resources, such as high-fidelity mannequins and ultrasound. The goals and objectives of this session include the development of thinking about abdominal pain and the approach to the decision-making process that defines clinical practice. Regardless of their ultimate career-path, medical students can benefit from early exposure to clinical reasoning as this drives their development as physicians. Specifically, integration of clinical skills with the teaching modalities of simulation and ultrasound may improve measurable performance.

14 Evidence-based Emergency Medicine: EBM at the Point of Care; A Capstone EBM Course for a Fourth Year Emergency Medicine Rotation
Dan Mayer
Albany Medical College, Albany, NY

At the Albany Medical College, a fourth year required emergency medicine rotation has been in existence for almost 30 years. The 4-week rotation requires the students to work an average of fourteen shifts, participate in didactic sessions including a suture lab and skills lab, and do simulation cases with emergency medicine faculty. There is a formal Evidence-based medicine component as part of the medical college’s 4-year longitudinal Evidence-Based Health Care course. In the emergency medicine rotation, students are required to do one formalinformatics search to answer a clinical question that comes up during one of their shifts. This is done independently and is timed. The student is encouraged to use the TRIP database, but his or her search strategies are completely open. The exercise is reviewed by the director of the Evidence-Based Health Care course at the end of the rotation. This is followed by a 2-hour debriefing session held on the last day of the clerkship. The students’ search strategies are reviewed and discussed. Also, the process of rapid critical appraisal is discussed using the sources that they have identified to answer their clinical questions. This is the second year that this formal exercise has been part of the rotation. Students are graded pass/fail on their searches and critical appraisals. Their presentations are reviewed in class. Student participation in the exercise has been excellent, including their participation in the final presentations.

15 Improved Efficiency and Effectiveness of the Emergency Medicine Residency Applicant Review and Rank Process via Utilization of iOS Technology, Database Software, and Cloud Storage
Nara Shin, Ronald Hall, Bernard L. Lopez, Richard Massone, and Harsh Sule
Thomas Jefferson University, Philadelphia, PA

With the increasing number of medical school graduates applying to emergency medicine residency programs, the applicant review and ranking process has become a tremendously time- and personnel-intensive task. For the 2012-2013 match season, our residency team employed the following time-saving and resource-reducing strategy. We used a licensed database software (FileMaker®) application on computers and Apple iOS® devices with cloud-based server synchronization to collect and organize information throughout the applicant screening and interviewing process. A record was generated for each applicant. It contained electronic score sheets from review of each applicant’s ERAS application for interview selection, interview-day evaluations, and a summary sheet. Each electronic score sheet contained six questions with drop-down menu selections. On interview day, the applicants had their photographs taken with an iOS device as an additional identifier for their database file. Each faculty and resident interviewer used an iOS device or computer to complete the post-interview electronic score sheet. The multiple score sheets synchronized in the background with the cloud-based server. The database software automatically calculated a consolidated score for each applicant and generated an updated rank order list at the end of every interview day. For the final session, residents and faculty viewed the applicants’ photographs, electronic score sheets, and final composite scores from the database on a large screen, and the final rank list was “tweaked.” This strategy automated several key steps, reduced repetitive data entry by residency staff, reduced transcription error, and made final review user friendly especially with the photographs. While initial setup of the database took several hours, ongoing updates and maintenance from year-to-year are minimal with a total cost under $500 per year. We fully intend to use it again for upcoming interview seasons.

16 Two for One: Residency Leadership Team Rounding to Assess/Improve the Patient Experience and Gain Emergency Medicine Resident Patient Feedback
Michael Bohrn and Elizabeth Hall
WellSpan York Hospital, York, PA

Educational Objectives: Obtaining direct patient feedback on resident clinical performance is often difficult, particularly in regard to communication and professionalism. All hospitals are aiming to improve their patient experiences in the emergency department (ED). We collected preliminary data in a novel Residency Leadership Team rounding process to help achieve both of these goals.
Curricular Design: IRB waiver was obtained as this is deemed to be an ongoing process improvement project. A checklist of desired behaviors and communication points was developed to help assess resident communication/professionalism and to assess key items for the patient experience. This checklist includes items related to hand-washing, acknowledgement of others in room, use of patient-centered language, and whether pain was addressed (if present). A schedule for Residency Leadership Team members was generated and team members proceeded to patient rooms for interviews using the checklist, following emergency medicine resident evaluations. Checklists were graded and immediate feedback was provided in the ED for the resident involved. A database of residents and checklist items was devised and this was queried periodically to provide both individual resident and overall program feedback. This is an ongoing project and preliminary data are listed below.

Impact/Effectiveness: N=50 patient encounters for 21 residents. Compliance with hand-washing = 84% (42/50); acknowledgement of others in room = 100%; use of patient-centered language = 100%; and addressing pain = 98% (49/50). Overall, survey results showed good compliance with standard patient experience goals, except in the area of hand-washing. These data will be used to target low-performing behaviors, such as hand-washing, for future interventions.

17 Establishing Innovation as a Structured Component of an Emergency Medicine Residency

Jude Kielyka, Sanjeev Malik, David Salzman, Michael Schmidt, and Michael Gisondi
Northwestern University, Chicago, IL

Objectives: Resident-driven change is an important component of an adaptive emergency medicine (EM) training program. In the academic year 2012 - 2013, the authors created the Northwestern Emergency Medicine Innovations Program (NEMIP) to integrate practical innovation as a structured component of a training program in EM. This provided a faculty mentored mechanism for meeting ACGME requirement V.2.1, ensuring that all residents are “integrated and actively participating” in quality improvement programs.

Methods: Each resident was required to propose an innovative solution to a perceived problem or emergency department (ED) operational weakness. Residents worked independently or in groups. No restrictions were placed on the ambitiousness of proposals. Each team recruited a faculty member to serve as a mentor. All full-time faculty received a survey containing de-identified project descriptions and scored proposals (using a five-point Likert scale) on the following: 1) potential contribution, 2) feasibility, and 3) likely costs. An Innovations Review Committee (IRC) reviewed proposals, taking into consideration the survey results.

Results: Twenty-five project proposals were submitted by 40 residents (mean group size: 2.0). The mean project budget requested was $932. Of 25 proposals, 9 were approved by the IRC and 7 received funding. As a result of NEMIP, several novel improvement projects are either ongoing or have been completed. Examples include the implementation of an electronic medical record mechanism for addressing incidental findings discovered in the ED, and the creation of an “advanced airway cart” which integrates supplies necessary for diffluent completing intubations.

Conclusions: The implementation of an innovations program within an EM residency provides an effective means of crowd-sourcing quality improvement projects, while meeting an ACGME requirement. Although initial results are promising, further efforts are required to ensure program sustainability.

19 Integrating Peer Review into the Emergency Medicine Residency Curriculum

Raashee Kedia, Reuben J. Strayer, and Bradley D. Shy
Mount Sinai School of Medicine, New York, NY

All academic departments must maintain peer-review or quality improvement processes to evaluate quality metrics, provide outcomes-based feedback, and identify causes of inefficiency and error. Typically, this is done by a small group of faculty members, with little resident involvement. We instituted a mandatory Clinical Quality Review (CQR) program, which involves all 60 of our residents in monthly case reviews. We created 13 high-risk patient case groups such as mortalities, 72-hour returns, and intubations. Each group is assigned 2-6 residents; groups are reshuffled every six months. Each month, teams perform a targeted review of the medical record and record quality metrics and outcomes into a structured database. Faculty CQR leaders review the databases and flag cases of concern or of educational value. During the monthly CQR meeting, these cases are highlighted, learning points discussed, and ideas for systems improvement suggested. Examples of process improvements include applying a sepsis order set, updating procedure note templates, and creating a rule-out ectopic algorithm. By integrating CQR into our residency curriculum, we transitioned peer review from a limited administrative process to a comprehensive educational activity. We were able to review 10 times as many cases (4,458 cases in 2012), better identify deficiencies, and implement changes. Surveying all 60 residents, 85% report that CQR has made them better clinicians, 77% believe patient care has improved due to resident participation in CQR, and 76% believe CQR is a valuable addition to their residency education. As reducing medical error has become a national focus, and as residencies are tasked with training residents in quality assurance, other institutions may find value in similar programs.
A Multi-modal Curriculum for Emergency Medicine Residents to Maximize Value of Attendance at a National Conference

Alicia Blazewskj1, Tony Rosen1, Mary Mulcare1, Daniel Golden2, and Sunday Clark2
1New York Presbyterian, New York, NY; 2Weill-Cornell Medical College, New York, NY

Background: All emergency medicine (EM) residents are required to complete a scholarly project prior to graduation. To encourage scholarly activity, programs send residents to a national conference. We know of no formal curriculum that ensures residents maximize the value of this conference experience.

Objectives: We designed and implemented a multi-modal curriculum during a conference to augment conference programming. Our goals included: to help identify areas of interest, exposure to scholarly inquiry, and to encourage development of meaningful and feasible scholarly projects.

Curricular Design: Residents were required to attend 1-2 sessions daily pre-selected by the curricular design team due to relevance for resident research as well as attend at least two self-selected sessions per day. Two 75-minute daily debriefs were held after conference days. Each session began with a brief presentation by a faculty member followed by small group discussions (led by a chief resident and an assistant program director) and finished with reportage. Day 1’s presentation was “Research Experiences as a Resident: Identifying Opportunities” followed by small group discussions focused on “I Wish I Had Thought of That” (easy to conduct research with potentially high-impact results) and “Cool Idea but Could Have Been Done Better” (research on important issues in EM but with methodologic flaws). Day 2’s presentation was “Pursuing Research Training to Enhance an EM Career” followed by small groups where individuals shared ideas and culminated with residents reporting on the project ideas of others to the larger group.

Impact: Post-session surveys found the curriculum to be effective in advancing scholarly projects and optimized attending the conference; 92% felt the curriculum gave them new ideas for projects and improved existing plans for scholarly projects, and 25% felt the curriculum should be expanded in the future.

An Asynchronous Educational Curriculum for Resident Flight Physician Orientation

Jeffery M. Hill
University of Cincinnati, Cincinnati, OH

At the University of Cincinnati emergency medicine residency training program, PGY-2 residents fly as primary flight physicians on the hospital-affiliated helicopter EMS (HEMS) program. Air Care & Mobile Care. To improve the existing orientation structure, provide formalized procedural education, create a venue for discussion of challenging clinical scenarios, and reinforce aspects of the care of critically ill patients in a prehospital environment, an asynchronous educational curriculum was developed organized around three major topics: safety and basic helicopter operations, common procedures, and commonly encountered patients. Within each of these topics are educational modules with specific educational objectives. Each of these instructional modules has been designed based on the HEAL instructional design model (Wiecha et al., 2002) and contain many learning activities: videos, podcasts, procedural slide sets, selected high-impact articles, and discussion board posts. This asynchronous curriculum is the first to teach EM residents the knowledge and skills needed to participate in the HEMS environment. The materials developed to teach critical procedures have been designed based on theories of cognitive processing and include written, auditory, and visual components. Unlike several previously described EM asynchronous educational curricula, this curriculum, through the use of discussion board posts, seeks to connect potentially passive educational materials to the learners’ ongoing clinical experience and, in the absence of that clinical experience, provide model clinical scenarios on which the learners can construct meaningful connections between theory and practice. This curriculum is part of a study looking at resident attitudes towards asynchronous education and its role in professional development. Completion of the curriculum will be required before the resident’s transition to solo flights as a PGY-2 resident.

SonoRoundtable - A Live Interactive Online Academic Educational Series for Ultrasound Fellowships

Stephen Leech1, Jason Nomura2, Resa Lewiss3, Srikar Adhikari1, Rajesh Geria3, Jillian Davison3, and Robert Huang1
1Orlando Regional Medical Center, Orlando, FL; 2Christiana Care Health System, Newark, DE; 3St. Luke’s Roosevelt Hospital Center, New York, NY; 4University of Arizona, Tuscon, AZ; 5Robert Wood Johnson Medical Center, New Brunswick, NJ

Table 21: Hill - Sample Common Patients Module (Penetrating Trauma Patients) Objectives & Activities

<table>
<thead>
<tr>
<th>Learning Objectives</th>
<th>Learning Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demonstrate needle thoracostomy and its indications</td>
<td>Video/procedural slide set - needle thoracostomy</td>
</tr>
<tr>
<td>Demonstrate finger thoracostomy and its indications</td>
<td>Video/procedural slide set - finger thoracostomy</td>
</tr>
<tr>
<td>Assess the challenges associated with performing finger thoracostomy from the flight physician’s seat and discuss possible patient complications that could result</td>
<td>(1) Blackboard discussion board post - virtual management of penetrating trauma patient. (2) Video/procedural slide set - finger thoracostomy</td>
</tr>
<tr>
<td>Demonstrate pericardiocentesis and its indications</td>
<td>Podcast - topic: when to transfuse penetrating trauma.</td>
</tr>
<tr>
<td>Recognize injuries that could result from penetrating trauma to chest, abdomen, flank, neck</td>
<td>(1) Blackboard discussion board post - virtual management of penetrating trauma patient. (2) Podcast - topic: when to transfuse penetrating trauma.</td>
</tr>
<tr>
<td>Demonstrate the use of the CAT tourniquet and discuss its indications</td>
<td>Video/procedural slide set - Using the CAT tourniquet</td>
</tr>
<tr>
<td>Demonstrate the use of the hemostatic gauze and discuss its indication</td>
<td>Blackboard discussion board post - virtual management of penetrating trauma patient.</td>
</tr>
<tr>
<td>Describe a patient presentation in which the use of TXA would be indicated</td>
<td>(1) Article review - Shakur R et al. Antifibrinolytic drugs for acute traumatic injury. Cochrane Collaboration issue 12, 2012. (2) Blackboard discussion board post - virtual management of penetrating trauma patient</td>
</tr>
</tbody>
</table>
Ultrasound (US) is a skill integral to the practice of emergency medicine. Using a state-of-the-art web conferencing platform, we created SonoRoundtable, a live interactive online academic educational series for US fellowships. Our educational objectives creating SonoRoundtable are multifold. We seek to build a community comprised of and focused on US fellows as well as advanced US users. We plan to cover diverse US topics, both current and controversial. In doing so, we hope to expose fellows to national and international leaders, provide opportunities for collaboration and networking for fellows, and avoid duplication of educational efforts between programs. SonoRoundtable is a collaborative educational program organized by a board of US fellowship directors. We cover a diverse series of fellow and advanced level topics, including clinical US applications, educational theory and processes, research methodology, administration and program oversight, and advocacy. All of the content and meetings on SonoRoundtable are available free of charge.

SonoRoundtable features a live, online, interactive grand rounds program. Participants can access the meetings from anywhere using a computer or mobile device. Using a panel discussion format, fellows learn from national experts and discuss cutting-edge and controversial topics. Meetings are recorded and posted on our website, www.sonoroundtable.com, for later viewing. Future plans include collaborative educational, administrative, and research projects. The pilot program ran for 2 hours in July 2013. Since that time, SonoRoundtable has been held monthly for 1 hour episodes, and over 10 fellowship programs have participated. Several national experts have lectured and spoken on their areas of expertise and led interactive discussions with fellows. We expect continued growth and involvement as the program gains momentum.

Background: Emergency medicine (EM) residents enter residency with a broad range of procedural experience and variable competency to perform core EM procedures. Procedural competency is a key component of EM training and a focus of the ACGME and ABEM Milestones Project. Inconsistencies in resident knowledge base and in the educational approach to procedures pose potential detriments to patient safety and resident procedural competency.

Educational Objectives: The procedure learning bundle (PLB) was developed to replace the traditional approach to procedure education rooted in the “catch as catch can” fashion. This novel curriculum uses several principles of adult learning theory to standardize and improve core EM procedural education and competency.

Curricular Design: The PLB is a multifaceted, longitudinal curriculum that combines self-directed learning, constructivism, and deliberate practice into one bundle for teaching core EM procedures. The PLB has three elements: (1) self-directed independent study aimed...
at priming the learner through a procedure manual and videos accessed on the course website, (2) an intensive procedure simulation “Boot Camp” session where expert faculty facilitate active procedural hands-on learning, and (3) deliberate practice sessions with expert-guided feedback and targeted teaching opportunities that occur quarterly. The curriculum runs for an entire academic year.

**Impact:** Preliminary data indicate improved perceived procedural competency among the participants. We are currently performing a longitudinal study to objectively assess the effect of the bundle on procedural competency. The feedback for the PLB curriculum has also been overwhelmingly favorable from both residents and faculty. While the PLB is presently being employed to teach seven core EM procedures, its adaptable design allows it to be utilized to teach procedures across all specialties.

24 **Sonoindex: A Novel Tool To Assess Emergency Ultrasound Skills**

Srikar Adhikari and Albert Fiorello

*University of Arizona Medical Center, Tucson, AZ*

Emergency medicine residents are currently required to learn point-of-care ultrasound, and it has been included into the core content for emergency medicine. ACGME recently released the emergency medicine milestones for evaluation of residents’ progress during residency training. Emergency medicine residents are required to demonstrate procedural competency in point-of-care ultrasound. Currently, there is significant variation in the methods of assessment of ultrasound skills.

**Objectives:** To describe a novel scoring system to assess point-of-care ultrasound skills and provide feedback to emergency medicine residents.

**Methods:** A novel scoring system called “Sonoindex” was created to assess point-of-care ultrasound skills of residents. The score ranges from 1 to 5, with 1 being low and 5 being high. The different components included in the scoring system are: number of ultrasound examinations, type of scans, technical quality of scans, selection of presets and probes, appropriate labeling, pathology detected, procedural skills using ultrasound guidance, accuracy of interpretation, and documentation of findings. In contrast to milestones levels 1-5, the Sonoindex scoring system takes into consideration all essential components of resident ultrasound education and assessment. Each component is graded separately and combined to obtain a cumulative score. Sonoindex scores are updated every month and feedback is provided to residents. Trends in Sonoindex scores are tracked throughout residency training.

**Conclusions:** This novel tool can facilitate the evaluation of residents’ progress and assessment of point-of-care ultrasound milestones during their residency training. It provides motivation to residents to improve their scanning skills.

25 **Team-based Learning Curriculum As An Alternative To A Traditional Emergency Medicine Residency Didactic Curriculum**

Tiffany Moadel and Scott Johnson

*SUNY Stony Brook University Hospital, Stony Brook, NY*

A team-based learning (TBL) curricular framework allows participants to reconcile new information with existing knowledge and apply it immediately to a known problem. Participants are active in the learning process, preparing prior to the session and using class time for problem solving. We propose an interactive TBL emergency medicine (EM) resident curriculum, which we have piloted at our resident conferences with great success. Upon arrival, residents take an Individual Readiness Assurance Test (iRAT) on pre-reading. Next, they work in assigned teams to select the best answer choices for the Team Readiness Assurance Test (tRAT), which is the same test as the iRAT. They select their answers on an immediate feedback assessment technique (IF-AT) scoring card that identifies the correct answer when selected, and how many tries it takes to answer correctly. After a brief opportunity for students to appeal questions, faculty discuss concepts behind challenging questions. Resident teams then work on application exercises. These exercises focus on a significant case/problem and they require teams to make specific management choices, which they present to the class. Recommended team-based applications include: (1) high-fidelity simulations, (2) oral-board style clinical vignettes, and (3) case-based problem solving. We created oral-board style clinical vignettes with two built-in “stop points.” The first takes place after history-taking, and at this point all teams present their weighted differential diagnoses to the class. The second takes place after the physical exam where teams list their desired diagnostic tests. Data are revealed in a stepwise fashion. With case-based problem-solving, teams are provided with a clinical case and several related patient-management questions. Teams use Free Open Access Medical Education (FOAMed) and peer-reviewed journal articles to answer the questions, and they present their results to the class.

26 **Encouraging Educational Research**

Marcia A. Perry, Laura Hopson, Samantha Hauff, Margaret Wolff, Joseph House, Suzanne Dooley-Hash, Michele Nypaver, Cemal Sozener, and Sally Santen

*University of Michigan, Ann Arbor, MI*

**Background:** Educational faculty frequently spend the majority of their time on their education mission. With very little time for individual scholarly production, educators often fall behind on scholarship and research that are key components for academic promotion.

**Educational Objectives:** The purpose of this innovation is to describe a four-pronged approach as a template for others to follow and improve scholarly productivity.

**Curricular Design:** We formed a group of faculty leaders from our emergency medicine residency, fellowship, and clerkship programs, as well as emergency medicine (EM) residents with a focus on education. First, we attempt to turn our usual work into scholarship. We studied the effects of changes made to improve our programs and submitted the curriculum or process as peer-reviewed work. Second, we worked as a team, sharing projects which led to improved motivation, accountability, and work completion. Third, our monthly meetings as the Medical Education Research Group (MERG) served as brainstorming sessions for new projects, research skill building, and tracking work completion. Lastly, we recently hired a work-study graduate student to help us write, turning abstracts to submitted papers. Our results include only scholarly products that were presented at EM national meetings with at least two MERG members as authors.

**Impact:** For the past two academic years, MERG produced the following:

**Conclusions:** An intentional focus on scholarship has led to our collaborative group of educators successfully improving their scholarship through team productivity, which ultimately leads to faculty promotions.

<table>
<thead>
<tr>
<th>Scholarship</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract presentations</td>
<td>15</td>
</tr>
<tr>
<td>Publications</td>
<td>6</td>
</tr>
<tr>
<td>Didactic sessions</td>
<td>7</td>
</tr>
<tr>
<td>Faculty members with at least one scholarly activity added to their CVs</td>
<td>9</td>
</tr>
<tr>
<td>Faculty members promoted (and an additional 3 awaiting news on promotion)</td>
<td>3</td>
</tr>
<tr>
<td>Submitted articles since graduate students</td>
<td>4</td>
</tr>
<tr>
<td>Papers in review or revision</td>
<td>6</td>
</tr>
<tr>
<td>Papers in draft</td>
<td>6</td>
</tr>
</tbody>
</table>
A Novel Computer-based Model To Improve a Resident’s Skills of Triage, Time/Resource Management and Medical Decision-making

Nestor Rodriguez and Kevin Wyne
University of Wisconsin School of Medicine and Public Health, Middleton, WI

Introduction: Appropriate triaging of patients and effective time/resource management are essential to the practice of emergency medicine (EM). Opportunities to hone these skills vary, however, and without practice, EM residents may become overwhelmed or react poorly in critical situations. By utilizing a computer-based model, we created a simulation that challenges learners to develop specific proficiencies and assesses a learner’s performance without placing patients at risk.

Objectives: To develop a computer-based model that residents can use to improve skills essential to the practice of EM including: triage, time/resource management, and medical decision-making.

Curricular Design: We developed a learning simulation that mimics “A Day in the ED.” Learners are presented with various clinical scenarios that they must simultaneously manage to keep the emergency department (ED) functioning optimally. In evaluating these patients, the learner is asked to interpret vital signs, laboratory values, and radiographs, and to make clinical decisions based on these results. Learners are also asked to apply skills related to effective patient interactions, including cultural competency and sensitivity to specific patient concerns. Students are provided feedback throughout the simulation and faculty are able to track student responses. Following the simulation, students are asked to reflect upon those areas where they did not perform well. This reflection is a mechanism through which a student’s maturity and self-awareness can be evaluated.

Impact: This simulation is an innovative tool that challenges learners to develop specific EM proficiencies and allows faculty to assess a student’s performance without placing patients at risk. Through student responses, we are able to track residents on multiple levels including medical knowledge and understanding of ED flow. Their responses and reflection about the activity also allows us to gauge learners’ maturity and self-awareness.

System Dynamics as a Tool to Understand the Operations of an Emergency Department

Nupur Garg1 and Robert Wears2
1Mount Sinai School of Medicine, New York, NY; 2University of Florida, Jacksonville, FL

Emergency departments (EDs) are systems of great complexity with many delayed consequences and downstream feedback effects. Understanding them is beyond the scope of many practitioners, yet ED operations is a part of the model core curriculum for residents. In parallel to the actual experience obtained during clinical shifts, formalized learning environments may present valuable insights that may otherwise be missed. We propose a game that simulates an ED in which doctors can experience all the complexities of managing patient flow in a high-yield learning environment. The Patient Flow Game is played over the course of 3-4 hours. It uses principles of system dynamics, a framework for studying the behavior of complex system, to teach management of patient flow in an ED. The Patient Flow Game is actually based on The Beer Distribution Game, which was designed in the 1960s at MIT to simulate the complexities of the industrial supply chain. In the Patient Flow Game, teams of participants are put in charge of managing various areas of an ED. Each team receives inputs of patients or orders, accomplishes their tasks at their desired efficiency, and places a signal to receive more patients/orders. As in real life, the goal is to keep the delays in care few and far between while meeting the demand of patients. Participants receive feedback in the form of points from their operational decisions. This point system informs participants about any unintentional side effects and possible delayed consequences of their actions, e.g. the result of delayed care, delayed information in a patient’s case, excessive testing, or ignoring patient/provider satisfaction. In a learning environment designed to illustrate the complex dynamics of an ED, participants are much more likely to visualize the environment in which they work through a meaningful lens and make better operational and practice decisions that lead to overall better patient care.

The Patient Flow Game

Figure 28. Garg and Wears.
Anatomy "Speed Dating": A Clinical Integration Respiratory Anatomy Lab for Emergency Medicine Residents

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1MSU-COM, E. Lansing, MI; 2Sparrow EM Residency, Lansing, MI; 3San Juan College, Farmington, NM

Introduction: Sparrow emergency medicine (EM) residency-Lansing, affiliated with Michigan State University, works to integrate basic science principles with clinical disorders to further develop foundational knowledge.

Objectives: To return EM residents to the cadaver lab with experiences designed to emulate experiences in clinical rotations and foster the link between anatomical material and clinical disorders.

Curricular Design/Methods: EM and anatomy faculty designed 12 stations that reinforce key anatomical topics/relationships germane and realistic to the practicing clinician related to the respiratory tract/system beginning in the head and neck. Groups of 4-5 residents spend 15 minutes per station then rotate similar to social "speed dating". Anatomy and EM faculty act as facilitators guiding learners through each scenario while challenging them to think. Some stations invite participants to correlate imaging with what can be seen and touched on cadaveric specimens; others address emergency intubations and relationships of the lungs to central line placements, all in brief but detailed review. All stations are interactive with learner participation required.

Impact/Effectiveness: The deliberate use of cadaveric tissue alongside radiology and procedural tools is innovative because it reveals the importance of bringing back high-fidelity anatomy in a novel way that camouflages curricular redundancy in clinical presentations. These activities also supplement the curriculum by promoting team participation enhanced by peer-to-peer teaching. Our respiratory lab experience provides a unique venue for the application of anatomy in clinical skills therefore enabling residents to hone their critical thinking skills and deepen their understanding of anatomy in the progression of health and illness in their future patients. All residents leaving the session requested this to be a model for their education for each system-based set of disorders.

Low-cost, High-Fidelity Simulator Using Off-the-Shelf Components for Global Medicine

Jeffrey A. Nielsen and David W. Laubli
Summa Akron City Hospital, Akron, OH

High-fidelity simulation is cost-prohibitive for developing countries. Low-cost, low-fidelity models are plentiful, but high-fidelity models using off-the-shell parts, open code, and open hardware have been unavailable. This type of modifiable and community-driven platform would allow for development and sharing of innovative scenarios globally. We sought to develop a high-fidelity simulator using open source code, open hardware, and off-the-shelf products for use in the global environment that would cost under $1000. We define high-fidelity as including the following features, provided in real-time and dynamically adjustable during the case: breath sounds, chest rise, heart sounds, palpable pulses, pupill action, and bedside monitor display with waveforms and vitals. We developed a simulator using a hobbyist microcontroller (Arduino Mega2560) which controls the physical aspects of the mannequin. The eyes are simulated by two OLED graphic displays, which adjust dynamically as lighting levels change or as adjusted by the simulation technician. Pulse is simulated by a stepper motor. An LCD screen displays real-time status information about the simulator to the technician, and control buttons cycle the simulator through various modes, such as ventricular tachycardia or respiratory distress. We met difficulties developing the bedside monitor display using open hardware (Raspberry Pi) due to performance issues. We are migrating to an Ubuntu Linux platform using an inexpensive mini-PC for audio output (heart and lung sounds, bedside monitor display and logging. Assembly instructions, functional code, and tutorials are being shared on the project website at www.valueusim.org. We demonstrated that a low-cost, high-fidelity simulator can be fashioned from hobbyist electronic parts for use in low-income medical simulation environments. We believe that low-cost, commercially available kits will be necessary to promote adoption and further development.
Introduction: Thorough needs assessment is an established prerequisite to the development of new curricula in medical education. This is particularly important in cross-cultural settings, where epidemiology, resources, and learners' baseline knowledge are highly variable and often unknown to the curriculum developer. Many curricula have been developed for teaching acute care and resuscitation skills in resource-limited low- or middle-income countries (LMICs); however, there is no standardized methodology for needs assessment in these settings. This creates potential for resuscitation education that aligns poorly with learner needs, or proves infeasible to implement.

Objective: Develop a standardized needs assessment tool for resuscitation education in resource-limited LMICs.

Design: We identified three major domains in which needs assessment data are required to optimize resuscitation education in LMICs: local epidemiology, local infrastructure, and learners' experience and prior training. Understanding of local epidemiology is needed to ensure appropriate coverage of the clinical problems commonly faced by participants. Infrastructure data are required to ensure feasibility of any procedures or protocols taught in the curriculum. Knowledge of learners' experience and training is essential to address actual or perceived skill deficits. We developed a structured questionnaire designed to elicit detailed information in each of these domains.

Impact/Effectiveness: For resuscitation education programs in LMICs to be truly beneficial, they must have a positive effect on patient outcomes. This can only happen if educational endeavors are well aligned with local epidemiology, are clinically practicable, and address the specific needs of the learners. Robust needs assessment methodology has the potential to improve the quality and impact of these programs.

33 Ultrasound Beyond the Walls of the Emergency Department
Chanel E. Fischetti, Bryan Sloane, Lance Beier, Patrick Leehan, Heather Marino, and John Christian Fox
UC Irvine, Irvine, CA

Background/Introduction: At UC Irvine, ultrasound has been incorporated as a means of deepening the students’ understanding of numerous subjects, has provided avenues for new and exciting research opportunities, and has increased the fund of knowledge students are able to share in both their local communities and abroad. In an effort to provide opportunities to both use and improve their newly developed ultrasound skills, UC Irvine has organized trips abroad to underserved areas, areas where fast and efficient imaging modalities are desperately needed.

I felt prepared before leaving for my trip to teach ultrasound.
I felt prepared before leaving for my trip to complete ultrasound research.
I felt confident translating/explaining my ultrasound skills to another culture.
I thought the language barrier made it difficult to transcend when teaching ultrasound.
I felt like I made a positive impact on the university/clinic/NGO that I was working with.
I am more inclined to do medical service trips in the future.
My time abroad made me more inclined to work with the underserved in my career.
It is useful for first year medical students to learn ultrasound.
I would recommend recommending bedside ultrasound.
This experience made me realize the usefulness of ultrasound in a clinical environment.
I would recommend traveling abroad to improve ultrasound skills.
I changed my specialty interest because of this experience.
I am more inclined to do a specialty that heavily uses ultrasound.

Educational Objectives: For students to hone newly acquired ultrasound skills, be able to study unique pathology, test their ultrasound knowledge, and disseminate and teach other health professionals.

Curricular Design: Students designed and planned research projects, some of which included imaging cerebral malaria in Tanzania, teaching Panamanian midwives to use ultrasound to assist childbirth in small villages, and scanning for renal disease in migrant farm workers in Nicaragua. In a follow-up study done at the conclusion of the summer, 27 students were asked to subjectively rate their ultrasound experiences on a scale of 1 to 5, with a score of 1 being “strongly disagree” and 5 being “strongly agree”. The response was overwhelmingly positive (see Figure 33).

Effectiveness and Impact: Overall, international ultrasound-focused opportunities provide an outlet for medical students to practice and apply their newly acquired ultrasound skill set under physician supervision. Our study showed that UC Irvine medical students felt that their international experiences positively affected the development of their ultrasound skills and training. By encouraging students to continue to pursue their interests within ultrasound as both researchers and teachers, we hope to help create more competent and experienced physicians with a better understanding of a broad variety of cultures, pathology, and practice methods.

34 Emergency Medicine Resident Education in Provider-in-Triage Operations
Shawn London, Cynthia Price, and Kenneth Robinson
Hartford Hospital/University of Connecticut School of Medicine, Hartford, CT

Introduction/Background: EDs are increasingly providing care at triage in order to address increasing volume and decrease door-to-provider times. Caring for patients in triage is different than providing care in the traditional ED room and requires practice to do well. Graduating residents may be expected to provide care in the front end on their first shift at their new job, yet they may have no experience doing so. A review of the literature from the last 10 years revealed no sources describing training residents to work in the triage section of an ED.

Educational Objectives: The objectives of this educational innovation were to train the EM residents to effectively provide care in triage, and to provide an introduction to the literature concerning ED provider-in-triage operations.

Curricular Design: We designed a program consisting of both didactic education and clinical experience. To provide a clinical experience, PGY-2 and PGY-3 residents were scheduled for one shift per block in the triage area of a busy (100,000 visit) urban, academic ED. The residents worked in collaboration with an advanced practitioner or EM attending physician and were overseen by an EM attending. The didactic instruction included a lecture on ED operations, with a focus on the literature related to efficient physician-in-triage functioning and a reading list of articles describing efficient front-end operations.

Impact/Effectiveness: This innovation helps to better prepare EM residents for the contemporary practice of EM. We demonstrated the effectiveness of this with a six-question pre/post survey on their knowledge about and confidence in performing this role. The post survey demonstrated a statistically significant improvement in the residents’ responses (Wilcoxon signed-rank, p < 0.05). Experience providing care in triage enables residents to be more confident and to
Medical Student Ethics Essays as Faculty Development Tools
Nik Theyyunni, Joseph House, Andrew Barnosky, and Sally Santen
University of Michigan, Ann Arbor, MI

Background: Ethical conduct is important in emergency medicine (EM), but there is little literature focused on continuing education in ethics for practicing emergency physicians (EPs). Medical students (MS) often learn ethics through the hidden curriculum by role modeling practicing physicians. Formal education on practical ethics for MS and those teaching them in the ED is needed.

Objectives: The purpose of this innovation was to use MS essays about ethics as a faculty development tool. This served to improve the ability of attending physicians to mentor MS on ethical situations and provide good and bad examples of behavior for faculty.

Curricular Design: During an EM clerkship, MS wrote essays on ethical dilemmas faced during their EM rotation. A team of EPs and ethicists analyzed the essays. Essays representing good and bad examples of physician actions, or teachable ethical points for MS were selected. These essays were presented at a faculty meeting and discussed. Feedback from this session will be used to make changes to the rotation, and change physician behavior going forward.

Impact: In the faculty feedback session, eight essays were presented to faculty and discussed. An example of ethical conduct was an EP calming an agitated patient, allowing him to be cared for. An example of negative behavior was a student communicating a patient condition to a resident and being ignored, leading to a bad outcome. Discussion focused on the objectives for each case to encourage faculty awareness when these situations occur. Changes were also made to the medical student rotation to address concerns brought up in the discussion. Faculty wanted the student ethics essays brought to them regularly. In conclusion, MS ethics essays provide valuable information for both faculty development and medical student education. Feedback provided to faculty and changes made to the rotation should help combat the effects of the hidden curriculum.

Development of a Small-group Concept Mapping Didactic for Early First-year Medical Students to Fill a Scheduling Gap during a Four-hour Simulation-based Experience
Michael Cassara1 and Gino Farina2
1North Shore University Hospital / Hofstra North Shore-LIJ School of Medicine, Manhasset, NY; 2Long Island Jewish Medical Center / Hofstra North Shore-LIJ School of Medicine, New Hyde Park, NY

Introduction: Reflection is recognized in medical education for its benefits in developing professional expertise. Teaching reflective skills has been found to enhance critical reasoning and professional habits of learners. In recent years accreditation bodies both nationally and internationally have included reflection at all levels of medical education. The unique cognitive challenges of emergency medicine (EM) make skills of metacognition especially relevant.

Educational Objectives: The primary goal of this curriculum is to introduce residents to the basic theory and skills of critical reflection and metacognition in order to prepare them to make decisions and articulate their thinking in complex clinical situations, accurately perform better in this environment and may enhance their ability to function in this role post graduation.

<table>
<thead>
<tr>
<th>Case</th>
<th>Objectives (Discussion Points)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable treatment of chronic alcoholics</td>
<td>Discuss with MS reasons for the range of practice with these patients</td>
</tr>
<tr>
<td>Treatment of chronic pain patients: unfairly withholding pain medication, or contributing to addiction</td>
<td>Discuss with MS medical student variability in treatment</td>
</tr>
<tr>
<td>EP takes time to explain to patient with aortic dissection why surgery will not be offered</td>
<td>Model good communication with family and end of life care</td>
</tr>
<tr>
<td>MS provides an example of a patient not provided all information and/or incorrect information regarding her condition</td>
<td>Make sure we are providing full and accurate information to our patients</td>
</tr>
<tr>
<td>Resident misreads a radiology study, student attempts to correct, but is ignored</td>
<td>Hierarchy can interfere with patient care. Students to be encouraged to speak up</td>
</tr>
<tr>
<td>Student attempts to communicate a patient’s declining condition to resident, who does not intervene</td>
<td>Hierarchy can interfere with patient care. Encourage improved communication skills with nursing, residents, and MS</td>
</tr>
<tr>
<td>Patient with trauma is agitated, but verbally de-escalated by a resident</td>
<td>Good communication leading to diffusion of a difficult situation</td>
</tr>
<tr>
<td>EP shows compassion to family during pediatric code</td>
<td>Strive to be good role models</td>
</tr>
</tbody>
</table>

Table 35: Theyyunni et al. - Discussion Cases (MS=Medical Student; EP=Emergency Physician)
self-assess, and continue their professional development upon completion of residency.

**Curriculum Design:** The authors created the REFLECT curriculum (Reflection in EM For Lifelong-learning, Empathy, and Critical Thinking), as a stand-alone curriculum for EM residents that will run over the course of one training year. The primary learners are PGY1-3 residents. Learners first received two introduction didactic sessions. The first reviewed theory and concepts of a reflective practice for EM. In the second, learners were introduced to a literature-based model of writing a written reflection. In this model, the learner reports on an experience, seeks feedback, and develops an informed plan for future practice. Over the course of the year, learners will submit one critical reflection each block they are in the ED. Feedback is given on each reflection by using a validated reflective ability-scoring rubric. Future didactic sessions will allow for peer sharing of reflections. Through implementing and evaluating this curriculum, the authors hope to gain a better understanding of teaching and assessing skills of reflection to EM residents.

**“Vulnerable Patients in the ED” Didactic Curriculum: Using Patient Voices To Increase Empathy and Knowledge for Emergency Medicine Residents**

**Anne Whitehead, Lee Wilbur, and Jennifer D. Walthall**
**Indiana University, Indianapolis, IN**

**Background:** The emergency department is the disproportionate location for health care services for patients with social and health disparities. Empathy levels have been demonstrated to diminish over the course of medical training. Emergency medicine residents specifically are often unprepared for the challenges associated with providing empathetic and appropriate care for these vulnerable patient populations.

**Curriculum:** Using a list of social and cultural determinants of health, a didactic series was created using content experts and patient panels to overcome knowledge and empathy barriers in the target audience. A brief lecture discussed the vulnerable population and was followed by a panel of patients sharing experiences and answering resident questions. Using a survey to determine resident receptiveness to the didactic and a validated empathy scale, we evaluated the first two components of this series: 1) the uninsured and 2) those affected by autism.

**Results:** After the didactic session regarding the uninsured, residents at all training levels indicated that they thought the didactic session addressed an important topic and felt that the use of patient voices was an effective teaching method. Those earlier in training tended to be most receptive to the series. Residents completed empathy scales before and after the session on autism. The majority of responses trended toward improvement, especially those regarding resident satisfaction in patient care.

**Conclusions:** A targeted vulnerable patient didactic curriculum that connects patients to trainees outside the clinical venue appears to affect empathy scores, satisfaction with patient interactions, and specific content knowledge. We intend to continue this series with additional vulnerable populations. Further assessment with empathy scales will further explore the impact of these sessions.

**Sensitivity and Specificity Smartphone Application**

**Timothy W. Jolis¹, Waihong Chung², Brenna Brucker², and Dan M. Mayer¹**

¹Albany Medical College, Albany, NY; ²Warren Alpert Medical School of Brown University, Providence, RI

In an emergency department setting, physicians develop their differential diagnoses and then order tests to either support or rule out these diagnoses. On a busy shift, these physicians are making hundreds, or even thousands of these decisions. Ideally, all of these decisions are based on solid evidence-based data. The challenge of finding the data quickly and easily led us to develop a smartphone application that can streamline this process. The Sensitivity and Specificity Smartphone application is available for the iPhone, Android, and Blackberry markets. It gives the sensitivity, specificity, and negative predictive value of hundreds of tests. The tests are arranged in three categories, which are imaging, laboratory tests, and other. The “Other” category includes things like physical exam maneuvers. The application also links every single value to the article from which the data was taken. We believe that this tool helps support the practice of evidence-based medicine. It is also an excellent teaching tool, which allows medical students to compare testing modalities. The application is being expanded to include more data, and different types of data, to give users a richer picture of the evidence behind each clinical decision.

**Mobile Simulated Patient Encounters (MoSPE) - Take Interactive Clinical Simulation Cases Anywhere**

**Karthikeyan Muthuswamy, and Rishi Madhok**
**Perelman School of Medicine at the University of Pennsylvania, Philadelphia, PA**

**Background:** Proliferation of technology opens new avenues for supplementing medical education. Medical apps are now common on smartphones. Tools such as SimMan have been developed to better simulate patient encounters. A logical evolution is to combine these avenues—the asynchronous learning advantage of apps with the interactive, case simulation approach of SimMan/standardized patient cases.

**Objectives:** To build a standardized patient case simulation app for mobile and tablet devices with an eventual goal of evaluating its benefits in supplementing medical education.

**Methods:** There are two core elements to the app: the engine and the clinical cases. The engine needs to be flexible and expandable so it can present a variety of cases while making it easy to add new cases. The engine is built on Android Eclipse, a Java-based platform. The clinical cases come from peer-reviewed simulation cases used at the University of Pennsylvania. Case-specific information is entered into an Excel document that automatically generates code fragments for use in Eclipse.

**Results:** MoSPE (Mobile Simulated Patient Encounters) is an Android app that can be downloaded and installed on portable devices. The initial build includes a “chest pain” case. Users interact with the “patient” through an easy-to-use interface. The user can ask questions, perform focused exams, enter orders, and check results. Many of these actions move the case clock forward. With time and action (or inaction) the patient’s condition evolves and is reflected by patient responses/vital signs. Finally, the user selects a disposition and the case ends. There is a detailed post-case feedback area which summarizes key learning points and provides a tailored report based on the user’s actions (or lack thereof). This report can be stored and sent to the instructor.

**Conclusion:** MoSPE’s interactive interface combined with its ability to present real-time patient scenarios will make it a useful adjunct to traditional education.

**Transvenous Pacing Video Model for Facilitated, Successful Transvenous Pacemaker Insertion in the Emergency Department**

**Josh Laird, Bryan F. Darger, Sara Miller, Samuel Luber, and Yash Chathampally**
**University of Texas Medical School at Houston, Houston, TX**

Insertion of a transvenous pacemaker (TVP) in the emergency department (ED) can be a lifesaving measure, but is an uncommon, complicated procedure for ED residents. Appropriate placement of a TVP has multiple steps that must be accomplished in appropriate order.
Traditional TVP education typically involves procedure texts and didactics prior to ED TVP placement. Due to the relative infrequency of performance and the complexity of the procedure, attaining competence of independent performance is difficult for most residents. We created a short, simple, web-based video that covers these technical details, ordered steps, and nuances that can be quickly accessed on a smartphone and reviewed to support successful completion of TVP insertion and utilization at the bedside. To test and train residents and medical students we have developed a pacing phantom model that simulates the procedure including ECG waveform based anatomical localization. Eighteen emergency medicine interns were trained on this model during orientation and completed the procedure correctly. To test the ability to reproduce the procedure 4 months after orientation, four interns were randomly selected and tested on the model using a procedure checklist. All four were able to complete the procedure using the smartphone video without missing items on the checklist. Smartphone video support helps residents perform rare, complex procedures like TVP placement.

**Med Sketch: Anatomy Drawing App for the iPhone and iPad - A Fun and Engaging Tool To Improve Clinical Communication and Bedside Education**

Karim Ali and Aadeeb Zaer

Emory University School of Medicine, Atlanta, GA

Today, more than ever, it is important for health care providers to communicate well with patients, learners, and each other. Increased communication leads to improved satisfaction and improved comprehension. However, satisfaction and comprehension are intricately linked. Additionally, improved communication decreases errors in medicine. To assist the busy clinician in improving both patient and learner comprehension and communication, we created Med Sketch. Clinicians may use this app to draw out their thought process to patients, patients’ families, students, and/or other practitioners. The app comes included with over 100 high-resolution anatomy, pathology, orthopedics, and trauma images. Users are able to draw on the images using their fingers with an assortment of colored pencils. Additionally, the app may be used to free sketch or draw. Using the included camera button feature, users may take pictures of patient pathology and patient imaging studies and draw on them to explain patient care. Pictures may be e-mailed to students, patients, and/or consultants. When a patient asks “I have pancreatitis? What is that?” or when a student asks “What is a pneumothorax?” or when consenting patients for procedures like central lines or lumbar punctures, this app may prove indispensable. Often, verbal explanations of this nature are lacking and difficult to communicate with the learner or the patient. The Med Sketch app bridges the clinical communication divide and allows for visual articulation by the provider at the bedside. Additionally, Med Sketch as a pocket tool is fun to use and allows the clinician to enjoy the teaching process while simultaneously engaging and educating the learner.

43 **A Mobile Application for Direct Observation Evaluation of Resident Physicians using ACGME Next Accreditation System Milestones**

Daniel Michael O’Connor1 and Arjun Dayal2

1The University of Pennsylvania, Philadelphia, PA; 2The University of Chicago, Chicago, IL

**Background:** The complexity and rigor of the ACGME’s Next Accreditation System (NAS) places additional requirements on residency programs’ resident evaluations, which increases the burden on program directors (PDs) and makes paper-based evaluations largely impractical. These additional requirements are particularly demanding in the emergency department (ED), where there are a large number of residents working with different attending physicians every shift. This makes comprehensive evaluations by individual attendings less feasible. Once implemented, however, the NAS may provide residents with more frequent and relevant feedback.

**Intervention:** The software application “InstantEval” was designed to allow attendings to complete resident evaluations in real time using a smartphone, tablet, or computer. An example of the user interface is shown in Panel A. Emphasis was placed on making the process as rapid and simple as possible. The software uses photo-based navigation and allows for voice dictation. Several unique features were implemented to ensure uniform sub-competency coverage, such as an “evaluation of the day.” The administrative interface allows the PD to customize evaluations, generate summary reports and heat maps, and export data to residency management suites. An interface was also created that enables residents to directly view their feedback.

**Results:** InstantEval was tested at three large academic EDs over a 4-month period. The mean number of evaluations completed was 69±22 evaluations per week. Evaluation rates remained strongly linear (r=1.00),

### Table 43: O’Connor and Dayal - Evaluations per Resident

<table>
<thead>
<tr>
<th>Site</th>
<th>Number of Residents</th>
<th>Evaluations per Day</th>
<th>Total Evaluations per Resident</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site 1</td>
<td>40</td>
<td>10.0</td>
<td>30</td>
</tr>
<tr>
<td>Site 2</td>
<td>51</td>
<td>5.8</td>
<td>14</td>
</tr>
<tr>
<td>Site 3</td>
<td>54</td>
<td>10.5</td>
<td>23</td>
</tr>
<tr>
<td>AVE</td>
<td>48</td>
<td>8.8</td>
<td>22.4</td>
</tr>
</tbody>
</table>

**Figure 43.** O’Connor and Dayal
which indicates steady usage throughout the pilot period (Panel B). The sites had an average of 22.4 evaluations per resident (see Table 43). Feedback from PDs and attending physicians was strongly positive and all PDs indicated a desire to continue using the software.

**Conclusions:** The InstantEval evaluation system appears to have simplified the process of implementing the NAS in ED residency programs.

**Introduction:** ACGME and ABEM recently released the emergency medicine milestones project. This project necessitates that the model by which we evaluate residents during their training change to better reflect the residents’ current performance level in relation to the milestones.

**Educational Objectives:** Incorporate emergency medicine milestones project evaluations using direct feedback and daily shift evaluation.

**Curricular Design:** We created a new method to evaluate residents that includes a daily web-based evaluation system. The daily evaluation of residents at the end of a clinical shift involves a series of seven questions that address specific milestones. We have pared down the anchor statements to questions relevant to clinical shifts such as “prioritizes essential testing” or “monitors that necessary therapeutic interventions are performed.” Statements have been further separated to junior and senior levels to more accurately capture training-level specific information. Seven questions out of a total of 87 are randomly selected to populate through a web based module (Figure 44) on the attending physicians’ computer during each clinical shift. At the end of the evaluation there is a free-text question to input direct feedback provided to the resident.

**Impact /Effectiveness:** These different evaluation processes may be used in a broad scale in other training programs to more effectively and efficiently evaluate residents in concordance with the new emergency medicine milestones project. Additionally, evaluations can be performed on a daily basis, instead of a 6-month process, providing more timely information with residents’ receiving real-time feedback.

**Introduction:** The emergency medicine milestones project by ABEM and the ACGME prompted our department to change the method by which we evaluate our residents as well as the system used to deliver those evaluations. We have described elsewhere the development of the content of our milestone-based evaluations. Here we describe our platform that can collect, analyze, and redistribute real-time evaluation data via a secure, reliable, and intuitive interface.

**Educational Objectives:** Develop a secure, web-based, milestone-oriented evaluation system that can process data in real time to generate resident reports and data visualizations mapped to the emergency medicine milestones.

**Description:** Our evaluation and reporting system involves three main components. The first component is the front-end evaluations, which the faculty access online via unique login IDs. Once logged in, faculty select a resident to evaluate, which prompts the system to generate an evaluation consisting of seven randomly selected questions from an online question bank and a text question for direct feedback comments. Data are uploaded to an online database where each question is mapped to a specific milestone. Faculty are blinded to the specific milestone to prevent bias. The second component involves data analysis through a cloud server where answers to specific questions are converted into scores for specific milestones. The final interactive component of the program generates real-time resident reports including summative numerical scores for each milestone as well as de-identified comments given by faculty. Residents, as well as administration, can log in to these reports to review their progress as they advance through residency.

**Impact:** This system for data collection, analysis, and review of resident performance offers an easily implemented, sophisticated, and economical tool that is relevant to any emergency medicine residency program.

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**Introduction/Background:** Emergency medicine (EM) residency programs have struggled with implementation of assessment systems that will assist in informing EM milestones subcompetency proficiency levels. Ten Cate has advanced the concept that milestones are descriptors of physicians, and entrustable professional activities (EPAs) are descriptors of the work physicians do (Ten Cate, 2013). EPAs are useful in defining competency-based decisions on the level of supervision required by trainees. There is often a struggle for faculty to assess the milestones as descriptors of the resident, when they traditionally have assessed patient care performance. We sought to

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**Table 46: Beeson et al. - EPA Chief Complaints**

<table>
<thead>
<tr>
<th>Chief Pain/EPA</th>
<th>Milestone Sub-competency</th>
<th>Milestone(s) Affected</th>
<th>Probability Level</th>
<th>Anchor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ankle injury</td>
<td>Diagnostic Skills (DS)</td>
<td>Integrate results of a diagnostic study, recognizing clinical signs and symptoms, avoid defendants when appropriate</td>
<td>5</td>
<td>Resident must assess and interpret the ECG when having an ST-segment complaint</td>
</tr>
<tr>
<td>Wrist injury</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Chest pain</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Pharyngitis</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Abdominal pain</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Shortness of breath</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Syncope</td>
<td></td>
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</tbody>
</table>

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**Figure 46.** Beeson et al.
develop EPAs for various chief complaints as a framework for informing milestone proficiency level.

**Educational Objectives:** We identified common key chief complaints, validated by an ABEM survey (Beeson, Marco, et al., 2013). We developed checklist items for each chief complaint, and then matched each of the checklist items to EM milestone subcompetency proficiency level.

**Curricular Design:** We developed EPAs for 10 different chief complaints (Table 46). Completed EPAs consisted of checklist items for that chief complaint scored in a binary fashion in terms of completed or not (Figure 46 as example). Each checklist item was mapped to one or more milestones within the EM milestone framework.

**Impact/Effectiveness:** Through this framework, we were able to develop multiple EPAs covering common and important chief complaints. By mapping milestones to checklist items, we were able to identify 60 different milestones within 21 subcompetencies for these 10 chief complaints. Levels 1-3 were more commonly represented, compared to Levels 4 or 5.

**Conclusions:** EPAs provide an effective means to describe milestone proficiency. It may be easier for faculty to assess residents within the framework of EPAs rather than the more general framework of milestones.

**47 Flipping the Clerkship**
Corey Heitz,$^{1}$ Melanie Prusakowski,$^{1}$ and George Willis$^{2}$

$^{1}$Virginia Tech Carilion School of Medicine, Roanoke, VA; $^{2}$University of Maryland, Baltimore, MD

**Background:** Linking educational objectives to clinical learning during clerkships can be difficult. Clinical shifts during EM clerkships provide a wide variety of experiences, some of which may not be relevant to recommended learning objectives. Students can be directed to standardize their clinical experiences, and this improves performance on examinations. We propose a “flipped clerkship” model for aligning learning and clinical experiences.

**Educational Objectives:** Using a “flipped clerkship” model, to 1) direct and align students’ pre-shift learning with patient selection during clinical shifts, and thereby 2) improve knowledge of specific chief complaints.

**Curricular Design:** Students performing EM clerkships at two sites are divided into six study groups and directed to learn a pair of chief complaints by a “flipped clerkship” model and another pair by standard educational methods. The chief complaints include chest pain, dyspnea, altered mental status, and abdominal pain. For the two chief complaints they are assigned as “flipped clerkship” topics, students are instructed to perform an educational module prior to a given shift and then to preferentially evaluate patients with that chief complaint. They are directed to perform the other two topic modules at their leisure during the clerkship and not to use specific chief complaint preference when choosing patients on other shifts. At the end of the clerkship, a 40-question multiple-choice exam with 10 questions per chief complaint is administered. A survey is sent regarding the effectiveness of the curriculum.

**Impact/Effectiveness:** Twenty-one students from both sites have completed the protocol to date. When compared to traditional learning, the flipped model is well received by students, rated as 3.55 on a scale from 1-4 (1 = worse/poor, 4 = excellent/better), and the ability to focus patient evaluations is rated 2.44. Willingness of attending physicians to allow patient selection is rated 3.36/4. Exam data will be analyzed after one academic year (approximately 100 students.)

**49 Generation of “SMART” Learning Goals After Simulation to Promote the Completion of Educational Actions**
Richard Bounds,$^{1}$ Amish Aghera,$^{2}$ Colleen Bush$^{3}$, Matthew Emery$^{2}$, Nestor Rodriguez$^{4}$, Brian Gillett$^{2}$, and Sally A. Santen$^{5}$

$^{1}$Christiana Care Health System, Newark, DE; $^{2}$Maimonides Medical Center, Brooklyn, NY; $^{3}$Michigan State University, East Lansing, MI; $^{4}$University of Wisconsin, Madison, WI; $^{5}$University of Michigan Health System, Ann Arbor, MI

**Background:** Structured debriefing following simulation guides learners to examine their cognitive processes and actions in a case to improve future performance. The generation of SMART learning goals (Specific, Measurable, Achievable, Realistic, and Time-bound) gives learners a powerful method for shifting the focus from instruction to the process of improvement, directed towards actual results and outcomes. Formally incorporating this process into standard simulation debriefing is not well described, although it is potentially a highly effective intervention.

**Objective:** Develop a process for learners to generate learning goals at the conclusion of structured debriefing after simulation to promote the completion of educational actions.

**Methods:** Following a simulated clinical scenario, faculty lead debriefing in four phases. First, learners openly review their actions, discussing what they did well and where they need improvement. Second, they reflect on the entire case while faculty provide critical feedback. Third, learners are asked to summarize key concepts to consolidate learning. Finally, faculty guide learners to individually develop and write SMART learning goals using the SMART framework. Following a 1-2 week period, the debriefers follow up with each learner to assess for the completion of learning goals.

**Conclusion:** The deliberate creation of learning goals after a simulation debrief enhances the value of the experience by stimulating greater action toward improvement. The SMART model provides a framework for learners who are unfamiliar with the generation of effective learning goals, and can be applied across all specialties and levels of training. Writing down one’s learning goals, and being held accountable by faculty, further enhances their impact. The addition of...
learning goals to structured debrief sessions requires minimal faculty resources while stimulating independent learning, and could potentially be applied to the clinical setting.

50 Teaching Value in Emergency Medicine: A Resident-based Educational Initiative
Michelle Lin¹ and Larissa Laskowski²
¹Brigham and Women’s Hospital, Boston, MA; ²New York University Medical Center, New York, NY

As emergency department (ED) visits increase and account for a growing share of hospital admissions, strategies to contain emergency medical costs are increasingly important. Studies have shown that high rates of blood testing, IV medications, and radiography contribute to increased length of stay and ED crowding, which can be associated with adverse outcomes. We implemented an educational intervention to incorporate evidence-based cost-conscious practices into residency training. We designed a 10-week supplemental lecture series to 1) instill residents with an evidence-based framework for making clinical decisions, and 2) reduce unnecessary testing when there is unlikely to be clinical benefit. An introductory module provided an overview of Bayesian decision analysis and the threshold model. Each subsequent lecture highlighted a commonly performed, often low-yield, diagnostic test such as chest x-ray, blood cultures, and urine toxicology screen. Lectures were 15 minutes each and case-based, comparing clinical scenarios of high, medium, and low pretest probability to guide decision-making. The curriculum is novel in its inclusion of actual cost and utilization data to educate residents on systems-based practice. Additionally, the initiative was completely resident-driven: the curriculum was designed by two senior residents, and lectures were delivered by residents of all PGY levels. Faculty advisor input helped address the variation in attending physician practice patterns perceived by residents as a barrier to implementation. An evaluation survey indicated that 92% of residents had improved their understanding of the costs of diagnostic testing, 100% had increased understanding of the risks and benefits of testing, and 72% indicated they had reduced unnecessary diagnostic testing as a result. Subsequent steps include analyzing post-intervention utilization data, expanding topics to additional tests and treatments, and disseminating the curriculum to other programs.

51 A Leadership Pipeline: An Innovative Fellowship for Medical Students
Tina Wu, Rahul Sharma, and Robert Femia
Bellevue Hospital, NYU, New York, NY

Introduction: Health care leadership has become increasingly complex. Traditional education fails to provide administrative and management skills necessary to lead in today’s health care environment. Physicians in training should be provided with broadly applicable skills and provides a means to identify those students who have an interest in additional formal leadership training.

Table 5.1. Wu et al.

Table 1: Healthcare Leadership Fellowship Curriculum

<table>
<thead>
<tr>
<th>Topic</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient Safety</td>
<td>What is Patient Safety?</td>
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<tr>
<td></td>
<td>Health Information Technology and Quality and Safety</td>
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<tr>
<td></td>
<td>Root Cause Analysis</td>
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<tr>
<td></td>
<td>Patient Handoffs and Provider Communication</td>
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<tr>
<td></td>
<td>National Patient Safety Goals, Joint Commission and CMS</td>
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<td></td>
<td>Using Safety and Quality Data to Drive Change</td>
</tr>
<tr>
<td>Clinical Practice</td>
<td>What is Quality?</td>
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<td></td>
<td>Ethics Committee Meeting</td>
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<td></td>
<td>Medical Malpractice and High Risk Emergency</td>
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<tr>
<td></td>
<td>How to Thrive in Clinical Rotations</td>
</tr>
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<td></td>
<td>Clinical Workshops (Saturating IV placement)</td>
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<tr>
<td>Administration</td>
<td>Economics of Healthcare</td>
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<tr>
<td></td>
<td>Healthcare Delivery Systems</td>
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<td></td>
<td>Value Based Purchasing and the Patient Experience</td>
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<td></td>
<td>Bundled Payments</td>
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<tr>
<td></td>
<td>Six Sigma and Lean Principles</td>
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<tr>
<td>Leadership and Professional</td>
<td>Leading in Times of Crisis</td>
</tr>
<tr>
<td>Development</td>
<td>How to Lead Effectively</td>
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<td></td>
<td>Leadership Communication</td>
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<tr>
<td></td>
<td>How to Maintain Effective Relationships</td>
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<tr>
<td>Advocacy</td>
<td>Change Management</td>
</tr>
<tr>
<td></td>
<td>Achieving excellence through diversity</td>
</tr>
<tr>
<td></td>
<td>Conflict Management</td>
</tr>
<tr>
<td>Scholarly Project</td>
<td>Fellow 1: Women Leaders in Medicine</td>
</tr>
<tr>
<td></td>
<td>Fellow 2: Order to Administration</td>
</tr>
<tr>
<td></td>
<td>Pharmacy Review</td>
</tr>
<tr>
<td></td>
<td>NYULMC Urgent Care &amp; In-patient Pediatric Antibiotics</td>
</tr>
</tbody>
</table>

Table 51. Wu et al.

52 Teaching Leadership and Communication Competencies Using an Austere Medicine Setting
Thomas D. Kirsch, Michael Millin, and Susan Peterson
Johns Hopkins University, Baltimore, MD

Leadership, communication, decision-making, and teamwork are critical to the practice of emergency medicine but not formally taught in many settings. We use the ‘Leadership Development Model’, developed by the Department of Defense (Mumford 1993), as the intellectual framework for the training, and an austere/wilderness setting to enhance cognitive attributes and teach decision and leadership competencies. The course is primarily scenario- and simulation-based, with preliminary background didactic sessions focusing on clinical knowledge and leadership skills. Courses are small (≤24 medical students), with teams of 4-5 individuals collaborating throughout the 2-week period. Increasingly complex critical resuscitation scenarios focusing on the assessment and management of the ABCDs provide the hierarchical approach to patient care. As students progress, increasingly complex environments are used and external injects are added to stress team relationships and leadership skills. Reflecting the ABCD approach teams are managed hierarchically and all team members rotate through the leadership and other roles. Nonmedical skills unique to austere settings are used for team building and creative decision-making. The final scenario involves multiple incidents with multiple patients/victims. Immediate standardized feedback is provided after each scenario by instructors on medical knowledge/interventions as well as leadership, communication, and teamwork skills. Additional written peer feedback is provided on the same competencies. Because of the focus on non-traditional, but critical skills the course has been the highest rated in the School of Medicine for the past 5 years.
Emergency departments (EDs) are systems of great complexity; subtle changes to one aspect of throughput may have far-reaching unforeseen consequences. Lectures and apprenticeship may fail to impart certain insights and administrative skills needed to effectively manage an ED. We propose a simulator in which doctors and administrators can experience all the complexities of managing patient flow in a high-yield learning environment. The ED Simulator is a tool run on software called Vensim that uses principles of system dynamics, a framework for studying the behavior of complex systems, to teach management of patient flow in an ED. In the ED Simulator, participants are put in charge of managing an ED. Patients, orders, turnaround times, and dispositions are randomly generated but modeled from actual, de-identified ED visits. As patients flow through the system, participants make operational decisions, and then track the effects of these decisions at each stage of the ED. As in real life, the goal is to minimize delays while meeting the demands of patients. Participants receive feedback in the form of points from their operational decisions, such as changing staffing levels, changing the number of beds, or adding speedier bedside tests. This point system informs participants about any unintentional consequences of their actions, e.g., delays in care, changes to patient or provider satisfaction, or changes in bottlenecks. The software system used to generate these outcomes is based on real ED throughput data and uses nonlinear algorithms to model the operational decisions made. Using a simulator designed to illustrate the complex dynamics of an ED, participants will visualize the many different factors affecting throughput, and thus make better operational decisions that can lead to overall improved ED management and eventually patient care.
medical librarian to learn effective quality improvement literature-searching strategies for their PICO-derived questions involving topics such as transitions of care, communication, and professionalism. Residents present their projects to their peers along with their recommendations for physician, patient, and system-related interventions and complete a reflection form. This curriculum is being adapted as a mentored research project for EM residents. 2012-13 KSA improved overall and ACGME and AHRQ HSOPC survey results documented 100% compliance with required resident quality improvement training. Two projects were presented at a department-wide interdisciplinary M&M, and one resulted in the targeted implementation of a bedside labeler to prevent ICU blood specimen mix-ups. RCA-based quality improvement and patient safety training for residents is feasible and sustainable and can result in system changes.