2023 ACS Surgical Simulation Summit

MARCH 2-4, 2023 / CHICAGO, IL

ACS Education

American College of Surgeons

Innovations in Simulation-Based Education: Simulation Summit "Shark Tank" Session
Thursday, March 2, 1:30-3:00pm Central

Moderator

Mark Aeder MD, MS, FACS, FAST, Professor of Surgery, Transplant and Hepatobiliary Surgery, Director, Surgical Quality UHCMC, Director of Transplant Quality UHTI, University, Hospitals Cleveland Medical Center, CWRU, Cleveland, Ohio

Video-Recorded Observed Structured Clinical Examination (VOSCE) for Evaluation of Informed Consent

Rui-Min Mao, MD, Alexandra M. Teoh, BS, Maverick Hunter Johnson, BS, Jennifer Moffett, MD, MS and Sarah Samreen, MD

The University of Texas Medical Branch, Galveston, Texas

Introduction: From the start of training, surgery residents are expected to properly obtain informed consent from patients. This is an important skill that carries significant medical, ethical, and legal implications, but there is rarely a formal curriculum or training process. Previous literature suggests that residents may not be adequately prepared based on written assessments, but there have not yet been evaluations carried out through simulation. Our study seeks to evaluate whether residents at our institution are able to properly obtain informed consent through simulation, video monitoring, and a standardized objective assessment.

Methods: General surgery residents participated in two clinical scenarios of obtaining a surgical consent from a standardized patient (SP), and their performance was video recorded. Performance was assessed using a standardized checklist and scored from zero to 100. The SPs also provided a rating of the resident's interpersonal skills from zero to five. Results were compared using Mann-Whitney U tests and analysis of variance (ANOVA).

Results: Eight general surgery residents of varying postgraduate year (PGY) levels were evaluated. There was no significant difference between junior (PGY1-2) and senior (PGY4-5) residents in checklist scores (89.0 vs 88.9, p=0.99) and SP rating (4.0 vs 4.5, p=0.48). When analyzed by PGY level, the interns received lower scores on the checklist and SP evaluation compared to the other trainees, but this difference did not reach statistical significance (Table).

Conclusion: Residents of all training levels were able to properly obtain consent at our institution based on a standardized assessment and SP feedback. Although this skill is not taught through formal courses or didactics, clinical experience and observation of senior personnel may be sufficient in learning.

Table 1.

Mean scores obtained from performance checklist and standardized patient rating		
Level of Training	Performance Checklist	Standardized Patient Rating
PGY-1	86.61	3.75
PGY-2	91.43	4.25
PGY-4	90.24	4.5
PGY-5	88.57	4.5

Mentorship for Surgical Interns to Improve Laparoscopic Skills

Alexandra Johns, MD, MPH, Samy Ramadan, MD, Alyssa R. Bellini, Minna M. Wieck and Shushmita M. Ahmed, MD

University of California-Davis, Sacramento, California

Introduction: Current laparoscopic skills curricula do not adequately prepare general surgery residents to operate independently [1]. Passing the Fundamentals of Laparoscopic Skills (FLS) exam is a graduation requirement, but residents are often tasked to learn/practice technical skills independently. Studies show mentorship/coaching improves technical skills of trainees [3-6]. However, there is limited literature on the impact of mentorship on both skills acquisition and confidence levels for junior learners. Thus, this randomized study aims to assess the differences in time to proficiency and confidence between mentored and non mentored residents.

Methods: Surgical interns are randomized into two groups: mentorship vs control arms. All participants will complete an introduction session demonstrating circle cut and intracorporeal knot tying. A pre-study survey and skills test will document baseline skill and confidence levels. Both groups will complete 3 practice simulation sessions (control arm independently, mentorship arm with faculty mentor) with skills test and post-practice survey following each practice session. All skills tests will be video recorded (and labeled with identification number) for scoring by blinded faculty graders using the Objective Structured Assessment of Technical Skill system. Analysis will compare overall improvement in skills, speed of improvement, and participant confidence level.

Results: We anticipate residents with assigned mentors will acquire proficiency at a quicker rate and have higher confidence in these skills.

Conclusion: This study will hopefully clarify whether faculty mentorship leads to improved FLS scores, quicker acquisition of skills, improved confidence amongst participants, and whether surgical interns are satisfied with mentorship in this capacity. These results should be used to advocate for improved mentorship in skills education.

Development and Implementation of a Learners Assessment at a Pediatric Trauma Center

Laquanda T. Knowlin, MD, Christina Lai, Todd Chang, Ryan Spurrier and Juan Pelayo, MD, FACS

Children's Hospital of Los Angeles, Los Angeles, California

Introduction: Pediatric trauma is the leading cause of morbidity and mortality in the United States. Teamwork and communication are among several factors that may lead to several pitfalls during these high stress evaluations. We aim to develop a learners assessment questionnaire for trauma (LAQ-T) to measure team performance and communication in pediatric trauma using longitudinal interdisciplinary in-situ simulation.

Methods: We conducted an in-situ simulated scenario with interdisciplinary team at a regional Level I Pediatric Trauma Center. A moderate-fidelity pediatric simulator (HAL 5, Gaumard, U.S) was utilized as the patient. The scenario was completed in 10-15 minutes. At the conclusion, the LAQ-T and Trauma NOn-TECHnical Skills (T-NOTECHS), previously validated in simulation studies, were administered to participants. Standard debriefing was completed to get feedback from participants. Video review was performed within 48hrs by a trauma expert. Descriptive analysis was conducted to gather validity evidence of learners assessment as part of pediatric trauma curriculum.

Results: Data analysis after the first simulation showed that participants gave themselves higher ratings on the LAQ-T in comparison to expert evaluators in communication on T-NOTECHS (median 5 (IQR 4.75-5) vs median 4 (IQR 3.4-4.5). Other discrepancies were seen in PPE use and establishment of roles. Close loop communication rate achieved at 84% (46 feedback/55 sender).

Conclusion: We will initiate a bi-weekly simulation curriculum with progressive difficulty to create a challenge for participants to improve in teamwork to better pediatric trauma outcomes. The learners assessment will be revised by board-certified surgeons to ensure adequate overview of a typical trauma performance. Both the learners assessment and T-NOTECHS will be given to participants before the debriefing. Instructions on how to use both assessments will be provided. Video review will be conducted by two independent expert evaluators for % close loop communications a correlate to subjective communication assessment within the LAQ-T and T-NOTECHS.

A State-space Model for Laparoscopic Camera Control: Proposal for Real-time Measures for Anatomical Identification and Safety

Diana Wu, BS, Szymon Kasperek, BS and Adam Sonnenberg, PhD

Carle Illinois College of Medicine, Urbana, Illinois

Introduction: Improved detailed visualization of critical anatomy allow for more precise and safe steps as well as clearer clinical decision making. The current options for solid state camera imaging are equipped with high resolution and a range of angled scopes. Yet, 2D imaging has key limitations. Specifically, there remain difficulties in determining the amount of indirect force applied and identification of specific anatomy due to needing to improve camera skills or limited by incision or trocar locations. These difficulties may result in unintended injuries to organs and could worsen the fulcrum effect generated by the visualizing equipment. We propose such injuries can be minimized with a novel state space model combined with an organ recognition software to augment the laparoscopic camera experience in maximizing the impact and efficiency of each surgical move as well as to provide safety indications and real-time guidance.

Methods: Through applications of PID controls systems, appropriate force models, and Lagrangian mechanics, we demonstrate the mathematical process that translates 2D mapping into 3D analysis to predict consequent applied force between the laparoscopic instruments and anatomical structure. For the state space model, there are two critical spaces we define pertinent: the observable and the controllable space. The relationship between these two spaces lay the foundation to further calculations.

Results: We apply our state space model in conjunction with an organ-identifying software similar to the one used in laparoscopic cameras to demonstrate the state space model in action with indicators for the surgeon to halt or reassess near major vessels as well as implement surgical standardized guidelines for procedure and safety.

Conclusion: Such control system opens opportunities for enhanced use of the laparoscopic camera to support the training for future residents through real-time feedback on technique and incorporating current guidelines to improve patient outcome.

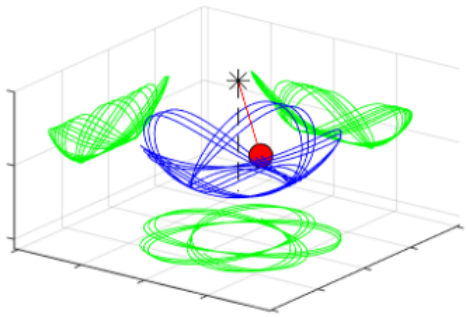


Figure 1: 3D model of observable and controllable space as defined by the state space model

Using long-term preservation fluid to improve brain simulation quality of cadavers embalmed by Thiel's method

Alexis Carmen Miranda, Jessica Taylor, Robert Becker and Thomas Kwasigroch

Eastern Tennessee State University, Johnson City, Tennessee

Introduction: Thiel's embalming method using surgical reality fluid enables cadavers to be used for surgical simulation. This method allows for maintenance of tissue plasticity and flexibility and is recognized as an alternative to standard embalming or fresh frozen cadavers. However, intracranial surgical training using cadavers with Thiel's method is limited due to the over softening of brain tissue. The goal of this study is to identify options to better preserve brain tissue to a consistency similar to living brain tissue while also maintaining the benefits of Thiel's embalming method for all other surgical simulations.

Methods: In this experimental study, cadavers received a 4-point system of intracranial injections of long-term preservation fluid (LTP). LTP is a formalin-based solution used for standard fixation of cadavers. Four sets of experimental subjects were used, with 2 cadavers in each experimental set. Set 1 had no intracranial injections of LTP. Set 2 had one round of 60 cc intracranial LTP injections. Set 3 had two rounds of 60 cc intracranial LTP injections 2 weeks apart. Finally, set 4 had three rounds of 60 cc intracranial LTP injections each 2 weeks apart. One method of evaluation was conducted by a neurosurgeon who performed ventricular catheter placement on all 8 cadavers and subsequently evaluated the realistic feel of the procedure by a series of standardized survey questions. A second evaluation was conducted by anatomists who performed gross anatomical examination post craniotomy.

Results: Comparison of the experimental models performed by a neurosurgeon and two anatomists indicate subjective results via survey scores that correlate with more realistic training utility and increased similarity to living brain tissue in the experiment cadavers with LTP injections.

Conclusion: We concluded that intracranial LTP injections improve brain simulation quality of cadavers embalmed by Thiel's method compared to no LTP injections.

Original Papers Session
Friday, March 3, 8:00-10:00am Central

Moderator
Tamara L. Owens, PhD, MEd, CHSE, Founding Director, Clinical Skills and Simulation Centers, Howard University Health Sciences Clinical Skills Center, Washington, DC

More is Not Better: A Scoping Review of Simulation in Transition To Residency Programs

Ananya Anand, MD, Rachel M. Jensen, MD and James R. Korndorffer, Jr., MD, FACS

Stanford University, Stanford, California

Introduction: Transition to residency (TTR) programs during the final year of medical school are increasingly prevalent, particularly due to perceptions that new interns are unprepared for residency. Non-clinical attributes (NCAs) such as self-improvement and organization are frequently cited as areas of weakness of surgical interns. TTR programs frequently use simulation to promote clinical skills but have limited emphasis on NCAs.

Methods: A scoping review was conducted to address: 1) How is simulation being used in TTR? 2) Do the simulation activities elicit any key NCAs (see Table 1)? Search terms including simulation and TTR were used to identify studies published after 2000 in PubMed, Scopus, and Embase. Studies were included that involved US-based TTR courses for graduating medical students that utilized simulation. Two authors (AA and RMJ) independently screened all abstracts and full text articles and identified NCAs elicited in each study's simulation activities. Disagreements were resolved through discussion and consensus.

Results: Database search identified 578 articles to screen. 63 full texts were selected and reviewed with 38 included in final analysis. Simulation activities were categorized as mock paging (37%, 14/38), case-based/clinical scenarios (73%, 28/38), and/or procedural skills (40%, 15/38). 95% of studies elicited at least one NCA (av. 3.3, SD 1.6, range 0-6). The most commonly elicited NCAs were communication skills, critical thinking, and teamwork (Table 1). Notably, utilization of more simulation did not increase the mean number of NCAs elicited (3.1 vs 3.6 vs 3.6, $p=0.7$).

Conclusion: Simulation is used broadly in TTR, but only captures a few of the NCAs required for a successful transition. This review found that incorporating more simulation does not translate to more NCAs elicited, illustrating the importance of utilizing more targeted simulation activities to promote NCAs effectively in future programs.

Table 1. Non-clinical attributes (NCAs) elicited through simulation activities in Transition to Residency (TTR) programs

Non-Clinical Attribute	Frequency Encountered
Communication Skills	82% (31/38)
Critical Thinking	79% (30/38)
Teamwork	71% (27/38)
Resilience	32% (12/38)
Organizational Skills	21% (8/38)
Emotional Intelligence	21% (8/38)
Self-Improvement	16% (6/38)
Intellectual Curiosity	5% (2/38)
Ethical Behavior	3% (1/38)
Vocational Commitment	0% (0/38)

What's the Word? Near Peer Teaching Feedback and Communication Style in Open Surgical Skills Kidney Transplant Simulation Model

Natalie Rodriguez, MD, MSc, Riley Brian, Fara Dayani, MD, Patricia O'Sullivan, EdD, Hueylan Chern, MD, FACS and Shareef M. Syed, MBChB, FACS

University of California-San Francisco, San Francisco, California

Introduction: Near peer teaching (NPT) in post-graduate surgical education is a well-documented method of bridging the gap in acquisition of complex procedural skills. NPT has the benefit of being collaborative, low stakes for the learner, and capitalizing on the senior peers' ability to translate recently acquired skills more accessibly to the junior compared to the expert instructor. Little is known about how near peers' style of feedback and communication in more complex surgical procedures differ from the experts. Simulating this dynamic in an open surgical skills kidney transplant exercise, we aimed to assess NPT feedback and communication to improve surgical resident teaching in the OR.

Methods: General surgery resident PGY2-PGY3 NPT pairs were asked to create end-to-side anastomoses of porcine kidney renal vessels in a 3D kidney transplant pelvis model. PGY2s received instruction from PGY3s, with transplant surgeon 'experts' circulating for additional assistance. Their conversations were recorded, transcribed, and grouped by speaker type. Transcripts were coded using conventional content analysis for emerging themes in key differences in communication.

Results: Five NPT pairs and five attendings/ transplant fellows participated. Preliminary analysis showed near peer teachers used more expressive, colloquial language, and provided more focused technical advice (setup, exposure, ergonomics, visual-spatial orientation, instrument control, tissue handling), whereas expert teachers used more directive language and provided more cognitive, theoretical guidance (specific maneuvers, case extrapolation, situational understanding, forward planning, learning optimization).

Conclusion: NPT is a valuable method of distilling complex procedural skills to the surgical trainee. Less is known about how NPT style of feedback and communication in more complex surgical procedures vary from that of experts. Analysis of NPT in a simulated kidney transplant model shows near peers were adept at providing focused technical advice, whereas expert teachers provided more cognitive, theoretical guidance. Both aspects are key as residents advance in surgical training.

An Analysis of YouTube as a Potential Training Resource for Laparoscopic Cholecystectomy

Armaun D. Rouhi, BA[1], Emily Kindall, MD[1], Jeffrey L. Roberson, MD[1], Abdourahmane Ndong, MD, MSc, MPH[2], William Yi, MD, MSEd, FACS[1], Noel Williams, MD[1] and Kristoffel Dumon, MD, FACS[1]

[1]University of Pennsylvania Perelman School of Medicine, Philadelphia, Pennsylvania and [2]Gaston Berger University, Saint-Louis, Senegal

Introduction: Laparoscopic cholecystectomy (LC) is the most common laparoscopic procedure performed in the US and a key component of general surgery training. Surgical trainees frequently access YouTube(r) for educational walkthroughs of surgical procedures. This study aims to evaluate the educational quality of YouTube(r) video walkthroughs on LC by using the LAParoscopic surgery Video Educational GuidelineS (LAP-VEGaS) video assessment tool.

Methods: YouTube(r) search was conducted using "laparoscopic cholecystectomy". Results were sorted by relevance and top 50 videos were gathered. Videos with patient education or concomitant procedures were excluded. Included videos were categorized as Physician (produced by individual physician), Academic (university/medical school), Commercial (surgical company), and Society (professional surgical society) and rated by two investigators using LAP-VEGaS video assessment tool (0-18). One-way ANOVA with Bonferroni correction was used to evaluate differences in LAP-VEGaS scores between video categories. Spearman's correlation test was performed to measure association between scores and video upload date, length, number of views and likes.

Results: 33 videos met selection criteria. The average LAP-VEGaS score was 7.95 ± 3.95 with a median of 7.00 (range 2-15). Inter-rater reliability was 0.86. Academic videos demonstrated a significantly higher mean LAP-VEGaS score than Commercial (10.69 ± 3.54 vs 5.25 ± 2.38, p=0.0330). A majority of academic videos failed to provide formal case presentation (63%), patient position (50%), intraoperative findings (50%), graphic aids (63%), and operative time (75%). A positive association was demonstrated between LAP-VEGaS scores and number of likes (r_s=0.60, p=0.0003), views (r_s=0.52, p=0.0019), and length (r_s=0.45, p=0.0091), but not upload date (r_s=-0.08, p=0.6801).

Conclusion: This is the first study to evaluate the quality of YouTube(r) video walkthroughs on LC using the LAP-VEGaS tool. Despite demonstrating higher LAP-VEGaS scores than other categories, video walkthroughs provided by academic institutions still lack several essential educational criteria for this procedure, highlighting areas of improvement for educators.

Comparison of GEARS with Objective Performance Indicators for Assessment of Skill During Robotic-Assisted Thoracic Surgery

Daniel S. Oh, MD, FACS[1], Marzieh Ershad[2], Jon O. Wee, MD, FACS[3], Manu Suraj Sancheti, MD, FACS[4], Desmond M. D'Souza[5], Luis Javier Herrera, MD[6], Lana Y. Schumacher, MD, FACS[7], Mallory Shields[2], Kristen Brown[2] and John Franklin Leopold Lazar[8]

[1]University of Southern California, Los Angeles, California, [2]Intuitive Inc, Sunnyvale, California, [3]Harvard Medical School, Brigham and Women's Hospital, Boston, Massachusetts, [4]Emory University, Atlanta, Georgia, [5]Ohio State University, Ohio, [6]Orlando Health, Orlando, Florida, [7]Harvard Medical School, Massachusetts General Hospital, Boston, Massachusetts and [8]Medstar / Georgetown, Washington DC

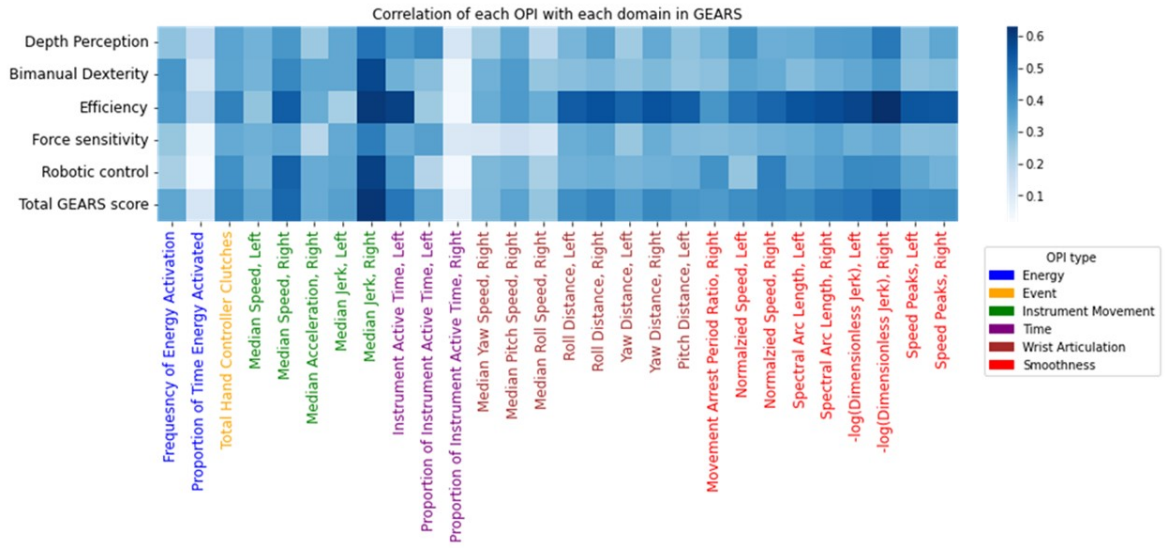
Introduction: Traditional assessment of surgeon performance utilizes expert observation and grading, commonly with the Global Evaluative Assessment of Robotic Skills (GEARS). Alternatively, a data recorder that captures video, event, and kinematic data from the robotic system can facilitate calculation of objective performance indicators (OPIs) to potentially reduce the observational and subjective aspect of skills assessment. The aim of this study was to compare OPIs with GEARS during robotic left upper lobectomy.

Methods: Thoracic surgery residents and attendings each performed robotic lobectomy using perfused advanced tissue models. Video, event, and kinematic data were recorded. Videos were annotated to identify the superior vein dissection and were graded independently by two blinded expert surgeons with GEARS. Separately, instrument activities and the console button/pedal presses of this task were analyzed to calculate OPIs for categories including energy use, event data, movement, smoothness, time, and wrist articulation.

Results: Video and data from 44 residents and 7 attendings were analyzed. At the aggregate level, there was a significant difference in GEARS scores between residents and attendings ($p<0.05$). However, at the individual level, there was poor inter-observer correlation in GEARS scores (defined as ≥20% difference in total scores by two raters) in 16/44 (36.4%) of residents and 3/7 (42.9%) of attendings. Several OPIs demonstrated differences between residents and attendings, and a correlation of these OPIs was made to GEARS (**Figure**). Only the efficiency score in GEARS had modest correlation to OPIs (average correlation coefficient 0.44). Of the OPIs, the right-hand median jerk, a derivative of acceleration, had the highest correlation to GEARS (average correlation coefficient 0.54).

Conclusion: There is poor agreement in the assessment of skill using GEARS in robotic lobectomy. OPIs may be a potentially more objective and granular approach to evaluating skill. Only the efficiency domain in GEARS had modest correlation to OPI skill assessment.

Figure 1.


Correlation of each OPI with each domain in GEARS
Depth Perception
Bimanual Dexterity
Efficiency
Force sensitivity
Robotic control
Total GEARS score
0.6
0.5
0.4
0.3
0.2
0.1
Frequesncy of Energy Activation
Proportion of Time Energy Activated
Total Hand Controller Clutches
Median Speed, Left
Median Speed, Right
Median Acceleration, Right
Median Jerk, Left
Median Jerk, Right
Instrument Active Time, Left
Proportion of Instrument Active Time, Left
Proportion of Instrument Active Time, Right
Median Yaw Speed, Right
Median Pitch Speed, Right
Median Roll Speed, Right
Roll Distance, Left
Roll Distance, Right
Yaw Distance, Left
Yaw Distance, Right
Pitch Distance, Left
Movement Arrest Period Ratio, Right
Normalzied Speed, Left
Normalzied Speed, Right
Spectral Arc Length, Left
Spectral Arc Length, Right
-log(Dimensionless Jerk), Left
-log(Dimensionless Jerk), Right
Speed Peaks, Left
Speed Peaks, Right
OPI type
Energy
Event
Instrument Movement
Time
Wrist Articulation
Smoothness

Relationship between Stress and Resident Non-Technical Skills during Interdisciplinary Trauma Simulations

Nicholas E. Anton, MS[1], Amelia T. Collings, MD[1], Dimitrios Athanasiadis, MD[1], Spyridon Giannopoulos, MD[1], Mohammad Kalantar, MD, MPH[1], Lauren Falvo, MD[2], Geoffrey Hays, MD[2], Eric Matthew Ritter, MD, FACS[1], and Dimitrios Stefanidis, MD, PhD, FACS, FASMBS[1]

[1]Indiana University, Indianapolis, Indiana and [2]Indiana University School of Medicine, Indianapolis, Indiana

Introduction: Non-technical skills (NTS), such as communication and situation awareness, are vital for patient care and effective surgical team performance. We have previously found that residents' perceived stress is associated with poorer NTS, however, few studies have investigated the relationship between objectively-assessed stress and NTS. Accordingly, the purpose of this study was to assess the relationship between objectively-assessed stress and NTS.

Methods: Emergency medicine and surgery residents voluntarily participated in this study. Residents were randomly assigned to trauma teams to manage critically ill patients. Acute stress was assessed objectively using a chest-strap heart rate monitor, which measured average heart rate (HR) and heart-rate variability (HRV). Participants also evaluated perceived stress and workload using the six-item version of the State-Trait Anxiety Inventory (STAI-6) and the Surgery Task Load Index (SURG-TLX). NTS were assessed by faculty raters using the non-technical skills scale for trauma (T-NOTECHS). Pearson's correlation coefficients were used to examine relationships between all variables.

Results: Fifty-two residents participated in this study. Average HR was negatively associated with T-NOTECHS cumulative scores, leadership, communication, and decision making (all $p<0.05$) (Table 1). Perceived stress was negatively associated with cooperation, and workload was negatively associated with T-NOTECHS cumulative scores and decision making ($p<0.05$).

Conclusion: Higher objectively-assessed and perceived stress and workload were associated with poorer NTS in general and nearly all NTS domains of the T-NOTECHS. Clearly, stress has a deleterious effect on residents' NTS during trauma situations, and given the importance of NTS on surgical care, educators should consider implementing mental skills training to reduce residents' stress and optimize NTS during trauma situations.

Table 1.

Correlations between Stress and NTS				
	Average HR	**HRV**	**STAI-6**	**SURG-TLX**
T-NOTECHS	**R=-0.31, p=0.03**	R=0.24, p=0.09	R=-0.18, p=0.2	**R=-0.28, p=0.047**
Leadership	**R=-0.3, p=0.03**	R=0.24, p=0.09	R=-0.22, p=0.12	R=-0.22, p=0.12
Cooperation	R=-0.18, p=0.21	R=0.21, p=0.13	**R=-0.28, p=0.048**	R=-0.27, p=0.052
Communication	**R=-0.32, p=0.02**	R=0.21, p=0.14	R=-0.05, p=0.7	R=-0.17, p=0.22
Decision Making	**R=-0.28, p=0.045**	R=0.23, p=0.1	R=-0.1, p=0.47	**R=-0.28, p=0.049**
Situation Awareness	R=-0.27, p=0.055	R=0.13, p=0.36	R=-0.08, p=0.59	R=-0.26,p=0.06

Interprofessional Education Papers Session
Saturday, March 4, 9:45-11:45am Central

Moderator
Susan Carter, MD, FACOG, FACS, Executive Director and Professor, Rocky Vista University Healthcare Simulation Centers, Parker, Colorado

Start-Of-Day Oculomotor Screening Demonstrates The Effects Of Fatigue And Rest Experienced During A Total Immersion Training Program

Peter Kufahl, PhD[1]., Scott Roberts[2], Taylor Norris[2], Rebecca J. Ryznar, PhD[2], Sagar Patel[2], Dean Paz[2], Kelly D. Gubler, DO, FACS[3], Greg Schwimer[1], Richard Besserman[1] and Anthony J. LaPorta, MD, FACS[2]

[1]Zxerex/Arizona State University, Phoenix, Arizona, [2]Rocky Vista University, Parker, Colorado and [3]Rocky Vista University, St. George, Utah

Introduction: We investigated sleep/fatigue and oculomotor metrics during total immersion training utilizing Fitbit monitoring of sleep and repeated oculomotor tests.

Methods: 42 military medical students participated in total immersion law enforcement training living as if deployed in mass casualty training for five days. Participants played patients, nurses, surgeons, or ER physicians as they gave treatment for simulated patients injured in scenarios. Forty participants underwent 3 min oculomotor tests at the beginning and end of each day utilizing Zxerex technology analyzing eye movement changes to characterize fatigue. Peak velocity/displacement was calculated for each microsaccade collected during the visual fixation tests and examined in a 2-way ANOVA of morning versus afternoon "B" sessions each day. Additionally, 24 subjects wore Fitbit devices throughout the event to assess sleep amount and quality.

Results: Fitbit data increased from Day 1 to Day 4 in minutes in REM (61-78), deep sleep (57-77), in bed (392-416) and less time in light sleep (225-217). The microsaccade peak velocity/displacement ratio exhibited a main effect of Day ($F_{3,14299}$=15.2, $p < 0.001$) and a Condition × Day interaction ($F_{3,14299}$=3.8, $p < 0.02$). Subsequent day-by-day t-tests found that this metric was significantly greater in the morning session on Day 1 ($p = 0.05$) but greater in the afternoon session on Day 4 ($p < 0.02$).

Conclusion: Decreasing microsaccadic peak velocity/displacement ratio has been shown previously to signal fatigue during demanding visual tasks. Our data demonstrate this decrease in the morning but not afternoon sessions, indicating repeating but temporary effects of accumulated fatigue. This study describes a new biomarker for fatigue that is measured in rapid and individually calibrated oculomotor tests. Measures of improved sleep could signal resilience to fatigue during afternoon testing. This could improve surgical and military training and improve the understanding of the relationship of training to sleep and fatigue.

Interprofessional Curriculum for Emergency Undocking in General Surgery Residency Robotic Training - Simulation Models and a Protocol

Mary H. Oh, MD, Haydee Del Calvo, MD, Benjamin Adan Benavides, Ray Chihara, MD, Min Kim, MD and Edward Y. H. Chan, MD, FACS

Houston Methodist Hospital, Houston, Texas

Introduction: General surgery residents are increasingly expected to be proficient in robotic surgery by graduation. Robotic surgery curricula have been incorporated into residency training to reflect this need; however, there is a dearth of literature describing emergency undocking training as a part of this curriculum. Bleeding during robotic surgery requiring emergency undocking is a high-stakes situation that requires coordination of the entire operating room (OR) team. It is important for surgeons to understand the emergency undocking protocol (EUP), communicate effectively with the team, manage the situation quickly, and be confident in their abilities to do so. This requires exposure, repetition, and practice, which should be taught in an interprofessional manner during residency to ensure optimal patient outcome.

Methods: We propose an interprofessional curriculum for teaching emergency undocking. The curriculum includes practicing effective communication, team-building exercises, and a simulated emergency bleeding scenario using various-fidelity simulation models to implement the EUP. This curriculum includes not only residents to simulate a skill that is not commonly encountered, but also incorporates the other OR team members including circulating nurses and scrub technologists.

Results: Preliminary data shows that 100% of residents and nurses implementing the EUP in simulated bleeding scenarios have increased knowledge and confidence in their abilities to manage a robotic bleeding emergency.

Conclusion: The ACGME requires general surgery residents to demonstrate competence in technical and non-technical skills sufficient to safely perform essential procedures. Management of situations requiring emergency undocking requires a set of skills that should be honed through exposure and practice just like other aspects of surgery. With the increase in robotic surgeries being performed, emergency undocking training is essential for patient safety and should be included in all robotic surgery curriculums.

Drive-thru Continuing Education to Meet Learners' Needs

Luke Simmons, MD and Brad Gable, MD

OhioHealth, Columbus, Ohio

Introduction: Continuing Education (CE) is a requirement for EMT/Paramedics to maintain certification in Ohio (Ohio, 4765-5-04). We developed a simulation-based model for CE to be provided in the ambulance bay with teaching from content experts (i.e. Physicians, Athletic Trainers). A pilot of this model was performed with concussion/sports trauma education in the ambulance bay of our Emergency Department (ED). To our knowledge, this model of education has not previously been described.

Methods: We utilized content experts from Sports Medicine (Physicians, Athletic Trainers) and Emergency Medicine to provide education in the ambulance bay for local paramedics. We labeled this as "Drive-thru CE" with the objectives to increase confidence in handling sports injuries (including concussion and cervical spine injuries) and safe removal of athletic equipment in spinal injuries. The content was delivered in 15-minute sessions with a didactic component and hands-on training for cervical spine injuries with athletic equipment in place. The participants completed evaluations of the curricula and educational model using a modified Likert scale.

Results: In total 60 paramedics completed the training and 59 completed surveys of the education (n=59). Results showed that 100% of participants were more confident in their ability to analyze protocols for injured athletes and to remove sports equipment. Additionally, 93% of participants intend to use what they learned from the CE. Importantly, 98% of participants felt that the environment was conducive to learning.

Conclusion: The model of Drive-thru CE was shown to be well-liked and accessible to paramedics. The participants were able to meet all learning objectives and felt this model was conducive to learning. Given the success of this pilot project we aim to continue this model of education and expand it to trauma training as well as surgical emergencies in several of our care sites.

Intro to 3D Printing for Clinicians: An Innovative Interprofessional Education Curriculum

Lisa M. Clemens, MS, PA-C, Kevin Pei, MD, FACS, John Lozo, Gavin Lehmann, Kayla Doran, Humza A. Shaikh and Ethan Bearman

Mirro Advanced Medical Simulation Lab, Fort Wayne, Indiana

Introduction: Additive manufacturing is an emerging application for patient education and surgical planning. To address a gap in clinician familiarity with the use of 3D printing technology, an interactive 3D printing for clinicians continuing medical education (CME) curriculum was developed.

Methods: A shark tank themed CME curriculum focusing on additive manufacturing for the clinician was developed using Kern's six-step model of curriculum design. The event featured an interactive group format with a short presentation by a 3D printing expert, clinical vignettes highlighting specific use cases, and physician testimonials. Participants were asked to complete pre-education surveys to gauge baseline understanding of 3D printing. Participants were split into multi-disciplinary groups and asked to brainstorm clinical problems which may benefit from 3D printing solutions. Next, groups pitched their final 3D printing solution to a group of sharks with experience using 3D printing technology. At the conclusion of the event, post-event surveys were completed. Analysis of the change in perceived knowledge of 3D printing for patient education and surgical planning was performed.

Results: A total of 7 participants completed pre- and post-education Likert scale surveys regarding their perceived knowledge about the use of 3D printing for patient education models and 3 participants completed pre- and post-education surveys regarding their perceived knowledge about the use of 3D printing for surgical planning. Clinician participants self-reported higher median knowledge of 3D printing for patient education and surgical planning after participation in the education, with statistically significant increases in knowledge of 3D printing for patient education after the training ($p=0.041$.)

Conclusion: This pilot 3D printing CME curriculum was found to be an effective method to increase clinician knowledge of 3D printing for patient education models. Knowledge application was able to be successfully integrated into the learning activity with minimum additional cost.

Use of Pediatric Trauma Simulations to Facilitate Resident Exposure to Pediatric Trauma Resuscitations

Elizabeth F. Horne, BS, Steven Thornton, Harold Leraas, Emily Greenwald and Elisabeth Tracy, MD, FACS

Duke University, Durham, North Carolina

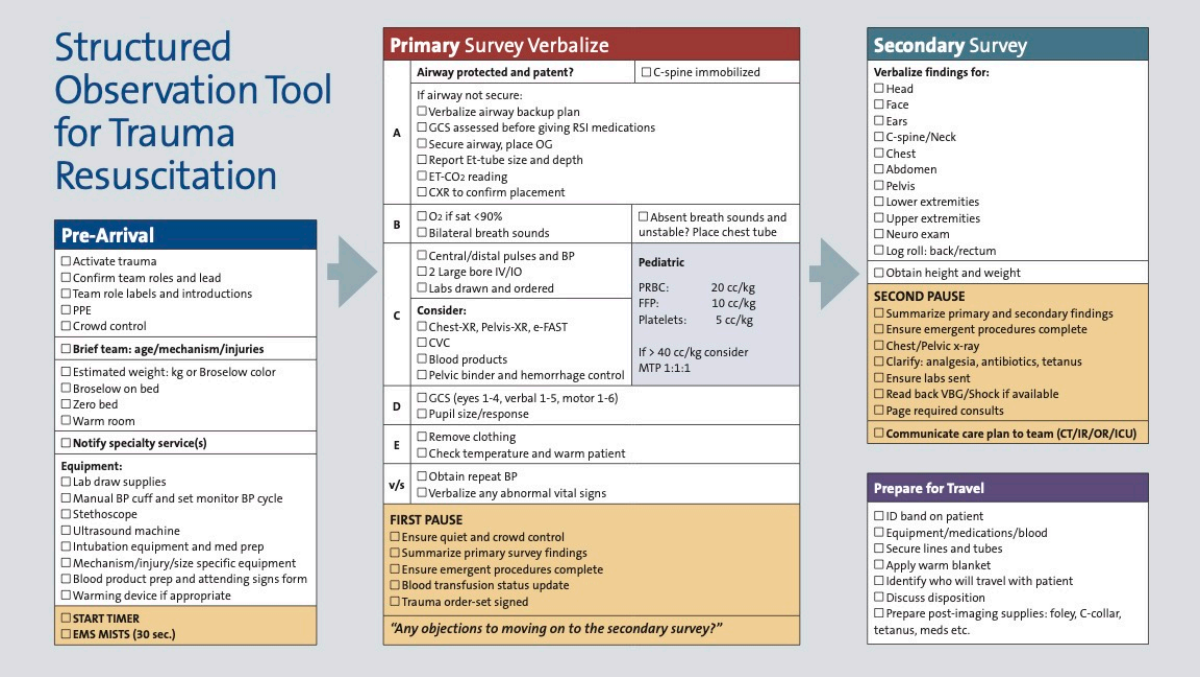
Introduction: Pediatric traumas are often high acuity, but low frequency events compared to adult traumas. While fundamental principles of trauma resuscitation are similar between adults and children, there are distinct differences in physiology, injury patterns, and clinical presentation. Though at least 40 non-operative resuscitations, and 20 pediatric surgeries are required by the ACGME, there is no minimum for pediatric traumas specifically, which contributes to relatively limited exposure of residents to these events.

Methods: To augment resident experience, we have developed a new pediatric trauma simulation curriculum through collaboration between the Pediatric Surgery and Pediatric Emergency Medicine departments. The curriculum involves monthly 1-hour sessions in the pediatric resuscitation bays during which, multi-disciplinary teams complete a level 1 pediatric trauma simulation. It is then formally debriefed with expert faculty and a trauma resuscitation checklist (Figure 1) is provided. The simulation is then repeated and assessed using completeness of the checklist to guide further debriefing and teaching.

Results: Thus far, 4 simulations have been conducted with up to 17 participants per simulation including surgical residents, emergency medicine residents, nursing staff, respiratory therapists, and students. Preliminary data indicates significant improvement in completeness in all aspects of the resuscitation checklist. For example, completeness of the primary survey improved from an average of 48.3% to 71.3% between simulations and improvement from 25% to 69% completeness of the second pause. Participants have expressed enthusiasm and anecdotal reports that skills acquired from the simulations have strengthened their patient care.

Conclusion: Early findings indicate that pediatric trauma simulations promote collaboration between multidisciplinary teams to further improve trainees' exposure and ability to respond to the complex and high acuity events of pediatric traumas. We plan to implement video review and pre and post surveys to further assess the impact of the curriculum on resident preparedness and experience with pediatric trauma.

Figure 1.


Structured Observation Tool for Trauma Resuscitation
Pre-Arrival
☐ Activate trauma
☐ Confirm team roles and lead
☐ Team role labels and introductions
☐ PPE
☐ Crowd control
☐ Brief team: age/mechanism/injuries
☐ Estimated weight: kg or Broselow color
☐ Broselow on bed
☐ Zero bed
☐ Warm room
☐ Notify specialty service(s)
Equipment:
☐ Lab draw supplies
☐ Manual BP cuff and set monitor BP cycle
☐ Stethoscope
☐ Ultrasound machine
☐ Intubation equipment and med prep
☐ Mechanism/injury/size specific equipment
☐ Blood product prep and attending signs form
☐ Warming device if appropriate
☐ START TIMER
☐ EMS MISTS (30 sec.)
Primary Survey Verbalize
Airway protected and patent?
☐ C-spine immobilized
A
If airway not secure:
☐ Verbalize airway backup plan
☐ GCS assessed before giving RSI medications
☐ Secure airway, place OG
☐ Report Et-tube size and depth
☐ ET-CO2 reading
☐ CXR to confirm placement
B
☐ O2 if sat <90%
☐ Bilateral breath sounds
☐ Absent breath sounds and unstable? Place chest tube
C
☐ Central/distal pulses and BP
☐ 2 Large bore IV/IO
☐ Labs drawn and ordered
Consider:
☐ Chest-XR, Pelvis-XR, e-FAST
☐ CVC
☐ Blood products
☐ Pelvic binder and hemorrhage control
Pediatric
PRBC: 20 cc/kg
FFP: 10 cc/kg
Platelets: 5 cc/kg
If > 40 cc/kg consider MTP 1:1:1
D
☐ GCS (eyes 1-4, verbal 1-5, motor 1-6)
☐ Pupil size/response
E
☐ Remove clothing
☐ Check temperature and warm patient
v/s
☐ Obtain repeat BP
☐ Verbalize any abnormal vital signs
FIRST PAUSE
☐ Ensure quiet and crowd control
☐ Summarize primary survey findings
☐ Ensure emergent procedures complete
☐ Blood transfusion status update
☐ Trauma order-set signed
"Any objections to moving on to the secondary survey?"
Secondary Survey
Verbalize findings for:
☐ Head
☐ Face
☐ Ears
☐ C-spine/Neck
☐ Chest
☐ Abdomen
☐ Pelvis
☐ Lower extremities
☐ Upper extremities
☐ Neuro exam
☐ Log roll: back/rectum
☐ Obtain height and weight
SECOND PAUSE
☐ Summarize primary and secondary findings
☐ Ensure emergent procedures complete
☐ Chest/Pelvic x-ray
☐ Clarify: analgesia, antibiotics, tetanus
☐ Ensure labs sent
☐ Read back VBG/Shock if available
☐ Page required consults
☐ Communicate care plan to team (CT/IR/OR/ICU)
Prepare for Travel
☐ ID band on patient
☐ Equipment/medications/blood
☐ Secure lines and tubes
☐ Apply warm blanket
☐ Identify who will travel with patient
☐ Discuss disposition
☐ Prepare post-imaging supplies: foley, C-collar, tetanus, meds etc.

Poster Rounds Session
Saturday, March 4, 8:30-9:30am Central

Moderators

Shannon DiMarco, MSHS, CHSOS, Doctoral Student, and Director, University of Wisconsin-Madison, Madison, Wisconsin

Angela L. Mitchell, MBA, Director, Houston Methodist Institute for Technology, Innovation and Education (MITIE), Houston, Texas

Homero Rivas, MD, MBA, FACS, FASMBS, DABOM, Professor of Surgery, Associate Dean of Innovation and the Future, Mohammed Bin Rashid University of Medicine and Health Sciences, Dubai, United Arab Emirates

Group A

Moderator – Angela L. Mitchell, MBA

GA1 - Poster of Distinction:

Use of Simulation for a Combined Residents as Educators and Mistreatment Workshop for General Surgery Residents

Rachel M. Jensen, MD, Ananya Anand, MD, Cara Liebert, MD, James R. Korndorffer, Jr., MD, FACS and Khoa Thomas Anh Pham, MD

Stanford University, Stanford, California

Introduction: Residents are expected to be good teachers and facilitate a positive learning environment without formal training. Additionally, medical student reports of mistreatment are high, particularly in surgery where students cite neglect, poor integration into teams, and inadequate teaching as common themes in their reporting. To address these issues, we implemented a simulation-based Residents as Educators (RAE) Workshop with a particular focus on mistreatment.

Methods: A total of 25 junior residents (PGY1-3) at a single institution participated in the RAE Workshop during protected education time. Participants worked through specific mistreatment reports to identify root cause and strategies for change. They also learned specific teaching strategies and then participated in simulated teaching sessions to reinforce content. Pre- and post-session surveys were used to assess resident perceptions of their role as educators and experiences with teaching. Paired t-tests were used for statistical analysis.

Results: Pre- and post-session survey results showed high acknowledgement of their impact on the learning environment, clerkship experience, and career choices for students (pre-survey average 4.62, 4.85, and 4.38 respectively on a 5-point Likert scale). In the pre-survey they reported relatively low perceptions of themselves as educators, comfort teaching, and use of specific teaching strategies (3.54, 3.46, and 3.31 respectively). Comfort level with teaching strategies improved significantly after simulated practice (3.31 to 4.38, p=.002).

Conclusion: This simulation-based RAE Workshop offers a practical approach to support residents in their roles as educators and to address high levels of mistreatment on the surgery clerkship. Simulated practice can equip residents with specific teaching strategies and concrete skills to engage medical students on their teams, thus improving the learning environment to decrease mistreatment. A future area of study could also consider the use of simulation to address specific mistreatment scenarios.

GA2

An affordable transperineal prostate biopsy model using gelatin ultrasound phantom

Nicholas Jonas, MD[1], Jonathan T. Xu, MD[2] and William C. Faust, MD[2]

[1]NewYork Presbyterian Queens, New York, New York and [2]Lahey Hospital & Medical Center, Burlington, Massachusetts

Introduction: Transperineal Prostate (TP) biopsy is a novel approach at sampling the prostate that avoids fecal contamination of the needle and therefore results in reduced infectious complications. The coordination of both hands as well as using ultrasound guidance results in a difficult learning curve and creates a need for a low-cost model for trainees to practice.

Methods: Different concentrations of gelatin and psyllium fiber were prepared and tested. Various low-cost mediums were examined for echoic properties with this gelatin-psyllium fiber formula and it was determined that several products could be reasonably used to create this model.

Results: This model was found to both look and feel very realistic compared to human tissue. The low cost of this model and relatively simple construction provide a reasonable solution for training learning urologists on this technique.

Conclusion: We created a relatively simple low-cost model that instructs trainees on dual hand coordination and ultrasound skills necessary to perform transperineal prostate biopsy. We will test the construct validity of this model at a urology skills lab in September of 2022.

Figure 1.


1
2
3
4
5
6
7
8
9
10
Directions
1. Container with marks identifying 11cm (base gelatin on which prostate sits) and 5cm (anterior most part of prostate). Bottom filled with silicon to reduce space.
2. Cover 14cm wooden dowel cling wrap.
3. Pour hyperechoic gelatin to 11cm mark covering bottom of dowel. Place in fridge for 3hrs.
4. Create hypoechoic "prostate" out of gelatin mold (mold made using Smooth-On Dragon Skin). Place in fridge for 3hrs.
5. Alternate "prostate" can be SPAM or whole canned beet. Will need to use hypoechoic gelatin mix for steps 3 and 9 if using.
6. Create beet cores using a straw and insert into drilled holes in "prostate". Pre-drill prostate and insert straw for urethra.
7. Completed "prostate" with beet targets and straw urethra.
8. Remove dowel from lid and keep in place. Place single toothpick in base layer of gelatin and place "prostate" through this and 2-4mm away from dowel.
9. Make hyperechoic gelatin mix, allow to completely cool before pouring, then fill to 1cm below top of container. Place in fridge for 3hrs.
10. Carefully remove dowel and cling wrap.

GA3

Collaborative Development of a Simulation-based Trauma Education Curriculum and Effect on Team Dynamics

Joshua A. Sznol, MD, MPH, Melissa Joseph, MD and Lucy Ruangvoravat, MD, FACS

Yale University, New Haven, Connecticut

Introduction: Simulation is an important and often underutilized educational tool used to train interdisciplinary teams in trauma management. Highly functional team communication is vital to an effective resuscitation. To improve training in team dynamics, a joint simulation curriculum was developed for residents in both Emergency Medicine (EM) and Surgery.

Methods: Several trauma simulations were created to represent commonly evaluated injury patterns. Residents underwent a monthly in-person and virtual simulations with structured debriefings. Utilizing the Trust in Teams scale, participants evaluated team dynamics before and after simulation. Responses were evaluated using paired t-tests.

Results: Data was collected from March 2021 through June 2022, representing 18 simulations. 24/65 (37%) of participants completed both surveys. Surgery residents report improvements in the domains of team benevolence (1/5), integrity (2/5), and predictability (1/5), but none in competence (0/5). Surgery residents felt that teams work to protect them ($\bar{x}$= .77, p=.01), teammates are fair ($\bar{x}$= .73, p=.01), teammates keep their promises ($\bar{x}$= .55, p=.05), and that teams stick to the plan in times of uncertainty ($\bar{x}$= .64, =.01) There were no significant changes among EM residents. Seniors reported increases in teams being consistent in their management plan during times of uncertainty ($\bar{x}$= 1, p=.01). Junior reported increased feelings of protection by teammates ($\bar{x}$= .5, p.01), teammates' motivation to protect them ($\bar{x}$= .38, p=.04), teammates honoring their word ($\bar{x}$= .21, p=.05) and keeping their promises ($\bar{x}$= .29, p=.02).

Conclusion: The development of a joint trauma simulation curriculum between departments represents an important opportunity to improve team dynamics and communication. Evaluation of team dynamics improved among Surgery residents after simulation. Further study of interdisciplinary simulation is warranted.

Table 1. Change in Trust In Teams Scale After Simulation and Education

	Overall		Surgery		Emergency Medicine		Senior		Junior	
Team Benevolence	Mean (Std Dev)	p-value	Mean (Std Dev)	p-value	Mean (Std Dev)	p-value	Mean (Std Dev)	p-value	Mean (Std Dev)	p-value
I believe that my teammates have my best interests in mind	-0.04 (0.77)	0.79	0.09 (0.7)	0.68	-0.2 (0.92)	0.51	0 (0.63)	1.00	-0.06 (0.83)	0.77
My team is motivated to protect me	0.37 (0.77)	0.03	0.55 (0.93)	0.08	0.25 (0.63)	0.24	0.33 (1.03)	0.47	0.38 (0.7)	0.04
I feel that my teammates work to protect me	0.54 (0.72)	0.00	0.77 (0.75)	0.01	0.4 (0.7)	0.10	0.67 (0.82)	0.10	0.5 (0.71)	0.01
My teammates watch my back	0.13 (1.01)	0.54	0.45 (0.82)	0.10	-0.2 (1.23)	0.62	0.67 (0.82)	0.10	-0.06 (1.03)	0.82
My teammates look out for me	0.11 (0.88)	0.56	0.09 (0.94)	0.76	0.15 (0.94)	0.63	0.17 (1.17)	0.74	0.09 (0.8)	0.65
Team Integrity	0 (0)		0 (0)		0 (0)		0 (0)		0 (0)	
I can depend on my teammates to be fair	0.3 (0.93)	0.13	0.73 (0.79)	0.01	-0.1 (0.99)	0.76	0.67 (0.82)	0.10	0.18 (0.95)	0.46
My teammates are honorable people	0.22 (0.74)	0.17	0.36 (0.67)	0.10	0.1 (0.88)	0.73	0.33 (0.52)	0.17	0.18 (0.81)	0.38
My teammates honor their word	0.24 (0.42)	0.01	0.27 (0.47)	0.08	0.25 (0.42)	0.10	0.33 (0.52)	0.17	0.21 (0.4)	0.05
My teammates keep their promises	0.35 (0.65)	0.02	0.55 (0.82)	0.05	0.1 (0.32)	0.34	0.5 (1.05)	0.30	0.29 (0.47)	0.02
My teammates tell the truth	0.3 (1.02)	0.17	0.45 (1.21)	0.24	0.2 (0.92)	0.51	0.33 (1.03)	0.47	0.29 (1.05)	0.26
Team Predictability	0 (0)		0 (0)		0 (0)		0 (0)		0 (0)	
I know what to expect from my team	0.52 (1.17)	0.04	0.15 (1.16)	0.69	0.5 (0.71)	0.50	0.92 (1.43)	0.18	0.38 (1.08)	0.16
I usually know how my teammates are going to react	0.04 (1.22)	0.87	-0.18 (1.47)	0.69	0.2 (1.03)	0.56	-0.33 (1.51)	0.61	0.18 (1.13)	0.53
In times of uncertainty, my team sticks to the plan	0.39 (0.78)	0.03	0.64 (0.67)	0.01	0.2 (0.92)	0.51	1 (0.63)	0.01	0.18 (0.73)	0.33
My teammates are reliable	0.26 (0.92)	0.19	0.36 (0.92)	0.22	0.2 (1.03)	0.56	0.5 (1.05)	0.30	0.18 (0.88)	0.42
My teammates behave consistently	0.2 (0.94)	0.33	0.14 (1.05)	0.68	0.3 (0.92)	0.34	0.08 (1.11)	0.86	0.24 (0.9)	0.30
Team Competence	0 (0)		0 (0)		0 (0)		0 (0)		0 (0)	
My teammates are capable at their jobs	0.04 (0.88)	0.81	0.27 (0.65)	0.19	-0.1 (1.1)	0.78	0.33 (0.82)	0.36	-0.06 (0.9)	0.79
My teammates know what they are doing	0.07 (0.77)	0.69	0.27 (0.65)	0.19	-0.15 (0.94)	0.63	0.33 (0.82)	0.36	-0.03 (0.76)	0.88
I have faith in the abilities of my teammates	0.13 (0.81)	0.45	0.27 (0.65)	0.19	0.1 (0.99)	0.76	0.5 (0.84)	0.20	0 (0.79)	1.00
My teammates are qualified to do their job	0.04 (0.88)	0.81	0.27 (0.9)	0.30	-0.2 (0.92)	0.51	0.33 (0.82)	0.36	-0.06 (0.9)	0.79
My team members communicate well	0.26 (1.06)	0.25	0.25 (1.03)	0.46	-0.5 (0.71)	0.50	0.5 (1.22)	0.36	0.18 (1.03)	0.49

GA4

Gender Specific Differences in Advanced Airway Trauma: Physiology Engines Can Fill the Gap

Austin Baird, PhD, David M. Hananel, BS and Robert M. Sweet, MD, FACS

The Division of Healthcare Simulation Science, Department of Surgery, School of Medicine, University of Washington, Seattle, Washington

Introduction: Gender plays a strong role healthcare simulation in multiple areas: communication, specific treatments, outcomes, anatomy, biases, and many others. Often female simulators and virtual patient avatars are only skin deep, not considering the vast physiological differences at play in between the genders. It is important that as healthcare simulation evolves, gender specific physiological differences are communicated and taught to prospective students in a variety of simulation experiences.

Methods: We leverage the Modular Healthcare Simulation Education System (MoHSES) to facilitate and connect advanced physiological models of airway trauma to a robotic manikin. These models consider gender when constructing the patients' initial state by allometrically scaling volumes, masses, and pressures. Although the physiological models do not consider the vast hormonal differences in gender and their relationship to trauma, they do show marked differences between the physiological state of the patient during the simulation.

Results: We show that for a complex airway trauma patient case, the physiological models that can interface with an advance robotic manikin provide marked differences between gender configurations and the initial patient data. This initialization may be configured by the user to be leveraged in a variety of learning modalities by interfacing with the MoHSES platform.

Conclusion: By being able to configure a unique patient using an advanced physiological model in a healthcare simulation setting, we can produce unique learning experiences that are centered around the gender of the patient. As these physiological models' progress, the distinct gender related trauma outcomes of patients seen in the clinic can be translated to advanced healthcare simulation settings. Gender plays a distinct role in trauma outcomes of patient and healthcare simulations must evolve to teach these differences as they may lead to dramatically different treatment considerations and educational experiences.

GA5

Rib Fixation Simulation is Beneficial for Surgical Residents

Kristen Reede, MD, Dustin Nowotny, DO, Steven E. Briggs and Mentor Ahmeti

University of North Dakota School of Medicine and Health Sciences, Grand Forks, North Dakota

Introduction: Rib fractures are encountered frequently trauma and are associated with substantial morbidity and mortality. Rib fixation procedures are performed more frequently as they have shown multiple advantages over the traditional non-operative management. Considering this paradigm shift in management of rib fractures, we implemented a cadaveric simulation curriculum for residents to improve their comfort, knowledge and ability to perform the procedure.

Methods: Postgraduate year (PGY) 3-5 residents attended rib fixation simulation course with cadavers. Trauma surgery faculty led the course. Simulation consisted of groups of residents reviewing anatomy and creating adequate exposure for the procedure. Each group created rib fractures in the cadaver, determined which materials were needed then performed the rib fixation procedure. Following the simulation, we surveyed the residents to determine the effectiveness of the structured cadaveric rib fixation-based course. Survey was performed using a four and five-level Likert questionnaire. Results were analyzed using paired t-tests.

Results: Of the 11 residents participating, 72% of residents performed five or less rib fixation procedures in their training. The simulation improved residents' comfort level with rib plating (2.5 versus 3.6), p-value: 0.0033. The greatest impact on comfort level was seen in the PGY-3 residents (2 versus 4), p-value 0.02. One hundred percent of residents found that having attendings present for the simulation was very helpful. The results demonstrated that most residents gained new knowledge of anatomy and technical dissection. Ten of out 11 residents strongly agreed that this simulation was beneficial to their surgical education in addition to real OR experience. Every resident recommended the simulation to younger resident classes.

Conclusion: Rib fixation simulations completed on cadavers are beneficial to surgical residents. The simulation increased residents' knowledge, comfort and ability to perform rib fixation procedures. Based on these findings, we will continue to incorporate these simulations into our program's curriculum.

GA6

Remote FLS instruction with a laptop, a video capture card, and a web camera

William Yi, MD, FACS, Armaun D. Rouhi, BA, Noel Williams, MD and Kristoffel Dumon, MD, FACS

University of Pennsylvania, Philadelphia, Pennsylvania

Introduction: The fundamentals of laparoscopic surgery (FLS) program has been utilized to teach and assess basic laparoscopic surgery skills for almost two decades. Although commonly delivered in person, advances in telecommunications now allow the program to be delivered remotely using a laptop computer. The objective of this study was to evaluate the feasibility of remotely teaching the technical skills component of FLS.

Methods: Twelve PGY-1 and PGY-2 residents without previous experience with the FLS curriculum were randomized into either the in-person control (n = 6) or remote experimental group (n = 6). Residents in both groups were assessed for time (seconds) on the five technical skills of FLS. Thereafter, the control group received in-person instruction on these skills while those in the experimental group received remote instruction. Both groups were then reassessed for time on the technical skills.

Results: All residents successfully completed the five technical skills at baseline and final assessment. Both groups improved their times on all five skills. However, no significant difference in improvement times for each of the skills was seen when comparing in-person to remote learners (peg transfer: 60.00 ± 39.60 vs 69.83 ± 40.69, p=0.3996, gauze cut: 98.33 ± 94.83 vs 159.17 ± 94.53, p=0.1955, endloop: 118.83 ± 126.33 vs 165.67 ± 99.10, p=0.1183, extracorporeal tying: 147.33 ± 119.44 vs 129.83 ± 30.66, p=0.7258, intracorporeal tying: 87.67 ± 45.79 vs 175.67 ± 141.26, p=0.2116).

Conclusion: Technological advancements allow FLS technical skills instruction to be done remotely with nothing more than a laptop computer. Our preliminary findings show that such instruction is equivalent to in-person instruction based on task completion time improvement. Remote technical skills instruction has the potential to free learners and instructors to learn and teach from home and offers the potential of delivering such instruction to low resource or remote settings.

GA7

Does Simulation-Based DDH Training Program Decrease Referral Rates to Orthopedics?

Saumya Gupta MS[1], Clifford Craig MD, FACS[2,3] Marie Skoczylas, MD[3] and Deborah Rooney, PhD[1]

[1]Michigan Medicine, Ann Arbor, Michigan, [2]Department of Orthopaedic Surgery, Pediatric Orthopaedics, C.S. Mott Children's Hospital, Ann Arbor, Michigan and [3]Von Voigtlander Women's Hospital, Ann Arbor, Michigan

Introduction: Unnecessary referrals for uncertain developmental hip dysplasia (DDH) diagnoses of newborns poses a challenge to Orthopedic practice with interventions required in only 4.0%-15.9% of referrals.[1-4] We developed the MiHip simulator and training program to improve residents' DDH examination skills. We extend earlier work [5-7] to test the curriculum's impact on trainees' knowledge, confidence, and clinical exam skills by measuring residents' a) diagnostic confidence, b) agreement with Pediatric faculty exam and later, c) alignment with Orthopedic faculty findings of referred newborns.

Methods: In 2021-2022 academic year, 59 residents participated in a simulation-based training program with pre-/post-training assessments of knowledge and confidence, using a non-randomized, stepped-wedge design. In the clinical setting, residents' and their attendings' examined and rated 1018 newborns (npre=701,npost=317) using 4-pont scale (see table for ratings). Resident-faculty diagnoses agreement was calculated as absolute change, and pre/post rating differences were compared using Wilcoxon rank sum test.

Results: Following training residents' DDH quiz scores improved,$p<.001$, and self-reported confidence increased,$p<.001$. In the clinical setting, following training residents' confidence toward diagnosing a DDH+ and DDH- newborns increased,$p<.001$ and percentage of residents agreeing with their faculty increased regardless of DDH diagnoses, although not significant,$p>.05$. Eighty-nine (8.7%) examined newborns raised some level of faculty concern. Chart review and diagnoses comparison with follow-up providers is pending.

Conclusion: Our results indicate training improved resident knowledge and confidence toward clinical DDH diagnoses. The MiHip simulator allows trainees to experience a DDH-postive hip prior to training, thus improving their confidence in the clinical setting. Evaluation of the program's impact on residents' diagnoses skills is pending chart review with follow-up Orthopaedic providers.

Table 1. Faculty diagnoses and resident percent rating agreement prior to and following training

Rating	Condition	Pre-training		Post-training	
		# Faculty Diagnosed	% Resident Agreement	# Faculty Diagnosed	% Resident Agreement
1	No noticeable abnormality	609	96.06%	271	100.00%
2	Abnormalities in LEFT hip	26	50.00%	17	70.59%
3	Abnormalities in RIGHT hip	11	45.45%	10	50.00%
4	Bilateral DDH positive	16	37.50%	6	50.00%

Group B

Moderator - Shannon DiMarco, MSHS, CHSOS, Doctoral Student

GB1 - Poster of Distinction:

The Impact of Implementation of a Robotic Surgery Curriculum and Gamification on Robotic Simulator Usage in a General Surgery Residency

Nicole Brooks, MD, Amy Y. Han, MD, Ajita S. Prabhu, MD and Clayton C. Petro, MD

Cleveland Clinic, Cleveland, Ohio

Introduction: Current literature is limited regarding longitudinal robotic simulator usage in general surgery residencies. We implemented a robotic surgery curriculum for junior and mid-level residents in the 2021-22 academic year, supplemented with a robotic skills tournament announced in December 2021 and completed in March 2022. This study aims to characterize longitudinal use of the robotic simulator, resident performance, and the effect of gamification.

Methods: Robotic simulator use and resident performance data from August 2021-July 2022 were extracted from the robotic skills simulator. Descriptive statistics were analyzed overall and in 4 month blocks before, during, and after the skills competition.

Results: Overall, 56 of 71 (79%) of residents used the robotic simulator, with 2856 attempts over 147 hours. There was high variability, with PGY1-3 residents utilizing the simulator more frequently and longer than PGY4-5 residents (Figure 1). PGY2 residents had the most usage, 100% active with 858 attempts over 47 hours. PGY5 residents had the least usage, 30% active with 258 attempts over 10 hours. PGY5 residents had an average score of 74 ± 35 compared to the overall mean of 62 ± 31. Usage of the simulator increased during the competition but then decreased (51 total hours before, 55 during, 40 after; 31 active users before, 36 during, 35 after). Change in use around the competition varied, increased in PGY3-5 residents and decreased in PGY1-2 residents. PGY3-4 residents had increased usage after the competition. Performance scores remained stable.

Conclusion: Introduction of a robotic surgery curriculum appeared to generate consistent usage of the robotic simulator by junior and mid-level residents, while gamification increased usage by more senior level residents. Strategies to optimize sustained involvement at all training levels, including longitudinal gamification, warrant further exploration.

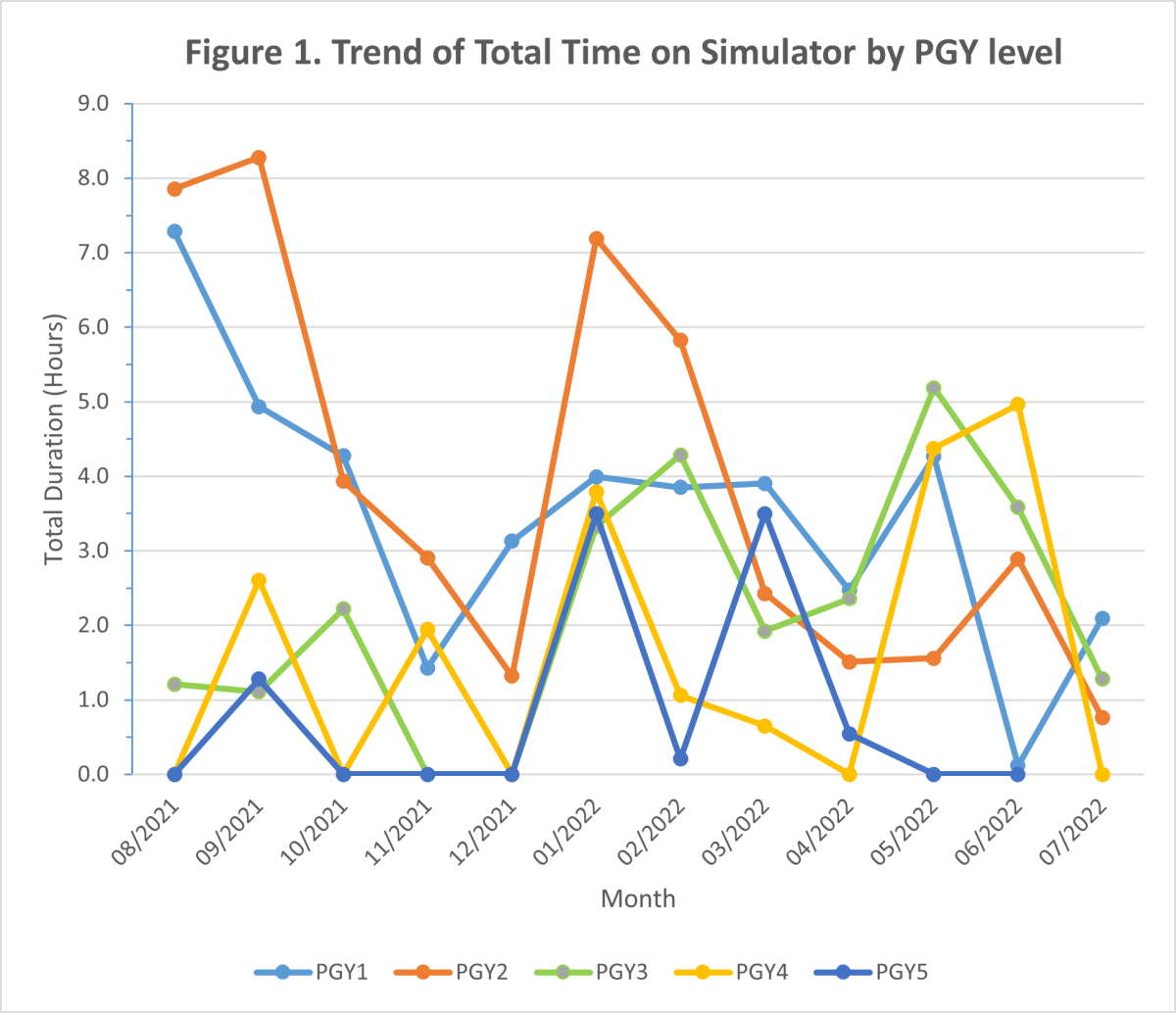


Figure 1. Trend of Total Time on Simulator by PGY level
Total Duration (Hours)
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
08/2021
09/2021
10/2021
11/2021
12/2021
01/2022
02/2022
03/2022
04/2022
05/2022
06/2022
07/2022
Month
PGY1
PGY2
PGY3
PGY4
PGY5

GB2

Correlation between perceived difficulty and laparoscopic procedural simulation performance

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Introduction: There may be several factors contributing to perceived difficulty of primary surgical tasks for new surgical interns (PGY-1). Hands on training and simulation experience during medical school may decrease the perceived difficulty of a task. Obtaining base line metrics through early simulation experiences may increase perceived difficulty. After the conclusion of a simulation assessment, PGY-1's self-reported higher perceived difficulty of two surgical tasks: suturing and open knot tying.

Methods: In summer 2022, PGY-1's completed the Surgical Olympics program at our institution. The results give learners and the Department of Surgery a baseline understanding of resident performance of surgical tasks. Tasks were completed on low-technology simulators and scored by surgical faculty calculating metrics on a scale of 1-10 (10 = highest possible score). Pre and post participation surveys were collected gauging pre-participation perceived difficulty of tasks. Survey questions on perceived difficulty were scored on a 5-point Likert scale (1=Not Difficult, 5=Very Difficult).

Results: 21 PGY-1's completed the Surgical Olympics. All participants completed the pre and post participation surveys. The suture task, learners scored an average of 8.375. The pre-participation survey question, "How difficult do you anticipate suturing?" the average scored was a 2.19. The post participation question, "How difficult did you perceive suturing?", the average score was 3.19. The open knot tying task, learners scored an average of 6.9. The pre-participation survey question, "How difficult do you anticipate open knot tying?" the average score was a 2.143. The post participation question, "How difficult did you perceive open knot tying?", the average score was 3.38.

Conclusion: Simulation experiences such as the Surgical Olympics can give PGY-1's an understanding of what they will see during residency. Considerations to scores and perceived difficulty can help both residents and faculty members gauge where more practice may be needed outside of the clinical setting.

GB3

Driving the Future of Experiential Learning - Collaborations and Technology

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Introduction: Atrium Health and Wake Forest University School of Medicine recently formed a strategic combination. This presentation will discuss the future anticipated intersection of healthcare, education, and technology especially when health system integration is involved.

Methods: This MORE track abstract is not a formal research study. During this presentation, participants will be able to: 1) Understand the integration process during a strategic collaboration that drives future thinking for experiential learning across a health system; 2) Identify futuristic experiential learning opportunities when considering the intersection of healthcare, education, and technology; 3) Discuss and practically apply information learned around to the intersection of healthcare, education, and technology to their own experiential learning journey.

Results: As we face changing headwinds in our healthcare systems and prepare for value based care focused on population health, our methods for educating future healthcare workers has to change. As healthcare systems are forging larger complex networks, stand-alone simulation centers are going to be asked to collaborate especially when networks form strategic partnerships or complete mergers and acquisitions. Amidst these changes, simulation centers are being challenged to offer responsive technology to enhance the practice of real-life medicine. We are at a crucial intersection where changes in healthcare, education, and technology are shaping the future and we must keep up to know how best to prepare our experiential learning centers to equip our future learners to best care for our patients.

Conclusion: This presentation will: 1) Share the current journey of two simulations centers who are forming a better together philosophy after the strategic combination of their two respective health care systems; 2) Discuss the intersection of healthcare, education, and technology in building simulation centers and the educational portfolios they support to reflect on futuristic experiential learning opportunities.

GB4

Using a Computer Vision Algorithm to Develop Objective Metrics for the Assessment of Surgical Skill Acquisition in PGY1 Surgical Residents

Ravi Nayak, BA[1,2], Orr Zohar, MS[3], Yilun Zhang, BA[2], Margaret Berrigan, MD[2], Brendin R. Beaulieu-Jones, MD[2], Sahaj Shah, BA[2], Jordan D. Bohnen, MD[2], Charles S. Parsons, MD[2] and Gabriel Brat, MD, FACS[2]

[1]Chicago Medical School at Rosalind Franklin University of Medicine and Science, North Chicago, Illinois, [2]Beth Israel Deaconess Medical Center, Boston, Massachusetts and [3]Stanford University, Stanford, California

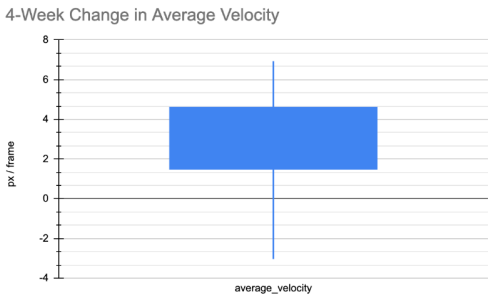
Introduction: Current methods of skill evaluation are subjective and rely on the time, effort and expertise of teaching surgeons. Our goal is to leverage a computer vision algorithm to develop and validate objective metrics of surgical skill in order to automatically evaluate trainee performance of a standardized simulated task over time.

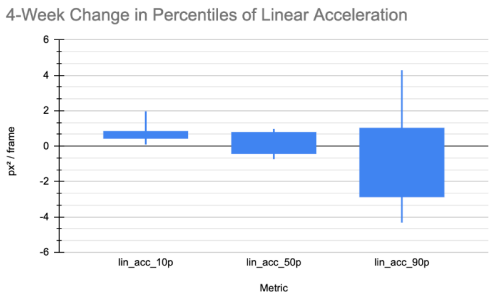
Methods: PGY1 surgical residents were recorded performing a standard task: three simple interrupted sutures with an instrument tie on a silicon skin incision model. Residents were filmed at weekly intervals for four consecutive weeks at the beginning of the academic year. Video data was analyzed using a computer vision algorithm to identify and track the center of the operators' hands. The algorithm extracted average velocity as well as the 10th, 50th, and 90th percentiles for linear acceleration, centripetal acceleration (a marker of direction change), and a "sliding deviation" defined as the standard deviation from the mean hand positions in continuous 11-frame bins. Videos were qualitatively inspected for detection accuracy; poor accuracy videos were excluded.

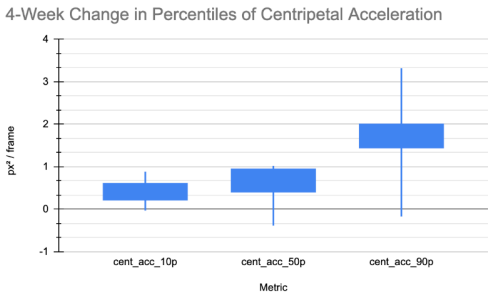
Results: Baseline data was recorded for 15 residents. Six residents performed the task for three or four consecutive weeks and were included in this analysis. Median change in average velocity between the first and last week was +3.55(IQR 1.51-4.56) px/frame. Median change in linear acceleration (50th percentile) was +0.03(-0.39-0.74) px^2/frame. Median change in centripetal acceleration (50th percentile) was 0.76(0.42-0.97) px^2/frame. Median change in "sliding deviation" (50th percentile) was 49.40(38.49-71.15)px.

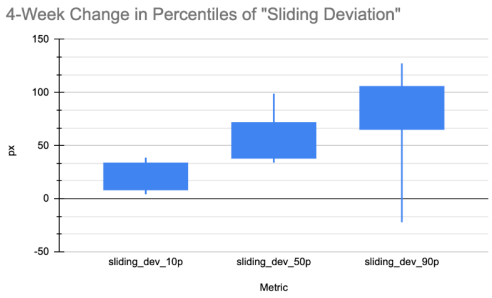
Conclusion: The computer vision algorithm can automatically track quantitative and objective metrics that may be associated with technical surgical skill. Further data collection is needed to verify the strength and direction of these trends as well as the association of metrics with skill acquisition.

Table 1.


4-Week Change in Average Velocity
px / frame
8
6
4
2
0
-2
-4
average_velocity


4-Week Change in Percentiles of Linear Acceleration
px² / frame
6
4
2
0
-2
-4
-6
lin_acc_10p
lin_acc_50p
lin_acc_90p
Metric


4-Week Change in Percentiles of Centripetal Acceleration
px² / frame
4
3
2
1
0
-1
cent_acc_10p
cent_acc_50p
cent_acc_90p
Metric


4-Week Change in Percentiles of "Sliding Deviation"
px
150
100
50
0
-50
sliding_dev_10p
sliding_dev_50p
sliding_dev_90p
Metric

GB5

Gaps Related to Pre-internship "Boot Camps": A Systematic Review of Pre-residency Skills Events

Joseph Crutcher, DHS and Vijay K. Mittal, MD, FACS

Simulation and Education Center/Van Elslander Surgical Innovation Center, Southfield, Michigan

Introduction: New resident and fellow “boot camps” have been discussed in previous literature for several decades. This review seeks to determine gaps in usage and measurement validation in the use of pre-internship skills education.

Methods: A systematic review using a keyword search of PubMed was conducted for the between January 1, 2001, and December 31, 2021, using only original, published research conducted in North America. Data were extracted to a form that tabulated specialty, skills taught, instructional methodology, course length, number of participants, demographics, study design, and the Medical Education Research Study Quality Index (MERSQI) scores to quantify relative quality of the research.

Results: The keyword search returned 464 articles. Twenty-five studies documenting 810 participants were included for analysis. A total of 12 specialties were represented: General Surgery (n = 7), orthopedic surgery (n = 4), pediatric cardiology (n = 3), internal medicine (n=2), Ob/Gyn (n =2), as well as a single study from pediatric anesthesiology, plastic surgery, pediatrics, anesthesia, emergency medicine, and otolaryngology. Mean MERSQI of the papers was 8.24 (SD=1.74). Single group cohort pretest-posttest or posttest only studies dominated study design (n =19). The remaining research utilized non-randomized two-group studies (n = 5) and a single randomized controlled trial. All studies measured satisfaction and attitudes, but only 11 examined knowledge/skills acquisition. No studies evaluated changes in practice or patient outcome resulting from training. Only 8 studies presented evidence of either content, internal or convergence or divergence validity.

Conclusion: There are gaps in usage, validity, and evidence of pre-internship boot camps. By targeting primarily the procedural specialties, researchers are omitting large numbers of residents who might be performing procedures on patients early in their residencies. Second, lack of validated measurement of attitudes and knowledge/skills acquisition ignores the purpose of these activities—to change practice and improve patient outcome.

GB6

It cost how much less?: Development of a Cloud-based Simulation Center Management Application

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Introduction: Repeated issues with its previous operating system necessitated the Simulation and Education Center | Van Elslander Surgical Innovation Center to purchase a replacement; however, the estimates for proprietary, "all-in-one" solutions were returned with setup cost ranging from $160,000.00 to $210,000.00 and yearly subscriptions fees ranging from $13,000.00 to $30,000.00/year.

Methods: A needs analysis was performed to determine and prioritize required features. The analysis returned ten items that were necessary for lab operations. See Table 1. Using these criteria, a scoring sheet was developed, and a search was conducted of event planning and database applications capable of meeting the need.

Results: During the last decade, several companies have developed relational databases that reside in the cloud, for example, Clickup®, Airtable®, Nifty®, and Spreadsheet.com®. Airtable® was selected for a trial calendar and attendance functions. The calendar and attendance features demonstrated success, and a one-year plan in four phases for adoption was implemented. • Phase I: Calendar and Attendance (July 1, 2021) • Phase II: Inventory (September 1, 2021) • Phase III: Financials (January 1, 2022) • Phase IV: Video Recording (December 1, 2022)

Conclusion: Airtable® has worked as an effective solution to management of the SEC | VESIC. Phases I-III have been fully implemented and Phase IV is in final testing. The primary outcome, a low barrier to entry, has been achieved. The cost per year have dropped from $16,960.00 using our previous system to $1440.00, and no setup or additional equipment fees were incurred. Moreover, the system has demonstrated its flexibility, and the SEC |VESIC has expanded the use of the system to the continuing medical education management and online course registration. Lastly, continuous reporting across disciplines, finance and procedures is being shared with interested parties through an API interface using Power Bi.

Table 1.

Results of the Needs Analysis
Low financial barrier to entry
Server resides outside hospital security
Event centric rather than class centric
Capable of tracking student progress, specimen usage, procedures
Simple data entry
Flexible enough to allow users to add features later
Not reliant on a single person for maintenance
Capable of financial record keeping including generation of estimates and invoices
Utilize current system components for recording video
Capable of generating live updates on SEC usage, attendance, finance, evaluations, etc.

GB7

Primary Survey of a Trauma Patient: A Simulation for Medical Students

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Introduction: The premise of Advanced Trauma Life Support (ATLS) is to evaluate, identify, and treat the greatest immediate threat of life in a trauma patient in a hospital setting. Initially, the primary survey provides guidelines to rapidly assess and treat life-threatening injuries. The main causes of death in trauma patients are airway obstruction, respiratory failure, hemorrhagic shock, and brain injury. The abbreviated steps are A (airway and C-spine control), B (breathing), C (circulation), D (disability), E (exposure/environment) which includes controlling external massive hemorrhage. The ATLS standardizes the evaluation and management of trauma patients in a timely and organized manner to facilitate improved patient outcomes.

The objective of this study was to evaluate a recently implemented innovative educational activity in the Surgery Skills Course for 3rd year medical students. This activity used a mannequin and task trainer to simulate a trauma patient. Students followed ATLS guidelines to perform a Primary Survey during the simulated event. Participating students filled out a questionnaire on Qualtrics about confidence levels regarding performing the Primary Survey before and after they experienced the scenario.

Methods: Learners received a lecture on ATLS prior to performance of the simulation which included the history, components of ATLS, and a trauma patient scenario. The learners completed a questionnaire before the simulation and after debriefing of the simulation. The questionnaire inquired about the confidence levels regarding treatment of life-threatening injuries in a trauma patient using the ATLS guidelines. The confidence level was measured on a 5-point Likert scale.

Results: 29 medical student participants started the research with 19 student participants finishing the post survey. Preliminary data suggests an improvement with overall comprehension when simulation was coupled with verbal presentation. Finalization of the results will end in December and data will be compiled at that time.

Conclusion: We are awaiting final data results.

Group C

Moderator – Homero Rivas, MD, MBA, FACS, FASMBS, DABOM

GC1 - Poster of Distinction:
Comparing Different Quantitative Approaches to Establish Virtual Reality Simulation Benchmarks for a New Surgical Robot

Mark Brentnall, MS[1], John P. Lenihan, MD[1], Anand Malpani, PhD[1], Antonio R. Gargiulo[2], Jeffrey Levy, MD[3] and Christopher Simmonds[1]

[1]Surgical Science North America, Seattle, Washington, [2]Center for Infertility and Reproductive Surgery, Brigham and Women's Hospital, Boston, Massachusetts and [3]CaseNetwork, Philadelphia, Pennsylvania

Introduction: Virtual reality (VR) simulators for robotic surgery are widely accepted as valuable and necessary tools for acquisition and maintenance of skills. Unique benchmarks should be established for each new surgical robot. In this paper, we analyze three methods for calculating "expert" benchmarks for VR training on a new surgical robot.

Methods: Nine surgeons from multiple specialties who are "superusers" of surgical robots were recruited over a three-month period. After a short familiarization curriculum, each surgeon was asked to perform all 49 skills exercises 5 times each on a VR simulator for the new surgical robot. The performance data, including summative metrics from 1915 sessions, were collected for establishing benchmark scores. The data was evaluated using three methods: (1) include all data, (2) exclude first repetition of each exercise per surgeon, and (3) exclude outliers. Outliers were identified using a box and whisker plot. For each method, the mean and standard deviations were calculated per metric per exercise, and the benchmark was set at a value of 1 standard deviation above/below the mean value.

Results: When all data was included (Method 1), about 40 data points were available for each metric for each exercise. Method 3 removed fewer overall data points than Method 2, but it also had a greater impact on calculating the benchmark values. Method 3 included, on average 38 data points per metric, and the benchmarks were 11% more difficult to pass compared to the benchmarks from Method 1. Method 2 included 32 data points and the benchmarks are approximately 2% easier to pass compared to Method 1.

Conclusion: The approach of establishing expert simulation benchmarks by excluding statistical outliers leads to stricter benchmarks compared to excluding the first repetitions. Future validation studies will determine the usability and effectiveness of these benchmark scores.

GC2

An International Collaboration to Develop Sustainable Simulation Models and Support a New Interprofessional Simulation Center

Abhishek Chandra, BS, Eesha A. Irfanullah, BBmE, BS, Rafat Solaiman, BA, Kumar Belani and James V. Harmon, Jr., MD, PhD

University of Minnesota, Minneapolis, Minnesota

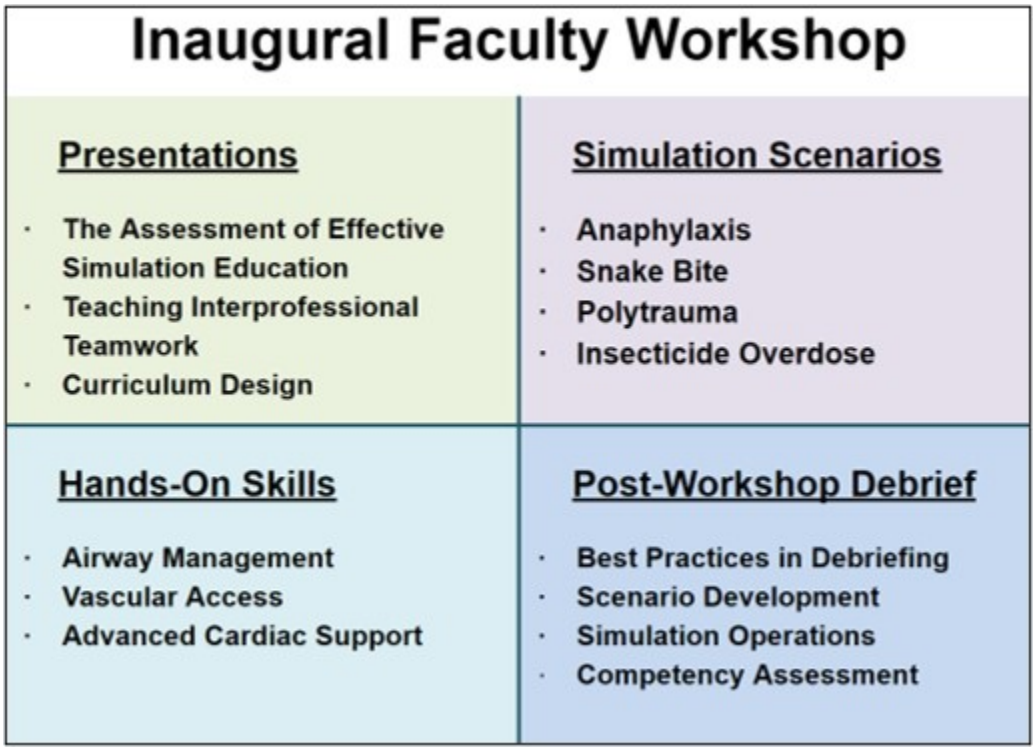
Introduction: We conducted a decade-long, multi-institutional, and international collaboration to advance simulation training. Our first aim was to develop low-cost simulation models at an academic medical center whose high clinical volumes limited the adoption of simulation training. Our second aim was to develop and support a new interdisciplinary simulation center.

Methods: Low-cost pericardiocentesis and thoracostomy simulation models were created using locally-sourced materials. Post-graduate learners who participated in a workshop using these models evaluated the educational value of the hands-on simulation. The local government allocated $3.9 million dollars to develop a new state-of-the-art interprofessional simulation center. Following construction, international simulation experts hosted a coaching workshop to teach new faculty best practices in simulation (Figure 1). On the first day, local educators served as “mock students” in simulated scenarios. On the last day, local educators conducted the same simulation instruction for local trainees. Local educators evaluated the value of the coaching workshop.

Results: The simulation models were constructed for less than $20 each. For the thoracostomy simulation, 109 post-graduate trainees participated and 95 completed an evaluation. The value of the sessions was ranked as “good” or “outstanding” by 64% of respondents. For the pericardiocentesis simulation, 97 trainees participated and 84 completed an evaluation. The value of the sessions was ranked as “good” or “outstanding” by 95% of respondents. 100% of educators at the coaching workshop reported that the training prepared them to teach similar clinical scenarios; over a third “strongly agreed” with this statement. 100% of the local faculty reported that the workshop helped them better appreciate interprofessional simulation practice; over a third “strongly agreed” with this statement.

Conclusion: International collaboration to expand simulation training yields high-value experiences for trainees across multiple disciplines. International interdisciplinary simulation workshops are scheduled for this year and a manuscript describing their impact is in preparation.

Table 1.


Inaugural Faculty Workshop
Presentations
The Assessment of Effective Simulation Education
Teaching Interprofessional Teamwork
Curriculum Design
Simulation Scenarios
Anaphylaxis
Snake Bite
Polytrauma
Insecticide Overdose
Hands-On Skills
Airway Management
Vascular Access
Advanced Cardiac Support
Post-Workshop Debrief
Best Practices in Debriefing
Scenario Development
Simulation Operations
Competency Assessment

GC3

Limited Laparoscopic Skills Exposure During Medical School Necessitates Early Residency Intervention

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University of Wisconsin-Madison, Madison, Wisconsin

Introduction: Medical schools have been creating new programs such as electives and bootcamps to better prepare their students for residency; surgery bootcamps are particularly popular to introduce students to the breadth of clinical and professional skills they will encounter in their first year of residency. One of the skills commonly introduced during bootcamp is laparoscopic skills. However, this is often the only time medical students get introduced to laparoscopic instruments, tasks, or camera driving.

Methods: During an annual simulation program for our 22 surgery interns, we surveyed interns' exposure to skills during medical school.

Results: The self-reported data showed that only 45% of residents had any exposure to laparoscopic skills (peg transfer, circle cut, laparoscopic suturing). Seven of those are general surgery categorical/preliminary, while the others were plastics, otolaryngology, and vascular. Of the 10 interns reporting exposure to laparoscopic skills during medical school, 8 disclosed less than 2 hours of exposure. The other 2 reported receiving 2-5 hours of exposure.

Conclusion: This is a clear gap in undergraduate medical education, as surgical residents are assigned to laparoscopic OR cases the first month of their residency. With no basic experience in laparoscopic skills, this puts first-year residents at a disadvantage and delays their learning of more advanced skills in the OR. To address this knowledge gap, we have implemented a competency test-out program for all interns who rotate through general surgery service. Each PGY1 is paired with a faculty member to sign off on their skills; only after obtaining faculty sign-off are they allowed to participate in laparoscopic OR cases. Such programs have been implemented in other programs across the country. The hope is that this program will ensure our residents are meeting benchmarks, improve their educational experience in the OR, and motivate interns to practice these critical laparoscopic skills.

GC4

Revamping and Enhancing our Simulation Fellowship Program

Lou Clark, PhD, MFA, Mojca Remskar, PhD, Eugene Floersch, MPH, Anne Woll and Melissa Elizabeth Brunsvold, MD, FACS

University of Minnesota, Minneapolis, Minnesota

Introduction: Our simulation team purposefully used the COVID pandemic as a time to pause and reevaluate our simulation fellowship program. This was critical in that the pandemic coincided with the merger of two simulation teams and three smaller facilities into one team and one larger facility. This new twenty-four thousand square foot facility includes two full scale ORs, and by combining staff, we now benefit from a longstanding human simulation/standardized patient (SP) program. Additionally, our combined staff affords us enhanced researcher expertise and resources including leadership development to support the simulation fellowship program.

Methods: We performed a program review identifying outcomes that included the accomplishments and challenges of previous simulation fellows in meeting the ACS criteria for successful fellowship completion. From this we gained a better understanding of the most effective aspects of our program and components that we could improve to enhance the fellows' ability to achieve program completion.

Results: Strengths of our program previously included educational expertise to provide teaching on curriculum building, program evaluation, and learner assessment; close proximity of institutes such as Medical Device Center to support innovation; and expert clinical faculty from surgical specialties, anesthesiology and emergency medicine to enrich fellows experience and research opportunities. Our team recognized numerous opportunities to enhance the program that include maximizing training opportunities in our new high fidelity OR facilities, adding a human simulation/standardized patient component, formalizing research mentorship with both qualitative as well as quantitative elements, developing a module called "Leadership and Human Resources/HR 101" to better educate physicians to integrate diversity, equity, and inclusion within their departments and institutions.

Conclusion: Our plan is to implement the revamped and enhanced simulation fellowship curriculum in July 2023 as we start the next fellow. We will study the curriculum through program evaluation and report on it to ACS.

GC5

Home practice for robotic surgery: A randomized controlled trial of a low-cost simulation model

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University of California-San Francisco, San Francisco, California

Introduction: Pre-operative simulated practice allows trainees to learn robotic surgery outside of the operating room without risking patient safety. While simulation practice has shown efficacy, simulators are expensive and frequently inaccessible. Cruff (2021) described a low-cost simulation model for learning hand movements utilized in robotic surgery. Our study evaluates whether practice with low-cost home simulation models can improve trainee performance on robotic surgery simulators.

Methods: Home simulation kits were adapted from those described by Cruff (2021). Hand controllers were modified to mimic the master tool manipulators (MTMs) on the da Vinci Skills Simulator (dVSS). Medical students completed two exercises, Sea Spikes 1 (SS1) and Big Dipper Needle Driving (BDND), on dVSS. They were subsequently assigned to either receive a home simulation kit with instructions for practice or to receive no kit. Students returned two weeks later and repeated the exercises. Overall SimNow score, economy of motion, time to completion, and penalty subtotal were evaluated, and an analysis of covariance (ANCOVA) was performed. Semi-structured interviews assessed student perceptions of the simulation kit.

Results: Twenty-nine medical students completed both simulator sessions. Within the experimental group, there was significant improvement in overall score, economy of motion, and time to completion for SS1 and BDND between the first and second dVSS trials. However, there was no significant relation between practice with the home simulation kit and improvement in overall SimNow score for SS1 and BDND. In interviews, students reported finding practice with the home kits useful in developing their familiarity and technical skills. However, they also noted that further refinement may be required to improve MTM replicability.

Conclusion: Low-cost home simulation models can be a useful tool to improve trainee comfort and technical skills on dVSS. Continuing studies are needed to assess the long-term impact of consistent practice on simulator performance.

Table 1. Scores for Baseline and Follow-Up SimNow Sessions

	Group Receiving Home Simulation Kits (n=15)			Control Group (n=14)		
	Average Score Session 1	Average Score Session 2	p-value	Average Score Session 1	Average Score Session 2	p-value
Sea Spikes 1						
Overall SimNow Score	37.67	67.93	**0.00046**	52.43	66.71	0.070
Economy of Motion (cm)	474.31	349.85	**0.0036**	386.16	341.26	0.057
Time to Completion (s)	284.13	185.93	**0.0033**	231.23	199.5	0.11
Penalty Subtotal	-21.13	-6.07	0.060	-10.36	-6.00	0.127
Big Dipper Needle Driving						
Overall SimNow Score	1.27	11.53	**0.016**	3.64	22.79	**0.0020**
Economy of Motion (cm)	889.01	696.21	**0.0020**	765.54	615.09	**0.0034**
Time to Completion (s)	792.89	610.59	**0.0011**	753.12	550.34	**0.00016**
Penalty Subtotal	-31.00	-25.60	0.075	-24.71	-16.07	**0.0024**

GC6

Turning Up the Volume: Evaluation of Decibel Levels as Measurement of Teamwork in Simulation-based Operating Room Team Training

John T. Paige, MD, FACS[1], Kathryn Kerdolff[1], Deborah D. Garbee, PhD[2], Qingzhao Yu[3] and Laura S. Bonanno, PhD[4]

[1]Department of Surgery, LSU Health New Orleans School of Medicine, [2]Office of the Dean, LSU Health New Orleans School of Nursing, [3]Department of Biostatistics, LSU Health New Orleans School of Public Health, [4]Nurse Anesthesia Program, LSU Health New Orleans School of Nursing, New Orleans, Louisiana

Introduction: High fidelity simulation-based inter-professional team training provides an opportunity to hone teamwork skills. The key to the success of HFS in this context is the reliable, effective, and efficient measurement of teamwork. To date, quantitative measures of teamwork skills in healthcare are still lacking. We investigated whether decibel levels during simulation-based training (SBT) could serve as such a measure.

Methods: Senior medical students, nurse anesthesia students, and senior undergraduate nursing students participated in the student operating room team training (SORTT) program at a health sciences center in the southeastern United States. Student teams participated in a dual scenario SBT session with immediate after-action debriefings following each scenario. During each scenario, two dosimeters, one placed near the head of the bed and one toward the foot of the bed, measured decibel levels. Additionally, trained observers evaluated teamwork for each scenario the Quick Teamwork Assessment Scales (Q-TAS), a 5-item instrument using a 6-point Likert-type scale (1=definitely no to 6=definitely yes) and having 3 subscales (team-based behaviors [TBB, 2 items], shared mental model [SMM, 1 item], and adaptive communication and response [ACR, 2 items]). Differences between mean dosimeter and Q-TAS item scores were analyzed between the two scenarios using paired t-test.

Results: Available data for analysis from 2020 sessions included 7 teams for Q-TAS evaluation and 8 teams for dosimeter measurements. Statistically significant increases in all Q-TAS subscale scores occurred from scenario 1 to scenario 2. A trend existed for increasing decibel levels from scenario 1 to scenario 2 for dosimeter values existed, but these increases were not statistically significant.

Conclusion: Measurement of decibel levels using dosimeters during SBT of inter-professional student teams is feasible. Although a trend existed related to increasing decibel levels from scenario 1 to scenario 2, they were not significant.

GC7

Adapted Chicken Model For Training Percutaneous Femoral Arterial Access

Julie Clanahan, MD, Gayan De Silva and John W. Ohman, MD, FACS

Washington University in St. Louis, St. Louis, Missouri

Introduction: Endovascular approaches within vascular surgery have grown substantially over the past two decades. As general surgery trainees gain exposure to these approaches, innovative simulation methods to train basic endovascular skills are needed. The purpose of this study was to pilot an existing low-cost model for percutaneous femoral arterial access and examine its effect on resident confidence and interest in these procedures.

Methods: A chicken breast model was adapted for ultrasound-guided femoral arterial access simulation using 5-French micropuncture kits. Rising post-graduate year 2-3 general surgery residents participated in training sessions and completed pre- and post-lab self-assessments using 4-point and 5-point Likert scales (1=very uncomfortable to 4=very comfortable, 1=not confident to 5=extremely confident). Vascular faculty provided didactic introductions for sessions. Paired t-tests and descriptive statistics were applied.

Results: Twenty-two residents participated in the simulation in May 2022. Mean resident confidence in overall ability to complete steps required for percutaneous femoral arterial access increased from 3.1+/-1.0 to 4.4+/-0.6 ($p<0.0001$). Most improved individual steps were identification of arterial cannulation site using ultrasound (mean difference +1.4 [95% CI: 1.0, 1.8], $p<0.0001$) and advancement of hemostatic sheaths (mean difference +1.5 [95% CI: 1.0, 1.9], $p<0.0001$). Residents also reported increased comfort level asking to participate in subsequent percutaneous access procedures (pre-mean 2.7+/-1.0, post 3.2+/-0.7, $p=0.0145$). On evaluations, the majority of residents strongly agreed that the model was realistic for training purposes and could be used for future skill assessments (Table 1).

Conclusion: General surgery trainees require opportunities for low-stakes, independent practice of basic endovascular skills, particularly those with applicability beyond strictly vascular surgery. In this study, use of a simple chicken model promoted increases in procedural confidence and was sufficiently realistic for further training with residents. In the future, this model will be incorporated into standardized assessments to ensure translation of simulation skills to live operative settings.

GC8

A Simulation Based Robotic Curriculum for General Surgery Residents

Aram Rojas, MD, Melissa Ramirez Barriga, Pierce Paterakos and Melissa E. Hogg

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Introduction: The widespread use of the robotic platform worldwide and its "new" incorporation in multiple surgical procedures (hernia, colorectal, HPB) makes the implementation of a standardized training method for residents necessary. The aim of this video is to show the feasibility of our curriculum in providing standardized training to ensure robotic surgical experience before utilizing the console in the OR.

Methods: Our two-week robotic rotation instituted by the University of Chicago general surgery residency program includes training based on VR simulations (using The *da Vinci® Skills Simulator* (DVSS), and SimNow®), inanimate drills, suturing, biotissue exercises, operating room (OR) observations, and mentored sessions. All the drills are recorded and resident's performance is graded using the Objective Structured Assessment Technical Skills (OSATS). This curriculum objective is to provide a standardized training for the new generation of surgeons.

Results: Here we show a PGY3 resident of our program performing all of the exercises included in our curriculum, including: docking practice, the pre and post test, inguinal and ventral hernia, biotissue exercises as interrupted hepaticojejunostomy, running hepaticojejunostomy, gastrojejunostomy and pancreaticojejunostomy (4 times each). Notably, the resident improves his robotics skills (OSATS scores) and time when comparing the 1st attempt with the 4th. When the resident concludes the curriculum and competency is demonstrated, the resident receives clearance to use the robot in the OR (with a supervising mentor) assuring patient safety.

Conclusion: In this presentation after the resident's completion of the curriculum, our resident performed a robotic cholecystectomy without any eventful complication, ultimately providing one example of the effectiveness of the curriculum.