

2D vs 3D Laparoscopy Training

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Introduction: Traditionally, laparoscopy is performed under 2D visual feedback. The introduction of stereoscopes, allowing either eye to look from a slightly different viewpoint, makes it possible to perform laparoscopy under 3D visual feedback. Although first reports are enthusiastic, hard data is lacking. We compared initial performance and performance development under both 2D and 3D conditions using a laparoscopic videobox trainer and an Oculus Rift virtual reality headset. Given the importance of stereo vision in psychomotor performance, we expected the 3D group to outperform the 2D group.

Method 60 fourth year medical Master students will participate in a four-session laparoscopic basic skills training course, to prepare for their surgical internships. They were randomized in a 2D group and a 3D group. Part of each session is a standard peg transfer exercise and a labyrinth exercise, in which students use a laparoscopic marker to trace a labyrinth. Outcome measures are duration and exercise-specific errors. All students train wearing the Oculus Rift virtual reality headset. To implement 2D and 3D visual feedback, two cameras are mounted side by side in the videobox trainer. In the 3D condition, the data of the left-hand camera are streamed to the left-eye Oculus Rift monitor, and similarly right-hand data to the right eye. In the 2D condition, both screens of the Oculus receive the videostream of the left-hand camera.

Results At the time of writing, 14 participants had completed the course, 7 in either group. T-tests were used to compare duration and error between groups, for each session. No difference between groups was found. Performance development was assessed using Repeated Measures ANOVAs. Performance significantly improved for all dependent variables, the only difference between groups was found for right-hand duration in the labyrinth exercise, where the 3D group outperformed the 2D group, $F(2,13) = 7.09$, $p < .005$.

Conclusion Preliminary, we conclude that 3D vision does not provide a benefit over 2D vision in laparoscopy. Based on our results of this experiment in progress, we would be interested to research 3D vs 2D under different laparoscopic viewing angles, taking spatial ability into account.

An Intensive Skills Course With Cadaver Improved Confidence of General Surgical Residents

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An intensive surgical skills course has the reported ability to accelerate the learning curve and improve performance. The Department of Surgery in the Faculty of Medicine at Prince of Songkla University had an intensive skills course that aimed to enhance surgical skills in open surgery for residents. Sixteen general surgery residents attended 12 procedure skill stations that performed on cadavers. The procedures included inguinal hernia repair, laparoscopic cholecystectomy, low anterior resection, right hemicolectomy, distal pancreatectomy, hilar dissection and right hepatectomy, esophagogastric junction dissection with gastrectomy, abdominal vascular exposure, thyroidectomy, carotid and subclavian vessels exposure, emergency department thoracotomy, and popliteal artery exposure. This research aimed to demonstrate the confidence of the residents before and after the course.

Methods: The residents were asked to complete an evaluation form on the confidence to do the procedures before the courses started and after the courses finished. The confidence was scored from 1 to 10. A comparison of scores on the confidence levels before and after the course was evaluated by t-test.

Results: Among the 16 residents, 13 residents responded to the evaluation form. The confidence of procedures statistically increased after the course. Both before and after the course, the residents had the lowest confidence in hilar dissection and right lobe hepatectomy (3.61 ± 1.82 vs 5.67 ± 2.09) and the highest confidence was in emergency department thoracotomy (5.62 ± 2.06 vs 8.31 ± 1.10). The results in other procedures are in Table 1.

Conclusion: An intensive surgical skills course in cadavers can enhance the residents' confidence in performing the procedures.

Procedure	Pre-course, mean (SD)	Post-course, mean (SD)	P value
Inguinal hernia repair	4.94 (2.26)	7.39(1.38)	<0.001
Laparoscopic cholecystectomy	5.33 (2.38)	7 (1.97)	<0.001
Low anterior resection	4.39 (1.88)	7.28 (1.64)	<0.001
Rt hemicolectomy	4.94 (2.36)	7.18 (1.38)	<0.001
Distal pancreatectomy	4.56 (1.91)	6.78 (1.06)	<0.001
Hilar dissection and Rt hepatectomy	3.61 (1.82)	5.67 (2.09)	<0.001
Gastrectomy and EG junction dissection	4.33 (2.11)	6.72 (1.90)	<0.001
Abdominal vascular exposure	4.33 (2.17)	6.89 (1.99)	<0.001
Thyroidectomy	4.63 (2.33)	7.62 (1.45)	<0.001
Carotid and Subclavian vessels exposure	5.08 (1.83)	8 (1.65)	<0.001
Emergency department thoracotomy	5.62 (2.06)	8.31 (1.10)	<0.001
Popliteal artery exposure	5.46 (1.66)	7.62 (1.44)	<0.001

Boot Camp Evaluation: Instrumental for First Year Success for Surgical Internship

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Importance: Changes in duty hour restrictions as well as medical education have demanded the need for more efficient and effective tools to educate residents. Many medical students have not developed the skills required to adequately care for surgical patients as they begin post-graduate training. We introduced a surgical intern boot camp focusing on clinical and technical skills that are required to provide patient care. We sought to assess the quality of the boot camp education by evaluating scores on multiple-choice tests of content knowledge, individual skill performance in areas of patient care, and confidence in performing tasks related to surgical care.

Methods: The boot camp was conducted over two days in July 2014. Pre and post multiple choice tests of knowledge were completed by the interns. The skills included instruction and simulated performances for CPR, BVM ventilation, use of an AED, I&D, suturing/knot tying, and placement of TLC with ultrasound, NGT/Dobhoff, Foley catheter, chest tube, and PIV. The faculty used a predefined evaluation tool to assess each skill. Interns rated their confidence on a 5-point Likert-type scale prior to boot camp and at 1 and 3 months after boot camp. Data were examined descriptively. Wilcoxon Signed Ranks Tests with a Bonferroni correction were used to compare the pre and post knowledge scores.

Results: Sixteen interns attended boot camp. Mean scores on the multiple choice tests improved pre to post. Scores were significantly higher pre to post for NGT/Dobhoff tube placement ($p=0.004$). Some multiple choice questions were consistently scored incorrectly on the pre and post-tests. Two interns required remediation for knot tying. Confidence ratings at 3 months indicated that interns were more confident in the majority of skills, however, 7 interns were not confident in all skills. Placing a TLC with ultrasound, placing a chest tube, and inserting an arterial line were particularly problematic.

Conclusions: Our boot camp increased intern knowledge and confidence in multiple clinical and technical skills. Further, we identified interns that needed remediation in some skills. Reassessment of confidence may be worthwhile as it may indicate skills that require further emphasis.

BREAST HISTORY AND PHYSICAL EXAMINATION CLINICAL SKILLS SIMULATION COURSE: A PILOT PROGRAM

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Introduction Teaching clinical skills via simulation as an adjunct to standard lecture has been proven to improve performance and comfort in the clinical setting. Standardized simulation courses have been integrated into medical education for scenarios as varied as advanced cardiac/trauma resuscitation and laparoscopic surgery. We designed a course incorporating lecture, video, and breast trainer simulation to teach a focused breast history and physical examination.

Methods As part of a preparatory course for 4th year medical students accepted into surgical training programs, a half-day session was conducted on performing a focused breast history and physical examination. Eight students participated and were evaluated with a 10-question test before and after the session, which included a lecture on conducting a breast history and physical examination, a video demonstrating the exam on a standardized patient and a hands-on experience with Tokyo® and Gaumard® breast palpation trainers. A comparison between mean pre- and post-test scores using Student's t-test was used to evaluate the course effectiveness. A value of ≤ 0.05 was considered statistically significant.

Results The average pre-test and post-test scores were 73% and 89%, respectively, with an average score improvement of 15% ($p=0.02$) (Table 1). Participant 1 was excluded because there was no pre-test score for comparison. Before the course, all participants report feeling uncomfortable or neutral in performing a breast history and physical exam. At the conclusion of the course, all reported feeling comfortable performing the same task.

Conclusion A standard curriculum incorporating lecture and simulation in the standard instruction of a focused breast history and physical exam can improve performance and comfort level in future clinicians. We hope to further validate the effectiveness of this course by testing it on a larger group of students. Table 1. Pre and Post-Test Scores # Pre-Post Change p-value Test Test Score Score 1 - 70% - 2 70% 100% 30% 3 70% 90% 20% 4 90% 90% 0 5 60% 100% 40% 6 60% 70% 10% 7 70% 80% 10% 8 90% 90% 0 Average 73% 89% 15% 0.02 Score

Can Faculty Development Improve Teaching in Surgery? The Pleasure of Finding Things Out.

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Background There is universal agreement in published articles examining surgical education that efforts to improve the teaching skills of surgical faculty through faculty development programs are desirable and important. An inclusive appraisal of the published literature in medical faculty development ("BEME #8" in 2006) demonstrated a lack of research into the effectiveness of faculty development programs in improving teaching skills. The primary goal of this research project is to analyze how the recommendations proposed in this review have been used to address the identified gap in subsequent study. Data Sources Publications obtained from literature searches on PubMed and Google Scholar using the search terms "effectiveness of faculty development to improve teaching" and "medical school faculty development teaching skills" were reviewed. An independent search was carried out by searching the journal databases of Academic Medicine, Medical Teacher, Teaching and Learning in Medicine, Journal of Surgical Education, and Harvard Business Review. Conclusions Since the BEME #8 review in 2006, the sheer volume of studies done based on the recommendations enumerated in that article is scant. Recommendations for research in this domain fall into 4 categories with two distinctly different perspectives. Obstacles to research are identified and specific activities are enumerated to overcome these obstacles using principles of biomimetic design (robustness, adaptability, distributed autonomy, and fractal scalability) and borrowing successful investigative approaches from other disciplines. These include formal mentoring programs, practice-based evidence, performance in complex environments, workplace learning, learning communities, communities of practice, human factors research, cognitive task analysis, collaborative and team learning, social learning platforms, diffusion of innovations, social network analysis, content marketing, viral marketing strategies, and implementation research. A diversity of approaches embracing complementary perspectives on goal definition, study design, implementation, and assessment are offered as solutions to expanding research into improving faculty teaching effectiveness.

Comparison of Written and Oral Evaluation Strategies From An African Trauma Course: How Effective Are Our Assessment Tools?

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Background: Trauma is one of the leading causes of death and disability worldwide, especially in low and middle-income countries. Sierra Leone is among the most medically resource-limited countries in the world; care is limited by both lack of resources and training. **Design:** Three-day trauma course held in 10/2012 at an urban teaching hospital in Sierra Leone, tailored to the resource-limited African setting. The course was led by US-trained surgeons, emergency physicians and family practitioners. Participants included physicians, anesthesia providers and physician extenders. The course consisted of lectures, small group teaching, tutorials (including X-ray review), and a hands-on animal and manikin skills lab (endotracheal intubation, chest tube placement, DPL and venous cutdown).

Methods: Pre- and post-course written tests were administered along with oral testing using standardized case scenarios where participants were tested on five subsets of trauma knowledge (airway, breathing, circulation, disability and exposure/environment). Separate, but similar, oral exams were scored with a 5-point Likert methodology and OSCE methodology. Paired t-tests were performed to compare pre- and post-test results. Pearson correlation was calculated between the different testing methods and between the oral evaluation subsets.

Results: Of the 50 participants, 38 completed the oral evaluations and 35 completed both the pre- and post-course written tests. Significant improvement in knowledge was demonstrated in comparing pretest ($45 \pm 17\%$) to post-test ($61 \pm 13\%$) scores, $p < 0.001$). The remaining subsets did not correlate. Additionally, post-test written competency was correlated to overall Likert ($r=0.52$, $p=0.001$) and OSCE ($r=0.48$, $p=0.003$) evaluations.

Conclusions: A brief trauma course, utilizing a variety of teaching modalities, significantly increased trauma knowledge. Written test scores correlated with oral evaluation scores in both methodologies. However, the lack of correlation in some of the oral evaluation subcategories demonstrated that the more detailed OSCE methodology might better highlight specific areas for further individualized education.

DEFINING SURGICAL CULTURE: AN ESSENTIAL ASPECT OF MEDICAL STUDENT ORIENTATION

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Background: Medical students beginning their third year surgical clerkship are often unfamiliar with surgical culture. Perceived tension or conflict between medical students and surgeons may reflect failure to recognize shared values. We developed a resident-driven lecture which defines and explains surgical culture and investigated its impact on medical student perceptions.

Methods: A new "Surgical Culture" lecture was incorporated into the third year medical student surgery clerkship orientation which utilized the framework of culture to explain commonly misunderstood characteristics of surgeons. Medical students were encouraged to approach the surgical rotation in the same manner they would approach a trip to a foreign country, with a focus on understanding cultural differences before passing judgment. Next, specific aspects of surgical culture were discussed, such as respect for the patient's trust, personal responsibility, hierarchy and placing the patient's needs above all else. For each cultural element, we discussed the underlying core values and specific situations in which the cultural value could be misinterpreted and create conflict. Medical students completed pre- and post-lecture surveys to assess their perceptions of surgical culture, consisting of 10 statements which were scored on Likert scale based on their level of agreement. Unpaired T-tests were used to compare the average scores.

Results: Sixty three medical students completed the surveys. After the lecture, scores were significantly difference on 7 of 10 survey items. Students rated their anxiety level as lower ($p=0.020$), felt more confident that they would be able to relate to surgeons ($p=0.002$), and feel part of the team ($p=0.032$) while having less concerns about malignant personalities ($p=0.002$). Additionally, they felt more prepared to start their rotation ($p=0.012$), understood expectations ($p= 0.000$) and knew their role on the team ($p=0.000$). The lecture did not alter how much they expected to enjoy the rotation, how much they looked forward to starting, or how concerned they were about abuse.

Conclusion: A lecture dedicated to surgical culture highlights shared values between surgeons and medical students, resulting in less anxiety and improved relationships. Further areas for study include the impact of surgical culture on learning environment and student performance.

Development of a highly realistic hernia simulator: implications for training and assessment of higher specialist surgical trainees.

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Summary Background Data: Simulation-based skills training is becoming increasingly important in the training pathway of surgical trainees. **Aims:** To develop a highly realistic and functional simulator for open indirect hernia repair. To validate the simulator within the scope of an integrated surgical skills programme.

Methods: An multidisciplinary, iterative approach was applied to develop the simulator in-house. Simulations-based skills training was delivered at a central site by consultant-level trainers to level 3 and 4 specialist surgical trainees. Validation forms and interviews were completed by senior trainees and consultant surgeons. Trainee performance was video recorded and rated based on procedure-specific structured objective criteria.

Results: In total, 106 trainees were trained and assessed on the hernia simulator by experts. Qualitative and quantitative feedback on face and content validity was satisfactory for simulator visual and haptic realism. Concurrent and construct validity results are in the process of being analysed.

Conclusions: Involvement of psychologists, educationalists, junior and senior clinical staff in the development of surgical simulators is key for visual and functional realism and for more effective simulation-based training.

Development of a Laboratory Based Training Curriculum for Microsurgery

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Introduction: The Halstedian apprenticeship model is one in which skills are acquired in the operating room under guidance of a mentor. Recent innovations in surgical education, using defined curricula, continuous assessment, and simulation, have proven effective in developing operative skill with greater efficiency and potentially lower patient risk. Microsurgery is a technically-demanding and often unforgiving modality. However, little is known about whether it can be effectively taught outside of the operating room. We hypothesized that novice plastic surgery residents would demonstrate subjective and objective improvement in microsurgical skills upon completion of a lab-based microsurgery curriculum.

Methods: A one-day curriculum was designed for resident training. All participants completed a pre-curriculum self-assessment. Following a one hour lecture, each resident performed a pre-curriculum arterial anastomosis on a turkey femoral artery, during which he or she was evaluated using the Structured Assessment of Microsurgery Tool (SAMS). Each resident then completed a microscope and instruments workshop and observed faculty demonstrations of rat arterial exposures and anastomoses. Each resident then independently practiced rat femoral and carotid anastomoses. At the end of the session, each resident completed a post-curriculum arterial anastomosis, during which the same evaluator assessed him or her. Statistical analysis of outcome data was performed using paired Student's t-test. The self evaluation was also completed at this time.

Results: Ten residents, PGY 1-6, completed the curriculum. After the course, there were statistically significant increases in all areas of resident self-assessment ($p < 0.01$). Comparing pre- and post-curriculum SAMS scores, there were trends toward improvement in all tested parameters and a statistically significant improvement in overall objective technical performance ($p < 0.05$). The greatest improvements were seen in the PGY 1-3 group.

Conclusion: Laboratory-based microsurgical curriculums provide a controlled, risk-free environment in which residents can improve their subjective and objective microsurgical skills. Further study will determine if skill improvement in the lab transfers to higher competency in the operating room and whether this skill is retained long-term. A microsurgical skills training lab should be considered as an adjunct to resident education across all programs in the country.

Development of a novel assessment tool for the training and evaluation of laparoscopic distal gastrectomy using Delphi methodology

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BACKGROUND: With the wide spread of minimally invasive surgery (MIS), the importance of fundamental skill training for MIS has been recognized. After the introduction of the training programs for basic skills of MIS in last decade in North America and Europe, there has been more effort to create specific assessment tools for the training of advanced MIS procedures, such as laparoscopic cholecystectomy, laparoscopic inguinal hernia repair, and laparoscopic colectomy. However, the measure for the performance assessment of laparoscopic gastrectomy is yet to be reported. Most likely due to complex nature of the procedure and small number of cases in Western countries. The purpose of this study is to develop the assessment tool for measuring the performance of laparoscopic distal gastrectomy (LDG) through the process of cognitive task analysis (CTA) and expert consensus using Delphi method.

METHODS: 1st step - CTA: The knowledge and the criteria, which required completing each aspect of LDG was enumerated on the basis of text book, instructional video and the interview by the novices and experts of MIS and was listed as subtasks. 2nd step - Development of the assessment scale for LDG: Delphi method was used to anonymously converge the opinions by leading experts of LDG in Japan with 3 rounds online survey. The experts were asked to rate the importance of subtasks using Likert scale from 1 to 5. Consensus of the experts was determined by internal consistency of each item using Cronbach's approach.

RESULTS: We conducted CTA to describe all of the important steps of LDG. Then, we started to determine the essential steps and to point out the contents of knowledge and decision-making required to perform LDG by expert consensus using Delphi method.

FUTURE DIRECTION: We will demonstrate the methodology and process of the development of the assessment scale for the skill for LDG, and also indicate the direction of the LDG training program using the assessment scale.

Development of the Ottawa Clinic Assessment Tool (OCAT) for Surgery Clinic

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Setting: The shift towards Competency Based Medical Education has triggered consideration of how to implement feasible assessment tools. The clinic environment is vital to surgical practice, yet no assessment tool is currently available to assess daily performance of technical and nontechnical skills of surgery residents. This project describes the development of a competency-based assessment tool, the Ottawa Clinic Assessment Tool (OCAT), for use in surgical clinic.

Intervention: A nominal group technique was used to generate and prioritize ideas in a consensus group. Experts were identified using purposive sampling of all surgical divisions at The Ottawa Hospital. A facilitator with previous experience in leading consensus groups facilitated item-generation of defining surgical clinic competencies. The OCAT was presented to staff surgeons and residents across the surgical department for their feedback.

Observations: The two consensus groups comprised 5 expert surgeons and 2 surgical residents each. This group identified 13 independent non-technical and technical items. To gather pre-pilot data 8 surgeons were asked to use the OCAT in clinic and provide initial impressions. The majority of those polled felt the tool was efficient to complete, contained all necessary items, and was feasible for use after a day of surgical clinic.

Discussion: Surgical programs will require a daily clinic assessment tool to define resident competency progression. The first draft of the OCAT will be piloted for 5 months, in 3 surgical divisions. Descriptive statistics and psychometric data will be collected. The OCAT has the potential to contribute to a portfolio of tools to guide surgical resident promotion.

Establishing the Need for Leadership Training in General Surgery Residency.

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Introduction. Leadership is a fundamental part of surgery and is required at all levels of training and practice. According to the American College of Surgeons, “surgeons across all settings must be able to ‘build and maintain effective teams...and translate the principles of leadership into action.’” However, leadership training is not a typical part of surgical residency. We evaluated perceptions of leadership and the need for formal training in an academic surgical residency program.

Methods. This study was a voluntary quality improvement survey of all categorical and preliminary residents in a general surgery residency program at an urban tertiary academic medical center. At the time, there was no structured leadership training. The survey was performed at the end of the 2013 – 2014 academic year using an online instrument with a 5-point Likert format ranging from strongly disagree to strongly agree, with opportunities for free-text responses.

Results. Of 54 residents, 29 (52%) responded to the survey. Response rates were similar between upper (PGY-3, 4, 5) and lower (PGY-1, 2 and research) level residents (41% vs. 59%, $P = 0.21$). The majority (82%) intended to pursue an academic career. While relatively few (34%) had prior leadership training, most (71%) had leadership experience outside of residency and felt they were a leader as a resident (82%). There was consistent agreement that leadership skills are important for all levels of residency training and practicing surgeons, and across a variety of healthcare and community settings. However, only a minority (39%) agreed or strongly agreed that “on-the-job” leadership training is sufficient for surgeons, while 61% felt formalized training should be a part of surgical residency.

Conclusions. This single-center study indicates that general surgery residents recognize their leadership responsibilities and the potential value of formalized training. While limited by its single-program sample and marginal response rate, this data suggests a need for structured leadership training during surgical residency.

IMPACT OF EARLY STRUCTURED MEDICAL STUDENT MENTORSHIP IN SURGERY ON STUDENT CONFIDENCE, CLERKSHIP PERFORMANCE, and CAREER SELECTION

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INTRODUCTION: Studies on the impact of medical student mentorship in surgery have predominantly targeted senior medical students. It is unknown what role early medical school mentorship plays for students' preparation for surgical clerkships and career selection.

METHODS: We administered Introduction to Surgery, a resident-directed, semester-long, preclinical elective to first- and second-year medical students who were then surveyed as fourth-year medical students after residency application. The course included didactic and experiential components, including operative exposure, technical skills sessions, case reports, journal club, conference, and clinic participation. Students' reported the perceived impact of the elective on their surgical clerkship preparation and career selection, tallied on a five point Likert-type scale. Elective participants (EP) were compared to non-participant applicants (EA), to their medical school classmates (MS), and to the National Residency Match Program outcomes report (USA).

RESULTS: The survey yielded a 100% response rate (19) from EP. A one-way within subjects ANOVA demonstrated that EP felt more prepared for general surgery (GS) and sub-specialty surgical (SS) clerkships due to increased confidence, less apprehension, enhanced technical skills, and insights into surgical culture, especially from interaction with residents [$F(13,266) = 2.87$, $p=0.00069$]. 47.4% of EP earned honors in their clerkship evaluations, 10.5% went into GS (2), and 36.8% went into SS (7). EP and EA demonstrated a three times greater likelihood to apply into surgical fields compared to MS (OR = 3.07, 95% CI 1.26-7.51, $p=0.01$). EP recommended a similar structured mentorship program for future students (mean response = 4.55 out of 5, or "strongly agree"), and two students reported the course to be the "main reason" they selected a surgical residency.

CONCLUSION: This preclinical elective provides a model for organized resident-directed junior medical student mentorship. Structured early medical student mentorship increases reported preparation for surgical clerkships and may increase surgical career selection.

Implementation of a night floats rotation to address 16-hour workday restrictions and evaluation of on-call competencies

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Background: Implementation in July 2012 of 16-hour workday restrictions in Quebec was associated with a negative impact on the educational environment. University of Montreal implemented in August 2013 a night floats rotation to address this issue and to evaluate more accurately on-call specific competencies.

Method: The Surgical Theater Educational Environment Measure and the Postgraduate Hospital Educational Environment Measure were administered before and after implementation to residents and professors of all surgical specialties in University of Montreal through a web-based survey.

Results: Samples before and after implementation were comparable for demographics. Response rates were 31 and 24 % for residents and professors respectively. Data was coded on a scale from -2 (strong negative perception) to 2 (strong positive perception). Professors and residents perceived an improvement in the educational environment, i.e. role of autonomy (-0.492 vs -0.069, $p<0.0001$), teaching (-0.569 vs -0.142, $p<0.0001$), social support (-0.337 vs -0.102, $p<0.001$) and surgical learning (-0.497 vs -0.177, $p=0.0005$). They noted an improvement in patients' safety (-0.237 vs 0.240, $p=0.0005$), but no difference on overall quality of care. Less consider increasing training length (60 vs 37 %, $p=0.0013$). However, only 26 % reported that feedback pertaining to on-call actions was improved in such a clerkship, while 55 % perceived no difference.

Conclusion: Implementation of a night floats rotation seems to have improved the educational environment of surgical trainees at University of Montreal. Less of them consider increasing training length as a result. Still, feedback processes pertaining to on-call competencies need to be improved.

Integrating a Flipped Classroom Model Into a Surgery Clerkship

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Introduction: Medical education in the clinical years faces a number of challenges, including an increasing amount of medical knowledge with diminishing clinical time. The flipped classroom education model involves inversion of typical lecture and homework components. The purpose of our study was to determine if addition of flipped classes into a surgery clerkship curriculum would improve students' comprehension and knowledge while also improving their perceptions of engagement and material retention.

Methods: Students were asked to watch two 15-minute videos covering the topics of bowel obstruction and hernia the night prior to the didactic session. At the didactic session, a four-question pre-test was given to confirm that they had completed the assignment. The didactic session itself involved case-based and interactive problem-solving activities. A knowledge based post-test consisting of eight questions covering the material presented in the flipped class and eight questions covering the material presented in two traditional classes was given halfway through the clerkship. In addition, the students were given a Likert scale to assess their perception of the experience.

Results: A total of 36 students participated. The overall average post-test score was 69.5%. The average score for the flipped class questions was 65.6% versus 73.3% for the traditional class questions. When asked if they felt engaged as learners, the student's gave an average score of 4.8 out of a 5-point Likert scale for the flipped classes versus 4.3 for the traditional classes. Furthermore, when asked if they felt they retained the material presented, the average score for the flipped classes was 4.5 out of a 5-point scale compared to 4.0 for the traditional classes.

Discussion: While the flipped classroom model did not appear to improve the student's comprehension, they reported feeling more engaged with perceived improved retention of the material. Further research is needed to determine the ultimate benefit and how to better integrate a flipped classroom model into a surgery clerkship.

Is early operative experience related to fellowship choice?

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Introduction: With over 80% of general surgery residents pursuing fellowship training, the question of why residents choose certain career paths remains unanswered. Research has shown many personal factors influence a resident's fellowship choice, however little focus has been placed on clinical experiences. The aim of this study is to evaluate if early operative experience during residency is related to fellowship choice.

Methods: The records of all residents that completed their training at our academic university based general surgery program between the years of 2003-2013 were reviewed (n=79). Data points included the number of cases completed during residency, the type of cases as defined by ACGME, and fellowship choice after graduation. To compare the mean proportion of cases for surgical residents in a defined fellowship category versus all other surgical residents, t-tests were conducted for fellowships with five or more surgical residents (e.g., the mean proportion of breast cases for residents who pursued a breast fellowship was compared to the mean proportion of breast cases for other residents).

Results: The top 3 case types completed were abdominal, alimentary tract, and lap-basic, regardless of fellowship pursuits. A trend was noted that residents who go into a particular fellowship did complete a higher proportion of related types of cases (e.g., residents who pursued a breast fellowship had completed a higher proportion of breast cases, on average, than other residents); however, this was not statistically significant

Conclusion: A large portion of general surgery training remains centered around the core competencies cultivated through open and laparoscopic abdominal cases. Our data demonstrates a potential trend between cases completed during residency and a similar focus during fellowship. Additional research could clarify the strength of that relationship, as well as examining the potential causality.

iStudy: The impact and feasibility of providing a mobile e-learning study tool for Plastic Surgery residents.

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INTRODUCTION: Self-directed learning is an important part of medical education. In the division of Plastics Surgery, residents are provided with a nation-wide in-service examination to prepare them for their final board certification. To prepare, various learning tools are employed by residents, though it is difficult to assess which tools are most effective. This study sought to determine whether e-learning resources were correlated with increased in service examination scores, and to determine the usability of self-directed e-learning resources.

METHODS: Plastic surgery residents across Canada were provided with one of two electronic study tools. The first allowed residents to review material that pertained to the testing topics of their examination. The second allowed residents to answer questions on the content and self-grade. The tools were created in application format, and were available for both iphone and android phones. Data was collected from the programmer and was based off of usage.

RESULTS: A total of 23 residents used either of the tools out of a possible 52. The intervention that allowed residents to self-test had more users, with a total of 13, whereas the read-only version yielded 10. The read-only version was used more often with 2756 entries as opposed to 592 for the alternate app. No correlations were found among questions answered correctly and in-service exam score. Similarly, questions answered correctly did not increase over time using the application. There were weak positive correlations for both applications, between time used and in-service examination score with an r of 0.53 and 0.47.

DISCUSSION: Self-directed learning is often difficult to assess. This study aimed at obtaining a better understanding of the effectiveness of e-resources provided to residents. A testing component of an e-learning resource does not seem to be as appealing to residents for study purposes, and yields no difference in performance improvement on examinations.

CONCLUSION: The greatest predictor of performance is time spent reviewing the material and not its delivery. Future directions for this research include providing a follow-up survey to the residents to determine why the usability of the applications. This could help guide future developments of online resources for self-directed learning.

Medical Students' Reactions to Anatomic Dissection: The Phenomenon of Cadaver Naming

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Purpose. The teaching of Gross Anatomy has, for centuries, relied on the dissection of human cadavers and this formative experience is known to evoke strong emotional responses. We hypothesized that the phenomenon of cadaver naming is a coping mechanism used by medical students and that it correlates with other attitudes about dissection and body donation.

Methods. The authors developed a 33-question electronic survey to which 1156 medical students at 12 U.S. medical schools voluntarily responded. Course directors from each institution were also surveyed about their curriculum and observations of students' coping mechanisms.

Results. The majority of students (67.6%) named their cadaver; the cadaver's age was the most common reason cited for why a particular name was chosen for the cadaver. A minority of the students who did not name the cadaver reported finding the practice of naming disrespectful. Almost all students indicated that they would have liked to know more information about their cadaver, with the past medical history of the body donor being the most desired. Finally, students who knew the birth name of the cadaver used it less frequently than predicted.

Conclusions. Much can be learned about students' and residents' approach to surgical patients by studying initial reactions to cadaveric dissection. Likewise, the cadaver lab can be instructive for students in compassionate care before entering clinical medicine. The authors found that the practice of naming cadavers is extremely prevalent among medical students, and that inventive naming serves as a beneficial coping mechanism for medical students. The authors suggest developing a method of providing students with more information about their cadaver while protecting the anonymity of the donor and family would be useful.

Medical Trainee Continuity of Care Following Emergency Department Consultations in a Pediatric Hospital

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Purpose: This study assessed the continuity of care provided by resident and fellow trainees following patient consultations in the emergency department (ED) across all specialties at a large pediatric, tertiary care center.

Method: A retrospective review of electronic medical records was performed to identify patients seen in consultation by a resident or fellow trainee in the ED over a one-year period (February 2012 to January 2013). Medical records were searched for those patients to identify continuity of care, defined as follow-up with the same trainee for the same condition over the next 6 months.

Results: Resident and fellow trainees from 33 divisions participated in 3,400 ED consultations. Half (1,718/3,400) of the patients seen in consultation by a trainee in the ED followed up with the same division within 6 months, but only 4.1% (70/1,718) followed up with the same trainee for the same condition. Trainee continuity of care ranged from 0% to 21% between divisions, with divisions with resident clinics (14.4%) having greater continuity of care than divisions without resident clinics (2.7%) ($p < 0.001$). Continuity of care did not differ between fellows (4.2%) and residents (4.0%) ($p = 0.87$), but did differ between post-graduate years (PGY) for residents ($p < 0.001$), with PGY5 residents having the greatest continuity of care (17%).

Conclusions: Trainee continuity of care for ED consultations was low across all specialties and levels of training. If continuity of care is important for patient well-being and trainee education, then efforts to improve continuity of care for trainees in the future must be undertaken.

New Approach to Skills Continuum in Laparoscopic Ultrasound (LUS) Teaching and Assessment. Pilot Study.

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Background: Laparoscopic ultrasound (LUS) is a valuable diagnostic and interventional tool within the operating room (OR). However, most surgical trainees have insufficient background exposure to LUS, as initial skills are still acquired predominantly in the clinical OR.

Methods: Three second-year general surgery residents participated in a two-week dedicated skills curriculum covering ten essential surgical procedures, one of which was LUS. Residents were first introduced to LUS using a dry lab simulator that included Abdominal Intraoperative&Laparoscopic Phantom (IOUSFAN, Kyoto Kagaku, Japan) and clinical grade ultrasound unit with LUS probe. The teaching paradigm consisted of pre-test, focused attending-mentored training and post-test. Residents were assessed on an in-house 20-points scoring system TDPLUS – Technical and Diagnostic Proficiency in Laparoscopic Ultrasound (GSCI, Evanston, IL). Scores were analyzed by Student's paired t-test and Pearson's correlation coefficient on SPSS 19.0 (IBM, Armonk, NY). At both points – curriculum entry and finish TDPLUS was utilized as self- and rator-applied assessment. At the next step of the program all three current and future residents will be TDPLUS-assessed on live large experimental animals and finally - during clinical LUS. Experimental and clinical intraoperative assessment is currently underway.

Results: Residents were similar in terms of training level and previous simulated and clinical LUS exposure. All received the same amount of LUS training in the lab. There was a significant improvement between pre and post-test scores from both trainees and evaluators ($p=0.001$ and 0.01 , respectively). The reduction in the difference between self and rator evaluations was strongly correlated to the percent improvement in both self and rator pre and post-test scores (Pearson CK: 0.747 , % Self vs. % Difference; 0.838 , % Self vs. % Rator).

Conclusion: Our results prove the utility of the paradigm. Further analysis of skills continuum and retention will be carried out. This will allow for construction of the learning curve with multiple data points. All future residents will go through this curriculum as prerequisite to clinical LUS.

Of Duty Hour Violations and Shift Work: Changing the Educational Paradigm

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Introduction: Successful surgical education requires a fine balance of residents participating in an appropriate number of operative cases and educational opportunities while meeting ACGME duty hour requirements. In order to achieve this, we instituted a night float system and hypothesized that its implementation would decrease duty hour violations while maintaining quality resident education.

Methods: A night float system was developed with alternating teams working 12-hour shifts on trauma/acute care surgery service for 5 days, maintaining 24-hour call coverage on Fridays and Saturdays. Data regarding violations and operative case volume was collected for one year prior to implementation and the two years following implementation. Additionally, a survey was given to residents, faculty, physician extenders, and administrative personnel at 2, 6, and 12 months after implementation. Statistical analysis was performed using Chi-square tests with significance attributed to a p-value < 0.05.

Results: The total number of duty hour violations increased by 26% during the first year of night float; however, the number of violations decreased by 62% in the following year. Prior to night float, the most common violation was shift length > 30 hours, but the new system led to a 90% decrease in this violation. Survey results revealed a decrease in the number who believed residents had a problem meeting duty hour restrictions (44% at 2 months, 14% at 12 months, $p = 0.012$). Additionally, there was consistent agreement that night float improves resident availability for didactic education (67% at 2 months, 79% at 12 months, $p = 0.733$). Further, the average operative case volume per academic year increased by 65%.

Time period	Violation					Case volume	
	Less than 4 days off	Duty hours exceed 80	Shift length > 30 hours	Shift break < 10 hours	Total	Chief Resident	Average/academic year
Prior year	8	8	40	37	93	283	69
First year	5	3	21	88	117	342	116
Second year	2	2	4	36	44	300	114

Conclusions: Night float systems are feasible and helpful in meeting ACGME duty hour requirements. We were able to decrease the overall number of violations while increasing operative case volume and allowing more time for didactic learning.

Penetrance of Rule-based Errors throughout the Learning Curve of LVH Repair

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Background:

Hernia recurrence following laparoscopic ventral hernia (LVH) repairs may result from intraoperative technical errors relating to mesh fixation. The aim of this study was to characterize the prevalence of transfascial suture and tacker fixation errors amongst general surgery residents during a simulated LVH repair. Our hypothesis was that higher level residents would commit fewer errors.

Methods:

Data from junior residents (PGY 1 N=2, PGY 2 N=19, PGY 3=9, PGY 4 N=1, Unknown N=1) and previously analyzed data from senior residents (PGY4-5 N=18) were reviewed for prevalence of suture and fixation errors during a simulated LVH repair.

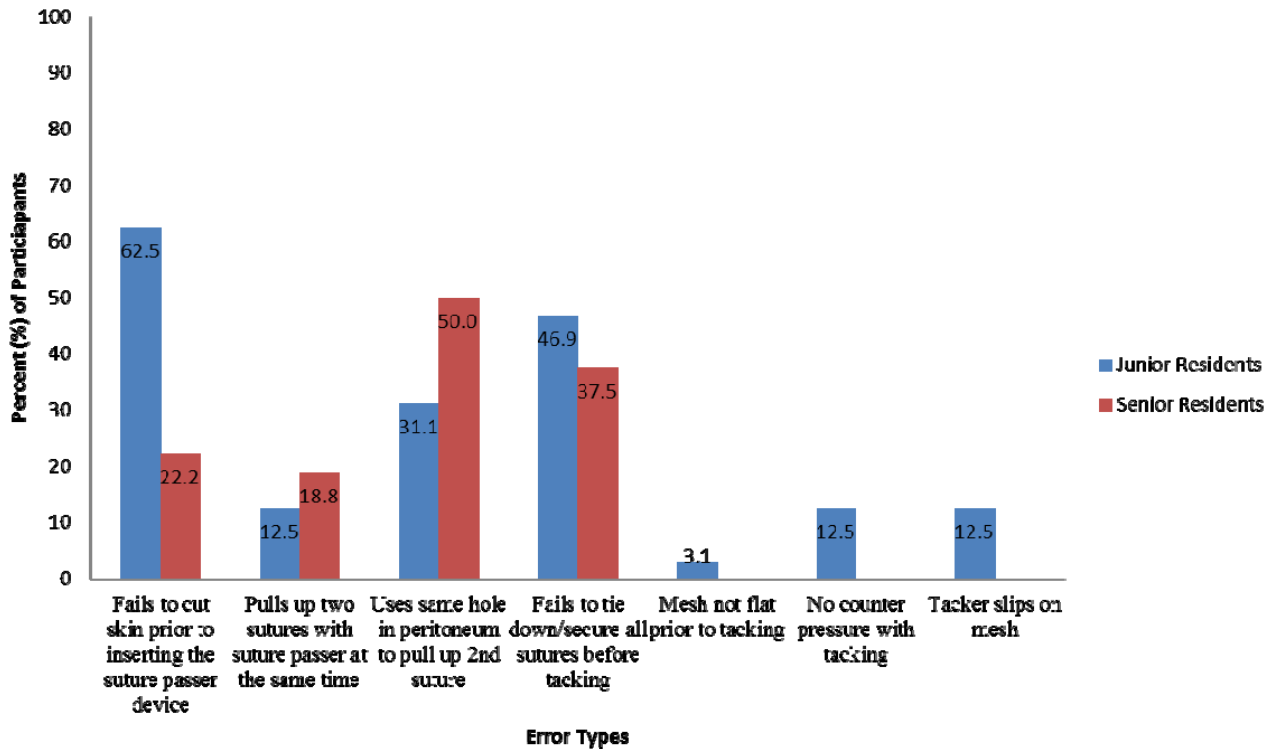
Results:

The majority of junior residents (87.5%) made at least one error relating to transfascial suture or tacker fixation. Of the seven errors committed by the junior residents, three errors were most prevalent: (1) failure to cut skin prior to inserting suture passer; (2) use of same hole in peritoneum to pull up 2nd suture; and (3) failure to tie or secure sutures prior to tacking ($F(1,30)=32.69$, $p<.001$, $p<.05$ for all pairwise comparisons) (Figure 1). Analysis of the senior resident data revealed similar error types and error occurrence of two of the three the most prevalent errors. The skin cut error showed a difference in prevalence (Junior =62.5%, Senior = 22.2%). For the senior resident data, three of the seven errors were not analyzed due to differences in operative context.

Conclusion:

Senior residents were equally at risk of committing mesh fixation errors compared to junior residents. Penetrance of this error throughout the learning curve in residency calls for focused teaching and error-driven, deliberate practice of the rules for mesh fixation. Identification of common operative errors is critical for curriculum development and ensuring resident readiness.

Table 1. Proportion of participants (%) committing errors during LVH repair



Perceived Effects of the 16-hour Workday Restriction on Surgical Specialties in Quebec: A Follow-Up Study.

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BACKGROUND: Quebec was the first Canadian province to implement a 16-hour workday restriction. First studies indicated a negative impact on education, safety and well-being. Our aim was to assess the evolution of these perceptions.

METHOD: The Surgical Theater Educational Environment Measure, the Postgraduate Hospital Educational Environment Measure, quality of the medical act, and quality-of-life questionnaires were administered 6 and 18 months after the work-hour restrictions to residents and professors of all surgical specialties in Quebec through a web-based survey.

RESULTS: Samples at 6 and 18 months were comparable for demographics, except for university of origin. Response rates were 30 and 16 % for residents and professors respectively. Data was coded on a scale from -2 (strong negative perception) to 2 (strong positive perception). Residents and professors perceived an improvement even though the educational environment remained negatively impacted: role of autonomy (-0.474 vs -0.333, $p=0.01$), teaching (-0.554 vs -0.304, $p<0.001$), social support (-0.353 vs -0.133, $p=0.0002$) and surgical learning (-0.492 vs -0.358, $p=0.017$). Overall, perception regarding safety ($p=0.09$) and quality of care ($p=0.53$) was unchanged, being slightly negative. The decreased perception of quality of life did not change either ($p=0.25$). However, less believed residency should be prolonged (64.2 vs 45.6 %, $p=0.0064$).

CONCLUSION: At 18 months following implementation of the new regulations in Quebec, residents and professors perceive a mild improvement for the educational environment, even though still negatively impacted. Impact perceived on safety and well-being is unchanged. Despite these perceptions, fewer believe that training length should be prolonged.

Predicting Factors Associated With Performance on United States Medical Licensing Exam (USMLE) Step 1

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Objective: The purpose of this study was to identify factors amongst medical students preparing for the United States Medical Licensure Examination (USMLE) Step 1 that imposed the greatest impact on their scores.

Methods: A sample of 106 students from the graduating class of 2013 from a single institution participated in a voluntary. Variables included number of months used to prepare for USMLE, number of hours studied during the last month of preparation, number of academic courses in which they received a grade of Honors, and resource materials used to study. Cochran-Armitage trend test was performed to evaluate the association of academic measures.

Results: Students who receive Honors in more courses during the first two years of medical school are more likely to score >236 on USMLE Step 1 ($p=0.0001$). Students who studied more months prior to examination were more likely to score >236 ($p=0.0067$). There was no significant difference in USMLE scores when comparing the number of hours studied the month before the exam or the resource materials used.

Conclusion: Higher academic performance during the first two years of medical education is independently associated with superior performance on the USMLE Step 1 while those who do not honor any courses are 9.5 times more likely to score <236. Students who started studying 1 month before the exam are 4.5 times more likely to score <218 than those who start earlier. Recognizing these differences can help educators identify students who are at risk for scoring low on USMLE Step 1.

Resident Stressors in Modern Training

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Introduction: Resident stress is an important topic as it relates to optimizing performance and improving patient safety. We surveyed residents to ask about the extent to which they believed they had balance between their personal and professional lives as well as the personal and professional stressors that affected them.

Methods: We invited all residents housed in General Surgery (including interns in Orthopedic Surgery, Otolaryngology and Head and Neck Surgery, Urology, Plastic Surgery, Cardiothoracic Surgery, Neurosurgery, and Vascular Surgery) to participate in a survey. We asked 15 true/false questions about how well they were able to balance their personal and professional lives. We also asked them to rate how much they were stressed by 10 stressors (e.g., bad outcomes, difficult faculty, health problems, etc.). We analyzed the data to understand how well-balanced residents felt they were and what the most significant personal and professional stressors were.

Results: 53 residents (~30% response rate) responded to the survey over a two-year period. The majority of residents (73%) felt either "on edge" or "out of balance" based on the 15 true/false questions. The most significant professional stressors for residents (on a 5-point scale with 5 being most stressful) were "bad outcomes" (M=2.74) and "difficult faculty" (M=2.61). The most significant personal stressors for residents were "health problems" (M=3.0) and "divorce" (M=2.63).

Conclusions: Our data suggest that despite the 80-hour workweek and recent efforts to improve resident well-being, residents are still highly stressed. The vast majority of residents were either "on edge" or "out of balance." It was not surprising that "bad outcomes" was the most concerning professional stressor. This was closely followed by "difficult faculty." With regard to personal stressors, health problems and divorce were the most stressful. While three of these four are largely out of the control of residency programs, having to work with difficult faculty is not immutable and should not be taken for granted. Efforts should focus on improving the culture of surgery to minimize the negative impact of "difficult faculty."

Robotic Surgery Training during Residency: Knowledge and Perception of Residents

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Objective: Since the introduction of robotics, there has been a rapid adoption of this technology in a variety of surgical specialties. However, we have little data on the residents' understanding of robotic surgery, their interest in developing robotic skills and integrating them into their practice after residency. Our study evaluates residents' perception of robotic surgery and training, and the need for such curriculum during the residency programs.

Methods: All current general surgery (GS) and obstetrics and gynecology (OBGYN) residents in our program were surveyed on their exposure and perceptions of robotic surgery training. The data were then compiled and analyzed.

Results: Participants included GS (N=34) and OBGYN (N=14) residents with 55% females overall. Our results showed that 100% OBGYN and 79% GS residents participated in robotic surgical cases during their residency training. Overall, 46% of residents did not receive any formal training prior to assisting on bedside in a robotic case. Most of these (52%) were GS residents. Furthermore, 24% GS and 44% OBGYN residents felt that robotic procedures performed by an attending interfere with residents' training experience and 45% (22) residents felt that being a bedside assistant in a robotic case adds to residents' learning experience and understanding of a procedure. Results suggest that 64% OBGYN residents and 41% GS residents agreed that their exposure to robotic surgery improved (or will improve) their overall operating skills. Moreover, 56% GS and 79% OBGYN residents agreed that robotic training should become a part of the training curriculum, but that would not influence their choice of institution for residency. Moreover, 29% GS and 57% OBGYN residents plan to incorporate robotic surgery in their future practice.

Conclusion: We believe that it is necessary to understand residents' perception of robotic surgery and training in order to maximize their learning experiences and opportunities. There appears a rapid acceptance and interest by the OBGYN residents, however reluctance within general surgery residents. Our preliminary data suggest that residents agreed to have robotic training as a part of their curriculum, but majority of them are not planning to utilize these skills in their practice or are unsure.

“Running out of Time”: The Effect of Proximity of Overnight Call to National Board of Medical Examiners Surgery (NBME) Examination Scores

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BACKGROUND: While many factors are considered in the selection of prospective residency candidates, the reliance of program directors on clerkship performances has added increasing pressures on medical students to perform well on the end of clerkship NBME subject examinations. Identifying and adjusting for external variables that may influence NBME exam scores may enhance the overall validity of this common evaluation tool. Commonly cited reasons for poor performance include the effect of sleep deprivation from overnight call preceding the shelf examination as well as a perceived disadvantage for students taking the test earlier during the academic year. We examined the effects of timing of the surgery clerkship (i.e., the quarter of the year in which the surgery clerkship was completed) and proximity of overnight call prior to the exam date on the performance of US medical students on their surgical shelf exam.

METHODS: We evaluated the call schedules and surgical exam scores at our institution from 2012 to 2014. During the study period, the shelf exam was administered the last Friday of the surgery clerkship, with no call Thursday night. Students were categorized into 3 groups; those taking call 1-3 nights, 4-6 nights, and >7 nights prior to the exam.

RESULTS: A total of 367 NBME standardized score results were recorded. Analysis of variance indicated that students taking the surgery exam in the latter half of the year outperformed those whose first clerkship was surgery. Additionally, analysis of variance revealed no significant differences in NBME scores regardless of the proximity of overnight call to the test date.

CONCLUSION: Students taking the NBME surgery exam in the third or fourth quarter outperform peers whose first clerkship was surgery, possibly reflecting the effect of accumulated clerkship experiences. Although sustained sleep deprivation and misalignment of circadian rhythms may negatively impact cognitive performance, overnight call does not meaningfully affect NBME surgical exam scores.

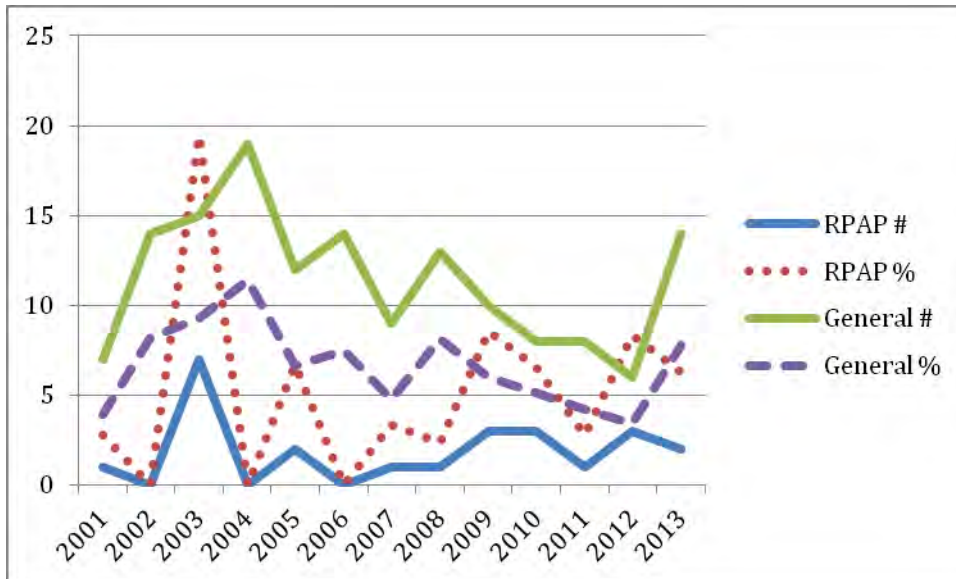
Rural Longitudinal Integrated Clerkships an Important Source of Surgical Residents

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Purpose: The University of Minnesota's Rural Physician Associate Program is a 44-y/o longitudinal integrated clerkship (LIC) where third year medical students complete the majority of their required core clerkship. The primary goal is to nurture student interest in rural primary care and has been successful in meeting this goal. Within RPAP a student completes their general surgical requirement with a rural general surgeon. Similar to family physicians, there is a recognized need for rural general surgeons. Nationally, there has also been a decrease in medical student interest in surgical careers. It is our hypothesis that this rural LIC model is successful at increasing student interest in a general surgical career, secondary to the longitudinal exposure to rural surgeons and can be a source of surgical residents.

Methods: Retrospective review of students enrolled into the LIC and classic general surgery clerkship from 2001-2013. The total number and percentages of students in each category that matched into general surgery were calculated and compared to the summation of students matching into residency.

Results: From 2001-2013 the University of Minnesota matched 173 of 2724 (6.35%) students into general surgery. 149 (5.47%) did the standard clerkship (2266 students) and 24 (0.88%) completed the RPAP program (452 students). When compared to their peer groups the percentages matching into general surgery changed, 6.57% for the clerkship (149/2266) and 5.31% for RPAP (24/452). The number and percentage of students matching each year ranged from 6-19 (3.4-11.4%) for the clerkship and 0-7 (0-19.44%) for RPAP.



Conclusions: A rural LIC provides a significant experience and can positively impact a student's decision to pursue a surgical residency. Some years a higher percentage of students matching into general surgery came from RPAP than the standard clerkship. A rural LIC can be significant source of medical student interest in general surgical careers.

Scripted Instruction for Residents: Development of a Visual Guide to Assist Residents in Teaching Medical Students.

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INTRODUCTION: Medical students are increasingly receiving less time allotted for surgical rotations. The Canadian Undergraduate Surgical Education Committee acknowledges this shift, however the list of objectives that students are expected to know remains the same. Residents are responsible for most on-service teaching, and the majority are unfamiliar with the lengthy objectives list. This study sought to create a user friendly tool that could facilitate resident teaching of medical students during their clinical rotation.

METHODS: Surgeon experts were consulted to determine the most feasible prototype for the tool. Once this was established, the experts were asked to rank all 283 General Surgery objectives, by relevancy. These ranks were compiled and grouped into categories by clinical presentation. The prototype was then presented to a separate list of experts to comment on the feasibility of the final product and to make further modifications.

RESULTS: The resulting tool was a single page visual reference card. The card was color coded for ease of use, based on the relevancy of objectives. Differential diagnoses were listed within each clinical presentation, and were also color coded to indicate which a student 'should know' versus 'good to know' and 'unimportant for their level of knowledge'.

DISCUSSION: This visual guide will contribute to teaching of medical students, by providing residents with a script that they can follow. This tool eliminates the effort of seeking out the list of objectives, which can sometimes be overlooked on a busy clinical service. The guide will also ensure residents are teaching topics that are relevant to a clinical clerk's expected knowledge level and will contribute to standardization of on-service medical education.

CONCLUSION: This quick reference guide provides residents with a resource to assist in medical student teaching that is feasible and easy to use. Future directions include iterative modification to the tool, based on resident use and implementation in their teaching.

Surgical Specialty Residents More Likely To Receive the Arnold P. Gold Humanism and Excellence in Teaching Award

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Introduction: The Arnold P. Gold Humanism and Excellence in Teaching Awards are given by third year medical students to residents based on their commitment to teaching and compassionate treatment of patients, students, and colleagues. The purpose of this study is to evaluate award winners by specialty, with the hypothesis that residents in surgical specialties are more likely to receive this award than residents in non-surgical specialties.

Methods: This was a retrospective study from 2004 – 2013. All of the recipients of the award were obtained from the Arnold P. Gold Foundation website. The specialties of award recipients were recorded and tabulated over time. The number of award winners per thousand specialty residents was estimated using the Accreditation Council for Graduate Medical Education Data Resource Book. Linear regression was performed to evaluate changes over time. Statistics were performed using an $\alpha = 0.05$.

Results: Over ten years, 2,489 Arnold P. Gold Humanism and Excellence in Teaching Awards were given. The number of awards has been increasing over time ($p = 0.002$). Overall, 52.6% of recipients were in non-surgical specialties and 47.4% of recipients were in surgical specialties. The top three specialties with the most awards were Surgery/General Surgery (22.3%), Internal Medicine (20.9%), and OB/GYN (20.4%). Adjusting for the resident population, there were 10.6 awards/thousand OB/GYN residents, 7.6 awards/thousand Surgery/General Surgery residents, and 2.3 awards/thousand Internal Medicine residents ($p < 0.001$).

Conclusions: Although the number of Arnold P. Gold Humanism and Excellence in Teaching Awards are more commonly given to non-surgical specialty residents, it is the surgical specialty residents that are more likely to receive these awards per capita. It is encouraging that surgical residents are commonly given teaching awards in the setting of duty hour restrictions.

Surgical Task Impact on Team Skills Acquisition in Surgical Residents: Pilot Study to Test Feasibility of Surgical Scenarios and Simulators

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Introduction: Current team training scenarios used to simulate OR environments lack fidelity in that they fail to simulate a surgical task for surgeons and surgical residents. We theorize that including a realistic surgical task and simulated patient in team training would impact acquisition of team skills in surgical residents. We performed a pilot study to develop and test scenarios and models to further explore this theory.

Methods: A multidisciplinary team including surgeons, anesthesiologists, biomedical engineers, artists, and simulation specialists designed a series of pilot sessions to test a control mannequin (Laerdal SimMan- no surgical anatomy), a medium-fidelity mannequin (Synthetic Anatomy for Surgical Tasks, or SAST- some surgical anatomy), and a cadaveric simulated patient. Two operative trauma scenarios were devised by team members to test the simulated patient models. The team collaborated in the development of the SAST mannequin anatomy and determined how best to simulate bleeding in the SAST mannequin and cadaver model. Two pilot simulations were conducted for each type of simulated patient as a way to identify and address problems.

Results: The six pilot sessions were conducted with an experienced surgeon playing the surgical resident role, along with a full team of scripted confederates consisting of an attending surgeon, anesthesia provider, scrub nurse, and circulating nurse. The pilot sessions with the SAST mannequin and the cadaver revealed a need to standardize the time point when remote-controlled bleeding to liver or spleen should stop. Other issues identified in pilot sessions primarily related to equipment which had not been stocked in the simulation environment, such as scalpel blades, electrocautery, retractors, and surgical drapes. Through feedback, it was also determined that a learning objectives handout as well as pre-briefing guidelines for faculty members leading the simulation sessions would be of benefit.

Discussion: It is feasible to simulate a surgical task with low, medium, and high fidelity models to test team skills acquisition. Pilot sessions provided valuable feedback to improve the performance of these simulations. Future study will focus on acquisition of teamwork skills by surgical residents using the scenarios and models refined in these sessions.

The Impact of Physician-Focused Education Regarding Diagnostic Decisions in the SICU

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Objective: The purpose of this study was to explore if providing education to physicians in the surgical intensive care unit (SICU) regarding the frequency of chest x-ray (CXR) orders would impact treatment decisions and reduce the number of CXRs.

Methods: In this retrospective cohort study, chart reviews were divided into three intervals. A pre-intervention review of patient charts was conducted for 9 weeks. Mid-study, our institution integrated lab costs into the electronic health record (EHR), thus potentially confounding results. To evaluate for changes in ordering patterns due to cost awareness, we reviewed charts for 7 weeks after the introduction of labs into the EHR. A final 9 week chart review was completed during our educational intervention involving a 15-20 minute didactic regarding the cost of portable CXRs. Physicians were encouraged to consider the frequency of radiology orders. To facilitate review and retention of information, visual education (e.g., posters and pocket-sized laminated cards) was provided. Discussion among residents, attending physicians, and nurses during rounds was monitored by key personnel. One-way analysis (ANOVA) of variance was conducted to evaluate the impact of the intervention on the number of CXRs ordered.

Results: Table 1 summarizes the number of CXR statistics by group. Number of CXRs was significantly different between the three groups ($p = 0.0177$). Tukey-Kramer HSD comparisons test showed the main difference was between the pre-education and intervention groups ($p = 0.0129$).

Conclusions: Results indicate a significant decrease in the number of CXRs ordered pre- and post- educational intervention, suggesting that educating physicians about the cost of test ordering along with justifying repeat CXRs is effective. Furthermore, results show decreased numbers of CXRs ordered after lab costs were available in the EHR, but before the intervention. This suggests an overall heightened awareness of costs can have an impact on physician ordering patterns.

Table 1

ANOVA analysis of number of chest x-rays by group

	N	Mean \pm SD	95% CI	<i>p</i> -Value
Pre-education I	155	5.6 \pm 9.5	(4.4, 6.8)	0.0177
Pre-education II	35	3.9 \pm 7.3	(1.4, 6.5)	
Post-education	204	3.2 \pm 5.8	(2.2, 4.3)	

The Surgery Clerkship Orientation: Evaluating Temporal Changes in Student Orientation Needs

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Introduction: Surgery clerkship students at our institution receive a standardized orientation covering objectives, requirements, grading, and expectations. Limited data exist regarding the effectiveness or student perceptions of this approach.

Methods: Anonymous surveys were provided to students at the conclusion of orientation and at the end of clerkship. Four groups of students were surveyed; 2 at the beginning of their clerkship year, 2 at the end of the clerkship year. Students were asked to rank the importance of the following topics covered in orientation: Course Learning Objectives, Course Expectations, Learning Resources, Student Role in the Operating Room, NBME Shelf Preparation, and Institution Grading Policies. They rated their satisfaction with inclusion of certain topics in the orientation, like suturing and knot tying. Comparisons of mean ratings of topic importance between each student grouping were analyzed using student t-tests. Variability in the relative importance of each topic was analyzed through analysis of variance (ANOVA) with Scheffe adjustment for pairwise comparisons.

Results: 80 surveys were collected. Student responses demonstrate significant variability in the mean score between topics ($p < 0.0001$). Pairwise comparisons indicate less importance placed on clerkship learning objectives vs. role in O.R. ($p < 0.019$), course expectations ($p < 0.015$), or shelf preparation ($p < 0.024$). Sub-group analyses reveal students from late clerkship sessions value shelf preparation more highly than institution grading policies ($p < 0.038$). Descriptive field responses indicated 31% of early clerkship students wanted more orientation time devoted to hospital tours and expectations (vs. 8% in later sessions). The mean score for each topic did not vary significantly between early and late session clerkship students, or among survey responses before or after completion of the clerkship ($p < 0.05$).

Conclusions: The orientation needs of students change throughout a clerkship year. Beginning students appear to prefer basic direction for time spent on the ward. Students at the end of the year prefer information regarding shelf preparation. All clerkship student groups felt time was less well spent discussing required course objectives compared to shelf preparation and course expectations.

Tracking Outcomes Associated with the Surgical Skills and Technology Elective Program (SSTEP)

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Background: The ACGME has called for increased involvement of surgical departments in the teaching of medical students. Surgical bootcamps for pre-clerkship medical students have therefore been growing in popularity. Here, we report the outcomes associated with piloting a student initiated 10-day surgical bootcamp program for second year medical students.

Methods: Eighteen students (n=18) participated in SSTEP, which consisted of 8 hours of daily learning in a surgical simulation center. Each day covered a different surgical subspecialty and was facilitated by surgical faculty. Pre-program and post-program assessment involved: (1) written surgical comprehension exam, (2) objective structured assessment of a technical skill (OSATS) video recording, (3) participant feedback questionnaire. The surgical comprehension exam was based on questions submitted by course facilitators. The OSATS station was a 12-minute task of completing 2 vertical mattress sutures in pigskin.

Results: Compared to the mean written pre-test score students scored significantly higher on the written post-test (52.11 +/- 5.95 vs. 35.83 +/- 6.56, range 40-60, p=0.01) and were more confident in their answers (184.50 +/- 35.99) (124.83 +/- 30.20) (p=0.01). Global rating and confidence in OSATS also improved following the program (10.10 vs. 17.94 out of 25 p=0.05). The exit questionnaire indicated 12 participants were considering a career in surgery prior to the program and 14 participants after attending the program (an increase of 11.1%).

Conclusions: Participation in SSTEP showed objective improvement in pre-clerkship medical students' surgical knowledge and technical skill. SSTEP also played a role in stimulating interest in pursuing a career in surgery as well as building confidence approaching basic surgical procedures. Performance in technical assessment following core surgery rotations will be assessed by OSATS in the study population and compared against students who did not complete the program to determine retention.

Trauma Scenarios and internal Medicine Residents: Education Needed to Build Triage Ability

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Introduction: A significant percentage of trauma patients are often admitted to the medical service, even in dedicated trauma centers. At our institution, a level-I urban teaching hospital, 10-20% of trauma admissions are placed on non-trauma services. The objective of this paper is to examine the ability of internal medicine residents to appropriately triage trauma patients in multicasualty scenarios.

Methods: Five multicasualty scenarios consisting of five patients each were developed in keeping with ATLS primary survey guidelines. Two scenarios incorporated a pregnant woman and a child. Our hospital's internal medicine residents were tasked with ranking patients by need for urgent intervention from 1 to 5, with "1" being the highest priority and "5" being the lowest. We also collected data on level of postgraduate training (PGY) and prior medical experience.

Results: 50 internal medicine residents participated: 23 PGY-1 (46%), 16 PGY-2 (32%), and 11 PGY-3 (22%). Mean experience including medical school was 7 ± 0.6 years. Six residents (12%) had one to two years of prior emergency medical service experience. 80% of residents correctly identified the number one patient in at least one scenario correctly (Figure 1). 40% ranked the first two patients in at least one scenario correctly. Only 34% ranked the top three patients in at least one scenario correctly. Level of training or prior clinical experience was not correlated with ability to triage scenarios appropriately.

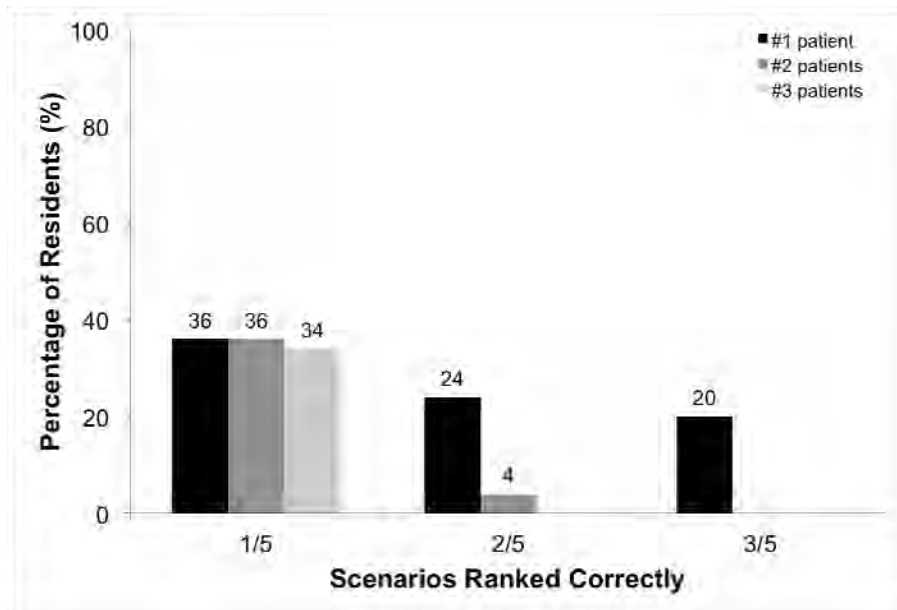


Figure 1. Multicasualty scenarios ranked correctly vs percentage of residents.

Conclusions: Trauma triage is not standard curriculum in undergraduate medical education. Internal medicine residents were unable to consistently identify the patient in need of urgent intervention across five scenarios. Considering the volume of trauma patients cared for by internists, intensive education on trauma patient management and triage principles would be appropriate.

Using a teaching module to improve surgery clerkship students' assessment of the acute abdomen at a community teaching hospital

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A teaching module on the acute abdomen was designed and structured to include a didactic learning module and a standardized patient (SP) experience as a means to improve third- and fourth year medical students' ability to assess, examine, arrive at a differential diagnosis and determine a plan of care of patients with an acute abdomen. The goal was to determine whether or not the education module was a valuable resource in educating and building the confidence of the students in approaching the acute abdomen. A total of 195 medical students rotating on surgery at York Hospital (YH), a community teaching hospital, were randomly divided into two groups at the beginning of their surgical clerkship. The intervention group was assigned to complete an educational module prior to meeting an SP. This module consisted of a computer-based lecture and video providing education on the assessment and management of the acute abdomen. They then were assigned to evaluate the SP. The control group saw the SP and then reviewed the education module. Following the exercise, all students completed a written history and physical exam, including assessment, differential diagnosis and plan. They also completed an evaluation of this educational exercise aimed at determining whether or not the module had any effect on educating and building up the confidence of those who saw it prior to the SP encounter. Summary results of the evaluations show that the intervention group perceived greater confidence in part by viewing the module in advance of meeting the SP (35% vs 30%, $p < 0.015$). Specifically, the intervention group reported significant confidence in their differential diagnosis ($p < 0.035$) and their ability to order the correct tests ($p < 0.02$). Overall, most students perceived value in both components of the simulation exercise. Both groups felt adequately oriented and understood the purpose of the exercise. They both agreed that the simulation encounter was realistic and that the exercise was an effective learning experience that will contribute to making them better at approaching and managing the acute abdomen.

UTILIZATION OF A NOVEL ADVANCED LAPAROSCOPIC CURRICULUM IN SURGICAL EDUCATION

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Objective: Laparoscopic simulation is an increasingly important component of surgical education in an era of expanding duty hour restrictions. An advanced laparoscopic simulation curriculum may successfully propel residents to greater levels of operative competency.

Methods: A validated, advanced laparoscopic simulation curriculum was used to assess technical ability using the Global Assessment of Laparoscopic Skills. Seventy-five general surgery residents (56 PGY1-3, 19 PGY4) and 18 medical students participated in five exercises. A signed-rank test was used to determine score improvements for each station. The Kruskal-Wallis test evaluated score differences among group levels and McNemar's test assessed the improvement in different skill subsets within each station.

Results: Final performance improved significantly from baseline at all stations: 1- bean drop/rope drill ($p=0.01$), 2- endoloop ($p=0.025$), 3- checkerboard ($p<0.001$), 4- endostitch ($p<0.001$), and 5- intracorporeal suturing ($p<0.001$). Subset analysis revealed improvement in all scoring components for stations 1, 4, and 5 ($p<0.02$). Participants improved significantly in efficiency and tissue handling in endoloop ($p<0.03$) and depth perception, bimanual dexterity, tissue handling, and number of shapes transferred at checkerboard ($p<0.04$).

Conclusion: Simulation is an important educational tool since it provides a foundation of technical skill with opportunities for independent practice outside the operating room. Residents and students participating in an established skills course, with opportunity for self-motivated learning, demonstrated significant technical improvement. Ongoing research will ultimately determine if this improvement will translate directly in greater operative efficiency.

Value of Cardiothoracic Rotations for General Surgeons

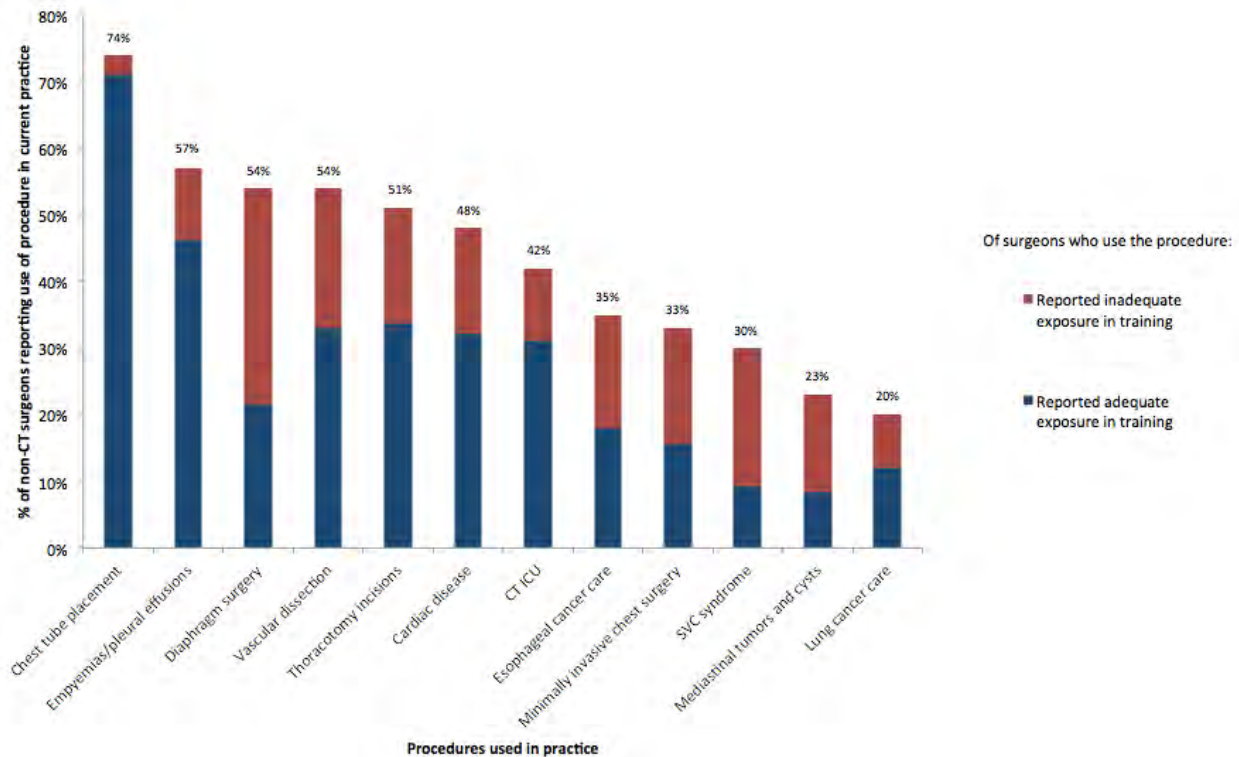
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Background: General Surgery residents are exposed less to Cardiothoracic (CT) surgery. We assessed relationships between training exposure and current practice utilization of CT procedures/conditions among general surgeons.

Methods: A survey was forwarded to general surgeons who graduated between 1999-2014. Respondents reported the level of exposure in training and current use of various CT procedures on Likert scales. Frequency distributions for categorical variables were examined to identify patterns.

Results: 94 surgeons responded. The figure shows reported differences in residency training exposure among surgeons who reported current procedure use and/or disease exposure in practice. The most utilized CT related procedures by general surgeons are chest tube placement, empyemas/pleural effusions, and diaphragm surgery at 74%, 57%, and 54%, respectively. Among surgeons who treat these issues, 96%, 81%, and 40%, respectively, reported adequate training exposure. Less than one-third of respondents reported currently treating SVC syndrome (30%), mediastinal tumors (23%), or lung cancer (20%). National data shows that lung resections comprise 38% of thoracic case volume. However, lung cancer care represents the least used skill by general surgeons. Surgeons reported a decline in length of CT rotations over time; yet, their perceived adequacy of exposure to thoracic procedures has remained consistent.

Conclusion: Our results highlight discrepancies between frequency of thoracic operative cases, general surgery residents' exposure to specific procedures/conditions, and procedure use in current practice. Results suggest that training in lung resection is marginally useful to general surgeons. As CT exposure decreases, we highlight areas to emphasize (empyemas, chest tubes, thoracotomies) and areas to reduce exposure (lung cancer, mediastinal tumors, SVC syndrome). This data will help align the goals of training with the demands of the workplace.



Weekly Emailed Teaching Tips and Reading Material Improve Awareness of Teaching Role Amongst General Surgery Residents.

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Introduction: Teaching is a major responsibility of surgical residents and is critical in the education of co-residents and medical students. Formal training in education is limited and often time-consuming. We sought to expand on our institution's Resident-As-Teacher workshops through a minimally-intrusive reminder incorporating emailed teaching tips and articles. We investigated how resident perceptions of teaching roles changed after distribution of a series of emailed weekly teaching tips and education-related publications.

Methods: The medical education literature was reviewed for publications on resident teaching. Peer-reviewed manuscripts with the following themes were identified: mentorship and role modeling, teaching methods, adult learning theory, feedback, and the resident role of teaching. Ten high-yield publications and 10 teaching tips addressing these themes were drawn from the initial literature search. Manuscripts and teaching tips were distributed to the general surgery housestaff by email on a weekly basis. Anonymous surveys on resident perception of teaching roles were completed by surgical housestaff prior to implementing the weekly emails and after completion of the email series (20 weeks). Statistics were descriptive with Fisher's exact test and Wilcoxon rank-sum test used for categorical and continuous variables, respectively.

Results: Thirty and 28 respondents completed the pre-email and post-email surveys, respectively (44.1% and 41.2% response rate, respectively). Sixty percent of respondents read the articles provided. Residents found the brief teaching tips to be more helpful and high-yield than the manuscripts. Weekly email reminders were "just right" in frequency according to 74% of respondents. Fifty percent reported changing their teaching style following the weekly teaching tips (figure 1).

Conclusion: Weekly emails about teaching were well-received by the majority of surgical residents when concise and also encouraged increased teaching effort amongst half of respondents. Such email reminders can be used to promote teaching effort and educate residents about teaching methodology applicable to surgical training.

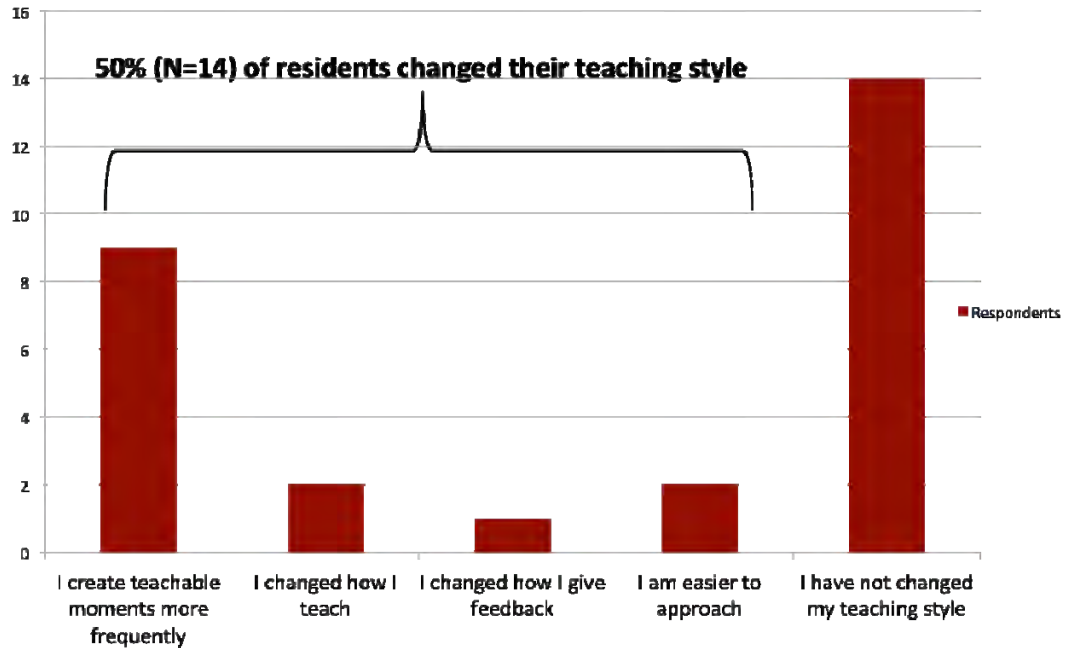


Figure 1. Resident response to the question, “How did the weekly emails change your teaching style?”

What Constitutes A 'Case'?

Obtaining Consensus From Trainers and Trainees

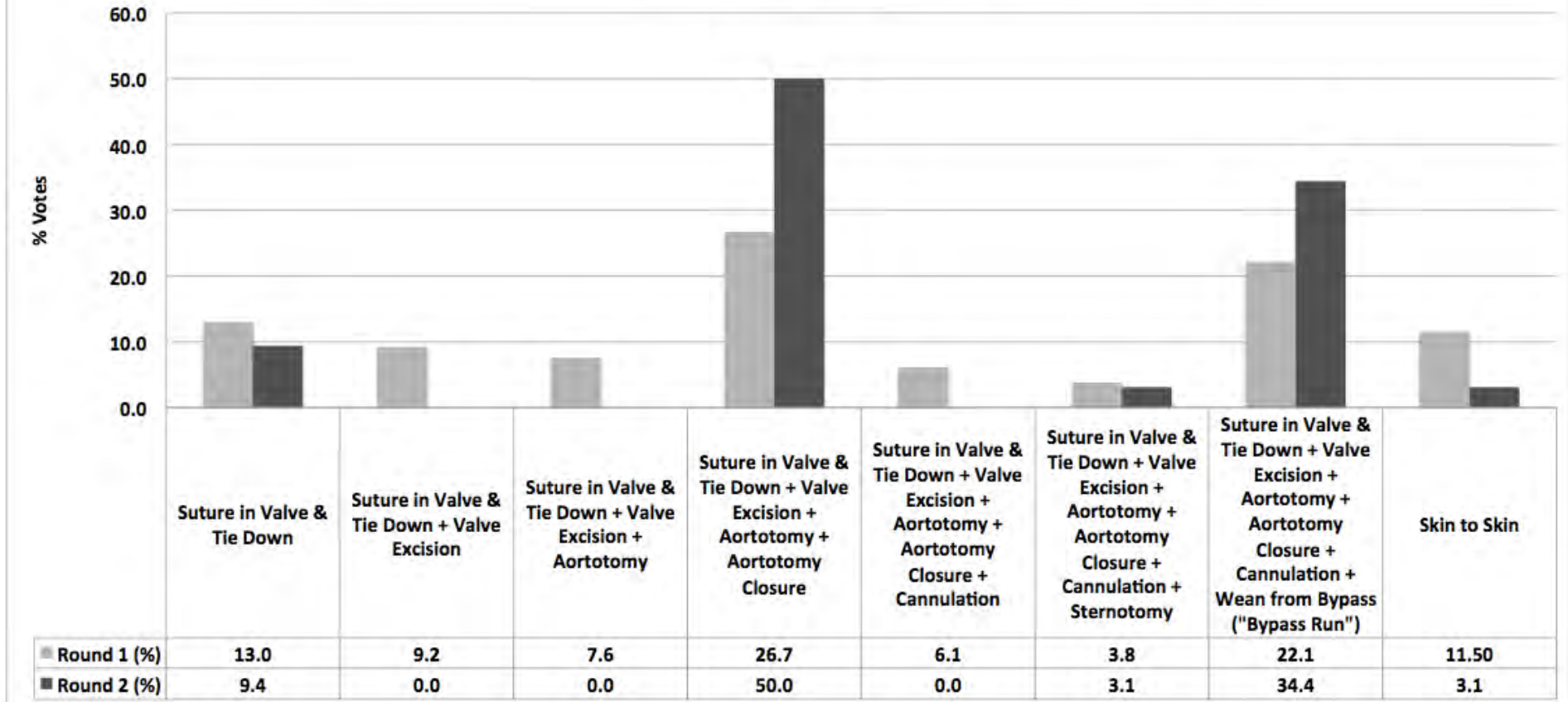
Burdett, C. Barnard, S & Dunning, J., Cardiothoracic Trainees Research Collaborative (CTRC), Kent, UK

Objective: The number of 'cases' performed by UK trainee Cardiothoracic Surgeons is already used informally and will soon be formally assessed to determine completion of training. Despite this, no universal definition exists on what constitutes a 'case'. We have demonstrated large variations in what trainees record in their logbooks; creating significant differences in the number of 'cases' claimed. For example, Coronary Artery Bypass Grafting (CABG): 20% counted performing only the distal anastomoses as a 'case', whereas 24% required skin-to-skin. We are now using a consensus process to address this worrying discrepancy.

Methods: Trainees and trainers were contacted by e-mail. A survey was created based on results from a pilot which gauged current nomenclature. After the first round, response rates were included next to each option so that participants could see how others voted. They were then asked to re-vote in light of this information (Delphi Consensus method¹). The project will complete in December 2014. The results will clarify what constitutes a 'case' before case numbers are introduced nationally for completion of training.

Results: 144 responses (60% trainers/40% trainees)- 1/3 of the UK Cardiothoracic community. The study focused on Aortic Valve Replacement (AVR), CABG and Pulmonary Lobectomy. For all procedures votes were spread across a range of categories from completing the central portion of the operation (e.g. suturing the valve) to skin-to-skin. However, some moderate peaks emerged. For the second round, there was an increased preference for the more popular choices and a trend away from less favoured options (Graph: AVR example).

Graph 1: Minimum amount of a procedure that needs to be performed to count it as a 'case' (Aortic Valve Replacement)



Conclusion: Current recording of 'cases' is disparate. To unify training and ensure parity, clear definitions are required. We have identified a significant problem within the UK system (with potential relevance to a number of specialties internationally) and highlighted how a consensus process can be used to address it.

¹<http://www.rand.org/topics/delphi-method.html?page=2>