

Conscientious Objection in Medical Students: The Role of Underlying Values

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Purpose: Medical students are frequently exposed to ethical or moral challenges. While physicians are generally recognized as having the capacity to engage in conscientious objection, the values that underlie these decisions in medical students have been seldom explored.

Methods: From January 2013 to January 2014, cross-sectional cohorts of medical students in the surgery and women's health clerkships (n=160) were invited to participate in a values clarification card sorting exercise using a widely-published personal value card deck. Student cohorts were assigned to receive one of 3 question prompts about their values for: (1) conscientious objection generally, (2) participation in a live animal laboratory, or (3) participation in termination of pregnancy. Students were asked to rank the top 5 related values they uphold. Using a modified Delphi process, ethics experts grouped the values into 3 domains - inward-focused, other-focused, and mission-oriented. The proportion of student responses in each domain was compared to the probability of proportions from random card draws.

Results: Responses were received from 150 students (93.8% response rate). In general, students selected fewer inward-focused terms in their top 5 than predicted (46.8% vs 74.6%, p=0.01). Students that objected to participation in a live animal laboratory were more likely to select inward-focused terms compared to laboratory participants (100.0% vs 30.3%, p=0.01), and chose the term 'responsibility' more often (42.9% vs 12.2%, p=0.038). Students that would participate in termination of pregnancy selected other-focused terms more often than objectors (100% vs 61.5%, p<0.001), while objectors were more likely to select inward-focused terms (30.8% vs 0%, p=0.002).

Conclusion: Medical students utilize consistent and specific values regarding conscientious objection to inform their decision-making about whether/how to participate in various clinical or clerkship activities. Identification of these values could aid in providing students clearer guidance for ethically challenging situations.

Table 1. Personal Value Card Domains

Inward-Focused		Other-Focused	Mission-Oriented
Acceptance	Mindfulness	Caring	Commitment
Accuracy	Moderation	Compassion	Contribution
Authority	Non-Conformity	Cooperation	Dependability
Autonomy	Passion	Courtesy	Duty
Comfort	Power	Forgiveness	Industry
Flexibility	Purpose	Helpfulness	Responsibility
Genuineness	Rationality	Justice	
God's Will	Risk	Nurturance	
Growth	Safety	Openness	
Honesty	Self-Acceptance	Service	
Hope	Self-Control	Tolerance	
Humility	Self-Esteem		
Independence	Self-Knowledge		
Inner Peace	Spirituality		
Knowledge	Stability		
Mastery	Virtue		

Modified from Miller WR, C'de Baca J, Matthew DB, and Wilbourne PL. *Personal Values Card Sort*, University of New Mexico, 2001. Accessed October 1, 2014, at: <http://casaa.unm.edu/inst/Personal%20Values%20Card%20Sort.pdf>

The Impact of the 2011 ACGME Duty Hours on Program Structure and Resident Education

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Introduction: The 2011 ACGME duty hour regulations required significant change in the structure of general surgery residency programs, due primarily to the 16 hour PGY1 rule. However, the scope of changes implemented by programs to meet these requirements, and the subsequent educational impact of those changes, are poorly understood.

Methods: A random sample of 20% of surgical residencies in the US (n=50), stratified by academic affiliation and location, were invited to participate in the study. Using constructivist grounded theory, we conducted semi-structured interviews with program directors (PD), focusing on changes in call schedule, interns' educational requirements, readiness for independent practice, and satisfaction. Interviews were conducted in an iterative fashion, with changes to the interview script based on feedback from early interviewees. The interviews were recorded and anonymized. Programs' call systems were categorized, and the interviews were qualitatively analyzed for emerging themes using NVivo®.

Results: 20 programs participated (40% response rate). The most common call system implemented was a month-long night float rotation (NF) (14/20, 75%). A minority of programs (5/20, 25%) used a weekly rotating schedule, where interns worked 5-6 nights and then returned to daytime service. A number of programs (65%) had a NF in place prior to 2011; these programs adjusted and expanded their existing schedule to accommodate the new regulations. Commonly cited challenges to instituting NF included weekend coverage (60%) and adequate days off during day-to-night transition. Interns spent up to 3 months of the year on NF duty. Regarding didactic education, only 5 (25%) programs made explicit changes to their teaching conference schedules or developed a dedicated curriculum for residents on NF. 75% of programs excused interns, explicitly or implicitly, from didactics while on NF. Common challenges PDs felt their interns face included delayed maturation, feeling of isolation from the team culture, and creation of an intense conflict for PDs and interns alike between "following the rules" and "doing what is right".

Conclusions: Programs have enacted a number of changes to accommodate the 2011 regulations; most commonly prolonged periods of night float coverage. These changes have the potential to significantly impact residents' educational and professional development.

Integrity as Defined by Applicants, Residents, Faculty and Staff of a General Surgery Program

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Introduction: Professionalism is one of the six core competencies defined by the ACGME as “a commitment to carrying out professional responsibilities and an adherence to ethical principles.” The aim of this study was to determine the views of resident applicants, residents, faculty, and staff of a general surgery department regarding the definition of integrity.

Methodology: A cohort of residency applicants, residents, faculty, and staff of a general surgery department were questioned on their definition of integrity. Grounded theory was used to qualitatively compare results. An interdisciplinary team of investigators individually categorized the responses into themes. After obtaining the group consensus, the statements were attributed to subthemes. Raters were blinded to the respondents.

Results: From the 58 residency applicants, 14 residents, 13 faculty, and 22 staff, 248 statements were generated. In this, seven themes were identified. Each theme was then divided into two to three subthemes. The table below shows the number of statements that were categorized into each based on the type of respondent. The majority of responses defined integrity in terms of moral compass, honesty, and responsibility. Interestingly, applicant and staff defined integrity mostly in terms of honesty while the residents and faculty emphasized moral compass. The subthemes mentioned the most included truthfulness and doing the right thing.

RESPONSE S	THEMES															
	Honest			Moral Compass			Selflessness		Empathy		Responsibility			Self-Awareness		Teamwork
	SUBTHEMES															
	1A Trustworth	1B Transpare	1C Truthfulnes	2A Standards/ Values/ Moral Code	2B Do the Right Thing	3A Self- Sacrificin	3B Acknowl edgment of Others	4A Understan ding	4B Compassio	5A Dedication	5B Dependabl e/ Reliable	5C Accountabi lity	6A True to Yourself	6B Self- knowledg	7A Collective Goals	7B Profession alism
Applicants	7	8	23	16	21	4	0	0	1	3	6	5	9	5	2	8
Residents	0	0	5	8	7	0	2	0	0	1	2	4	3	0	2	2
Faculty	1	0	5	5	7	2	2	0	2	0	2	0	4	0	0	0
Staff	3	0	12	4	8	1	0	1	5	4	5	6	3	1	4	7
Sub- Theme TOTAL	11	8	45	33	43	7	4	1	8	8	15	15	19	6	8	17
Theme Total	64			83			11		9		38			25		25

Conclusions: The majority of responses defined integrity in terms of honesty and moral compass and less so in terms of other themes such as selflessness, empathy, responsibility, self-awareness, and teamwork. Within the themes of honesty and moral compass, integrity is defined as truthfulness and doing the right thing despite consequences. There are clear differences in the definition of integrity among those practicing surgery compared to those aspiring to the career or working with surgeons.

Eye of the Beholder: National Benchmark Program Comparison of PGY 1 Basic Open Skill Performance 2011 to 2014

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Background: The National Benchmark Program is a multi-institutional endeavor to track and establish surgical resident performance levels in selected open and laparoscopic skills. Since 2011, it has performed baseline testing of incoming PGY 1s as part of its protocol. With the recent emphasis on fourth year medical student surgical preparatory curricula, we investigated whether incoming PGY 1s in 2014 were more proficient in basic open surgical skills compared to 2011.

Methods: Incoming PGY 1 categorical and preliminary surgical residents underwent baseline testing of five basic open surgical skills during June and July of 2011 and 2014 at three residency programs. The skills included two handed knot tying, one handed knot tying, and simple interrupted suturing. Residents completed two trials of each task with overall scores determined related to time to completion and total errors. Mean values were determined for each of the five tasks with time values and overall scores compared using unpaired two-tailed t-test.

Results: Thirty-two 2014 PGY 1s were compared to 31 2011 PGY 1s. 2014 PGY 1s had statistically significant lower times and higher scores on two handed knot tying under tension using a surgeon's knot. 2011 PGY 1s had significantly lower times on one handed knot tying but overall scores were similar to 2014 PGY 1s. All other task time and overall score comparisons were not statistically significantly different.

Conclusions: 2014 PGY 1s appear to be better at two handed knot tying under tension. Overall, however, skill level has not notably changed for most basic open technical skills among incoming PGY 1 levels from 2011 to 2014.

Resident-Attending Interactions and Progressive Autonomy in the Operating Room

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Background/Purpose: The operating room is a critical learning environment for surgical residents. Moving residents from observers to assistants to safe independent practitioners, while keeping patient safety paramount, is a complex feat. Faculty must make entrustment decisions and determine the degree to which they feel they can safely release greater responsibility to the resident. It is absolutely necessary to better understand resident-attending interactions in the operating room and what factors enhance or inhibit this progressive entrustment to produce safe independent surgeons. Starting with one key member of the teaching-learning dyad, this study explores resident perspectives on educational interactions and progressive autonomy in the operating room.

Methods: Applying convenience sampling, all senior residents at a surgical educational conference were invited to participate in the study. Using grounded, constructivist theory, we conducted semi-structured interviews with thirty-two senior surgery residents (PGY3-PGY6) and fellows from a variety of geographic regions and types of institutions on their perceptions of entrustment and progressive autonomy in the operating room. Interviews were transcribed, open coded, and thematically analyzed using NVivo®.

Results: Six higher-order themes emerged that focused on resident-attending interactions that impact entrustment in the operating room. These include degree of independence resident is granted to lead the case in part or whole (opportunities for trainee to safely advance the operation), degree of resident engagement in perioperative decision-making (briefing, intraoperative teaching, debriefing), attending ability to segment case in steps (stepwise gradual release), system factors that impact release of case to resident (faculty pressures/concerns regarding resident's role), physical and behavioral cuing by faculty (verbal and non-verbal), and degree of faculty presence during the case (scrubbed and leading to out of the room). Each theme represents a continuum of relations that range from enhancing progressive autonomy to inhibiting progressive autonomy.

Conclusions: Identification of specific resident-attending interactions which enhance and inhibit progressive entrustment in the operating room is critical to the development of successful faculty training interventions to optimize resident progress towards autonomy. Equal investigation into the perspectives of faculty regarding this critical interaction is needed.

Getting In On The Ground Floor: Informing Pre-Medical Student Decisions To Join The Surgical Workforce Of Tomorrow

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Background: In 2010 a program was established to provide pre-medical students with the opportunity to gain first-hand experience with careers in surgery at an academic hospital. Students attend workshops, round with surgical teams and observe operations. Some contribute to surgical research projects. The goal of the study was to characterize the backgrounds and follow-up on the outcomes of all program participants to date.

Methods: An anonymous, voluntary, online survey was distributed using an e-mail listserv to all individuals who completed the program from 2010 to 2014. The 36-item survey characterized participants' demographics, satisfaction with the program, and career plans after completing the program.

Results: A total of 224 students responded to the survey (46% of 486 students). Approximately one-eighth (30/224) of responding students self-identified as an under-represented minority (URM). Nearly half (109/224) of the students had applied to medical school at the time of survey, with a 76% acceptance rate. Of the 14 URM students who applied to medical school, 12 were accepted. Of the students who had not applied to medical school at the time of the survey, 11 had chosen not to pursue a career as a physician. The majority (178/224) of students noted that the program influenced their attitude toward a career in medicine positively. Students were satisfied with the program experience (209/224) and were likely to recommend the program to a peer (211/224). Students' perceived knowledge about a career in medicine increased from 3.1 to 4.5, on a 5-point Likert scale. There was a ten-fold increase in the number of students reporting a score of 5 (very knowledgeable) after completing the program.

Conclusion: The program successfully provides pre-medical students with an opportunity to experience surgical practices in a clinical setting early in their education, allowing them to make more informed choices about their career paths. It also provides mentorship with applying to medical school for those who wish to pursue careers as physicians. Tailoring outreach efforts at the pre-medical stage may be instrumental in increasing diversity among medical school matriculates and potentially future surgeons.

Stress Survey of Anesthesiology Residents

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Introduction

The role of stress and burnout is well established among physicians. It is related to a higher risk of medical error and substance abuse. Anesthesiologists are not immune to these risks. Burnout among anesthesiologists especially department leaders including department chairs and residency program directors has been previously studied. This is a study describing the prevalence of burnout and the causes of stress among anesthesiology residents at all levels of training.

Methods

In the summer of 2014, a survey was sent to all the existing anesthesiology residents excluding interns at a large academic anesthesiology residency program. The residents were told that the survey was elective, and that all answers were anonymous and would have no impact on their training and evaluation. The residents were told the objective of the study was to assess sources of stress among residents. The survey included questions about demographics, causes of stress, and stress coping mechanisms. Burnout was assessed by questions adapted from the Maslach Burnout Inventory. The residents were able to offer free text comments about stress too. The statistical method was primarily a descriptive summary.

Results

Among 60 residents, 25 residents (41%) responded to the survey and were included in the analyses. Overall, 48% of respondents met criteria for burnout which is defined as high depersonalization, high emotional exhaustion or low personal achievement. In this group of anesthesiology residents, high depersonalization was most notable (40%), followed by high emotional exhaustion in 20%. The rate of low personal achievement was only 12% (Fig 1). The residents noted that the greatest cause of stress was production pressure. Other significant sources of stress included conflict with the surgical team and the acuity of the patient's illness (Fig 2). The most useful coping mechanisms for stress among the residents include support from family, friends and colleagues (Fig 3). The majority of the residents identified residency program leadership or faculty advisors as stress coping mechanism slightly or not at all (Fig 3).

Discussion

Anesthesiology residents comprise a high at-risk group for burnout due to their position in the medical hierarchy. This study of stress among residents at a single institution indicates that a significant number of residents met burnout criteria. The greatest causes of stress were related to the operating room environment namely production pressure. This study also suggests that the residency program and the anesthesiology faculty can better support how the residents cope with stress and burnout.

Fig 1. Maslach Burnout Inventory - Human Services Survey

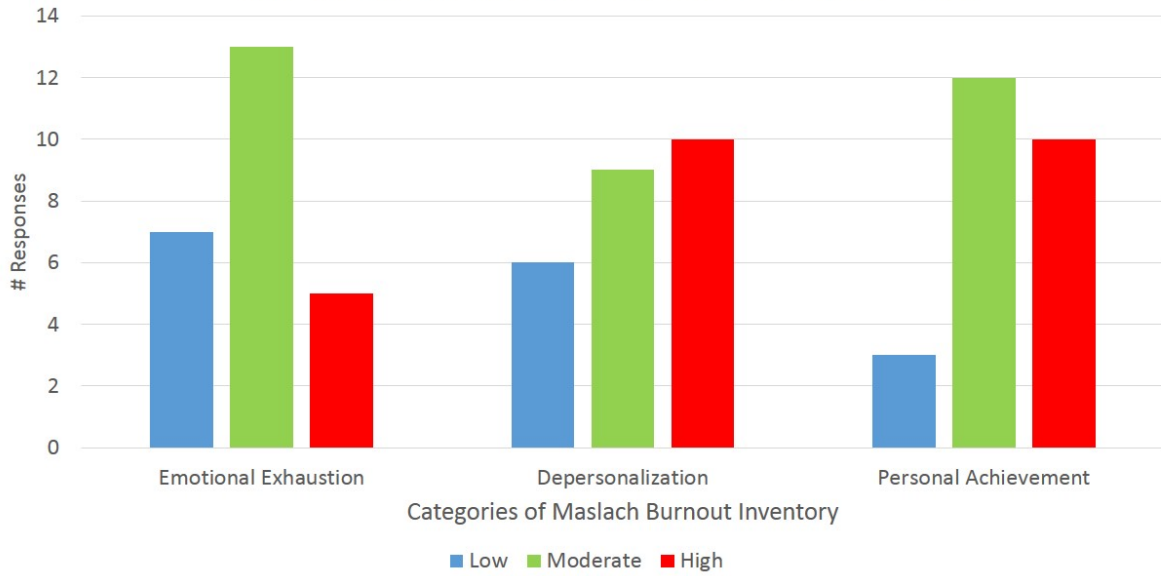


Fig 2. Causes of Anesthesiology Resident Stress

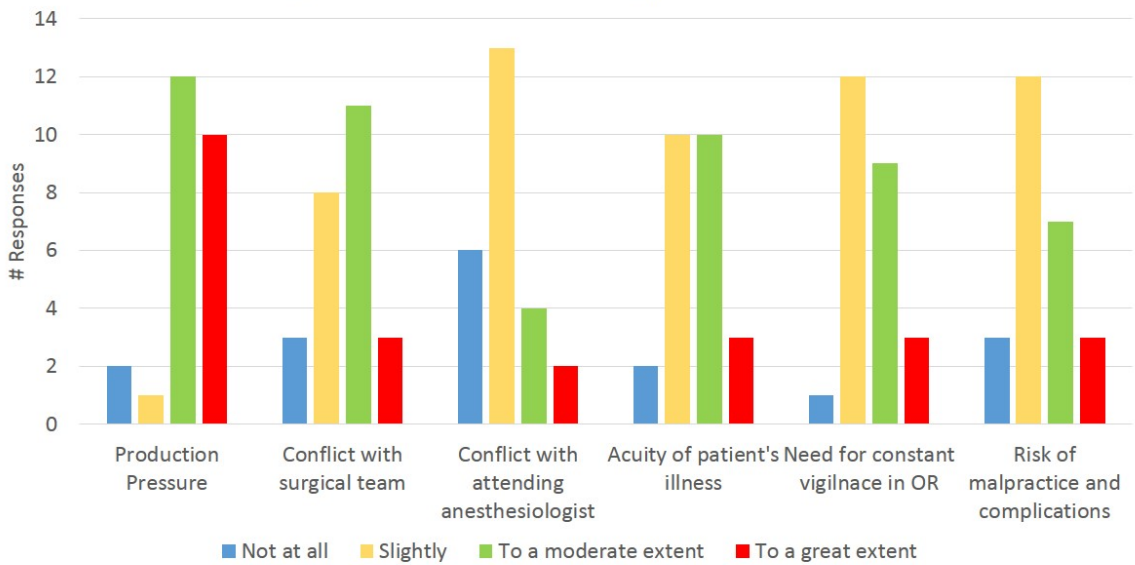
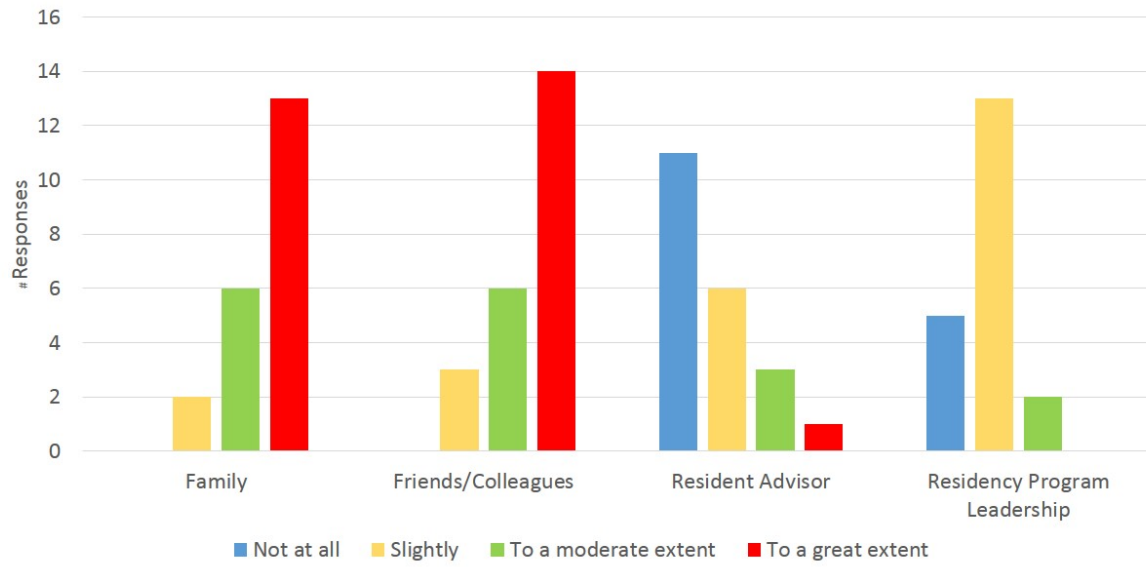


Fig 3. Resident Stress Coping Mechanism



Assessment of a mentorship program in an academic anesthesia department

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Background: Mentorship of residents by faculty has become an important part of residency training, although there is little data surrounding these efforts within academic anesthesiology departments. The University of Wisconsin (UW) has had a resident mentorship program in place for many years. The intent of this survey was to examine the congruency in the perception of the mentoring program between faculty and residents and determine what both parties feel are important areas to address in mentoring relationships.

Methods: The Institutional Review Board granted exemption status for this project. Anonymous surveys (Figure 1) were emailed to residents and academic faculty in the UW Anesthesiology program. Both current residents and most recent graduating class were included.

Results: Faculty and residents were asked to complete the survey, with response rates of 63% for faculty and 70% for residents. Fifty-six percent of faculty respondents (N=18) were mentors and 76% (N=28) of resident respondents were mentees. The mentees who responded included one CA-1 (clinical anesthesia year one) (4%), 29% CA-2's, 43% CA-3's and 25% recent graduates. Tables 1 and 2 present survey results addressing the mentor/mentee relationship, with additional questions regarding feedback and mentoring support. Faculty and residents were asked to rank order a list of subjects which might be dealt with in a mentoring relationship. Both groups identified "career planning" as the most important issue. Similarly, both groups identified "guidance on the boarding process and exams", "achieving a balance between work and personal life" and "how to succeed as a resident at UW Hospital" as top issues to address.

Discussion: These results demonstrate that overall both residents and faculty report that they are in positive mentoring relationships, and the two groups generally agree on the most important issues to be addressed. They disagree on the frequency with which these areas are being addressed. Lack of departmental support was identified as an issue for mentors, a finding that was reinforced by an open-ended question on which over half (10) of faculty stated a desire for further training. It has been suggested that a formal mentorship training program may improve the mentors' confidence and understanding and thereby reduce a barrier to successful mentorship¹ but this has not been demonstrated in the literature. Further exploration into the characteristics of effective, supported mentoring relationships at UW between faculty and residents is warranted based on these survey results.

1. Flexman AM, Gelb AW. Mentorship in Anesthesia. Current Opinion in Anesthesiology. 2011;24:676-681.

Default Question Block

Do you have mentor assigned to you?

- Yes
- No

Did you choose your mentor?

- Yes
- No
- Not applicable

Approximately, how often do you formally meet with your mentor?

- Less than once a year
- Once a year
- 2-3 times a year
- 4+ times a year
- I have never met with my mentor and I am NOT a CA-1
- I am a CA1 and have NOT had a chance to meet yet with my mentor
- Other

Approximately how often do you informally meet with your mentor?

- Never
- Less than once a year
- Once a year
- 2-3 times a year
- 4+ times a year
- Mentor is NOT a CA1 but I have never met with them
- I am CA-1 and I have NOT had a chance to meet them
- Other

Approximately how often would you like to meet with your mentor in total (both formally and informally)?

- Never
- Less than once a year
- Once a year
- 2-3 times a year
- 4+ times a year
- Other

What year are you?

- CA-1
- CA-2
- CA-3
- Past CA-3

Does your mentor provide guidance in research and academic pursuits?

- Yes
- No

Does your mentor provide guidance in balance of your personal and professional life?

- Yes
- No

Does your mentor provide guidance in how to demonstrate professionalism (respect and sensitivity toward patients)?

- Yes
- No

Does your mentor provide you with assistance in formulating the basis for the clinical judgments you make regarding cases?

- Yes
- No

Does your mentor provide guidance in career planning?

- Yes
- No

Does your mentor provide you with guidance in how to be a leader in the operating room?

- Yes
- No

Does your mentor provide you with guidance on how to prepare for the exams you need to take in anesthesia and/or the boarding process?

- Yes
- No

Does your mentor provide guidance in how to succeed as a resident in the UW anesthesia program?

- Yes
- No

Do you think that your mentor can recognize signs of sleep deprivation and/or stress and will (or has) take(n) steps to discuss this with you and/or alleviate this issue?

- Yes
- No

My mentor is accessible.

- Yes
- No

My mentor is approachable.

- Yes
- No

My mentor is supportive and encouraging.

- Yes
- No

My mentor encourages me to improve my work product.

- Yes
 No

My mentor answers my questions satisfactorily (timely response, clear, comprehensive).

- Yes
 No

My mentor models a commitment to life-long learning.

- Yes
 No

My mentor discusses residency program improvements with me.

- Yes
 No

My mentor challenges me to grow professionally.

- Yes
 No

My mentor provides effective positive feedback to me.

- Yes
 No

My mentor provides effective negative feedback to me.

- Yes
 No

My mentor provides me with guidance on how to deal with difficult situations.

- Yes

No

Do you feel that your mentor has adequate time to be an effective mentor?

Yes

No

My mentor is an effective mentor.

Yes

No

The department supports mentoring relationships between faculty and residents.

Yes

No

Is mentorship of residents by faculty is important?

Yes

No

The following are a list of suggested areas in which a mentor may provide guidance. Please rank how important you think it is that a mentor provide guidance in each of the following areas. "1" will indicate the most important area and "10" the least important.

- Clinical judgement for cases
- Research and academic projects
- Leadership strategies in the operating room
- Professionalism in anesthesia (respect and sensitivity toward patients, responsiveness to patient needs etc)
- Career planning
- How to succeed as a resident at UW Hospital
- Achieving a balance between personal, career, and family responsibilities
- Guidance in preparing for my board and other exams, as well as guidance in the boarding process
- Addressing issues of sleep deprivation and stress
- Other

How could the mentoring process be improved?

Thanks for completing this survey. If you have any concerns or comments please post them here or email
Melanie Donnelly at mjdonnelly@wisc.edu

Table 1. Resident responses to survey (N=26) presented as a percentage of respondents

Question	Yes(%)	No(%)
Does your mentor provide guidance in research and academic pursuits?	69	31
Does your mentor provide guidance in balance of your personal and professional life?	73	27
Does your mentor provide guidance in how to demonstrate professionalism (respect and sensitivity toward patients)?	85	15
Does your mentor provide you with assistance in formulating the basis for the clinical judgments you make regarding cases?	76	24
Does your mentor provide guidance in career planning?	69	31
Does your mentor provide you with guidance in how to be a leader in the operating room?	72	28
Does your mentor provide you with guidance on how to prepare for the exams you need to take in anesthesia and/or the boarding process?	48	52
Does your mentor provide guidance in how to succeed as a resident in the UW anesthesia program?	81	19
Do you think your mentor can recognize signs of sleep deprivation and/or stress and will(or has) take(n) steps to discuss with you and/or alleviate this issue?	62	38
Do you feel that your mentor has adequate time to be an effective mentor?	73	27
The department supports mentoring relationships between faculty and residents.	80	20
Is mentorship of residents by faculty important?	97	3

Table 2. Faculty responses (N=16) presented as a percentage of respondents

Question	Yes (%)	No(%)
Do you provide guidance to your mentee in research and academic pursuits?	69	31
Do you provide guidance to your mentee in balance of your personal and professional life?	75	25
Do you provide guidance to your mentee in how to demonstrate professionalism (respect and sensitivity toward patients)?	56	44
Do you provide your mentee with assistance in formulating the basis for the clinical judgments you make regarding cases?	56	44
Do you provide guidance to your mentee in career planning?	100	0
Do you provide guidance to your mentee in how to be a leader in the operating room?	63	38
Do you provide guidance to your mentee on how to prepare for the exams you need to take in anesthesia and/or the boarding process?	87	13
Do you provide guidance to your mentee in how to succeed as a resident in the UW anesthesia program?	81	19
Would you be able to and/or do you recognize signs of sleep deprivation and/or stress and will(or has) take(n) steps to discuss with you and/or alleviate this issue?	81	19
Do you feel that you have adequate time to be an effective mentor?	75	25
The department supports me in my role as a mentor to the residents.	53	47
Do you think mentorship of residents by faculty is important?	93	7

Gender Amongst Academic Anesthesiology Leadership

Robert ES Bowen, MD – New York-Presbyterian/Weill Cornell Medical Center

Jean A Simonson, MD – University of Nebraska Medical Center

Lisa L Schlitzkus, MD – University of Nebraska Medical Center

Introduction: Women are underrepresented in academic anesthesiology. Only 28% of academic anesthesiologists are female, but half of all medical school graduates and 37% of anesthesiology residents and fellows are female. We hypothesize that despite the increasing presence of females, there remains a paucity of females in the leadership roles of Program Director (PD) and Chair and that females are more likely to be PDs than Chairs.

Methods: Using the ACGME program database and program websites, we identified the gender of the Chair and Program Director of all anesthesiology core residencies and ACGME approved anesthesiology fellowships by name and picture identification. Statistical analysis compared percentages in these roles and based on location and type of program using chi-square and Fisher exact tests where appropriate with a $p < 0.05$ considered significant.

Results: More women serve in the role of PD than Chair in anesthesiology and in every fellowship (Table 1). They are statistically more likely to be PD for Anesthesiology residencies, Adult Cardiothoracic, Obstetric, and Pediatric fellowships (Table 1). There is a higher percentage of female Chairs in community programs, but in academic programs, women are significantly more likely to be PD (Table 1). There is no statistical difference between the percent of female Chairs when comparing community to academic or the percent of female PD when comparing community to academic (Table 1). When comparing program location by regions (North, South, Midwest, West), there was no statistical significance between the percent of female Chairs or PDs (Table 2).

Discussion: Women are minorities in the roles of Program Director and Chair except for serving as PD for Obstetric anesthesiology fellowship. More women hold the role of PD and when compared to the percent of chairs, for the most part, this difference is significant. Gender diversity is critical to providing healthcare reflective of society and improving care and knowledge. We should focus on the career development of academic female anesthesiologists to help them achieve leadership roles. In turn, they may serve as role models, encouraging more females to consider anesthesiology and pursue academic careers.

Table 1

	n	Chairs	PDs	p value
Anesthesiology (core residency programs)	132	10.6%	32.6%	<0.005
Adult Cardiothoracic Fellowship	61	14.8%	34.4%	0.025
Critical Care Fellowship	55	10.9%	16.4%	0.9
Obstetric Fellowship	27	18.5%	59.3%	<0.005
Pain Fellowship	97	11.3%	19.6%	0.9
Pediatric Fellowship	50	20.4%	48.0%	<0.005
Community Core Residency Programs	30	26.7%	16.7%	0.3472
Academic Core Residency Programs	98	9.2%	34.7%	<0.0001

Table 2

	North	South	Midwest	West	p value
Anesthesiology (core residency) Chair	14.3%	10.3%	6.5%	10.5%	0.7936
Anesthesiology (core residency) PD	26.2%	33.3%	29.0%	47.4%	0.4124
Adult Cardiothoracic Fellowship Chair	26.3%	17.7%	6.7%	0%	0.2439
Adult Cardiothoracic Fellowship PD	36.8%	23.5%	40.0%	40%	0.7321
Critical Care Fellowship Chair	7.7%	21.1%	7.7%	0%	0.4748
Critical Care Fellowship PD	15.4%	10.5%	15.4%	30%	0.6252
Obstetric Fellowship Chair	25.0%	20.0%	16.7%	0%	1.000
Obstetric Fellowship PD	50.0%	60.0%	83.3%	33.0%	0.5084
Pain Fellowship Chair	18.5%	12.9%	5.0%	5.3%	0.4713
Pain Fellowship PD	7.4%	25.8%	20.0%	26.3%	0.2547
Pediatric Fellowship Chair	27.3%	40.0%	7.7%	0%	0.0515
Pediatric Fellowship PD	36.4%	53.3%	42.9%	60%	0.6839

Personality types and conflict comfort level perception: How well do they correlate?

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Chris Fox, PhD – Medical College of Wisconsin

Jutta Novalija, MD PhD – Medical College of Wisconsin

Intro: The operating room is a high-stress workplace where interpersonal conflict can be intense. The ability to cope appropriately with conflicts is dependent on experience and the unique set of behavioral skills of every individual. Personality types may play a role in the performance evaluation of each anesthesiology resident. Objective standardized tests such as the MBTI and TKI (standardized personality type and conflict management inventories) can tailor feedback to enhance learning. We hypothesized that personalized feedback coupled with HFS scenarios that emphasized interpersonal and/or communication issues, would further improve trainee's perception of usefulness of the HFS in their training and lead to improved individual performance on HFS as it pertains to managing difficult interpersonal conflicts. To test this hypothesis, we exposed our control and experimental groups to a series of four high-fidelity simulation scenarios over the course of a year.

Methods: Two CA-1 (n=42) classes were enrolled in a randomized controlled study. Each participant was assessed with the Thomas-Kilmann Conflict Mode Instrument (TKI) and the Myers-Briggs Type Indicator (MBTI) before participating in two sets of HFS scenarios. Participants were randomized into two groups: group C (control) to receive communication on simulation scenarios with no individual attention tied to MBTI or TKI results and group E (experimental) to receive feedback based on residents' individual conflict-management styles or personality type preferences. All simulated scenarios were videotaped and rated by trained personnel using a checklist-scoring instrument to determine performance on pre-specified competency areas. Pre- and post-study surveys were performed and a final follow-up one-year questionnaire was administered. Statistical analysis was conducted to answer 2 questions: 1) does conflict style (compete vs avoid) correlate with MBTI personality type and 2) does perceived comfort level in dealing with conflicts correlate with extraversion or introversion.

Results: Statistical analysis with SAS (student's t test of the mean) and OLS regression demonstrated significance to a 5% level between Introverts and avoiding conflict style but not with Extraverts and competing style. In addition, it demonstrated significantly higher pre and post conflict comfort level scores (5 point Likert scale) in Extraverts even after controlling for avoiding and competing styles.

Conclusion: Personality types and conflict styles may be used to enhance learning when coupled with tailored feedback. Avoiding conflict style was associated with Introvert personality type in our cohort providing us the platform to use HFS scenarios in targeting interpersonal conflict and communication to improve collaborative care in the OR.

Y= pre

Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	Intercept	1	4.42069	0.47828	9.24	<.0001
Extrovert_or_Introvert	Extrovert or Introvert	1	-0.59853	0.30225	-1.98	0.0566
TKI_avoiding	TKI avoiding	1	-0.76061	0.53190	-1.43	0.1627
TKI_competing	TKI competing	1	-0.35353	0.51980	-0.68	0.5015

Y = post

Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	Intercept	1	4.15522	0.41314	10.06	<.0001
Extrovert_or_Introvert	Extrovert or Introvert	1	-0.48068	0.26089	-1.84	0.0741
TKI_avoiding	TKI avoiding	1	-0.38077	0.45342	-0.84	0.4069
TKI_competing	TKI competing	1	-0.18761	0.46640	-0.40	0.6900

Watch what happens: Using a web-based operative video platform to enhance intra-operative learning and development of clinical reasoning

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Introduction: Operative observation is a traditional component of surgical clerkships; however, the association between enhanced learning and case volume and diversity has not been established. We aim to determine whether the number and variety of operations observed in both live operative settings and internet-based video review are associated with improved clinical reasoning and fund of knowledge.

Methods: Following Institutional Review Board approval we conducted a retrospective review of clerkship students' usage of a web-based platform with surgical videos, self-reported record of operations observed, clinical evaluations, and examination scores between January 2013-June 2014. Exploratory principal component analysis was used to determine the dimensions constituting the overall evaluation. A multivariate regression model was applied to determine factors predictive of enhanced clinical reasoning and fund of knowledge.

Results: Case log data for 231 students revealed a median of 25 (range 4-53) observed cases across a median of 8 (range 3-13) categories (Figure 1). Students accessed the web-based video platform a median of 15 times (range 1-78) for a median of 39 minutes (range 0-243). Principal component analysis yielded four factors contributing 74% of the variability with a Kaiser-Meyer-Olkin coefficient of 0.83: subjective evaluation, clinical reasoning and fund of knowledge, video utilization and case log. The multivariate regression model revealed that NBME shelf score ($p < 0.0001$), internal clinical skills examination score ($p < 0.0001$), subjective evaluations ($p < 0.001$) and video website utilization ($p < 0.001$) were significant predictors of clinical reasoning and fund of knowledge evaluations, but observed cases were not.

Conclusions: Utilization of a web-based operative video platform during a surgical clerkship is an independent predictor of clinical reasoning, fund of knowledge and overall evaluations. This modality can serve as a useful adjunct to live observation, though further study is needed to determine how to assess and optimize the learning process.

Figure 1

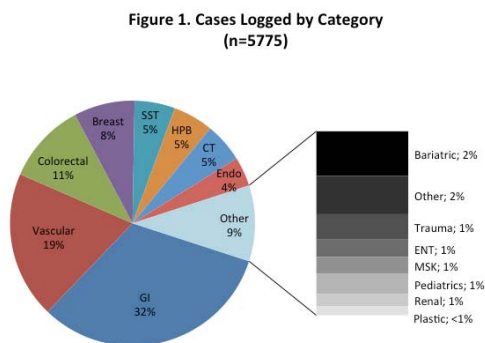


Figure 1- Diversity of cases logged by clerkship students between January 2013-June 2014. SST = Skin and soft tissue; HPB = Hepatobiliary; CT = Cardiothoracic; Endo = Endocrine; ENT = Otorhinolaryngology; MSK = Musculoskeletal.

A Team Based, Open Inguinal Hernia Simulation Improves Resident Teaching Skills and Junior Learner Comfort with Operative Skills

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Background: Building a team-based simulation to incorporate technical skills training for junior learners (medical students and interns) with senior resident teaching skill development remains an ongoing challenge. A high quality inguinal hernia simulation may be able to incorporate dual educational goals.

Methods: We developed a low cost, high fidelity, inguinal hernia simulator that includes junior learners as the primary operators, supervised by a senior resident. An attending surgeon oversaw the simulation. Content validity of the model was assured by a panel of expert general surgeons through an iterative revision process. Knowledge pretests were given to junior learners. Direct feedback was given and recorded after the simulation using a standardized form. Senior residents evaluated junior learners' technical performance while junior learners and the supervising attending evaluated the residents' teaching and team leadership skills. Video was obtained for future demonstration. Grounded qualitative analysis identified key themes and subthemes from student and resident feedback.

Results: The team-based simulation replicated an operating room environment, based on performance scores separating novice from experienced learners. Based on post exercise discussion, students and residents valued both the learning and teaching experience. Pre-test student knowledge was highly variable. Residents and junior learners focused their comments on "communication" and "professionalism" while junior learners gave feedback to residents on "guiding and instructing" and "allowing autonomy." Residents focused their feedback to junior learners on "mechanics", "perspective/flow" and "knowledge/experience." This simulation was rated a median score of 5/5 for knowledge application, educational needs fulfillment and application of skills to clinical work by all participants. Serial testing and revision refined both the tangible model and team simulation process.

Conclusions: A team-based simulation can be used to achieve dual educational goals. This simulation offers the opportunity for junior learners to improve their operative technique while augmenting resident teaching skills. We have incorporated this team-based model into our surgical sub-internship and surgery residency intern curriculum.

Low-fidelity haptic simulation versus “mental imagery” training for epidural anesthesia technical achievement in novice anesthesiology residents: a randomized comparative study

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Introduction

Epidural anesthesia (EA) is rated among the most difficult technical skills to acquire for anesthesia trainees. Many teaching methods for EA exist, ranging from traditional “see one, do one, teach one” approaches on a human patient, to low fidelity (LF) haptic or high fidelity (HF) haptic simulation. Previous work indicates that there is no difference in skill acquisition when novice learners engage in HF versus LF simulation for EA.¹ However no study exists comparing the effect of LF haptic simulation versus “mental imagery” training (or “non-haptic” simulation) for EA. We hypothesized that LF haptic simulation training for EA would be more effective in achieving technical skills among novice trainees, compared to “mental imagery” training in which no physical practice is attempted.

Methods

In this IRB approved single center randomized comparative study, 20 PGY-2 anesthesiology residents were tested at the beginning of the training year. After a didactic lecture on EA, they were randomized to two groups. Group 1 had 60 minutes of LF simulation training for EA using a banana.^{2,3} Group 2 had 60 minutes of “mental imagery” training: they were oriented to the parts of the epidural kit, EA was described in stepwise detail, and a spine model was referenced, but no physical practice was undertaken. Each resident then individually performed EA on a partial-human task trainer on three consecutive occasions under the direct observation of skilled evaluators, who were blinded to group assignment and who assessed technical achievement using a modified validated skills checklist.⁴ Scores (0 –21) and duration (minutes) to task completion were recorded. A mixed model analysis was performed to determine differences in scores and duration between groups and over time. Demographic features were compared using Fisher’s exact test or Mann-Whitney’s U test as appropriate.

Results

Baseline characteristics were similar between the groups (Table 1). There was no statistically significant difference in scores between the two groups ($P=0.58$) (Figure 1A). Both groups showed a similar time effect for score, in that scores increased over time ($P=0.0015$). Time to complete the procedure decreased similarly for both groups after the first attempt ($P=0.032$) (Figure 1B).

Conclusion

Our results suggest that utilization of LF haptic simulation is not superior to “mental imagery” training for technical performance of EA. Education on EA with structured didactics and “mental imagery” training may be adequately preparative for novice learners prior to an attempt on human subjects.

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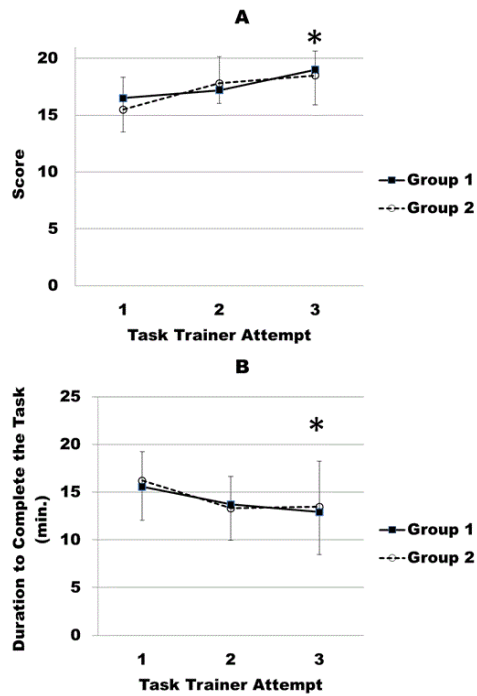


Figure 1. Score (A) and duration to complete the task (B) between groups and over three epidural placement attempts. The asterisk (*) denotes a $P < 0.05$ for the third attempt compared to the first attempt among both groups.

Variable	Group 1 n = 10	Group 2 n = 10	P
Age (years)	28.7 ± 2.0	28.9 ± 4.4	0.38
Sex			1.00
Male	5 (50.0%)	6 (60.0%)	
Female	5 (50.0%)	4 (40.0%)	
Prior epidural anesthesia experience			0.63
Yes	2 (20.0%)	3 (33.3%)	
Prior spinal anesthesia experience			1.00
Yes	3 (30.0%)	2 (22.2%)	
Degree			0.47
M.D. or D.O.	9 (90.0%)	10 (100.0%)	
M.D., Ph.D.	1 (10.0%)	0 (0.0%)	

Table 1. Comparison of the baseline characteristics of the two groups. Data are reported as mean ± SD or number of subjects (percentage).

Knowledge and Motor Skill Acquisition and Retention after a Multimodal Perioperative Ultrasound Curriculum for Interns

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Introduction:

Perioperative ultrasound (US) is an essential skill for anesthesiologists, but residency programs lack structured teaching for US, and the ideal stage to teach this skill has not been determined. We hypothesized that participation in a structured, multimodal curriculum in basic perioperative US would allow US naïve anesthesiology interns to (1) develop knowledge and motor skills necessary to perform perioperative US, (2) sustain these gain over ninety days, and (3) meet or exceed the performance of graduating senior anesthesiology residents on knowledge and motor skills testing in perioperative US.

Methods:

Six interns completed a multimodal 13-day basic US course in November 2013. The course covered basic US, knobology, US-guided regional anesthesia and vascular access, lung US, transthoracic and transesophageal echocardiography (TEE and TTE), and US in shock. Teaching tools included live lectures, online modules, Apple iBooks, case discussions, observation in the operating room, simulation on phantom models and haptic echocardiography simulators, and live interactive workshops.

The interns' US knowledge was assessed using a 55-question test before and after the course. At the end of the course, the interns were asked to obtain basic US images on live models; image quality and need for assistance were noted. Echocardiography skills were assessed at the end of the course using probe motion data from simulators.

Knowledge and echocardiography skills were reassessed ninety days after the course. Six senior residents completed the same knowledge and echocardiography skills testing in May 2014. Comparisons were made with the Wilcoxon signed-rank test or Mann-Whitney U test, as appropriate.

Results:

Interns scored higher on the knowledge test at the end of the course than at the start ($p = 0.03$, Figure 1). Their follow-up scores were similar to their end-of-course scores and to the senior residents' scores ($p > 0.05$, Figure 1). At the end of the course, all interns acquired adequate images on the models with little assistance (Table 1). Their echocardiography skills at the end of the course and at follow-up were superior to the senior residents' skills ($p < 0.05$, Table 2). Their follow-up skills were similar to their end-of-course skills ($p > 0.05$, Table 2).

Discussion:

A multimodal US course can impart basic perioperative US knowledge and skills to interns that are sustained ninety days after the course. The performance of interns was comparable to senior residents on knowledge testing and superior to senior residents on echocardiography skills testing. Further research is needed to demonstrate generalizability.

Figure 1: Scores on Knowledge Test

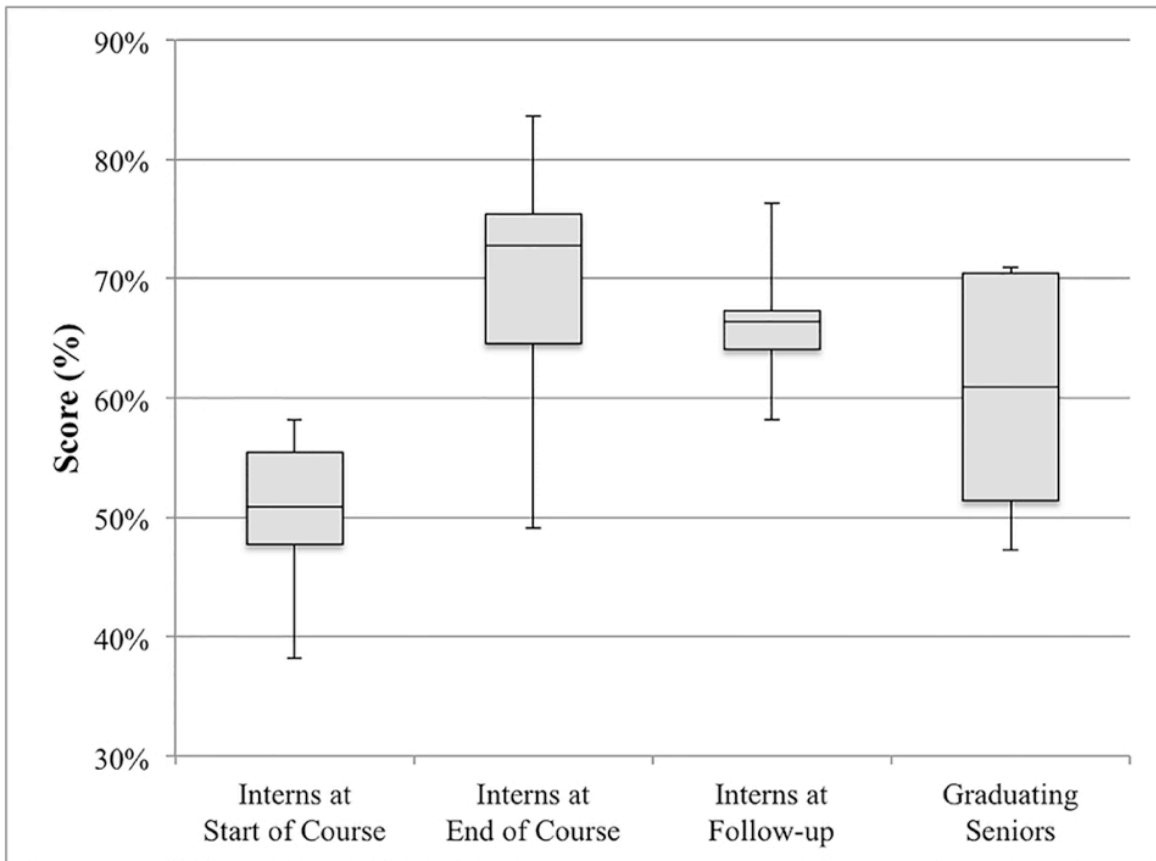


Table 1: Evaluation of Image Acquisition on Live Human Models

	Image Quality (% of views)				Need for assistance (% of views)	
	Excellent	Good	Fair	Poor	Yes	No
Ultrasound modality						
Vascular access	100	—	—	—	—	100
Regional anesthesia	100	—	—	—	8	92
Transthoracic echocardiography	61.2	31.7	7.1	—	20	80

Table 2: Kinematic Metrics for Interns and Graduating Seniors

Echocardiographic Modality	Kinematic Metric	Interns (End of Course)	Interns (Follow-up)*	Graduating Seniors**
<i>Transesophageal</i>	Path length (cm)	11.70 (4.89-21.03)	8.06 (4.63-12.80)	12.63 (3.99-18.15)
	Probe accelerations (#)	48.5 (26-80.25)	45 (27.52-77.5)	89 (40.5-138.5)
	Total Time (s)	17.24 (13.94-24.71)	14.84 (10.85-23.10)	26.43 (15.59-46.77)
<i>Transthoracic</i>	Path length (cm)	39.82 (27.64-54.61)	30.30 (18.65-41.21)	117.76 (54.80-160.53)
	Probe accelerations (#)	80.5 (54.5-126)	77 (48-131.5)	553 (266-814)
	Total Time (s)	12.10 (8.70-18.48)	11.40 (8.42-18.16)	64.47 (28.14-90.47)

*p > 0.05 for all metrics for Interns (Follow-up) versus Interns (End of Course); p < 0.05 for all metrics for Interns (Follow-up) versus Graduating Seniors

**p < 0.05 for all metrics for Graduating Seniors versus Interns (End of Course) and for Graduating Seniors versus Interns (Follow-up)

Teaching Ultrasound-Guided Regional Anesthesia by Telesimulation: A Feasibility Study

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Background

The use of ultrasound in regional anesthesia has introduced a new set of skills. These include ultrasound imaging, needle insertion and needle tracking skills. Learning requires one-on-one teaching and practice. We investigate the efficacy of Telesimulation, a novel teaching platform which uses simulators, a series of webcams and basic video conferencing software, as a method for developing and assessing the skills required for ultrasound-guided regional anesthesia (UGRA).

Methods

Ten Anesthesia Site Chiefs working at hospitals across Ontario, Canada were sent a letter inviting their anesthesia teams to participate in UGRA Telesimulation training. The first four hospitals expressing interest for this training were enrolled in the study, with four to five anesthetic participants per site. Telesimulation platforms (including simulation models and ultrasound machines) were setup at each location. Training consisted of four sessions and one off-line lecture in order to teach an ultrasound-guided supraclavicular block. Participants were evaluated pre- and post-training by on-site and off-site raters using a validated 22-point Checklist and 9-item Global Rating Scale (GRS). Inter-rater reliability was evaluated using intra-class correlations (ICCs). Pearson's correlations between the GRS and Checklist scores were calculated and presented separately for on and off-site rating.

Results

Nineteen staff anesthesiologists were recruited. Post-training scores were significantly higher across both assessment tools and for all rating methods, on-site ($p < 0.0001$) and off-site remote training location ($p = 0.003$). The inter-rater reliability between on-site and remote training site ratings were good for the Checklist (ICC=0.672, 95% CI: 0.369-0.830) and excellent for the GRS (ICC=0.847, 95% CI: 0.706-0.921). Scores recorded on-site via Telesimulation had a correlation of 0.811 ($p < 0.001$), while those at the remote location were correlated at 0.848 ($p < 0.001$).

Discussion

This is the first study to demonstrate the effectiveness and feasibility of using Telesimulation to teach UGRA. We saw marked improvement in UGRA skills in our participants after two sessions, with them being more confident in performing the procedure after the training. This was assessed with a recently validated Checklist and GRS, which have importantly shown good discriminative power between novice and expert UGRA practitioners on both patients and simulation models. The rating was performed by multiple raters; two on-site and one off-site at the remote teaching location to limit any bias in assessment. Future research will focus on developing this program for other ultrasound-guided procedures and its application in resource-restricted regions globally.

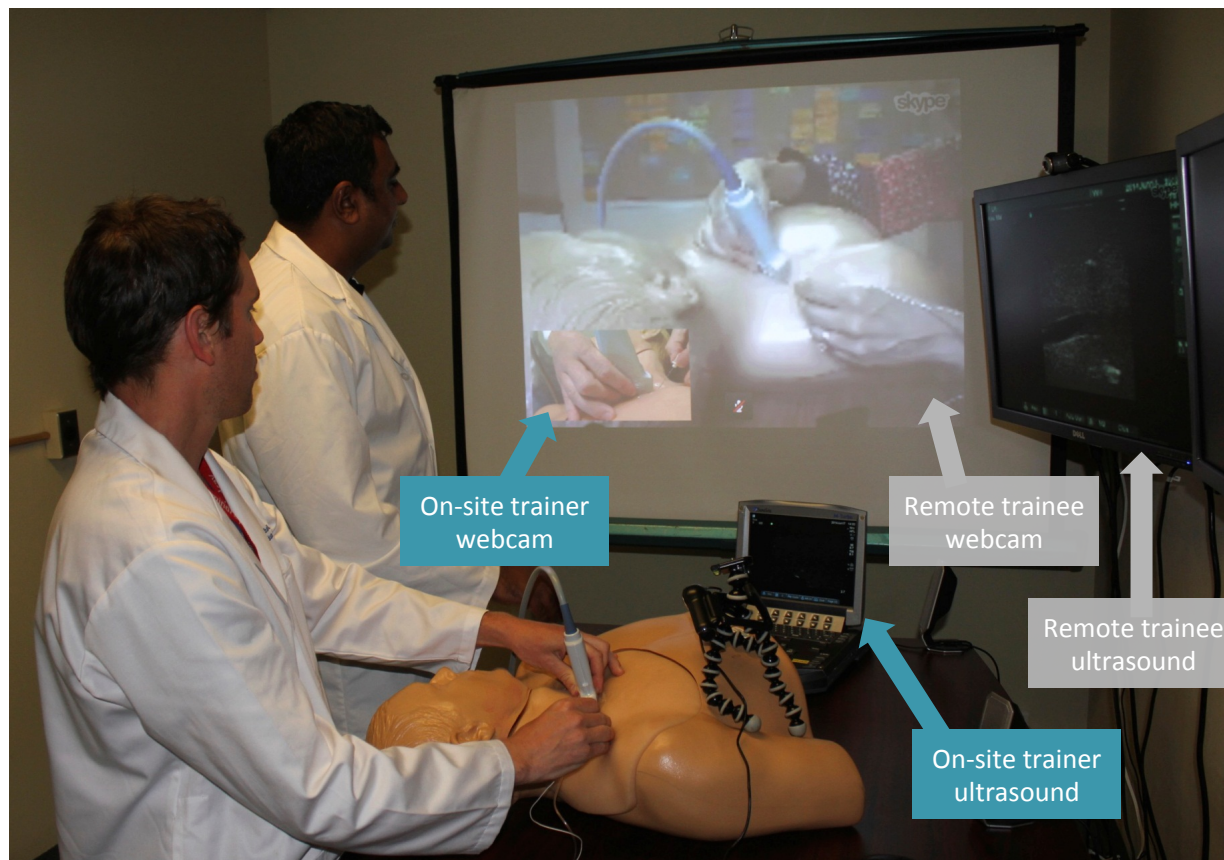


Figure 1. A typical Telesimulation platform setup for ultrasound-guided regional anesthesia. In this context, on-site refers to trainers at the our Telesimulation Centre and off-site refers to the trainees at a remote training location.

Trainee experience with high fidelity medical simulation for a Pediatric Advanced Life Support course

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Alyssa Brzenski, M.D. – University of California San Diego

Introduction: Pediatric resuscitations are infrequent events that may be encountered by physicians that do not usually treat pediatric patients. Certification courses, such as Pediatric Advanced Life Support (PALS), address this educational need, but outcomes remain poor for pediatric resuscitation. This study examines whether the addition of high-fidelity medical simulation (HFMS) is perceived by medical professionals to offer educational benefit for PALS training.

Methods: Anesthesiology residents attending PALS courses at a tertiary care academic medical center were invited to participate. The course consisted of a didactic review of PALS algorithms, followed by scripted case scenarios requiring clinical assessment and intervention according to the PALS algorithms. These simulations were run on an infant mannequin (SimBaby, Laerdal). The mannequin was equipped to provide physical signs and vital signs that were altered as the scenario progressed. Pre- and post-intervention surveys were administered covering prior experience with pediatric care and HFMS. 5-point Likert scales measured confidence level with pediatric care, attitudes towards the use of HFMS and impact of physical mannequin features on the realism of the scenarios. Pre- and post-intervention data were compared using a paired-samples t-test. Data from the additional post-intervention questions were summarized descriptively.

Results: From January-August 2014 a total of 19 anesthesiology residents participated in the PALS course. All residents participated in the surveys. For 13 (68%) participants, this was their first experience with pediatric HFMS. Six (32%) participants had no or minimal prior experience with pediatric care, 11 (68%) had limited experience of 2-6 months, and 2 (11%) had experience of greater than 6 months. Post-intervention responses showed statistically significant increases in comfort with assessment and treatment of critically ill pediatric patients ($p < 0.05$), comfort with using simulators in training for PALS ($p < 0.05$) and attitudes regarding simulator realism ($p < 0.05$). Of the trainees' ratings of simulator features, the ability to palpate pulses was rated the most highly (4.26 +/- 0.7), followed the ability to hear vocal sounds (4.16 +/- 0.8).

Discussion: This study supports the finding that participation in HFMS increases comfort level with pediatric critical care situations. This is true even in a participant group composed mostly of trainees with minimal or limited experience with pediatric care. This finding suggests that HFMS may benefit physicians who are occasionally tasked with caring for pediatric patients in emergent situations. Future studies will be needed to determine if the use of HFMS improves the retention of PALS resuscitation knowledge.

A randomized, controlled trial comparing the effectiveness of simulation-based deliberate practice versus a standard curriculum on learning regional anesthesia in resident anesthesiologists

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Introduction

Performing ultrasound (US)-guided peripheral nerve blocks (PNB) is a competency expected of anesthesiology residents. Some methods for learning this fundamental skill include apprenticeship, online videos, and simulation-based training. The impact of these various educational techniques on resident competency in regional anesthesia are largely unquantified. We aim to determine the efficacy of simulation-based deliberate practice (DP) on novice residents' performance of US-guided PNB. DP training entails 1) focused and repetitive practice, 2) informative real-time feedback, 3) precise measurements of performance, 4) a motivated learner, and 5) well-defined learning objectives. We hypothesize that simulation-based DP will increase resident assessment scores and self-confidence in performing US-guided PNB versus a standard curriculum.

Methods

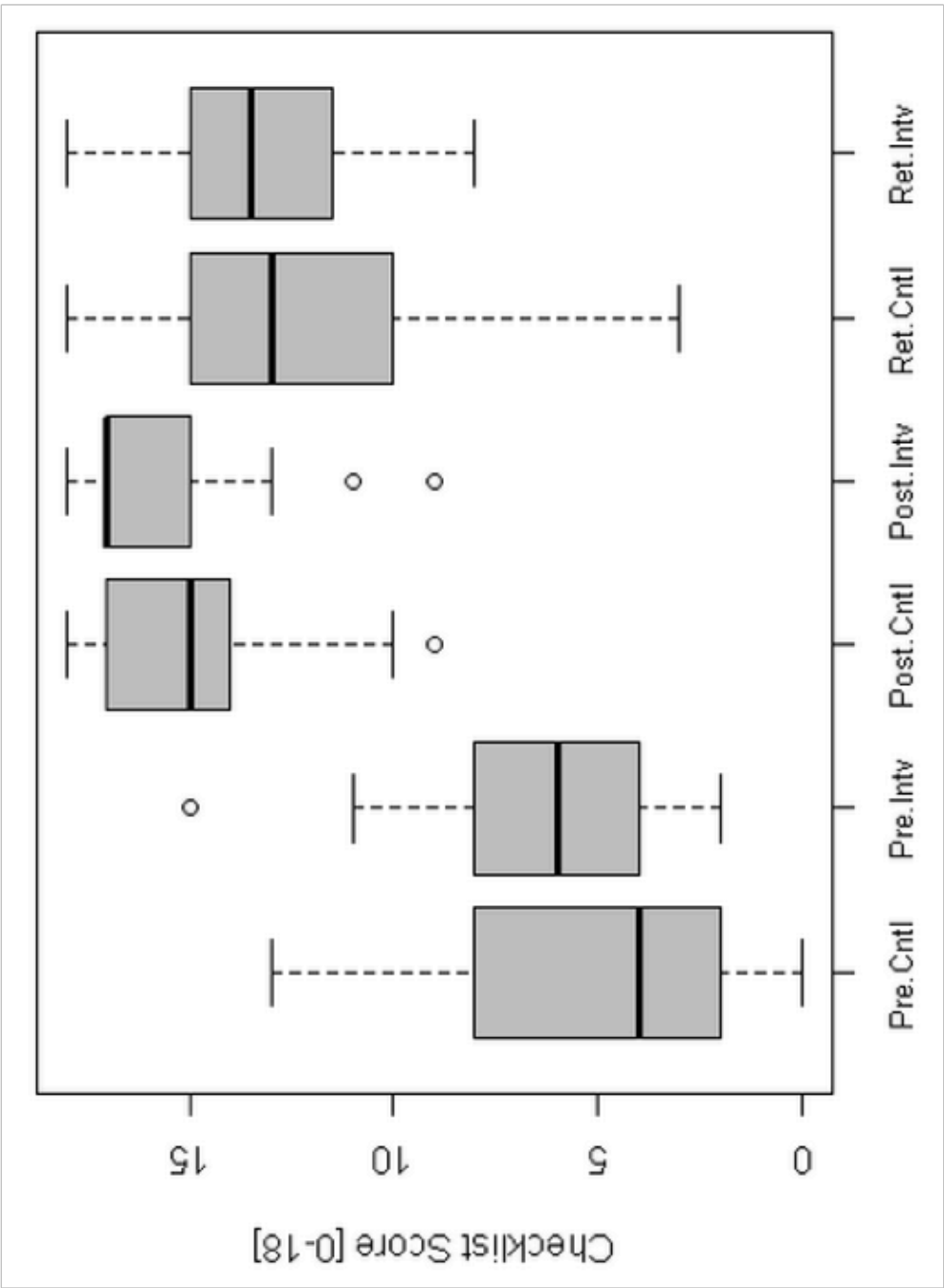
After IRB approval, novice, anesthesiology residents participated in a standardized base curriculum consisting of written instructional and video materials. Participants were then randomized to receive either DP or self-guided simulation-based training. The DP training session used expert coaching and an iterative process requiring mastery of each procedural step before proceeding to the next on a PNB simulator. Two blinded reviewers scored each participant's performance of US-guided PNB after equipment orientation (baseline), immediately after completing the curriculum (post), and three months following study enrollment (retention). Performance was scored using a published assessment tool. Each participant's confidence in performing unassisted US-guided PNB was reported at each interval.

Results

28 participants enrolled and were video-recorded at three intervals performing US-guided PNB. Statistical tests showed no significant difference between groups in assessment scores immediately after the curriculum ($p=0.215$) and three months following study enrollment ($p=0.145$) [Fig. 1]. Participants in each group did not self-report any difference in their confidence in performing unassisted US-guided PNB at any interval (Baseline $p=1$, Post $p=0.560$, Retention $p=1$). The amount of time participants spent with the simulator differed between groups. Participants enrolled in the DP curriculum spent on average 2907s compared to 409s spent by participants in the standard curriculum ($p<0.001$).

Discussion

Participation in a simulation-based DP curriculum did not show improved regional anesthesia skill performance or self-confidence compared to a standard curriculum in resident anesthesiologists. Both curricula improved US-guided PNB skills for novice anesthesiology residents from baseline, however, the DP teaching session required more time than self-guided simulation-based training.



Simulation as a set-up for technical proficiency: Can a virtual warm-up improve live fiberoptic intubation?

Stefan T Samuelson, MD – Icahn School of Medicine at Mount Sinai

Alan J Sim, MD – Icahn School of Medicine at Mount Sinai

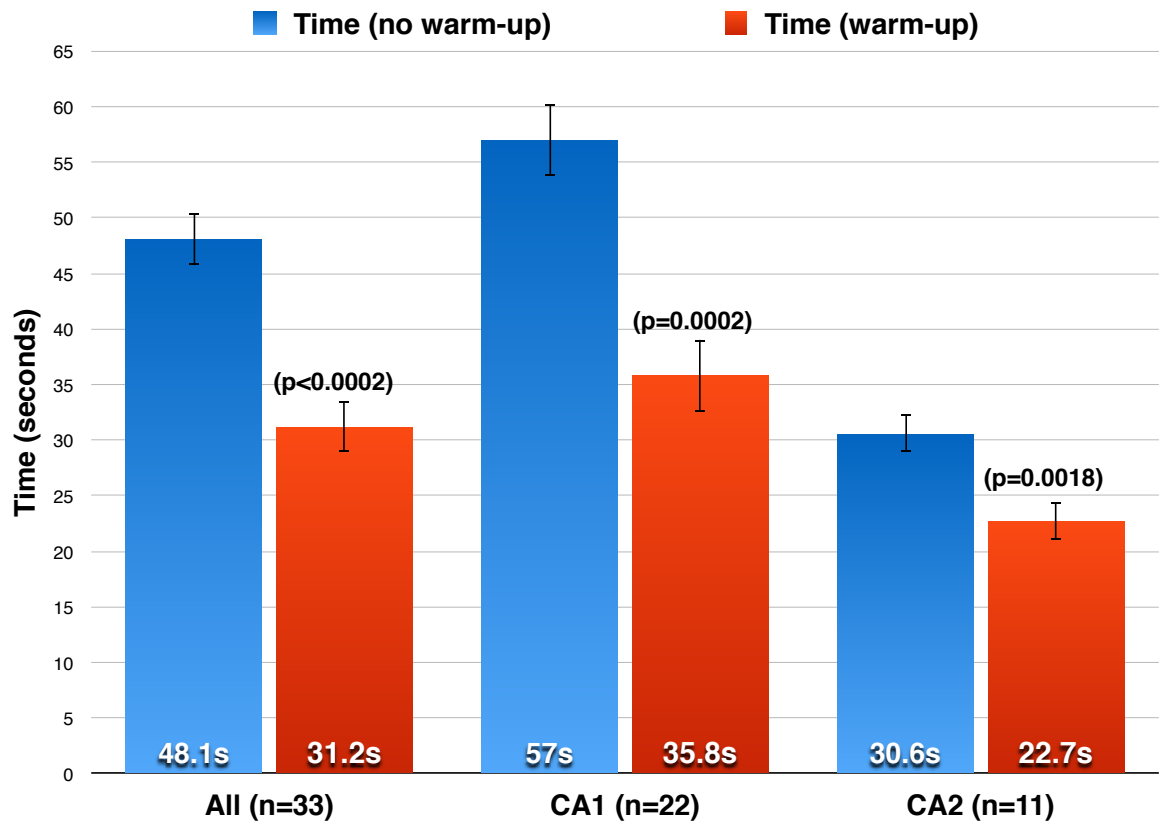
Sam DeMaria, Jr, MD – Icahn School of Medicine at Mount Sinai

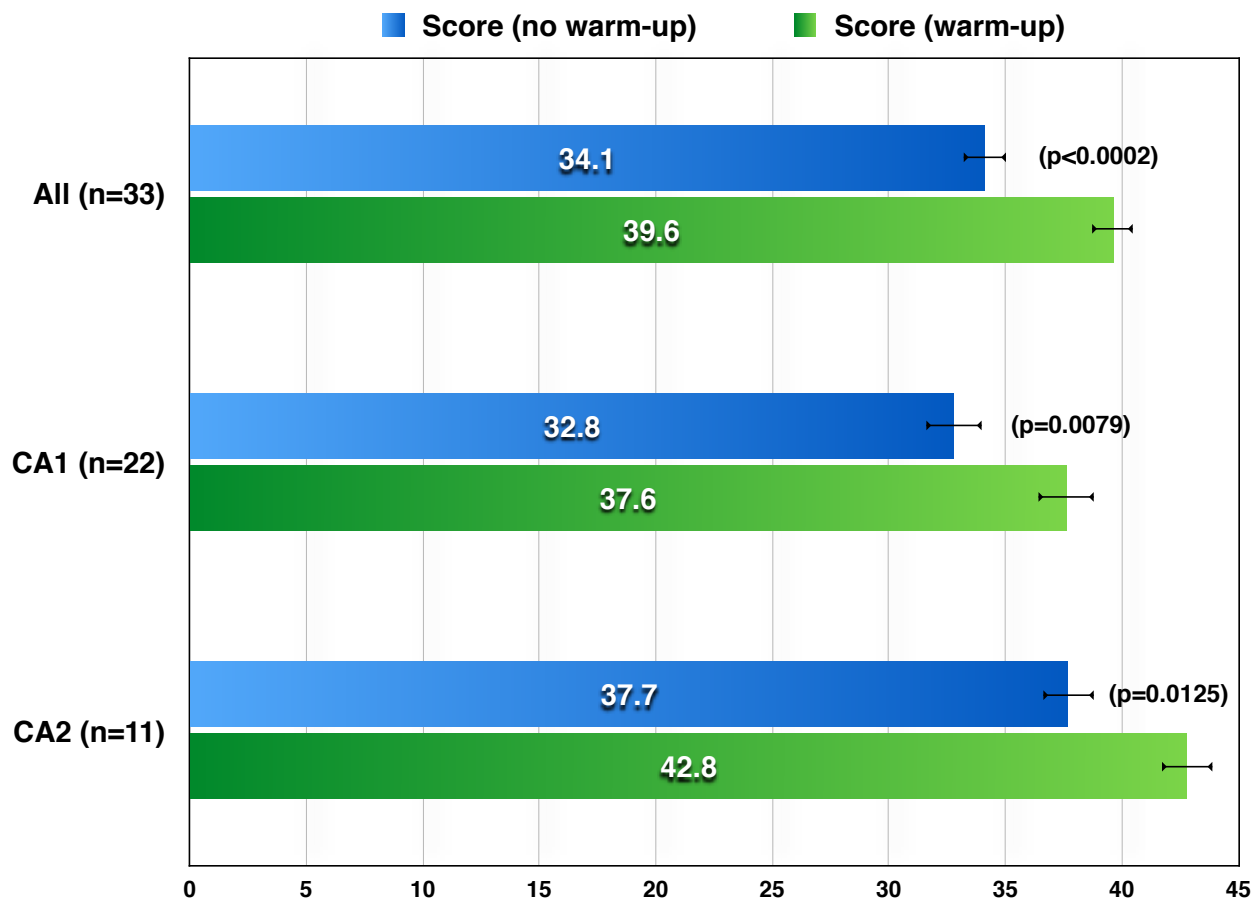
Background: Fiberoptic intubation (FOI) is an advanced technical skill which anesthesiology residents frequently must perform under pressure. In anesthesia education, simulation has been increasingly used to teach crucial skills prior to live patient interaction; however, motor skills and procedural knowledge are subject to decay. Recently in the surgical subspecialties, a virtual "warm-up" has been employed to prime and refresh a practitioner's skillset immediately before performing challenging procedures. This study examined whether a virtual warm-up could improve anesthesiology resident performance of elective live patient FOI, using speed and technical performance as benchmarks.

Methods: CA1 and CA2 residents were recruited to perform elective asleep oral FOI. Residents either underwent a 5-minute, guided warm-up immediately prior to live FOI using a high fidelity bronchoscopy simulator, or performed FOI without the warm-up. Subjects were timed performing FOI (scope passing teeth to visualization of the carina) and were graded on a 45-point skills scale by 2 blinded attending anesthesiologists. To prevent selection bias, all subjects were re-sampled after a minimum 2-week washout period as members of the opposite cohort. Computerized OR records and ACGME case logs were mined to quantify each resident's prior experience level at the time of sampling (total number of FOI performed and time since last FOI). Multivariate analysis was performed, controlling for variations in prior resident FOI experience, to determine the effect of warm-up on the two primary outcomes (speed and score).

Results: 33 anesthesiology residents were recruited, of which 22 were CA1 and 11 were CA2. Virtual warm-up conferred a 37% reduction in time for CA1s (mean 35 vs. 57 sec, $p < 0.0001$) and a 26% decrease for CA2s (mean 23 vs. 31 sec, $p = 0.01$). Global skills score increased with warm-up by 4.8 points for CA1s (mean 32.8 vs. 37.6, $p < 0.0001$) and 5.1 points for CA2s (37.7 vs. 42.8, $p < 0.0001$). Crossover period and sequence were not statistically significant.

Discussion: Virtual warm-up significantly improved resident performance of FOI as measured both by speed and by scaled skills evaluation. Warm-up conveyed a significant benefit for all residents, CA1s, and CA2s even when controlling for prior experience level. For novice as well as more experienced practitioners, greater speed and efficiency gained by virtual warm-up prior to live FOI could confer clinical benefit, as time saved during intubation could be an important consideration in sicker patients





The influence of death in simulation-based anesthesiology training: How much is too much?

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Andrew Goldberg, MD – Icahn School of Medicine at Mount Sinai

Sam DeMaria, Jr, MD – Icahn School of Medicine at Mount Sinai

Background: While high-fidelity patient simulation has gained ever-increasing support as a tool for anesthesiology education and assessment,^{1,2} few guidelines have been established to maximize its efficacy. In recent years there has been debate regarding the influence of “failure”, i.e. patient death, on learning and performance, and little data exists to support or oppose its inclusion in anesthesiology training. This study examined whether death of simulated patients could be correlated with objectively-assessed performance in a simulated curriculum.

Methods: After IRB approval, PGY-2 Anesthesiology residents from our institution were recruited to participate in a 12-week structured simulation-based didactic curriculum. Each week, residents were presented one or two operating room scenarios in which they had to manage a simulated patient. The residents were divided into three cohorts: 1) patient always dies, 2) patient never dies, and 3) patient dies approximately 50% of the time in an unpredictable fashion. After 8 weeks of the simulation-based curriculum had been completed, residents were then objectively scored on four remaining scenarios by blinded attending anesthesiologists using the validated Anesthesia Non-Technical Skills (ANTS) scale (this scale does not analyze patient outcome, but rather assesses task management, teamworking, situation awareness, and decisionmaking).³ Linear regression was carried out to analyze the effect of cohort assignment on objective performance in these selected scenarios.

Results: 26 Anesthesiology residents were recruited to complete the simulation-based curriculum, of which 9 were assigned to the “patient never dies” cohort, 9 to the “patient always dies” cohort, and 8 to the “patient dies unpredictably” cohort. All participants completed all scenarios. Assignment to the “patient never dies” cohort and the “patient dies unpredictably” cohort were both associated with higher ANTS scores ($p=0.0185$ and $p=0.0054$, respectively). Conversely, assignment to the “patient always dies” cohort was associated with poorer performance as measured by the ANTS ($p=0.0057$).

Discussion: In this study, residents who predictably experienced patient death in the simulated scenarios performed worse in non-technical skills assessments as measured by the ANTS. Residents who never experienced patient death, or who experienced patient death in an unpredictable fashion, did significantly better. While further investigation may clarify this association, it may be that expectation of failure predisposed participants to lackluster performance by undermining confidence or encouraging emotional detachment over time.

Grace under fire: Identifying predictors of engagement and success in simulation-based education

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Background: With increased utilization of high-fidelity human patient simulation for education and assessment in anesthesiology, it has become apparent that some people engage readily with the simulated environment, while others stubbornly resist. To facilitate learning in this medium, it may be possible to identify characteristics predisposing participants to such behavior. “Mindfulness”, a concept borrowed from the psychology literature, is generally defined as focusing one’s attention in a nonjudgmental manner or accepting the experience occurring in the present moment.¹ Furthermore, willingness to engage in simulation, i.e. suspend one’s disbelief, may confer a more emotionally charged experience and even an enhanced ability to learn from a simulated scenario. In this study we examine whether a measure of Mindfulness can predict emotional impact and improved performance.

Methods: After IRB approval, PGY-2 Anesthesiology residents were recruited to participate in a 12-week simulation-based didactic curriculum. Prior to beginning, each resident completed the Kentucky Inventory of Mindfulness Scale (KIMS), in which a higher scale indicates increased mindfulness.¹ Residents participated in one or two structured operating room scenarios each week. After 8 weeks, resident performances on four remaining scenarios were objectively rated by blinded attending anesthesiologists using the Anesthesia Non-Technical Skills (ANTS) scale (this validated scale assesses task management, teamworking, situation awareness, and decisionmaking).² At the end of the curriculum, each participant completed an Impact of Events Scale (IES, a measure of psychological response to a stressor in which a higher score indicates higher impact)³ and were asked 1) how helpful and 2) how traumatic they had found the curriculum (1-5, with 5 being highest). Multivariable analysis was carried out to analyze the effect of KIMS score on IES, self report of trauma/helpfulness, and objective performance.

Results: 26 Anesthesiology residents were recruited, all of whom completed the entire 12-week simulation-based curriculum. Higher KIMS score was significantly associated with higher IES score ($p=0.005$) and with greater subjective report of trauma ($p=0.002$). On objective assessment of performance, higher ANTS score was associated with greater self-report of trauma ($p<0.0169$) and of helpfulness ($p<0.0246$).

Discussion: In this study, greater mindfulness was associated with increased post-curriculum emotional impact, subjective report of helpfulness/trauma, and enhanced performance in simulated scenarios. As all of these are suggestive of “engaged” participants, it may be that a measure of mindfulness can be employed in the future to help identify those who would benefit most from simulation-based learning.

All for Knots: Evaluating the Effectiveness of a Proficiency-driven, Simulation-based Knot Tying and Suturing Curriculum for Medical Students during their Third Year Surgery Clerkship

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Purpose: Simulation-based training (SBT) is a safe, efficient manner for teaching technical skills to novices. A SBT suturing and knot tying curriculum for medical students rotating on their third year surgery clerkship is an attractive option for ensuring that every student completing the clerkship has obtained fundamental surgical skills. We evaluated the effectiveness of implementing a proficiency-driven, simulation-based knot tying and suturing curriculum for medical students during their third year surgery clerkship.

Methods: From September 2013 to June 2014, medical students rotating on the third year surgical clerkship completed a proficiency-driven, simulation-based knot tying and suturing curriculum consisting of six tasks. Students had a group introduction to the tasks with baseline testing and were then given practice kits for use at home and instructions regarding proficiency criteria to be attained. Over six weeks, they completed the curriculum and performed post-intervention testing. The six tasks chosen were based on a previously published curriculum developed for surgical residents at the University of Texas, Southwestern. The effectiveness was evaluated by comparing the initial pre-session scores to the final post-session scores on an 8-item self-efficacy scale and evaluating pass rates on end of clerkship skills testing. A paired t-test was used to analyze data.

Results: One hundred thirty six students completed pre-intervention questionnaires with 112 completing the post-intervention questionnaires. Of these, 65 students had matched pre-/post-intervention questionnaires for analysis, corresponding to a 58% response rate. Pass rates approached 100% by the third attempt on all tasks. Students demonstrated statistically significant gains on all 8 items of the self-efficacy questionnaire from pre- to post-training. No statistical difference was found in mean change scores in pre/post-training items comparing students who took the general surgery rotation during the first six weeks of their clerkship (n=35) to those during the last six weeks (n=30).

Conclusions: In conclusion, implementation of a SBT, proficiency-driven knot tying and suturing curriculum for third year medical students during the surgery clerkship is feasible and effective in improving student self-efficacy and objective proficiency toward performance of the tasks taught. Future work will endeavor to determine if such a curriculum increases interest in surgical specialties.

Assessing the Cost of Intra-Operative Resident Education

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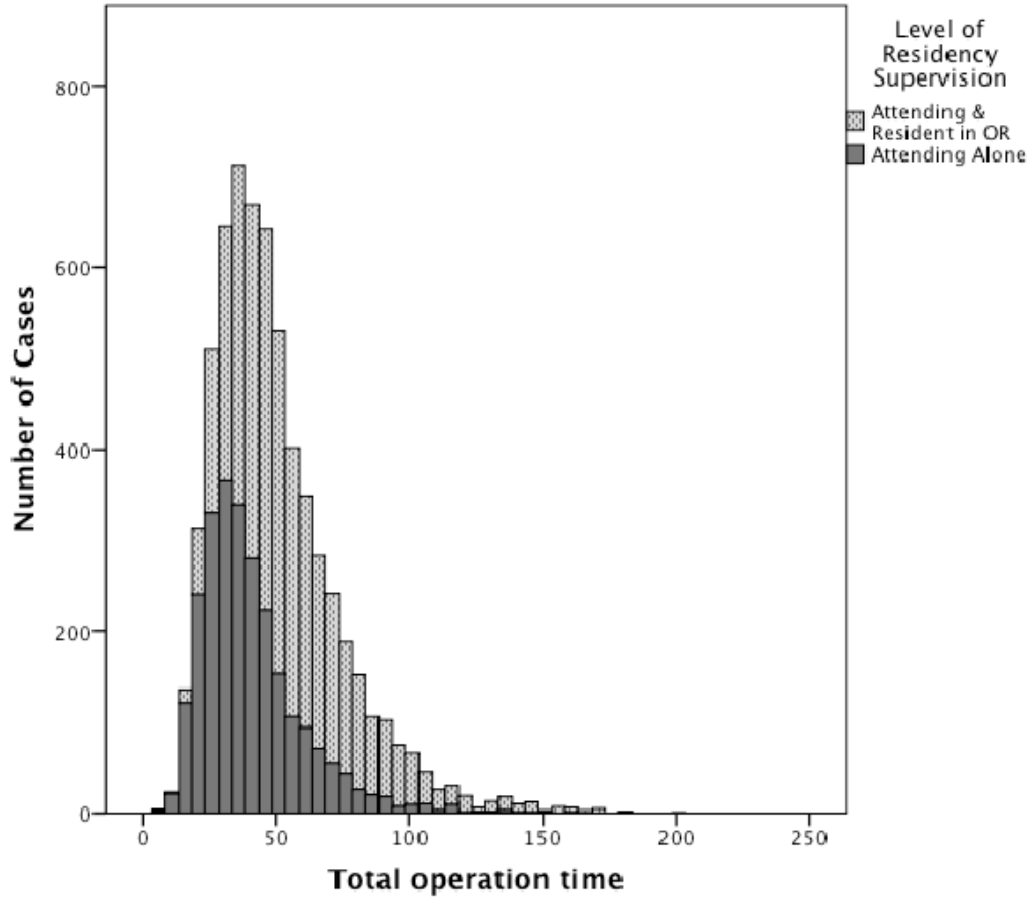
Background: Resident education is rewarding but demanding in many ways for attending surgeons. While clinical and formal training pose time demands on the surgeon, operative teaching presents unique challenges. Simulation has been shown to aid in skill acquisition for in-training residents but little can replace true intra-operative training. Current re-imbursement for most academic attendings is based on the relative value unit (RVU), which is generated in part from the time required to complete an operation. Although this method does not factor in time required for intra-operative teaching. We hypothesize that resident education will increase the operative time for routine cases.

Methods: We utilized the NSQIP data set to query for all patients under going laparoscopic appendectomy by code 44970. We grouped patients by resident presence in the OR as a binary variable and explored operative time as our primary outcome. In our secondary outcome we explored the effect of the resident postgraduate year (PGY) in training on operative time.

Results: Using the NSQIP data set we identified 23,891 with target CPT code. Complete data was missing in a substantial portion of cases resulting in a final subject set of 6,359 patients. A resident participated in 3,801 cases while an attending performed the operation alone in 2,558. Pre-operative patient characteristics were well matched between groups. Cases with residents were significantly longer on average 40.5 minutes vs 55.9 minutes ($p < 0.001$). (Figure 1). Cases with residents PGY 2-5 ranged between 55.1-56.5 minutes, no statistical difference was found.

Conclusion: Current physician reimbursement utilizes RVUs to standardize physician workload and payment. The addition of resident physicians in routine laparoscopic appendectomies increased operative length by 37%. Consideration of this time should be reflected in RVU calculations.

Figure 1: Histogram of laparoscopic appendectomy total operative time by resident involvement



Designing a curriculum on social responsibility for surgical learners

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Introduction: In the course of the last two decades, the "professionalism movement" has spawned numerous education programs for residents geared toward promoting professionalism and ethical practice of medicine. In the course of this, it is important to equip residents with skills for critical assessment and enhancement of their professional relationships. The ASE Committee on Citizenship and Social Responsibility set out to develop a curriculum on social responsibility which included three components: personal and interpersonal responsibility (ability to self-assess and use for improved interpersonal relationships), institutional and community responsibility (patients, diversity, community, institutional mission), and global responsibility (burden of disease, innovation, divergent standards of care). The aim of this study was to examine the views of other educators on the feasibility and design of this curriculum.

Methods: The goals and objectives of each of the three components of the curriculum on social responsibility were presented at a workshop at the ASE meeting in April 2014. Some of the proposed methods of instruction were also outlined. An open one hour discussion followed. A survey focusing on the future direction of the curriculum was distributed. The results have been presented.

Results: About 30 educators participated in the workshop and subsequent survey. With regard to the curriculum, 56% expressed preference for a sequentially ordered and thematically organized modules. They also expressed interest in specific learning objectives associated with learning activities that were adaptable to varying environments. As for the period over which the curriculum spans, 72% of respondents felt that it should be flexible so that the local environment can dictate the time investment. All participants felt that the curriculum will apply to not only residents, but also faculty and staff. Case-based and modular teaching tools were seen as preferable to predesigned powerpoint presentations. Most respondents commented on the appropriateness and timeliness of the concept of this curriculum.

Conclusion: A curriculum on social responsibility for surgical learners was well received among surgical educators. This is seen as feasible and important in surgical education. The most important aspects of the curricular design include flexibility to adapt to the local learning environment and a modular design.

CAN ADVANCED TRAUMA LIFE SUPPORT (ATLS) PREDICT JUNIOR RESIDENT PERFORMANCE?

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Introduction: Advanced trauma life support (ATLS) is an educational course used to train general surgery (GS) and emergency medicine (EM) residents. We hypothesized that ATLS given to incoming interns could predict performance and specifically identify academically "at risk" residents.

Methods: Incoming categorical GS and EM residents were administered the ATLS course prior to initiation of internship. Detailed results of the course performance were compiled but not available to the faculty of these residents. Resident performance was measured by faculty evaluations based on the ACGME core competencies (CC) for the first 15 months of training as well as national in-training examinations (ITE) during the intern year. The performance by CC was then summarized as below, meeting, or exceeding expectations, as well as an overall evaluation by the same qualifiers.

Results: 41 residents (23 GS and 18 EM) were administered ATLS over three years. Review of evaluations demonstrated 32% with \geq one CC below and 37% with \geq 1 CC exceeding expectations; with 10% below and 10% exceeding expectations by overall evaluation. 32% of residents scored below the 25thile of the ITE, while 17% of residents scored above the 75thile. Of the residents who failed the ATLS written exam (initial pass rate was 88%), 40% were rated as below expectations for medical knowledge while 20% scored \leq 25thile on the ITE. Of the 6 residents who required remediation of the moulage, 50% scored below 25thile on ITE and 33% were identified as below expectations on medical knowledge. 20% of interns were identified "instructor potential" at \geq 1 skill stations. 88% of these had \geq 1 CC exceeding expectations. There was one ATLS course failure, with this resident being overall below expectations, eventually electing to not continue in GS.

Conclusion: Passing ATLS was unable to predict at risk intern performance as measured by the ITE or CC, while course failure was predictive. However, residents who required remediation or had instructor potential did trend to performing lower or higher respectively. While small numbers of residents limited our analysis, we postulate that a more discriminatory evaluation tool during ATLS may better identify at risk residents.

Integration of longitudinal patient experiences within the traditional clerkship structure: Impact on medical students' learning

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Background: Longitudinal clerkships have been shown to benefit medical student clinical experiences and learning. Many medical schools, however, find it challenging to implement longitudinal clerkships due to the resources required. We hypothesized that embedding a small number of longitudinal patient experiences amongst traditionally structured clerkships would be sufficient to have a positive impact on student learning. This study investigated the impact of a Longitudinal Clinical Experiences with Patients (LCEP) program on medical student knowledge acquisition and attitudes toward future care.

Methods: Students developed 1-4 longitudinal patient relationships that included 4 or more encounters each over 6 or more months. Surveys querying demographics of LCEP encounters and reflections on lessons learned were collected at the end of the program. An iterative consensus-building process was applied to the survey data via 4 researchers. Data was coded and analyzed for themes from 3 categories in which learning occurred (patient-centric, healthcare system-centric and pathophysiologic-centric). Descriptive statistical analysis was used to quantify the results.

Results: One hundred percent of 52 medical students participated and contributed 227 comments related to the impact of LCEP on their learning: 168 comments represented knowledge gained from the LCEP and 59 comments illustrated students' self-predicted attitudes/behaviors for future patient care. The majority of student's comments reflected learning in patient-centric categories (49.4%), followed by health care system-centric categories (37.5%) and followed lastly by pathophysiologic-centric categories (11.3%). In reflecting on future attitudes/behaviors, the majority of comments focused on using effective communication strategies with patients (35.6%) and coordination of patient care (28.8%).

Conclusions: A LCEP program, even when limited in scope such that it does not require deconstructing traditional clerkship structure, benefits medical students' knowledge acquisition. The knowledge and attitudes gained are particularly notable in patient-centric and healthcare system -centric areas.

Table – Summary of knowledge gained from the LCEP

Comments related to	Knowledge Learned from LCEP (n=168)				Impact on Future Attitude and Behaviors (n=59)
Category	Patient Centric (n=83)	Healthcare System Centric (n=63)	Pathophysiologic Centric (n=19)	Learned Nothing (n=3)	
Sub Categories and Frequency of Comments	<ul style="list-style-type: none"> • Learned about individual patients (e.g. emotions, motivations, comprehension, impact of disease, and socioeconomic status), 74 • Learned about patient interactions with family/social circle, 9 	<ul style="list-style-type: none"> • Learned about complexities of communication 27 • Learned about challenges to delivery of care, 13 • Learned about multidisciplinary care, 11 • Learned about being a physician, 6 • Learned about health insurance, 4 • Learned about ancillary support, 2 	<ul style="list-style-type: none"> • Learned about the natural history of diseases, 17 • Learned about how diseases interact, 2 		<ul style="list-style-type: none"> • Self-predicted changes in behavior, 56 • Self-predicted changes in attitude, 3

Student Use and Perceptions of Mobile Technology in Clinical Clerkships – Guidance for Curriculum Design

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Purpose: This generation's medical students are perceived as high adopters of mobile technology; however, the types of technologies and attitudes towards their use for learning in clinical clerkships are not known. We aimed to better elucidate (1) the types of technology currently used on clinical clerkships and (2) students' perceptions of technology implementation in a clinical clerkship curriculum.

Methods: Students at a single institution (n=131) were prospectively invited to complete an online questionnaire prior to their surgical clerkship between June, 2013 and March, 2014. Types of devices, frequency of use and comfort with use were recorded. Student perceptions on benefits of and barriers to technology for learning were also elicited.

Results: The survey was completed by 125 students (95% response rate, 51.2% female [n=64]). Almost all students (n=120, 96%) own a personal laptop computer and a smart phone device (n=119, 95.2%); tablet devices (n=66, 52.8%) and desktop computers (n=18, 14.4%) were less common. The majority of students (n=77, 62%) reported using an electronic device at their clerkship for more than 11 hours per week. The most frequent daily use of technology was accessing reference information for class-related purposes (n=103, 82%) and independent learning (n=100, 80%). Despite students' preference for classes that use technology extensively (n=67, 54%), independent reading and small group discussions were the most highly rated learning methods (80% and 63% of students [n=100 and 79], respectively). Online modules and video lectures were the least preferred learning methods for 72% (n=90) and 69% (n=86) of students, respectively. The most common benefits of learning technology cited for clinical clerkships were completion from multiple locations (n=115, 92%), reviewing prior materials more easily (n=112, 90%) and completing coursework on their own schedule (n=103, 82%). While many students (n=97, 74%) felt that technology aided in understanding complex concepts, some (n=59, 47%) perceived decreased interactions with faculty.

Conclusion: Portable and mobile technology use for learning efforts are common among medical students. While students cite many benefits of technological tools in a curriculum, educators must try to balance their use with faculty interaction to encourage maximal adoption.

The Use of Pre/Post-Tests to Demonstrate Improved Knowledge Following SEA-HVO Fellowship Teaching

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Jo Davies, MBBS, FRCA – University of Washington Medical School

Introduction

The Society for Education in Anesthesia-Health Volunteers Overseas (SEA-HVO) Traveling Fellowship is a competitive program established in 1996 to encourage senior residents to teach anesthesiology in developing countries. The traveling fellows are knowledgeable in the topics they teach, but language barriers, cultural differences, limited resources, and different styles of learning can all impact effectiveness. Many SEA-HVO fellows have successfully completed teaching trips to developing countries, but there is limited data regarding quantifiable improvement in the students' knowledge.

Methods

During a recent trip to Malawi, the author (a SEA-HVO Fellow) taught neuraxial anesthesia over the course of one week. On day one, 16 students were given a 20-question pre-test to assess baseline knowledge. They were not told that there would be a post-test at the time the pre-test was given. The students then received morning and afternoon lectures from the fellow for the entire week. One week after the last lecture, the students were given an identical post-test. Scoring was based on percentage of correct answers. The primary outcome was improved knowledge, judged by comparing the post-test to the pre-test. At this site the students were all fluent in English, so language barriers were unlikely to play a major role.

Results

All 16 students took both the pre-test and post-test. One student's scores were excluded due to failure to complete the test. The pre-test scores ranged from 45% to 85% with an average of 62.7%. The post-test scores ranged from 60% to 95% with an average of 77.7%. The average improvement was 15% with a range of 0% to 35%. 13 students demonstrated an improvement in knowledge and 2 students achieved the same score.

Discussion

An average increase in test scores from pre-test to post-test of 15% suggests that the students benefited from the SEA-HVO fellow's teaching. It is reassuring that the majority of students demonstrated some level of improvement. Limitations of this study include the small sample size, with knowledge of only one subject being tested and analyzed. Future research could include larger groups of students, tests for different topics for students at the same site, and comparative studies at different HVO sites, exploring how barriers to learning vary between countries. These results do not suggest that barriers to teaching at this site don't exist, rather that teaching can be adapted to achieve effective learning.

A Fellowship's Internal Program Evaluation: a 5 Year Review

Dr Rupa P Sekhar – Children's National Medical Center

Dr Ira Todd Cohen, MD, MEd – Children's National Medical Center

Introduction: The Accreditation Council for Graduate Medical Education (ACGME) states that “residents and faculty must have the opportunity to evaluate the program confidentially and in writing at least annually” and that “the program must use the results [...] to improve the program.” We reviewed one program’s experience with this process.

Methods: Responses from a web-based, anonymous survey were retrospectively reviewed for the years 2010-2014: The survey, based on ACGME’s Resident-Fellow Survey content areas, was completed at the end of each academic year. Three survey areas: strength vs weaknesses, education vs service balance, and didactics were examined. Changes in the program, in response to the survey results, included fewer weeks on Pain, specialized Regional group, more physician extenders (NP, AAs) and restructured Grand Rounds. Results were compared for trends and outliers.

Results: The average response rate was 73.8% (35/47) with a range of 55.6% (5/9) to 100% (10/10). Overall ratings of the strengths and weaknesses of the program components are shown in Figure 1. Evaluation of the didactic sessions is shown in Figure 2. Depiction of the balance between education and service is shown in Figure 3.

Figures: See attached figures.

Discussion: Overall, fellows’ evaluations of the program have shown increasingly higher scores but, relatively, comparison among specific items has not changed (Figure 1). Target areas such as pain, regional, case assignments and Grand Rounds have not shown improvement in comparison to other surveyed items. Fellow’s conference and cardiac anesthesia have been consistently rated highly (Figure 2). The most consistent area of improvement was an increased focus on education over service (Figure 3). Overall limitations include sample size, response rate, and specific cohort, thus it may be difficult to assess whether the data accurately reflects the changes within the department. Based on this data, the ACGME survey may not be the most ideal way to capture what improvements need to be made within a department or how effective these changes are. It may also be that the changes made in the department have not actually improved the program. Pending analysis involves assessment of corresponding faculty evaluations.

Figure 1: Evaluation of strengths and weaknesses of the program.

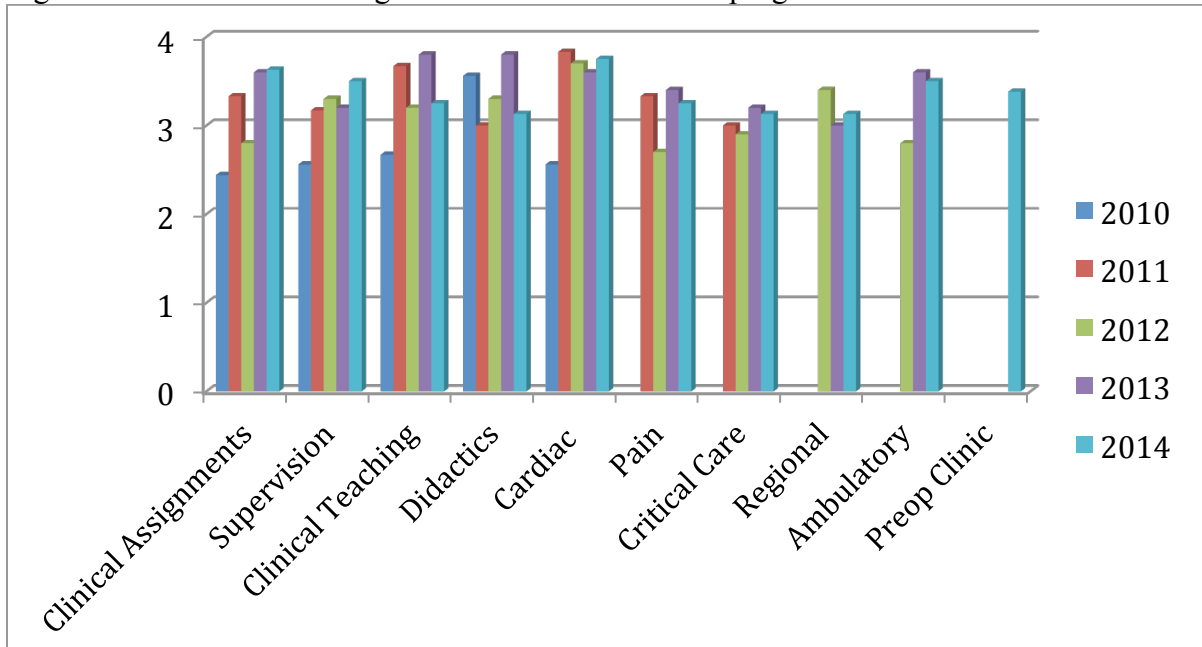


Figure 2: Evaluation of Educational Sessions

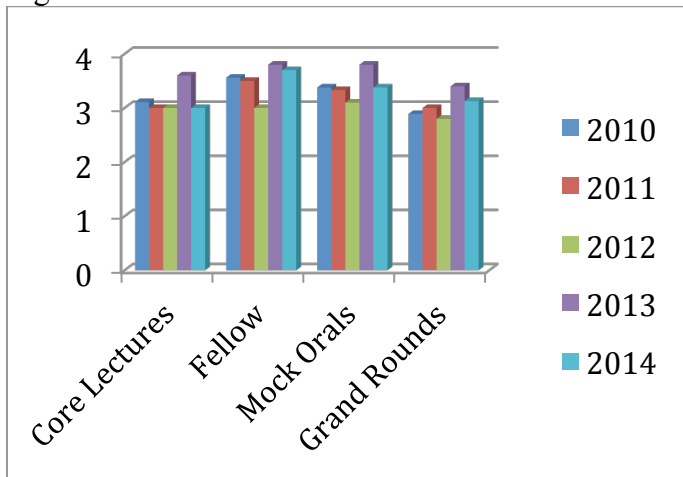
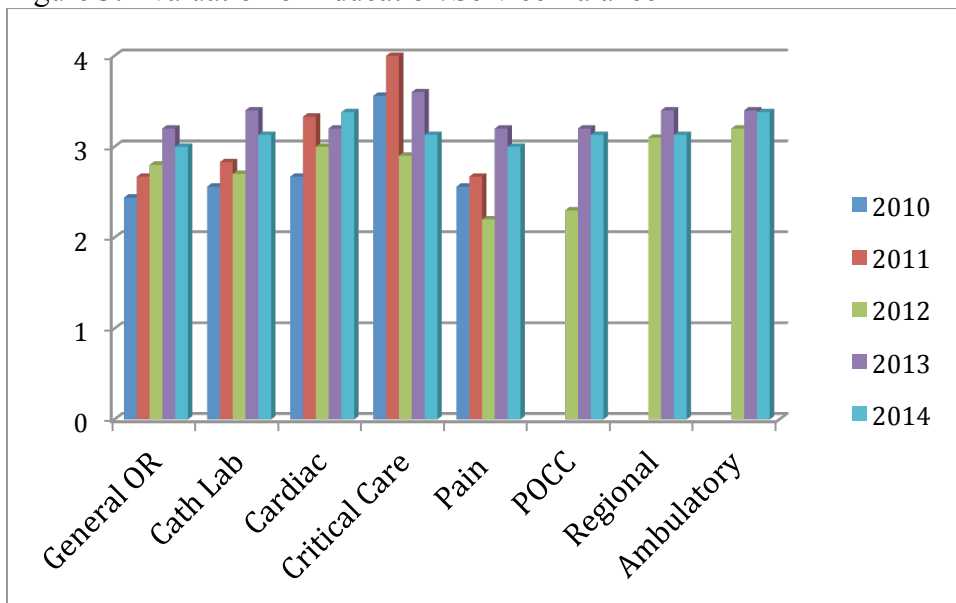


Figure 3: Evaluation of Education/Service Balance



A Survey of Anesthesiology Residents and Attendings Evaluating the Logistics and Goals of the Pre-Operative Phone Call

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Rebecca D Minehart, MD – Massachusetts General Hospital

Introduction:

It is common practice in academic anesthesiology for residents to page their attending anesthesiologists the day before working together in order to review their cases for the next day. However, there does not appear to be standardization of when, how, and what to talk about, and the clinical and educational benefits of having these discussions may not be obvious. We conducted a survey of residents and attendings to evaluate the logistics and goals of their pre-operative phone call (POPC) experiences.

Methods:

Following IRB exemption, an electronic 10-question survey (REDCap) was sent to a total of 303 staff and 168 residents of all PGY-levels across two academic institutions to inquire about their POPC experiences. Questions were both objective, such as frequency of and duration of discussion, and subjective, such as assessing the importance of the POPC to planning for perioperative events. In addition, each group was asked about their perception of the other group when a page or a call-back did not occur, (i.e., attendings' assumed reasons for not being paged, and residents' assumed reasons for not being called back).

Results:

Responses were collected from 92 attendings and 80 residents for an overall survey response rate of 36.5%. Attendings and residents tended to agree on most objective questions. Most POPCs were between 10-30 minutes. Significantly more attendings than residents viewed the POPC as an important opportunity for residents to learn how to set up the OR (65% vs 34% ranked it "very important", $p < 0.001$ using Mann-Whitney U test) and anticipate perioperative complications (60% vs 16% ranked "very important", $P < 0.001$), though both viewed these as being among the most important benefits to the discussion. Assessing the residents' skills was viewed as the least important by both groups. Overall, residents reported fewer benefits to having the POPC than attendings, and furthermore seem concerned that not paging their attending may reflect poorly on them.

Conclusion:

Over the course of residency, many hours are spent in conversation between anesthesiology attendings and residents. Given the amount of invested time, it is curious that there seem to be differing expectations from the two groups involved. Strikingly, residents were more concerned about the lack of professionalism that not contacting their attending might reflect, while attendings were planning for perioperative events. Perhaps setting expectations and standardizing the process, in addition to clarifying the goals of the POPC, would be the next logical steps.

Training surgery-clerkship medical students to effectively use emergency manuals

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Background/Significance

Emergency manuals (EMs), context-relevant sets of cognitive aids (e.g. crisis checklists), can help teams optimally manage critical events. High stakes industries, such as aviation, integrate EMs into training and expect their use during critical events. In healthcare, EM training and use during critical events are nascent. There are several versions of perioperative EMs now freely available, with recent clinical implementation at multiple institutions. For more information, see www.emergencymanuals.org and <http://emergencymanual.stanford.edu>.

Medical students often lack relevant clinical skills during crises. However, in addition to using EMs as educational resources, students can be valuable team members during critical events if they are trained for EM use. We designed a brief, video-based training to teach surgical clerkship students why, when, and how to use EMs, and to familiarize them with the Stanford EM.

We hypothesized this training would lead to increased and sustained: awareness, familiarity, and comfort using EMs.

Methods:

Surgical clerkship students (N = 102) completed a brief (30-minute) blended-learning training session, which includes a video with graphic illustrations and simulation examples on *why* and *how* to use EMs, plus in-person practice activities. Students completed Likert-scale retrospective pre-post assessments immediately following the training and again post clerkship.

Wilcoxin tests for non-parametric data were used to calculate statistical significance (see figure 1). We also calculated power for our main analyses (in each case, power >.9).

Results:

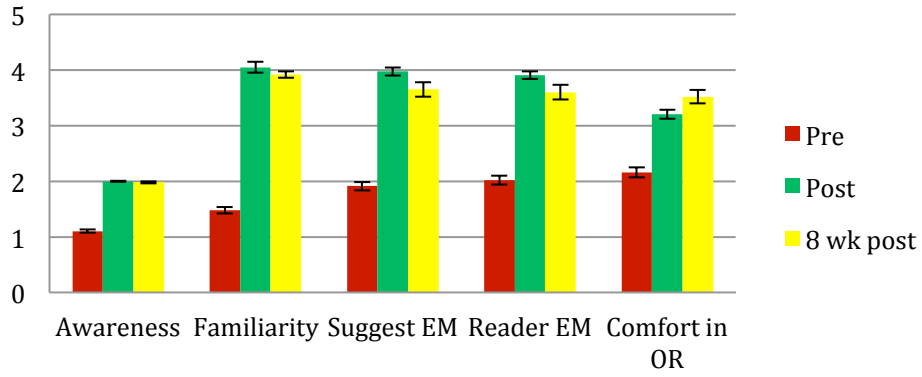
Directly post training, students reported increased: awareness of and familiarity with EMs, willingness to suggest using EM, willingness to be an EM reader, and comfort contributing to OR teams during crises, (All $p < .001$).

Comparing immediately post-training to 8-weeks later (post-clerkship), students retained training gains across most measures (see figure 1), e.g. awareness of and familiarity with EMs in ORs (*NS*). Students' willingness to suggest using EMs ($p < .05$) and be readers ($p < .05$) decreased slightly 8-weeks post training, but remained much higher than pre-training. Students' comfort contributing to OR teams during crises increased ($p < .01$). Students also reported using EMs for educational review (23%) and during critical perioperative events (7%).

Discussion:

A brief training during surgical clerkship orientation immediately increased students' self-assessed familiarity and willingness to use EMs during critical events and improved comfort as OR team members. Multiple benefits were sustained 8 weeks later despite no further formal training. More research is needed on how to train clinicians and students for effective EM use.

Emergency Manual Awareness, Familiarity, and Comfort Increase Sustainably Post-Training



Residents' pre-operative preparation: do they do it and how do they do it?

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Background: A reduction in working hours has resulted in the increased need for high quality learning experiences for residents within the operating room. It is assumed that trainees prepare for these experiences, but how they actually do this, and how this could be improved is not known.

Objective To determine how residents prepare for the operating room, the extent to which they use videos, whether this differs in the UK compared with the USA, and what could be improved.

Methods: Surgical residents at four US teaching institutions and within the UK London Deanery received a survey administered either electronically or by hand over two months. Residents provided their opinion using 5-point (preparation items) and 7-point (video items) Likert scales. High numbers indicate a favorable rating. Descriptive statistics (mean, standard deviations) and percentages are reported, and non-parametric test(Mann-Whitney U) to compare the results from the UK and USA (significance level $p < 0.05$).

Results: 44 surveys were completed (31%)(years 1-5) in the USA, and 41 from the UK (40%). 95% of all residents claimed to prepare, usually within 24hrs of an elective case(76%). US residents spend significantly more time preparing than those from the UK ($p < 0.001$). 86% of all residents use books but only 44% use videos to support their preparation. Most find their preparation to be effective (4.02,[S.D.0.79]), although feel their understanding of anatomy (3.98,[S.D.0.97]), dissection technique (3.97,[S.D.0.68]), visualization of operative planes(3.77,[S.D.0.92]) and contingency planning(4.15,[S.D.0.70]) could be improved. 88% find watching videos helpful with most using the internet (71% YouTube, 62% Websurg) and only 11.6% using an institutional video library as their source. Educationally videos are thought to be potentially useful at demonstrating relevant anatomy(5.89,[S.D.0.92], operative techniques (5.94[S.D.0.88]), steps(6.03,[0.77]) and visual cues(5.77[S.D.1.01]). Videos are thought to be improved by narration(90%) and annotation(80%), but only 21% of residents watch a video in its entirety stating poor quality, editing, skipped steps and length as reasons for stopping.

Conclusions: Both UK and USA surgical residents prepare similarly for operative cases, under-utilize video resources and feel that their preparation could be improved. Their criticisms point to further work in developing videos targeted to operative preparation.

Failure to fail: challenges to providing meaningful assessment and feedback in surgical training

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Introduction: Recent reports from the Royal College of Physicians and Surgeons of Canada (RCPSC) and the Accreditation Council for Graduate Medical Education (ACGME) suggest problems with current assessment practices, particularly around low stakes assessments. Researchers have previously described the phenomenon of "failure to fail", a reluctance to fail poorly performing students. The present study examines challenges to providing more meaningful assessment and feedback throughout the training process, and specifically explores the pressures perceived by educators to provide positive assessments and feedback.

Methods: Semi-structured interviews were conducted with surgical educators. Surgeon educators were recruited using a purposeful sampling technique: participants were asked to share the names of their colleagues who might be willing to share their insights. Interviews were audiotaped and transcribed verbatim. Three independent researchers analyzed the transcripts using a grounded theory approach to identify common themes.

Results: Participants expressed a reluctance to provide negative assessments and feedback to trainees. Many were concerned about repercussions for themselves or the program, especially regarding appeals or litigation in response to failing a resident. Indeed, several participants reported passing students whom they actually perceived as below the threshold of acceptable skills and knowledge for their level of training. Importantly, we found a recurring theme whereby educators perceived hostility or backlash from residents in response to negative feedback or assessments. Many were concerned about being labeled as intimidating or having inappropriate bias. Participants believed that more frequent formative assessments could help educators more effectively evaluate trainees by ensuring adequate documentation, although this raised time and resource concerns.

Conclusions: Hostility and backlash from trainees as well as anticipation of appeals or litigation may dissuade educators from providing accurate assessments and feedback. The use of more regular formative assessments may provide residents with insight into their abilities and help ease the stress of summative evaluations. As residency programs shift towards competency-based curricula, it is imperative that these barriers be addressed. Improving assessment and feedback in this way will help meet the mandates set forth by the ACGME and RCPSC to enhance the learning process, help residents attain competency, and ultimately improve patient safety.

Development of a Tool for Global Rating of Endoscopic Surgical Skills (GRESS) for Assessment of Otolaryngology Residents

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Objective: To develop a valid and reliable assessment tool for endoscopic sinus surgery (ESS). **Material and methods:** Data were collected prospectively in an observational study through evaluations at two tertiary academic institutions, i.e. St. Paul's Sinus Centre, St. Paul's Hospital, Vancouver, British Columbia, Canada, and King Fahd Medical City, Riyadh, Saudi Arabia, from December 2006 to December 2009. A 2-page evaluation form was developed in conjunction with the Objective Assessment of Technical Skills Surgery (OSATS) evaluation form developed by Reznick et al in Toronto to assess residents' surgical skills. A Likert scale (1-5 where 5 = excellent) was used for evaluations. The Global Rating of Endoscopic Surgical Skills (GRESS) evaluation instrument was designed with input from academic otolaryngologists, fellowship-trained rhinologists, and experts in medical education. The experts' comments were incorporated, establishing face and content validity. Residents from various levels of training were assessed objectively using this instrument. Internal consistency was evaluated using Cronbach's α . Test-retest and inter-rater reliability was measured using intra-class correlation. **Results:** A total of 31 assessments were completed by 15 residents. GRESS showed high reliability in the context of internal consistency ($\alpha = 0.99$), test-retest (0.95, CI = 0.83-0.98), and inter-rater reliability (0.86, CI = 0.31-0.98).

Conclusions: This pilot study demonstrated that GRESS is a valid and reliable assessment tool for operating room performance.

Writing Questions as a Study Method for the American Board of Surgery In-Training Examination

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Background: The generative learning model posits that individuals remember materials that they have generated better than materials that have been generated by others. The generative effect has received a great deal of empirical support in the laboratory using tasks such as presenting lists of rhyming word-pairs vs. requiring participants to complete the word pairs (e.g., “rave-cave” vs. “rave-c_____”). In applied educational settings, the generative effect has been successfully studied in K-12 and undergraduate levels using tasks such as generating content outlines, taking lecture notes, and writing questions for practice tests. The goals of this study were to evaluate the usefulness of question generation as a study method for the American Board of Surgery In-Training Exam (ABSITE) and investigate whether the quality of submitted questions correlated with ABSITE performance.

Methods: Residents (n = 194) from six general surgery training programs were randomly assigned to two study conditions. Ninety-six residents were asked to write two questions for each of 10 ABSITE keywords in addition to studying as they normally would. A surgical faculty member at each institution used a validated scoring rubric to grade the submitted questions for good question-writing mechanics and quality. The remaining 98 residents were not asked to write questions.

Results: On average, residents wrote 12.6 questions (SD = 6.4) out of 20. Data were analyzed based on the number of questions actually written and Kruskal-Wallis analysis did not reveal a significant difference in terms of ABSITE percentile score. Correlations between question quality metrics and ABSITE percentile score were not statistically significant.

Conclusions: Generating questions and question quality were not associated with residents' ABSITE scores. Thus, we did not find support for the generative learning model. These findings could be a result of the study protocol being insufficiently small (i.e., only 20 questions covering 10 ABSITE keywords) and/or resident performance factors (i.e., residents only generated 12.6 questions). Residents may have quickly glanced at a textbook and generated questions rather than deeply processing the content. It is also possible that the generative learning model is not applicable to an advanced learner population such as general surgery residents.

Mid-Clerkship Self Evaluations: Do students see what their supervisors see?

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Background: Mid-clerkship self-evaluations (MCSEs) require students to reflect on their knowledge, skills, and behaviors. Little is known about the alignment of medical student self-assessment with supervisor evaluation. We hypothesized that medical student self-assessments would be consistent with those of their preceptors and residents during a surgical clerkship.

Methods: MCSEs of 153 students who completed our surgery clerkship in the 2012 and 2013 academic years were compared to supervisor mid-clerkship evaluations. The mid-clerkship evaluation form includes a 4-point rating scale (1=unacceptable, 4=competent/advanced) for five different domains. Each form also requires free text statement of two items the student does well and one item for improvement. The different domains of the MCSE and supervisor evaluation were compared for accuracy. Identified areas of strengths and weakness were evaluated for thematic consistency.

Results: MCSE accuracy is shown in Table. Student self-rating was most accurate for timeliness (67%); students were most likely to overrate themselves in professional demeanor (11%) and most likely to underrate themselves in medical knowledge (43%).

Students were most likely to identify strengths in teamwork (46), patient care (33) or knowledge (29). Residents or preceptors most commonly cited initiative (29), attitude (26), or teamwork (22) as student strengths. Students most often described knowledge (55), oral presentations (30), and generating assessments and plans (22) as areas for improvement. Residents or preceptors most commonly indicated knowledge (57), oral presentations (25), and generating assessments and plans (24) as areas for student improvement. Areas identified as strengths by students aligned with external evaluators 33% of the time; areas for improvement aligned 32% of the time between MCSE and external evaluation.

Discussion: MCSE ratings were usually accurate with a tendency by students to underrate. The lack of overlap between student and supervisor identification of strengths and weaknesses in clinical performance merits further investigation.

Table: Accuracy of student self-assessment for MCSE domains (N= 153)

	Underrate	Overrate	Match
Medical Knowledge	66 (43%)	18 (1%)	68 (44%)
Progress Note	54 (35%)	13 (9%)	78 (51%)
Timeliness	39 (25%)	11 (7%)	102 (67%)
Initiative	49 (32%)	12 (8%)	91 (59%)
Professional demeanor	31 (20%)	16 (10%)	105 (69%)

All values are n (%)

Individual Learning Plans: Bridging the Knowledge Gaps in the Surgery Clerkship through Self-Directed Learning

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Background: Life-long learning skills are necessary for a successful medical career and are supported by independent study and self-directed learning. Individual learning plans (ILPs) are useful tools that help students identify areas for improvement and support self-directed learning. Our goal was to implement ILPs during the surgery clerkship allowing students to identify perceived knowledge gaps and utilize on-line resources to address them.

Methods: Students were required to complete an ILP that identified two topics they felt would not be sufficiently covered through the clerkship didactic sessions or their clinical experiences during the 8-week surgery clerkship. Students were required to utilize any of the 21 available Web Initiative for Surgical Education of Medical Doctors (WISE-MD) online case modules to address their perceived knowledge gaps. Students either completed an essay (450 word limit) describing the knowledge gained or crafted a multiple-choice board-style question based on the modules' content and submitted their work electronically via the learning management system (Desire2Learn). Their work was graded (0-5 points for each topic) and feedback provided by faculty based on clarity and accuracy through an I-Pad application.

Results: Over an 8-week clerkship, 68 submissions were received from 34 students. 83% of submissions were essays, and 17% of students chose to write questions. The most frequently selected modules were trauma resuscitation, abdominal aortic aneurysms, and burn management, with frequencies of 16%, 13%, and 10%, respectively. No students selected hernia or appendicitis. The mean grade provided was 8.9 out of 10 possible points. The total number of WISE-MD modules accessed during this time period was 124, compared to 10 modules accessed the previous year during the same time period before the implementation of the ILP requirement.

Conclusions: Medical students have perceived knowledge gaps while on the surgery clerkship. Implementation of a self-directed ILP addresses these gaps consistent with LCME requirements to promote life-long learning skills (Standard 6.3). The WISE-MD modules provide an excellent on-line resource to address such knowledge gaps and allow self-directed learning opportunities. The frequency at which modules are selected may allow further tailoring of clerkship didactic experiences to address areas of perceived knowledge gaps.

Systems-Based Practice Project for Anesthesiology Residents: a 10-year Single Center Experience

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INTRODUCTION: More than a decade has passed since the first Outcome Project description was issued by the Accreditation Council for Graduate Medical Education (ACGME). Among the six core competencies, systems-based practice (SBP) has been a teaching/evaluation challenge for residency programs. To date, no long-term analysis of SBP projects has been performed. We reviewed a SBP project format used within a large academic anesthesiology residency program for the last 10 years.

METHODS: The SBP project has been mandated for PGY-4 residents since 2004. PGY-4 residents were introduced to the SBP project in September with benchmarks set such as project identification, literature review, data collection, and proposal draft. The project was concluded with the presentation to the department executive committee in the spring. Each presentation received scores for clinical significance, proper identification of contributing factors, proposed solution, and the presentation technique using a Likert scale (1-9, where 9 is the best). In this study, **the** SBP projects completed for the last 10 years (2004 – 2013) were reviewed. The projects were summarized into the seven categories: safety initiatives, economic analysis, process analysis, policy change recommendations, education initiatives, teamwork/communication, and operating room efficiency. The scores and the rate of implementation in the department based on the presentations were examined.

RESULTS: One hundred forty nine SBP projects were completed. The categories of the projects were policy change recommendations in 46 projects (30.1%), process analysis in 36 (24.2%), safety initiatives in 27 (18.1%), teamwork/communication in 18 (12.1%), education initiatives in 13 (8.7%), operating room efficiency in 7 (4.7%), and economic analysis in 2 (1.3%) (**Table 1**). The overall evaluation score was 7.6 ± 0.6 . Among the 111 projects presented from 2004 to 2011, 45 projects (40.5%) have been implemented in the department as system improvement. These projects with implementation received a higher evaluation score in the aspect of “clinical significance” compared to the projects without implantation (7.9 ± 0.6 vs. 7.6 ± 0.6 ; $p = 0.029$). No statistically significant difference was found between the two groups in terms of scores in the other aspects, categories, or year of presentation.

DISCUSSION: The SBP project within an anesthesiology residency program in a large academic medical center has resulted in not only a deeper understanding of the core competency by the residents to fulfil the Level 4 Milestone Project competency requirement but also in direct system improvement to the department.

TABLE 1
Representative Systems-Based Practice Projects with Top Scores per Category
Presented for the Last 10 Years

CATEGORY	TITLE	SCORE (Overall)
Policy change recommendations	• <i>Early Preoperative Type and Screen Analysis of Patients at High Risk for Red Blood Cell Alloimmunization</i>	8.5
	• <i>Emergent Airway Management During Codes</i>	8.5
	• <i>Proposed Initiative to Reduce Intraoperative Wastage of Blood Products</i>	8.5
Process analysis	• <i>An Indirect Laryngoscope: A Cost Effective Adjunct for Difficult Airway Management in Off-Site Locations</i>	8.4
	• <i>Preventing Diversion from Automated Drug Dispensing Machines</i>	8.4
	• <i>Difficult Intubation: What's the Story?</i>	8.3
Safety initiatives	• <i>Painful for the Patient and Anesthesia Provider</i>	8.3
	• <i>How Should We Screen for Pregnancy in Our Patients?</i>	8.2
	• <i>Improving Safety of Off-Site Procedures on the Weekend</i>	8.2
Teamwork/Communication	• <i>Anesthesia Members to Critical Care Medicine Communication</i>	8.5
	• <i>Improvement in Communication with Blood Bank</i>	8.3
	• <i>Can You Hear Me Now? A Discussion of Communication within an UPMC Affiliated Department of Anesthesiology and Suggestions for Improvement</i>	8.2
Education initiatives	• <i>Standardizing Emergency Response Equipment for Anesthesiologists and Providing Training for Usage of All Equipment</i>	8.3
	• <i>Increased Education of Radiation Exposure and Safety Procedures for Anesthesia Personnel in the Operating Room</i>	8.0
	• <i>The Telephone Game</i>	7.7
Operating room efficiency	• <i>Creating User Friendly Summary Cover Sheet</i>	8.7
	• <i>ISMETT-UPMC Palermo Operating Room Efficiency</i>	8.0
	• <i>Incomplete Cardiac Preoperative Evaluations Causing Cancellation and Delay on the Morning of Surgery</i>	7.4
Economic analysis	• <i>The Effectiveness and Economics of the Use of Chlorhexidine-Impregnated Sponges in Central Venous Catheter Dressings</i>	7.4

Abbreviations: UPMC, University of Pittsburgh Medical Center; ISMETT, Istituto Mediterraneo per i Trapianti e Terapie ad Alta Specializzazione (Mediterranean Institute for Transplantation and Advanced Specialized Therapies)

Results of Anesthesia Olympics as an Objective Assessment of Resident Skill Progression

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Introduction:

Residency programs are charged with teaching, assessing, and documenting resident competency for a multitude of skills throughout the course of training. An annual skill assessment event (Anesthesia Olympics) was developed to assess requisite skills in an environment of friendly competition.^{1, 2} Workstations focused on competence in basic anesthesia skills (airway management, IV placement, and OR Anesthesia workstation checkout). The aim of this project was to determine if an Anesthesia Olympics-style event can be used as an objective assessment tool to document resident skill progression.

Methods:

After IRB approval, 21 anesthesia residents participated in the Anesthesia Olympics project during both their PGY1 and PGY2 training years between 2012-2014. Using simulation models, times for endotracheal intubation, peripheral IV placement and OR anesthesia workstation checkout were recorded. Identification of an air leak was needed in the OR anesthesia workstation checkout. Times of the PGY1 performance were compared to the PGY2 performance. Data (times in seconds) are reported as mean \pm SD. Paired t-test and exact binomial test were used for statistical significance ($P < 0.05$).

Results:

A total of 21 residents participated in both events: $n=10$ 2012/13, $n=11$ 2013/14. The workstations were identical in the PGY1 and PGY2 year.

Workstation	PGY1	PGY2	Difference	p-value
Endotracheal Intubation	187 \pm 50 sec	154 \pm 57 sec	33 \pm 83	0.017
Peripheral IV placement	217 \pm 78 sec	140 \pm 71 sec	77 \pm 114	0.011
OR anesthesia workstation	800 \pm 194 sec	647 \pm 179 sec	153 \pm 239	0.008
Leak identified	13/21	20/21		<0.001

Discussion:

The PGY2 outperformed their PGY1 performance in all workstations evaluating basic anesthesia skills. The annual skill assessment event (Anesthesia Olympics) is able to objectively assess and document progression in anesthesia resident skill level and may be useful for milestone assessment throughout residency. Future studies are planned to investigate the value of a similar events for assessment of skills that are, challenging to objectively assess (e.g. professionalism, communication, crisis management).

References:

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Establishing Performance Benchmark Norms for Interdisciplinary Teamwork in the Operating Room

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Introduction: The quality of interdisciplinary teamwork in the operating room (OR) is increasingly recognized as an important determinant of high quality and safe surgical care. Benchmarking operative performance is an important quality improvement approach that can be used to identify outliers (particularly underperforming teams) and monitor progress longitudinally. At present, benchmark norms in relation to the quality of interdisciplinary teamwork are lacking. The aim of this study was to develop performance benchmark norms for the quality of interdisciplinary teamwork in the OR.

Methods: This was a prospective observational study conducted in 5 National Health Service (NHS) Hospitals in England. The validated Observational Teamwork Assessment for Surgery (OTAS) tool was used to evaluate the quality of interdisciplinary teamwork performance in the OR. OTAS assesses the quality of 5 behavioral constructs of teamwork (communication, cooperation, coordination, leadership, team monitoring). In total, the quality of teamwork was assessed in 654 elective surgical cases (including general, urology, and orthopaedic). All observations were collected in real-time by trained OTAS evaluators. Means and standard deviations of interdisciplinary teamwork performance of 654 OR teams were calculated. OR teams with performance 1 standard deviation (SD) below the mean were considered underperforming, OR teams with performance 1 SD above the mean were considered over performing.

Results: Global OTAS scores were 3.69/6 (SD=0.54), indicating that the quality of teamwork in the OR typically enhances team function. Table 1 displays the benchmark norms of teamwork performance across operative phase, teamwork behavior, and OR sub-team. Taking the Global OTAS average as the benchmark norm for OR interdisciplinary teamwork performance, 55.7% of ORs failed to reach this benchmark (quality of teamwork <3.69). In total, 25.7% of teams were identified as performing 1 standard deviation above or low the benchmark norm outliers; 13.3% of OR teams were identified as underperformers (1 standard deviation below benchmark); 12.4% of OR teams were identified as over performers (1 standard deviation above benchmark). 0.2% of OR teams were identified as 'extreme' underperformers (2 standard deviations below benchmark). 4.7% of OR teams were identified as 'extreme' over performers (2 standard deviations above the benchmark). Figure 1 depicts the distribution of quality of OR interdisciplinary teamwork performance.

Discussion: This study provides the first attempt at establishing benchmark norms for OR interdisciplinary teamwork based on aggregated data across a large number of OR teams. Such data can be used by organizations to identify underperforming OR teams and develop tailored interdisciplinary team training.

Figure 1: Distribution of Quality of OR Interdisciplinary Teamwork

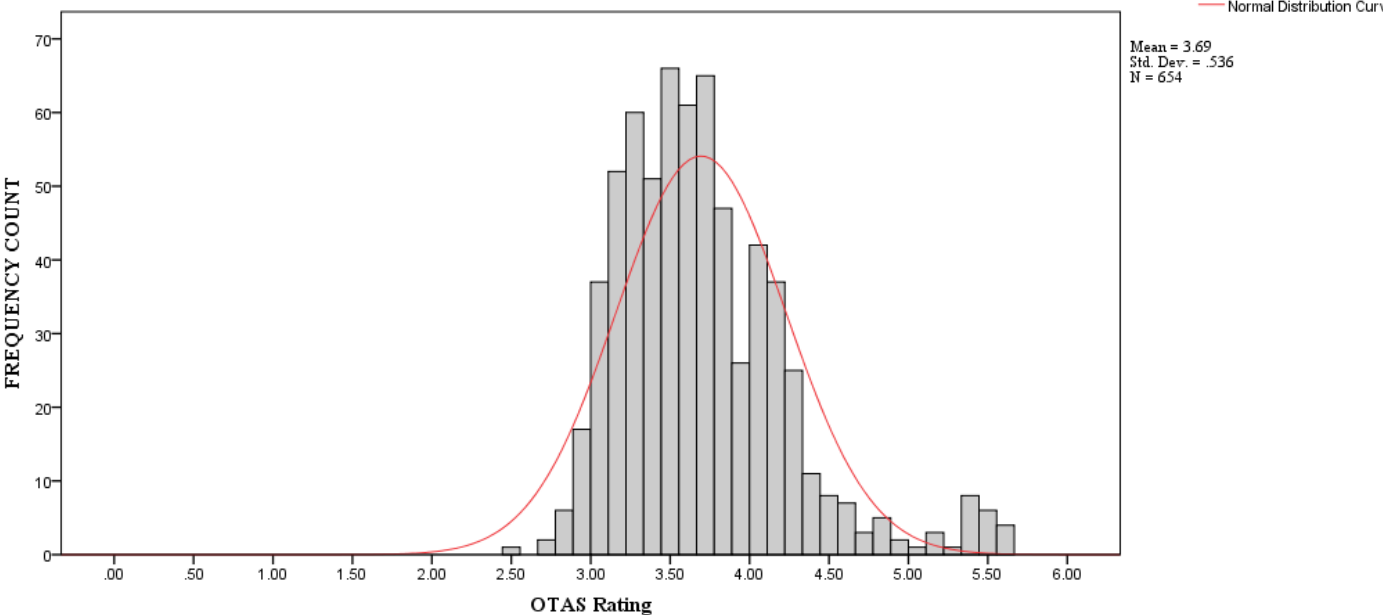


Table 1. Quality of Interdisciplinary OR Teamwork Across Sub-teams and Operative Phases (poor teamwork=0, moderate teamwork=3, exemplary teamwork=6)						
	Team Communication	Team Coordination	Team Cooperation	Team Leadership	Team Monitoring	Overall Quality of Teamwork
Operative Phase						
Pre-Operative						
Anesthetic team	3.75 (0.74)	4.02 (0.75)	3.98 (0.76)	3.83 (0.75)	3.98 (0.76)	3.91 (0.66)
Nursing team	3.74 (0.74)	3.90 (0.86)	3.98 (0.80)	3.66 (0.76)	3.78 (0.76)	3.81 (0.69)
Surgical team	3.78 (0.85)	3.85 (0.96)	3.91 (0.88)	3.69 (0.86)	3.83 (0.92)	3.81 (0.82)
Intra-Operative						
Anesthetic team	3.62 (0.80)	3.87 (0.78)	3.84 (0.82)	3.57 (0.76)	3.81 (0.85)	3.74 (0.71)
Nursing team	3.93 (0.79)	3.91 (0.92)	4.08 (0.84)	3.67 (0.77)	3.93 (0.85)	3.90 (0.75)
Surgical team	4.01 (0.88)	4.10 (0.80)	4.10 (0.85)	4.04 (0.79)	3.83 (0.86)	4.01 (0.75)
Post-Operative						
Anesthetic team	3.91 (0.70)	3.86 (0.76)	3.90 (0.75)	3.82 (0.72)	3.89 (0.75)	3.87 (0.66)
Nursing team	3.71 (0.72)	3.88 (0.78)	3.89 (0.78)	3.56 (0.71)	3.73 (0.77)	3.74 (0.66)
Surgical team	3.38 (0.84)	3.37 (0.95)	3.41 (0.96)	3.19 (0.83)	3.19 (0.95)	3.30 (0.82)
						3.69 (0.54)

One-month Intensive Training Improves AKT Scores and Clinical Performance of CA-1 Residents at an Academic Medical Center

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Introduction: As part of a comprehensive plan to improve clinical training and Anesthesia Knowledge Test (AKT) scores, the anesthesiology residency program at an academic medical center instituted an intensive month of training for the clinical anesthesia 1 class (CA-1C) during AY 2014-2015.

Methods: Training was comprised of daily lectures with emphasis on basic airway anatomy, physiology, and basic pharmacology of the common intraoperative medications as well as simulation training. During the month-long training, CA-1C were assigned to clinical duties and were closely supervised by faculty on a 1:1 ratio or paired with a senior anesthesiology resident if the faculty was assigned to more than one operating room. The CA-1C were evaluated using a standard form by up to 8 faculty members on facemask ventilation, direct laryngoscopy, laryngeal mask airway placement, and overall resident clinical performance as compared to residents at the same level of training. The 3 skills were judged as “needing improvement” or “done well”; overall performance was scored from 1 (distinctly below peer level) to 5 (distinctly above peer level). Evaluator scores were averaged and residents with lower scores (< 3) were considered for remediation. To determine whether the training had an effect on knowledge of anesthesia concepts, we compared scores of the AKT taken on the first day and last day of the first month of clinical training of the CA-1C (intensive training group). A historical cohort (CA-1HC) which did not receive the same level of intensive training during the first month of their CA-1 class served as our control group. The groups were compared using t-test.

Results: The faculty evaluation score of the CA-1C group was 3.6 ± 0.5 (range, 2.4 - 4.2). For the pre and post AKT comparison, the two groups were academically equivalent prior to the educational intervention. The mean USLME Step 1 and 2 scores for the CA-1C were 226 and 224 and for the CA-1HC, 230 and 229. The scores of 10 CA-1C (1 “off-cycle” resident did not receive intensive training and was excluded from analysis) for the pre and post AKT scores were $57\% \pm 14\%$ and $87\% \pm 5\%$. By contrast, the AKT scores of the 13 CA-1HC were $44\% \pm 20\%$ and $32\% \pm 26\%$ (Figure 1). The comparison of mean change using t-test (MedCalc) was significant, difference of -0.42, standard error of 0.07, $p < .0001$.

Discussion: This preliminary study appears to suggest that more intensive training is effective in improving the clinical skills and test scores of anesthesia residents. In addition to lectures and simulations, other methods of knowledge- and skills-based training should be considered.

