

## Presentation #1

*Surgical Potpourri I*

### DOES SEPTAL THICKNESS INFLUENCE OUTCOME OF MYECTOMY FOR HYPERTROPHIC OBSTRUCTIVE CARDIOMYOPATHY?

Anita Nguyen, MBBS, Hartzell V. Schaff, MD, Rick A. Nishimura, MD, Joseph A. Dearani, MD, Jeffrey B. Geske, MD, Brian D. Lahr, MS, Steve R. Ommen, MD

**Presenter:** Anita Nguyen MBBS

Mayo Clinic, Rochester, Minnesota

**Background:** Patients with hypertrophic obstructive cardiomyopathy (HOCM) and basal septal thickness <18mm are often considered unsuitable for myectomy. Mitral valve (MV) replacement is frequently performed instead.

**Objective:** This study investigated whether septal thickness affects outcomes and adequacy of myectomy.

**Methods:** Clinical and echocardiographic data of 1,486 consecutive adult patients with HOCM who underwent transaortic septal myectomy between January, 2005 and December, 2014 were reviewed. Comparisons between patients grouped by septal thickness (≥21mm, n=505) were performed with Kruskal-Wallis, Pearson's  $\chi^2$  tests, and semi-parametric analysis of covariance.

**Results:** Median ages of the three groups were 57, 57, 54 years ( $P=0.007$ ), and 50.4%, 56.7%, 62.0% were male ( $P=0.003$ ). Intrinsic mitral valve disease was present in 5.9%, 5.2%, 4.6% ( $P=0.8$ ). All patients underwent transaortic septal myectomy. Additional MV procedures were performed in 7.6%, 7.8%, 8.1% ( $P=0.9$ ). Reasons for MV surgery included intrinsic mitral valve disease (66.7%), residual mitral regurgitation (MR) (30.8%), and postoperative gradient (2.6%). Post-bypass obstruction relief was seen amongst all groups (median reduction 51, 54, 50 mmHg;  $P=0.1$ ). Postoperative ventricular septal defect (VSD) occurred in 4 patients (0.3%) and risk did not differ by group ( $P=0.2$ ).

**Conclusion:** Adequate relief of LVOT obstruction can be achieved via transaortic septal myectomy in septal thickness <18mm without concomitant MV procedures, and risk of VSD is very low. Concomitant MV repair/replacement should be reserved for patients with intrinsic mitral valve disease or inadequate relief of MR/LVOT obstruction following adequate extended septal myectomy.

## Presentation #2

### *Surgical Potpourri I*

#### **PROPHYLACTIC TRICUSPID VALVE SURGERY SHOULD BE CONSIDERED FOR PATIENTS WITH ATRIAL FIBRILLATION UNDERGOING LEFT VENTRICULAR ASSIST DEVICE IMPLANTATION?**

Lucman A. Anwer, Salvatore Poddi, Vakhtang Tchantchaleishvili, Richard C. Daly, Lyle D. Joyce, Sudhir S. Kushwaha, Yan Topilsky, John M. Stulak and Simon Maltais

**Presenter:** Lucman Anwer MD

UIC/MGH, Chicago, IL

**Background:** Atrial fibrillation (AF) and tricuspid regurgitation (TR) are common in patients undergoing left ventricular assist device (LVAD) implantation. TR progression is associated with the presence of AF, and questions remain as to who benefits from TV procedures (TVP).

**Objective:** The effects of AF on LVAD outcomes have been underreported, especially when studied in relation to its impact on TR. In the present study, we sought to examine the impact of preoperative AF on the progression of TR post LVAD implantation.

**Methods:** From Feb-2007 to May-2014, 250 patients underwent LVAD implantation at our institution. Patients with concomitant TVP were excluded from this analysis (113 patients). The indication for LVAD was destination therapy in 80 (58%) patients and the etiology of heart failure was ischemic in 73 (53%). Follow-up was available in all early survivors for a total of 393 patient-years of support.

**Results:** Of the 137 non-TVP patients, 52 (38%) had AF preoperatively. Observed overall survival at 1, 3 and 5 years was 82%, 67% and 55%, respectively. Median grade of TR increased from 2 preoperatively to 3 ( $p=0.04$ ) in the AF group and 2.2 ( $p=0.75$ ) in the non-AF group at 5 years of follow-up. We also observed a significant difference in the degree of TR between groups at 3 months ( $p=0.03$ ), and 12 months (0.01) post-implantation, and a trend towards significance at 18 ( $p=0.06$ ), and 24 ( $p=0.07$ ) months.

**Conclusion:** The presence of AF is associated with early progression of TR after LVAD implantation. Addition of concomitant TVP in patients with preoperative AF may be considered in patients with less than severe TR. The impact of these findings on right ventricular failure/remodeling remains to be evaluated.

### Presentation #3

#### *Surgical Potpourri I*

#### **TIME-RELATED RISK OF ADVERSE EVENTS DURING LONG-TERM SUPPORT WITH HEARTMATE II**

Salvatore Poddi, MD, Lucman A. Anwer, MBBS, Vakhtang Tchantchaleishvili, MD, Lyle D. Joyce, MD, PhD, Richard C. Daly, MD, Shannon M. Dunlay, MD, Simon Maltais, MD, PhD, John M. Stulak, MD

**Presenter:** Salvatore Poddi MD  
Mayo Clinic, Rochester, MN

**Background:** Adverse events after Left Ventricular Assist Device (LVAD) implantation continue to detract from durable outcome, and may limit widespread adoption of this therapy. Very little data exist evaluating the comprehensive, time-related risk of adverse events during long-term support with the HeartMate II (HM2).

**Objective:** The aim of the present study is to analyze the incidence of major complications over the time of support in patients that underwent HM2 LVAD implantation at our institution, specifically pointing up the long-term outcomes and the modifications of complications incidence during that time.

**Methods:** Between January 2007 and October 2016, 347 patients underwent LVAD implantation at our institution; 270 (78 %) received the HM2 and were included. Risk of events through time on support was assessed with restricted cubic splines.

**Results:** The median age at implant was 63 years (range, 18-82) and 228 patients were male (84%). The indication was destination therapy in 200 patients (74%) and the etiology of heart failure was ischemic in 135 patients (50%). The median cardiopulmonary bypass time was 102 minutes (range, 15-416). Concomitant valvular surgery was performed on the tricuspid valve in 127 patients (47%) and the aortic valve in 39 patients (14%). There were 21 early deaths (7.8%). The median length of stay was 19 days (range, 5-384). Follow-up was available in all early survivors for a median of 1.6 years (max., 9 years) for a total of 572 patient-years of support. Survival after HM2 implant was 79%, 58%, and 42% at 1, 3, and 5 years, respectively. Figure 1 shows the relative hazard of major adverse events (stroke, thromboembolism, any bleeding, driveline infections) over the time of support. The risks of stroke ( $p=0.038$ ) and thromboembolic events ( $p=0.024$ ) were highest early after implantation, declined and then stabilized. The risks of bleeding events ( $p=0.8$ ) and percutaneous driveline infection ( $p=0.6$ ) fluctuated slightly over time on support.

**Conclusion:** Support with HM2 LVAD offers very good survival and stable rates of adverse events extending late into follow-up. Risk of stroke and thromboembolism decrease significantly early after implant and remain stable late after implant, while bleeding and driveline infection rates increase slightly up to 2 years before returning to rates similar to early after implant.

## Presentation #4

### *Surgical Potpourri I*

#### PERFORATED PEPTIC ULCER DISEASE - LAPAROSCOPIC VS. OPEN REPAIR: A RETROSPECTIVE PROPENSITY SCORE MATCHED COHORT STUDY

Victor Vakayil, MBBS; Brent Bauman, MD; Reema Mallick, MD; Malavika Chandrashekar, B.S.; Sayeed Ikramuddin, MD, MHA; James V. Harmon Jr., MD, PhD, FACS

**Presenter:** Victor Vakayil MBBS

University Of Minneapolis, Minneapolis, Minnesota

**Background:** Both open (OP) and laparoscopic (LP) surgical approaches for perforated peptic ulcer disease (PPUD) are associated with significant morbidity and mortality. Some literature suggests that in PPUD, the laparoscopic approach may offer advantages over the open approach due to; the reduced size of the surgical wound, diminished postoperative pain, fewer postoperative complications. However, there is no universal consensus on which approach is superior.

**Objective:** To evaluate and compare intraoperative and perioperative outcomes between the laparoscopic approach and the open approach for perforated peptic ulcer repair.

**Methods:** A 4-year retrospective review (2012- 2015) of the ACS-NSQIP database identified 4,035 adult patients (LP=514, OP= 3521) who underwent the OP or LP surgical approach for PPUD. All patients who had a history of any concurrent surgical procedure, bleeding peptic ulcers, severe renal failure, severe COPD, disseminated cancer were excluded from analysis. To eliminate the confounding effects of heterogeneity between the two patient cohorts, using a caliper distance +0.5 and a case: control ratio of 1:4; a propensity score(PS) matched analysis was performed to evaluate intraoperative and postoperative outcomes( Image 1).

**Results:** PS matching yielded a total of 2570 patients (LP=514, OP= 2056). Univariate analysis demonstrated successful matching on demographic and baseline clinical variables including Age, Race, BMI, comorbidities, baseline laboratory variables and ASA scores. The laparoscopic approach was associated with increased operative time (LP= 98.39 ±80.58 vs OP= 72.69± 51, P=0.001) but shorter duration of stay (LP= 6.91±8.1vs OP= 8.15±7.06, P=0.001). Laparoscopic surgery was associated with a decreased the risk for superficial surgical site infection (LP= 1% vs OP= 3.6%, P=0.002) and postoperative wound dehiscence (LP= 1.3%% vs OP= 0.2%, P=0.028). There was no difference in the rates for deep space infections, pneumonia's, urinary tract infections, pulmonary embolism, sepsis, readmission rates and overall mortality between both matched groups( Table 1).

**Conclusion:** Less than 13% of all PPUD was repaired laparoscopically. Moreover, the laparoscopic approach was associated with a shorter duration of hospitalization, and given the significantly reduced risk of postoperative infection and wound dehiscence, a minimally invasive approach may superior given that the patient is a suitable candidate.

## Presentation #5

### *Education Session*

#### VALIDATION OF THE ADVANCED INVERTED PEG TRANSFER (IPT) TASK FOR SURGICAL SIMULATION-BASED ASSESSMENT

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**Presenter:** Amro Abdelrahman MBBS

Mayo Clinic, Rochester, Minnesota

**Background:** Although regular Peg Transfer (rPT) is used to assess basic laparoscopic surgery skills, rPT doesn't expose surgical trainees to all required intra-abdominal laparoscopic situations (i.e. intra-abdominal wall during laparoscopic ventral hernia repair (LVHR)).

While surgical simulation is viewed positively in Minimally Invasive Surgery (MIS) assessment and training, the educational benefits of the currently available low fidelity laparoscopic surgical tasks are limited in regards to the ability of evaluating surgical trainees' advanced laparoscopic skills needed for safe independent laparoscopic practice in the operating room.

**Objective:** The study goal was to evaluate the validity evidences of a novel inverted Peg Transfer (iPT) task for assessing laparoscopic skills of both novices and experts and compare iPT to the regular peg transfer (rPT) task.

**Methods:** A crossover-randomized design was used to compare participants' performance during rPT and iPT in a medical simulation center. The iPT consisted of a magnetic pegboard with standard rPT pegs and triangles attached to the ceiling of a Park Trainer Box on a laparoscopic-video tower (Stryker Corp.). iPT, like rPT, is designed to assess hand-eye coordination, ambidexterity, and depth perception plus assesses skills needed to place mobile objects against gravity like for LVHR (content evidence). Participants were divided into two groups: novices (medical students and first-year surgical residents without laparoscopic experience), and experts (Minimally Invasive Surgery (MIS) attendings). Participants were asked to complete each version of peg transfer separately (6-minutes maximum). rPT was completed on a Fundamentals of Laparoscopic Surgery trainer. This was the first exposure to iPT for both novices and experts. Completion time (efficiency) and number of dropped and transferred triangles (precision) were collected. A scoring rubric was used to calculate a normalized participant score between 0 and 100, where a higher score indicated better performance (internal structure validity). Wilcoxon rank sum and Mann-Whitney tests were performed as appropriate using SPSS v22 (IBM Corp.) with  $\alpha=0.05$ . Receiver-Operating-Characteristic Curves were graphed for the two task scores to measure the Area Under the Curve (AUC) to identify tasks' sensitivity and specificity in differentiating between novices and experts.

**Results:** Thirty-six novices and eight experts participated. Both experts and novices had longer completion time and lower scores during iPT than rPT (p

**Conclusion:** IPT is a valid assessment of advanced laparoscopic skills for surgical trainees with higher specificity and sensitivity than rPT. As advanced Minimally Invasive Surgery (MIS) becomes more common, it is important that tasks such as IPT be included in surgical simulation curricula and training assessment.

## Presentation #6

### *Education Session*

#### **LAPAROSCOPIC PORT PLACEMENT CONCEPTS; IT'S ALL ABOUT THE FUNDAMENTALS**

Nimesh D. Naik M.D., Eduardo F. Abbott M.D., Francisco J. Cardenas M.D., David R. Farley M.D., Travis J. McKenzie, M.D.

**Presenter:** Francisco Cardenas MD  
Mayo Clinic, Rochester, MN

**Background:** Successful laparoscopic surgeries depend on optimal port location. The concepts of triangulation, distance to the target organ and specific target anatomy, require mastery to obtain optimal port-placement locations for surgery. Many trainees memorize port placement locations for various laparoscopic surgeries (e.g. cholecystectomy, appendectomy, etc.), but when tasked with unique procedures or anatomical variants, the concepts of port placement become essential. Evaluation of the understanding and application of these concepts in clinical practice by general surgery residents has not been described in the literature

**Objective:** To evaluate the application of port-placement concepts in general surgery residents

**Methods:** Utilizing a low-fidelity model of the human abdomen with multiple predefined port-entry sites, participants were given a baseline test that consisted of four simulated scenarios. An instructional video with fundamental port-placement concepts was distributed after the baseline assessment to all the participants and the same test was given 6 months apart from the baseline. Each scenario consisted of a different operative procedure with different target organs, where trainees were required to verbalize table & patient positioning, palpate relevant anatomical landmarks, and commit to port placement of camera and working trocars. After completing the four scenarios, trainees were given 90 seconds to complete a five-question quiz. Our primary outcome included total score and its improvement between the baseline and post-intervention assessments. Secondary outcomes were correct performance on routine tasks (positioning and palpation of relevant anatomical landmarks), port-location, and quiz score.

**Results:** A total of 63 PGY-1 to 5 general surgery trainees completed the pre & post intervention assessments. Participants were split into juniors (PGY 1-2, n=38) and seniors (PGY 3-5, n=25). 63% of the junior residents and 60% of the senior residents watched the instructional video in the interim. Junior residents who did and did not watch the interventional video showed significant improvement in the total score (Mdn=10.25,  $p<0.01$  and 5.58,  $p<0.01$ ), as well as in the routine tasks (Mdn=4,  $p<0.01$  and 2.8,  $p=0.02$ ), port-location (Mdn=4,  $p<0.01$  and 2.7,  $p<0.01$ ), and quiz score (Mdn=1.8,  $p<0.01$  and 0.8,  $p=0.01$ ). Only senior residents who watched the video presented improvement in the total score (Mdn=4.5,  $p=0.01$ ), routine tasks (Mdn=4,  $p=0.01$ ), and quiz (Mdn=1,  $p=0.03$ ); but not in the port-location (Mdn=1.25,  $p=0.73$ ). Significant differences between the junior and senior residents were observed in the baseline total score (Mdn=17.6 and 27.8,  $p<0.01$ ), routine tasks (Mdn=8.2 and 12.5,  $p<0.01$ ), port-location (Mdn=6.6 and 10.4,  $p<0.01$ ), and quiz scores (Mdn=3 and 5.5,  $p<0.01$ ). Similar

differences were observed in the post-intervention scores between these two groups, except for the port-location (Mdn= 10.8 and 11,  $p=0.26$ , respectively).

**Conclusion:** An instructional video for learners pertaining to the concepts of port-placement is an effective way to educate and improve assessment scores. The lack of improvement on port-location scores seen in the senior residents may represent memorization of the port-location for the given target organs, however, it was demonstrated that their concept understanding improved according to our evaluation. Application of these concepts in clinical practice remains to be tested.



## Presentation #7

### *Education Session*

#### **SURGICAL INTERNS IN 2017: OBJECTIVE ASSESSMENT SUGGESTS THEY ARE BETTER BUT STILL DANGEROUS**

Yazan AlJamal MBBS, Francisco Cardenas Lara MD, David Farley MD.

**Presenter:** Yazan AlJamal MBBS

Mayo Clinic, Rochester, MN

**Background:** The transition from 4th year medical student to surgical intern is difficult: lack of repetitions, experience, and knowledge have been documented.

**Objective:** We report our experience using Objective Structured Assessment of Technical Skills (OSATS) and Non-technical Skills (OSANTS) to assess the competency of GS interns in July and January of their intern year.

**Methods:** As part of a larger assessment effort, our GS interns (2008 through 2016) have been tested using OSATS and OSANTS on performing an emergent cricothyroidotomy (EC), interpreting two arterial blood gasses (ABG), and reading three chest x-rays (CXR). We retrospectively analyzed GS interns' performance on these three tests (total maximum score =10).

**Results:** A total of 207 interns completed both July and January (identical) assessments. Overall mean scores in July (2.7/10, SD+/-2.7) improved by January (6.4/10, SD+/-2.5). All GS interns improved their total score between July and January (mean gain=3.6, SD+/-2.9;  $p<0.05$ ). Over the last 8 years, GS interns' mean baseline scores improved in July (2008 to 2016, respectively: 1/10, 3, 2, 3, 2, 3, 4.5, and 5.1;  $p<0.05$ ) and in January (means from 2009 to 2017, respectively: 5/10, 6, 7, 6, 7, 7, 8.5, 7.6;  $p<0.05$ ).

**Conclusion:** Although our data suggest that surgical interns start residency training with low levels of skill and comprehension with EC, ABGs, and CXR, they improve significantly over 6 months of clinical and simulation training. Encouragingly, overall scores for both July and January assessments have improved over the last 8 years – leading us to suggest that although they may still be dangerous, they are getting better.

## **Presentation #8**

### *Education Session*

#### **IN ORDER TO TEACH: DOES THE ORDER OF THE LEARNING CYCLE AFFECT TEACHING? A PILOT STUDY**

Jacob Billings, Becca Gas, Yazan AlJamal MBBS, David Farley MD

**Presenter:** Jacob Billings UREP

Mayo Clinic, Rochester, MN

**Background:** Training surgical residents requires a multifaceted approach. The knowledge behind the procedure, the skills necessary to perform, and operational practice are all important. Education theories would suggest that there is an ideal order to these facets; first an understanding should be developed, then deliberate practice, and finally a full operative scenario

**Objective:** We sought to determine the most effective order of simulation education.

**Methods:** Every Friday morning, surgical interns participated in three-hour simulation education sessions. Each session began with an introduction of the week's topic, and then proceeded to a rotation of 3 rooms, followed by a debriefing and five question quiz. The rooms included in the rotation were "academics" which included knowledge based, a "skills" where trainees practiced specific surgical skills on individual bench models, and an "operating room" (OR) in which interns performed abbreviated portions of operations. Interns were divided into three groups and were assigned a starting room that would remain the same for all sessions. All groups rotated through each room; each rotation was 40 minutes. A post-test concluded each session. Test scores were then analyzed.

**Results:** There were 10 trainees who began in the academic room (and proceeded to skills then OR); average post test score was 3.55. The average score for 9 residents rotating from skills to OR to academic was 3.57, and 3.53 for the 9 that moved from OR to academic to skills.

**Conclusion:** We did not see any differences in post test scores from the varying order of rotations, suggesting that as long as each resident experiences each room, they perform similar. We continue to search for the most effective way to teach and train surgical residents.

## Presentation #9

### *Mini-Talk Session I*

#### **OUTCOMES AFTER THE IMPLEMENTATION OF PRACTICE MANAGEMENT GUIDELINES FOR THE TREATMENT OF CARDIOVASCULAR IMPLANTABLE DEVICE POCKET INFECTIONS (CIDPI)**

Buckarma.E, Mohan.M, Baddour.L, Tan.E, Schiller.H, Loomis.E

**Presenter:** EeelN Buckamra MD

Mayo Clinic, Rochester, MN

**Background:** Treatment of CIDPI requires a multimodal approach that includes antimicrobials, device explanation and local wound care. Our institution implemented a Practice Management Guideline (PMG) to standardize the care of Cardiovascular Implantable Device Pocket Infections (CIDPI) and engage our Acute Care Surgeons in 2013. Our PMG includes wound culture, complete capsulectomy, pulse lavage and placement of a negative pressure wound therapy device at the time of device extraction. 48 hours later, wounds are irrigated and closed in a delayed primary fashion over drains.

**Objective:** Our objective was to compare the outcomes of patients who underwent cardiovascular device extraction before and after the implementation of the PMG for the treatment of CIDPIs.

**Methods:** An IRB approved retrospective review of 155 patients at our institution from 2012-2015 who underwent cardiovascular device explanation. Evaluated outcomes measured included days from device explant to wound closure, post-operative complications (hematoma, surgical site infection, unplanned return to OR) Outcomes data was analyzed prior to (Group A) and after (Group B) enactment of the PMGs.

**Results:** 58 patients (Group A: 42 male, 16 female; mean age 68) were managed prior to PMG implementation and 97 (Group B: 72 male, 25 female; mean age 67) managed after. Mean days from device explanation to wound closure were compared (Group A,  $6 \pm 3.5$  and Group B,  $2.6 \pm 1.8$ ) and time to closure was reduced by 3 days in Group B ( $p < 0.05$ ). No increase in surgical site infection, unplanned return to OR, hematoma was demonstrated between groups ( $p < 0.05$ ).

**Conclusion:** The implementation of PMGs is effective in reducing the number of days to pocket wound closure; acute care surgeons are well equipped to participate in this practice and improve patient outcomes.

## Presentation #10

### *Mini-Talk Session I*

#### **A BLENDED SIMULATION AND ONLINE-BASED SURGICAL EDUCATION CURRICULUM IMPROVES FIRST YEAR GENERAL SURGERY RESIDENTS' KNOWLEDGE**

Nimesh D. Naik M.D.\*, Eduardo F. Abbott M.D., TK Pandian M.D., Becca L. Gas, Francisco J. Cardenas M.D., David R. Farley M.D.

**Presenter:** Francisco Cardenas MD  
Mayo Clinic, Rochester, MN

**Background:** General surgery (GS) training in the United States has changed with the implementation of the 80-hour work week restriction. This has subsequently led to decreased autonomy and educational time in the operating room (OR). To combat this decline, educators have been tasked to develop inexpensive, objective, and applicable tools to allow GS residents to be better prepared before they enter the OR. We hypothesize that a blended online and surgical simulation curriculum will improve trainee performance on a video-based assessment related to surgical anatomy, instruments, and procedures.

**Objective:** To evaluate the general surgery residents' insight/knowledge of operative related procedures and facts

**Methods:** A 13-minute video, composed of 13 separate muted clips from a variety of laparoscopic and open surgical procedures, was created and shown to first year GS trainees. Trainees watched the video and were instructed to provide verbal commentary on the various clips as they played. The first 10 clips assessed knowledge by giving focused questions (e.g. name the components of the critical view of safety of laparoscopic cholecystectomy, state the procedure on-screen and name the structure that is being ligated). For the last 3 clips, trainees were instructed to name all aspects of the videos (e.g. all instrumentation, normal and pathologic anatomy, and any other facts of the surgery/onscreen video clip). A baseline video assessment was given in July (2015 & 2016), at the beginning of residency and an identical follow-up video assessment 6 months later in January (2016 & 2017). In between the assessments, trainees had access to an online website which hosted surgical educational content such as operative videos, modules, games. Additionally, they were required to attend a 3-hour weekly simulation session that revolved around specific organ systems and surgical procedures. A paired t-test was used for statistical analysis.

**Results:** A total of 55 trainees completed the baseline assessment, and 51 trainees completed the follow-up assessment over a 2-year period. The mean video assessment score (range 0 to 91 points) was 27.4 and 39.9 for the baseline and follow-up assessments respectively, with a statistically significant mean improvement of 12.5 points [95% CI: 7.3 to 17.6; p-value<0.01].

**Conclusion:** This pilot study shows that an inexpensive simulation and online based surgical education curriculum improves first year GS trainee knowledge of operative related procedures

and facts. Video based assessments, with a blended online and surgical simulation curriculum, improve resident knowledge & performance.

## Presentation #11

### *Mini-Talk Session I*

#### **SELF-EFFICACY IS KEY: THE ROLE OF MOTIVATION, PERCEIVED COMPETENCE, AND DELIBERATE PRACTICE DURING SURGICAL INTERN ASSESSMENT**

Rebecca Martin, Jessica Pakonen, Becca Gas, Yazan AlJamal, M.B.B.S., David Farley, M.D.

**Presenter:** Rebecca pp Undergraduate student  
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**Background:** Self-efficacy, one's confidence in influencing their success, has been shown to promote effective learning and successful performance. Motivation, perceived competence, and purposeful practice help predict one's self-efficacy.

**Objective:** We aim to further understand the relationship between motivation, perceived competence, and performance within medical assessments and education.

**Methods:** Mayo Clinic surgical interns participated in a surgical skills assessment in July 2017. The assessment consisted of 18 technical and non-technical skills including open knot tying and fascial closure tests. During the 6 minute open knot tying station, interns were given the opportunity to re-attempt the task and were surveyed on their perception of their own inherent level of motivation (using a Likert scale: 1= none through 9=high). Prior to the fascial closure station, interns were asked to rate their perceived competence on closing the fascia (Likert scale: 1=incompetent through 9=masterful).

**Results:** From 34 interns participating in the assessment, survey data was complete on 32 interns (21 males, 11 females). Overall mean time to complete 30 knots on the first attempt was 90.7 seconds (32 interns' range: 34 to 140 seconds). Mean time on the second attempt was 83.0 seconds (22 interns' range: 43 to 139 sec.), and on the third attempt mean was 62.6 seconds (6 interns' range: 47 to 74 sec.). As the number of attempts increased, average time to complete the open knot tying station decreased. The difference in mean times between the first and second attempt was 7.7 seconds [95% CI (3.4, 11.8)] and the difference in mean times between the second and third attempt was 20.4 seconds [95% CI (20.1, 20.8)]. No significant outcomes were found when stratified by sex. For the entire cohort, mean motivation score was 7.8 (range: 5 - 9) and perceived competence score was 4.3 (range: 1.5 - 8). Both motivation and perceived competence scores correlated with the choice to reattempt the knot tying task ( $p < 0.01$ , and  $p < 0.05$ , respectively).

**Conclusion:** Groups who reattempted the knot tying task self-reported increased motivation and perceived competence as well as improved performance, as demonstrated by speed. The significant relationship of motivation and perceived competence with purposeful practice within different stations suggests their reinforcing nature and may aid in self-efficacy. This significant relationship may play a critical factor in effective learning and heightening performance.

## Presentation #12

### *Mini-Talk Session I*

#### **BLACK ESOPHAGUS: A CASE STUDY**

Jacob Billings, Yazan AlJamal MBBS, Eric Dozois MD

**Presenter:** Jacob Billings UREP

Mayo Clinic, Rochester, MN

**Background:** This case presentation involves a 57 year old male who suffered multiple adverse sequela from the delayed diagnosis of a large presacral mass. He initially presented with left leg swelling and was diagnosed and treated for a lower extremity deep venous thrombosis (DVT). Several months later he had progression of his DVT and developed a pulmonary embolus (PE). Due to his complaints of sharp right groin pain, imaging was obtained that demonstrated a 13X14 cm presacral pelvic mass almost completely filling the pelvis. The presacral mass occluded the right sided venous return from the leg and caused the DVT and PE

**Objective:** To answer these questions. What is the risk of surgical intervention for resection of the pelvic mass given his extensive clot burden? Is the patient a candidate for thrombolytics? Should the mass be removed prior lytic therapy? Is a preoperative biopsy needed? What would the surgical approach be – intralesional, marginal (2 cm)?

**Methods:** Due to the extensive lower extremity thrombosis and PE that patient had an inferior vena cava filter that was placed and eventually clotted. He then was referred to Mayo for surgical consultation. The patient did receive lytic therapy prior to surgical resection of his pelvic mass and unfortunately developed hematemesis and a significant hemoglobin drop. An esophagogastroduodenoscopy (EGD) showed a proximal “black esophagus.” A transthoracic echocardiogram (TTE) showed a patent foramen ovale.

**Results:** The patient eventually stabilized and a repeat EGD a week later showed resolution of the ischemic esophagus. The patient later underwent a resection of the pelvic mass after confirmation was made that the pelvic veins were patent.

**Conclusion:** The surgical approach and the surgical decision making will be discussed

## Presentation #13

*Mini-Talk Session I*

### LAPAROSCOPIC LIGATION OF CISTERNA CHYLI FOR REFRACTORY CHYLOTHORAX; A CASE SERIES AND REVIEW OF THE LITERATURE

Ilitch Diaz-Gutierrez, MD; Madhuri V. Rao, MD; Rafael S. Andrade, MD

**Presenter:** Ilitch Diaz Gutierrez MD

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**Background:** Chylothorax complicates 1.4% of patients following pulmonary resection and 3.8% of patients post-esophagectomy. It is associated with higher 30-day major morbidity and mortality. Patients with chylothorax who have either failed or are not candidates for thoracic duct embolization or trans-thoracic ligation pose a particular challenge.

**Objective:** To describe an alternative technique for the treatment of chylothorax with ligation of the cisterna chyli via laparoscopy when all other measures have failed.

**Methods:** A waiver for IRB approval was granted for this study. We performed a retrospective review of patients with refractory chylothorax that were managed with laparoscopic cisterna chyli ligation between January 2013 and December 2016. We present a case series of 3 such patients and compare our results with the published literature.

**Results:** Our success rate was 67%. There were no procedure related complications. One patient died of multiorgan system failure.

**Conclusion:** Laparoscopic ligation of cisterna chyli is an available therapeutic option for patients with chylothorax unresponsive to medical management, embolization, and trans-thoracic ligation of the thoracic duct.



## Presentation #14

*Mini-Talk Session I*

### INTESTINAL MALROTATION ASSOCIATED WITH COLON CANCER IN A YOUNG ADULT: A CASE REPORT

Lumbard, Derek, MD, Nygaard, Rachel, PhD, Marek, Ashley, MD

**Presenter:** Derek Lumbard MD  
HCMC, Minneapolis, Minnesota

**Background:** Intestinal malrotation is a congenital anomaly defined as a deviation from the normal 270-degree counterclockwise rotation around the SMA axis during embryologic development. The incidence in adults is only 0.2% with a majority of symptomatic cases diagnosed shortly after birth. Moreover, intestinal malrotation in adults associated with colon cancer is extremely rare with few case reports in the literature.

**Objective:** Describe a case of an unusual patient found incidentally to have colon cancer during surgery for malrotation in an adult under the age of 30.

#### **Methods:** CASE DESCRIPTION:

A 28 year-old male presented to the emergency department with nausea, vomiting, abdominal pain, and history of intermittent diarrhea/constipation. His past medical history was significant only for renal stones. Laboratory results showed WBC 12,150/mm<sup>3</sup>. Computed tomography (CT) demonstrated bowel obstruction with transition points at Ligament of Treitz and mid-transverse colon. The cecum was noted to be in the mid abdomen with a mesenteric swirl. He underwent an exploratory laparotomy emergently. Dense adhesions between the colon and the retroperitoneum were noted as the transverse colon passed under the mesenteric root. A firm, strictured area was found in the mid-transverse colon at the transition point. The stricture was resected. A Ladd's procedure was then completed. The pathology report revealed a 3.8 cm moderate to well-differentiated adenocarcinoma with invasion through the muscularis propria (T3), 1 of 3 lymph nodes positive (N1) or stage IIIB. Upon further questioning, he had no family history of colon cancer. Continued staging and work-up was significant for absence of microsatellite instability on immunohistochemistry studies, a post-operative CEA of 0.5 and no evidence of metastatic disease on either initial CT or positron emission tomography. He was started on FOLFOX chemotherapy for a total of 12 cycles.

#### **Results:** DISCUSSION:

Review of the current literature reports twelve cases of intestinal malrotation with synchronous colon cancer (excluding situs inversus or complex congenital disorders.) While the older patient population with intestinal malrotation is more likely to have colon cancer in general, it remains unclear why a young patient with no other risk factors or family history would have synchronous cancer. We have entertained a theory that the chronic inflammation at the lead point of the volvulus at the mesenteric root could cause changes at a cellular level, leading to carcinogenesis.

**Conclusion:** This report represents the first case to our knowledge of colon cancer associated with intestinal malrotation found in an adult under the age of thirty. It is possible that chronic inflammation from adhesions and twisting and untwisting of the mesentery can facilitate malignant transformation.

## Presentation #15

### *Surgical Potpourri II*

#### **DIDACTIC VS VIDEO VS EXPERIMENTAL TEACHING: WHAT IS THE BEST WAY TO TEACH GENERAL SURGERY INTERNS? A PILOT STUDY**

Yazan AlJamal MBBS, Becca Gas, David Farley MD

**Presenter:** Yazan AlJamal MBBS

Mayo Clinic, Rochester, MN

**Background:** Educators struggle with the best way to teach young learners. Multiple ways have been described in literature, however assessing what works best for learners remains elusive.

**Objective:** We sought to compare didactic session, instructional video and low-cost low-fidelity model in teaching the general surgery interns a side-to-side, 2-layered, hand-sewn small bowel anastomosis (HSBA).

**Methods:** Nineteen general surgery interns participated in a prospective randomized study. Participants were asked to write down the steps for performing a side-to-side, 2-layered HSBA (pretest). They then were divided into three groups and learned the steps of a side-to-side, 2-layered HSBA in a didactic session (Group 1), an instructional video (Group 2) or low-cost low-fidelity model (Group 3). A post-test (identical to pretest) concluded the session. The maximum test score was 12 points. 3 weeks later a retention test was administered. Participants were surveyed anonymously regarding the degree to which teaching models were educationally effective. Pretest, post-test, and retention test scores were compared among the groups.

**Results:** No differences were found in the trainees' pretest scores (mean [SD], G1 =0.8 [1.3], G2 =0.3 [0.8], G3 =0.5 [0.8],  $p>0.05$ ). All groups of trainees scored higher on the post-test (G1; 5 [1.7], G2; 6 [0.9], G3; 10.14 [1],  $p$

**Conclusion:** Low-cost, low-fidelity models are more effective for learning for general surgery interns in comparison with video and didactic sessions. This effect remained stable over 3 weeks. The information gained from this study suggests experimental "hands on" learning improves the educational effectiveness of the sessions. Further studies with larger numbers are needed to confirm the findings of this study.

## Presentation #16

### *Surgical Potpourri II*

#### **LEFT VENTRICULAR ASSIST DEVICES; HOW DO WE DEFINE SUCCESS?**

Lucman A. Anwer, Salvatore Poddi, Vakhtang Tchantchaleishvili, Richard C Daly, Lyle D. Joyce, David L. Joyce, Shannon M. Dunlay, John M. Stulak and Simon Maltais

**Presenter:** Lucman Anwer MD

UIC/MGH, Chicago, IL

**Background:** Advancements in left ventricular assist device (LVAD) technology coupled with improved device outcomes have created a paradigm shift in the management approach to patients with refractory heart failure. Nevertheless, several complications previously encountered with the older pulsatile devices continue to pose a challenge for the contemporary LVADs.

**Objective:** Despite the growing acceptance of left ventricular assist device (LVAD) therapy to improve survival and quality of life in heart failure (HF) patients, uncertainties persist regarding the definition of a successful implant. We sought to determine an innovative criteria to define success and subsequently compare preoperative variables affecting outcomes.

**Methods:** From Jan-2007 to Jan-2015, 278 patients underwent LVAD implantation at our institution. Median age at implant was 60 (range, 18-82) years and 227 patients were males (84%). Indication for support was BTT in 99 (35.5%) and DT in 180 (64.5%) patients. Etiology of HF was ischemic in 135 (48.4%) and dilated in 115 (41.2%) patients. We defined successful LVAD implant as someone who was alive or transplanted at 2 years, had less than 3 readmissions and no major adverse events in the first year, and had a NYHA class of  $\leq$  II at 6 months. Follow-up was obtained in all early survivors for a median of 1.7 years (range, 1 month-9 years) for a total of 605 patient-years of support.

**Results:** Based on our criteria, 96/278(34.5%) patients were defined as having a successful implant. Preoperative factors associated with success were BTT indication( $p=0.003$ ), dilated HF( $p=0.037$ ), lower BMI( $p=0.05$ ), lower renal replacement therapy( $p=0.05$ ), and a greater number of inotropes employed for patient optimization( $p=0.008$ ). On multivariable analysis, BTT(HR:0.47,  $p=0.006$ ) and number of preoperative inotropes(HR:1.81,  $p=0.004$ ) were independently associated with a successful LVAD implant.

**Conclusion:** Despite an overall trend towards improved outcomes on device therapy, our criteria classified only one-third patients as successful. With a rapidly evolving field, it is imperative to have a reliable benchmark for success to establish best practice guidelines.

## Presentation #17

### *Surgical Potpourri II*

#### DISTRIBUTION OF 21-GENE RECURRENCE SCORES AMONGST BREAST CANCER HISTOLOGIC SUBTYPES

Scott Kizy MD, Ariella Altman MD, Jing Li Huang MD, Schelomo Marmor, PhD, MPH, Todd M. Tuttle, MD, MS, and Jane Yuet Ching Hui, MD, MS

**Presenter:** Scott Kizy MD

University of Minnesota, Minneapolis, Minnesota

**Background:** The 21-Gene Recurrence Score (RS) provides a probability of distant recurrence, and guides clinical decision making regarding the use of adjuvant chemotherapy for estrogen receptor-positive (ER), human epidermal growth factor receptor 2-negative (HER2) breast cancers. The utility of RS for rarer histologic subtypes of breast cancer is uncertain.

**Objective:** To determine the distribution of RS among various histologic subtypes using a population database.

**Methods:** Women between the age of 18 and 75 with ER-positive, HER2-negative breast cancer and RS results were identified using the Surveillance, Epidemiology and End Results database. RS was categorized into risk groups using both traditional and TAILORx cutoffs. Multivariable logistic regression was used to determine factors associated with high-risk RS.

**Results:** We identified 45,618 patients with stage I to III, ER-positive, HER2-negative breast cancer who had RS available. Overall, 3,087 (7%) and 6,337 (14%) of cancers were classified as high risk based on traditional and TAILORx RS cutoffs, respectively. The proportion of high-risk RS ranged from 1% (tubular, 2 of 225) to 69% (medullary, 13 of 19) and 4% (tubular, 10 of 225) to 79% (medullary, 15 of 19) for traditional and TAILORx cutoffs, respectively. Based on multivariable logistic regression (excluding medullary), subtypes other than invasive ductal carcinoma (IDC) and papillary carcinoma were significantly associated with lower RS. The strongest predictors of a high-risk RS were higher tumor grade and negative PR status.

**Conclusion:** We identified distinct distributions of RS amongst different histologic subtypes of breast cancer. Excluding medullary carcinoma, histologic subtypes other than IDC and papillary carcinoma all predict lower RS.

## Presentation #18

### *Surgical Potpourri II*

#### **ADENOSQUAMOUS CARCINOMA OF THE PANCREAS: A TRANSLATIONAL APPROACH**

Matthew C. Hernandez MD, Jennifer L Leiting MD, Lin Yang PhD, Mark J Truty MD MS

**Presenter:** Matthew Hernandez MD

Mayo Clinic, Rochester, MN

**Background:** Adenosquamous carcinoma of the pancreas (ASCP) is a rare and particularly lethal histologic subtype of pancreatic cancer. ASCPs are defined by a mixed histology with the presence of at least 30% malignant squamous cell carcinoma and coexisting ductal adenocarcinoma. Normal pancreas tissue has no benign squamous epithelial components. Thus the origin of this tumor is uncertain. Currently, there are no curative medical therapies for ASCP. This malignancy is often detected at an advanced stage and in the majority of cases only a fraction present with disease amenable to surgical resection. Despite curative intent resection, postoperative recurrence rates are high and ASCP demonstrates significantly worse overall survival, even compared to ductal adenocarcinoma. Furthermore the low prevalence of ASCPs makes it difficult to design research studies and to conduct clinical trials that exploit unique features of this tumor. To date there are no known effective therapies for patients with this intensely aggressive cancer.

**Objective:** To generate and amplify patient-derived ASCP malignant tissue in order to (1) genomically characterize (2) functionally assess and (3) correlate functional assay sensitivity with therapeutic response using tumor bearing ASCP mice.

**Methods:** Patient derived xenografts (PDX) were generated from surgical resection of patient tumor tissue in NOD SCID mice. All patient and derived PDX tumors were histologically (H&E and IHC) confirmed. Western blot and immunohistochemistry for the presence of MTH1 enzyme was performed. Cells were cultured using a hanging drop technique and treated with both cytotoxic as well as targeted therapies. Cell viability was assessed using daily cell counts as well as Prestoblue dye using a cell plate reader.

**Results:** Five patient derived ASCP PDX models were created with 100% initial engraftment rate and >90% engraftment ratio. Immunohistochemistry for p63 (squamous) and mucin components demonstrated the adenosquamous phenotype. Western blot and immunohistochemistry revealed variable expression with highest MTH1 expression in PAX 265 and lowest in PAX 208, 217 but moderate in PAX 232 and 139. Cellular spheroids and 2D cultures demonstrated cytostatic sensitivity to the combination of gemcitabine and oxaliplatin. This was confirmed in tumor bearing PDX models of ASCP.

**Conclusion:** ASCP is rare but displays a more malignant phenotype compared to pancreatic adenocarcinoma. We have generated the world's first models of ASCP and demonstrate variable expression of MTH1 exists. Functional assays using three dimensional organoids demonstrate

cytotoxic as well as targeted monotherapy responses. This correlated with therapeutic response in tumor bearing PDX models.

## **Presentation #19**

*Surgical Potpourri II*

### **THE ROLE OF PREEMPTIVE VIDEOS ON OLYMPICS SCORES**

Jacob Billings, Becca Gas, Yazan AlJamal MBBS, David Farley MD

**Presenter:** Jacob Billings UREP

Mayo, Rochester, MN

**Background:** Training surgical residents requires a multifaceted approach. The knowledge behind the procedure, the skills necessary to perform, and operational practice are all important. Education theories would suggest that there is an ideal order to these facets; first an understanding should be developed, then deliberate practice, and finally a full operative scenario. **Objective:** We sought to determine the most effective order of simulation education.

**Objective:** To determine the effect of instructional videos on Surgical Olympics July (baseline) scores.

**Methods:** Olympics participants were sent an email with instructional videos two days prior to the event. Videos included specific instructions on the objectives and expectations of each station. Following the Olympics, all station scores were de-identified, analyzed, and compared to July 2014, 2015, and 2016 scores for the same stations.

**Results:** Average scores from the Olympics are shown in the table below. Scores are similar to previous years.

**Conclusion:** Introductory videos with objectives, expectations, and examples did not appear to have an effect on resident baseline scores. We look forward to seeing if there is any effect on January scores.



## Presentation #20

### *Surgical Potpourri II*

#### OMENTAL POUCH TECHNIQUE FOR COMBINED SITE AUTOLOGOUS ISLET TRANSPLANT FOLLOWING TOTAL PANCREATECTOMY

Mark Stice, BA; Ty Dunn, MD, MS; Melena Bellin, MD; Mariya Skube, MD; Gregory Beilman, MD.

**Presenter:** Mark Stice BA

University of Minnesota, Minneapolis, MN

**Background:** Intraportal infusion is the predominant choice for islet cell transplantation after total pancreatectomy, but elevated portal pressures can cause serious complications and persistent elevation requires infusion cessation. Transplanted islet cell mass is a critical determinant of future insulin independence therefore it is optimal to transplant any remaining islets to an alternative site. The omentum is an attractive alternative site because it is easily accessible intraoperatively, lacks volume restrictions, and is highly vascularized with portal venous drainage.

**Objective:** The objective of this report is to detail our experiences creating an omental pouch for islet autotransplantation (IAT) after full intraportal infusion was prohibited.

**Methods:** We used an omental pouch technique in three patients after elevated portal pressures during islet infusion precluded complete intraportal islet transplantation. In each case, the remaining islets were transplanted to the omentum and affixed with a biological scaffold. Creation of the omental pouch is shown in Figure 1.

**Results:** Patient characteristics are summarized in Table 1.

**Conclusion:** In our experience thus far, construction of an omental pouch for combined site islet autotransplant in the setting of elevated portal pressures or technical difficulty is safe and does not result in worsened early postoperative islet function. Further studies are necessary to evaluate long-term efficacy of this approach. Based on these limited experiences, the omentum is potentially a viable alternative site for IAT.

## Presentation #21

### *Surgical Potpourri II*

**DEPPE LM, KASAL CA, HINMAN RP, MATHIS KL, LARSON DW**

Recent data has suggested value of TAP (transversus abdominus plane) neural blockade in procedure related pain management as part of an enhanced recovery surgical program.

**Presenter:** Larry Deppe MD, FACS

Mayo Clinic Health System, Red Wing, MN

**Background:** Our goal was to retrospectively analyze pain management using combined bupivacaine and liposomal bupivacaine as part of a community laparoscopic colorectal and surgical program.

**Objective:** Records of consecutive laparoscopic segmental colectomy and enterectomy patients performed by four surgeons over an eighteen month period were reviewed under IRB approval. Patients who returned to the operating room within thirty days were excluded from analysis. Comparison was performed to previously published results of an enhanced recovery program (which we also adopted) utilized by our Rochester, Minnesota based colorectal surgical system colleagues.

**Methods:** Twenty four patients were included in analysis. Two patients were excluded; one requiring re-exploration for hemorrhage after anticoagulation and another with an anastomotic leak (who eventually succumbed to respiratory failure). Three enterectomies were included (for malignancy and inflammatory bowel disease) as well as twelve right hemicolectomies and nine sigmoid/left hemicolectomies (eighteen for neoplasia and the remainder for diverticulitis). We found compliance with enhanced recovery elements varied greatly and was generally surgeon dependent. In place of an intrathecal block, an ultrasound (US) guided bilateral TAP block was performed by the operating surgeon using 266 mg of liposomal bupivacaine and 50 mg of 0.25% bupivacaine with epinephrine using the technique previously described. No site related reactions were noted. Median length of stay was three days, consistent with previously published academic institutional results. Our ASA 1-2 population was 58%, comparing favorably with published experience by our colorectal team which was 81%. Mean body mass index and median oral morphine equivalents were 30.6 kg/m<sup>2</sup> versus 26.9 kg/m<sup>2</sup> and 4.5 mg versus 37.5 mg respectively. Opiate naïve patients were 46% versus 26% by our academic colleagues. There were no readmissions within thirty days, although one patient did develop a deep incisional surgical site infection. Though not formally timed, performing the block was found to add a minimal amount to case duration (estimated at five minutes).

**Results:** Incorporating a surgeon performed US guided TAP block as part of an enhanced recovery program resulted in similar length of stay, favorable oral morphine equivalent utilization and narcotic naïve patient population percentages to published data utilizing an intrathecal block. Further study is indicated in more controlled circumstances to identify potential for even greater abstinence from postoperative narcotics.

Conclusion:

## Presentation #22

### *Mini-Talk Session II*

#### **RESUSCITATIVE ENDOVASCULAR BALLOON OCCLUSION OF THE AORTA (REBOA) CATHETER FOR CONTROL OF MASSIVE GI HEMORRHAGE: A PRE-CLINICAL ANATOMIC EVALUATION**

Zachary D. Miller, Eliza R. Pelrine, Jillian V. Johnson, Peter Kernahan, Brent Bauman, Victor Vakayil, James V. Harmon

**Presenter:** Zachary Miller BS

University of Minnesota Medical School, Minneapolis, MN

**Background:** Resuscitative endovascular balloon occlusion of the aorta (REBOA) is used to control massive hemorrhage and maintain cerebral and myocardial perfusion until definitive hemostasis can be achieved. REBOA catheters are typically used in the setting of abdominopelvic trauma and ruptured abdominal aortic aneurysms. An emerging use of the REBOA catheter is in patients with massive GI hemorrhage. Balloon occlusion between the left subclavian artery and the celiac trunk, Zone 1, is used for control of GI hemorrhage. While REBOA deployment is relatively simple, patient safety and efficacy may be enhanced by pre-clinical anatomic evaluation prior to emergency clinical application.

**Objective:** Our objective was to obtain additional familiarity with deployment of the device and to analyze more fully the anatomic relationships and measurements associated with deployment and placement of REBOA catheters in the human anatomy laboratory.

**Methods:** The study was approved by the Anatomy Bequest at the University of Minnesota. Familiarity with the ER-REBOA™ catheter (Prytime Medical; Boerne, TX) was obtained using a perfused silicone simulator. Anatomic measurements were obtained by deploying the device in a pressurized perfused fresh cadaver model. Anatomic distances between relevant anatomic structures and landmarks were measured following anatomic dissection in two fixed cadavers and in one fresh cadaver donor. All measurements were made by two observers, and the results were averaged.

**Results:** The REBOA catheter was advanced 25 cm and inflated. The aorta was opened, which confirmed successful placement in Zone 1. Measurements of anatomic landmarks of the cadavers were obtained as reported in Table 1. In the fresh cadaver, the distance from the estimated femoral artery puncture site to Zone 1 was 34.0 cm. In the two fixed cadavers, the distances were 37.1 cm and 33.4 cm, respectively.

**Conclusion:** While obtaining familiarity with the device was possible using the silicone model, confirmation of the anatomic measurements was only possible using the human cadaver donors. Appreciation of the anatomic relationships may increase the likelihood of successful emergency deployment of the REBOA catheter. We will continue to analyze the deployment of the REBOA catheter in the anatomy laboratory; and we plan to use the REBOA catheter to control massive hemorrhage in patients with massive GI bleeds at our hospital in the near future.



## Presentation #23

### *Mini-Talk Session II*

#### **ANTICOAGULATION COMPLIANCE IN THE ICU: AN OBSERVATIONAL ANALYSIS**

Kristie Holbrook, Pharm.D., Chidera Esele Pharm.D., Ashley Niemczyk Pharm.D., Victor Vakayil M.B.B.S., James Harmon Jr., Ph.D.

**Presenter:** Kristie Holbrook Pharm.D.

Fairview Ridges Hospital, Burnsville, Minnesota

**Background:** Venous thromboembolism (VTE), which includes deep venous thrombosis (DVT) and pulmonary embolism (PE), is a preventable harm often experienced by hospitalized patients. A recent review at a large single site determined that 12% of prophylactic anticoagulation doses were not administered. We performed 30 day review of the administration of anticoagulation orders in a mixed medical and surgical intensive care unit.

**Objective:** To evaluate the appropriateness of pharmacological VTE prophylaxis orders and adherence to appropriate anticoagulation monitoring parameters.

**Methods:** This review was conducted over a one-month period to determine compliance with VTE prophylaxis protocols. Parameters reviewed included missed doses; appropriate labs ordered, the presence of active bleed, and significant reductions in platelet number. Analysis included current anticoagulation medication orders, provider notes, nursing orders, and medication administration times.

**Results:** 336 intensive care days were included in this study. Per patient chart reviewed completed, platelet levels were omitted in eleven cases (3.3%) yielding a 96.7% compliance rate. Five patients experienced a platelet count of less than 100,000, three requiring further assay to confirm HIT with negative results; two had pre-existing conditions. Eighty-two patient days (24.4%) included dual anticoagulation therapy with PCDs, heparin, low molecular weight heparin or other oral anticoagulation agents. No post-surgical patients developed a PE or DVT while in the ICU. We had a 99% administration rate of anticoagulation medications. The single dose of anticoagulation medication that was missed was held due to the possibility of removal during dialysis. Seventeen patients (5.1%) were identified with an active bleeding episode which required the discontinuation of anticoagulation prophylaxis.

**Conclusion:** This study shows that greater than 90% compliance with VTE prophylaxis protocols ordered and administered in an intensive care setting of a community hospital is possible through interdisciplinary team coordination and communication.

## Presentation #24

### *Mini-Talk Session II*

#### THE IMPACT OF INTRAOPERATIVE MICROBREAKS EXERCISES ON SURGICAL TRAINEES' FATIGUE AND WORKLOAD

Abdelrahman, Amro, M.B.B.S., Lowndes, Bethany, Ph.D., Bingener, Juliane, M.D., Hallbeck, Susan, Ph.D.

**Presenter:** Amro Abdelrahman MBBS  
Mayo Clinic, Rochester, Minnesota

**Background:** Surgical trainees are at risk of musculoskeletal pain/fatigue with no mitigation intervention designed for these risks.

**Objective:** The objective of this study is to measure the impact of an intraoperative microbreaks exercises intervention on surgical trainees' self-reported fatigue and workload.

**Methods:** Surgical trainees at a tertiary medical institute participated in a control operative day and microbreaks operative day with exercises, led within the sterile field (1.5-2 minutes) at convenient intraoperative times. Postoperatively, trainees rated workload and pre-, intra-, and post-operative fatigue level, as well as overall distraction and workflow (0=none) on validated visual-analog scales. Trainees rated microbreaks impact on performance and mental focus (Improved/Not change/Diminished). After the last procedure of the microbreaks day, trainees rated interest in incorporating microbreaks exercises into their OR (Yes/No). Descriptive statistics, correlation and analysis of covariance were calculated as appropriate ( $\alpha=0.05$ ).

**Results:** Seventy-three trainees reported on 90 operative procedures, 58 (64%) with microbreaks. Operative duration, workload and pre-operative fatigue did not differ significantly between days with and without microbreaks ( $p>0.5$ ). After adjusting for operative duration, microbreaks days had significantly lower worsening of intra and post fatigue from preoperative baseline than control days ( $p< 0.01$ ) (Figure 1). Trainees reported microbreaks improved performance (72%) and mental focus (50%). Median trainees' microbreaks distraction and surgical flow disruption ratings were 2/10 and 2.5/10 (IQRs: 1-4). 72% of the trainees wanted to incorporate intraoperative microbreaks into their ORs.

**Conclusion:** Microbreaks were associated with lower fatigue; however, attention is needed to ensure minimal workflow disruptions. Trainees are open to intraoperative microbreaks to improve their performance and health.

## Presentation #25

### *Mini-Talk Session II*

#### **OPERATIVE GAMES: ARE THEY ACCEPTED AND USEFUL TO SURGICAL INTERNS?**

Mohamed Baloul, MBBS; Miguel Gomez Ibarra, MD; David Farley, MD

**Presenter:** Mohamed Baloul MBBS

Mayo Clinic, Rochester, MN

**Background:** Educational games can help complement and reinforce taught material by promoting participation and engagement in an interactive, enjoyable, and motivational learning environment (Aburahma, 2015). Interactive and educational learning is gaining more attention by introducing dynamic learning to the traditional learning styles.

**Objective:** We sought to review the learning styles of surgical residents, and their inclination and satisfaction in using games and interactive modules.

**Methods:** First year surgery residents were offered to play an operative-based interactive video game of cholecystectomy ("Rapid Reps") in a classroom while their classmates watched them play. Help was not allowed throughout the course of the game. Two surveys were distributed to collect trainee views on the general use of interactive modules for learning and impressions of the Rapid Reps game.

**Results:** Twenty-two residents were present to experience the game, with only four of them actually playing it. While 18 (90%) residents expressed they mostly rely on textbooks to study, 14 residents (70%) indicated they learn by playing games, while 17 (85%) were keen to utilize this module to learn if topics were appropriate. The top requested subjects were: anatomy, radiology and operative games. All residents indicated they would utilize the Rapid Reps module to better understand important operative concepts; two trainees (10%) suggested better game organization to ease comprehension.

**Conclusion:** The use of interactive games can be applied to aid in learning operative procedures. Despite the strong acceptance from the residents, further exploration is needed to evaluate the utility of operative games.



## Presentation #26

### *Mini-Talk Session II*

#### **THE ACGME CASE LOG SYSTEM MAY NOT ACCURATELY REPRESENT OPERATIVE EXPERIENCE AMONG SURGICAL INTERNS**

Nimesh D. Naik M.D., Eduardo F. Abbott M.D., Cornelius A. Thiels D.O., Johnathon M. Aho M.D., T.K. Pandian M.D., Stephanie F. Heller M.D., David R. Farley M.D.

**Presenter:** Nimesh Naik MD  
Mayo Clinic, Rochester, MN

**Background:** General Surgery training has changed with the implementation of the 80-hour work week restriction. In 2011 postgraduate year one (PGY-1) residents were limited to a maximum 16-hour shift, further confining their training. Studies assessing the impact of these limitations on operative case volume have largely been based on the Accreditation Council for Graduate Medical Education (ACGME) case log system. We hypothesize that the ACGME case log system does not accurately reflect operative experience, thus weakening this data.

**Objective:** Assess if the ACGME case log system accurately captures operative experience of our postgraduate year one (PGY-1) residents.

**Methods:** ACGME case log information was retrospectively obtained for five cohorts of PGY-1 residents (2011-2015) and compared to the number of operative cases captured by an institutional automated operative case report system (Surgical Access Utility System, SAUS). SAUS automatically captures all surgical team members who are listed in the operative dictation for a given case, including interns. A paired t-test analysis was used to compare number of cases coded between the two systems.

**Results:** Forty-nine PGY-1 general surgery residents were identified over a 5 year period. Mean operative case volume per intern, per year, captured by the automated SAUS was  $176.5 \pm 28.1$  (SD) compared to  $126.3 \pm 58.0$  ACGME cases logged (mean difference = 50.2 cases,  $p < 0.001$ ).

**Conclusion:** ACGME case log data may not accurately reflect the actual operative experience of our PGY-1 residents. If such data holds true for other general surgery training programs, the true impact of duty hour regulations on operative volume may be unclear when using the ACGME case log data. This current standard approach for using ACGME case logs as a representation of operative experience requires further scrutiny and potential revision to more accurately determine operative experience for accreditation purposes.

## Presentation #27

### *Mini-Talk Session II*

#### LAPAROSCOPIC REPAIR OF PERFORATED PEPTIC ULCERS: A LOW-FIDELITY SIMULATOR AND TRAINING CURRICULUM FOR SURGICAL SKILL DEVELOPMENT

Kristen Cox; Marcos Molina, MD; Malavika Chandrashekar B.S., Jack Hedberg, Elizabeth Zudock, Victor Vakayil, MBBS, James Harmon Jr., MD, PhD

**Presenter:** Kristen Cox -

University of Minnesota, Bloomington, Minnesota

**Background:** Despite shorter hospital stays and lower rates of wound dehiscence and infection, only 13% of perforated peptic ulcers are repaired laparoscopically. Currently no trainer model exists to teach laparoscopic Graham patch repair. If a cost-effective training model is available for resident and attending surgeons the preferential adoption of the laparoscopic approach may result in better surgical outcomes.

**Objective:** The objective of this work was to evaluate the utility of a cost effective, low-fidelity laparoscopic training model and curriculum for teaching the steps and skills required for repair of a perforated peptic ulcer.

**Methods:** Our training curriculum consisted of an audiovisual learning component, a skills trainer, and active surgical coaching. Participants watched a video teaching the critical steps of laparoscopic peptic ulcer repair. Participants were then introduced to two low-fidelity peptic ulcer models while receiving active coaching as they completed the procedure. All participants made three attempts per model. The silicone model consisted of a silicone sheet with an interwoven flexible mesh stretched over a container filled with bile-like fluid, with an additional silicone sheet simulating omentum. Foam models were simpler in design, lacking fluid and simulated omentum. After the procedure, the participants completed a 5-point Likert scale survey to evaluate the effectiveness of both models.

**Results:** 25 post-event surveys were analyzed with the Mann-Whitney U-test (Table 1). Participants reported the silicone model to be more lifelike, to provide a better simulation of the procedure, and to be more effective in the acquisition of laparoscopic skills. Participants indicated a significant preference to use the silicone mesh prototype over the traditional foam model for continued training.

**Conclusion:** Given the clinical benefits of laparoscopic repair of perforated peptic ulcers, the lack of formal training in this procedure, and participants rating of our model, the development of a silicone-based skill trainer and a rapid training curriculum seems to be a feasible alternative to breach the gap of training and teach the technical steps of a laparoscopic Graham patch repair.

## Presentation #28

### *Mini-Talk Session II*

#### ILEAL POUCH-ANAL ANASTOMOSIS AND ITS EFFECT ON REPRODUCTION, PREGNANCY, AND MODE OF DELIVERY

N Prabhakar, EJ Dozois, KL Mathis

**Presenter:** Nicholas Prabhakar BA, research assistant  
Mayo Clinic, Rochester, MN

**Background:** Infertility in young females is a recognized complication following ileal pouch-anal anastomosis (IPAA) for ulcerative colitis (UC).

**Objective:** The objective of this study was to determine fertility rates, pregnancy complications and delivery methods in female patients with an IPAA performed for UC.

**Methods:** A standardized patient survey was mailed to 474 female patients with UC who had previously undergone IPAA. All patients were 40 years of age and younger at the time of IPAA. Two-hundred seven responses were collected (44%). Questions concerned respondent's ability to become pregnant and outcome and complications of pregnancy and delivery. Summary statistics are reported as count and percentages for discrete variables; Chi square was used to test associations between categorical variables.

**Results:** Of the 207 patients who returned surveys, 96 attempted to get pregnant after IPAA, and 65 were successful (68%). Of the 65 patients with successful pregnancy after IPAA, 12 (18%) used artificial means to achieve pregnancy (5 of the 12 had multiple pregnancies using artificial means). There were 125 total pregnancies reported, and 93 pregnancies (74%) were uncomplicated. Fifty-two patients (42%) had a planned cesarean delivery (87% because of IPAA); 38 patients (30%) had a spontaneous vaginal delivery; 22 patients (18%) had an unknown delivery method; 10 patients (8%) had an unplanned cesarean (20% because of IPAA); and 3 patients (2%) had an elective termination. Of the 38 patients with vaginal delivery, 68% had no complications and 39% described a vaginal tear. The only predictor of impaired fecundity was open surgery (pregnancy occurred in 50/79 (63%) of those undergoing open surgery versus 15/17 (88%) of those undergoing laparoscopic surgery,  $p=0.0321$ ).

**Conclusion:** Concern remains about infertility following IPAA in young females. We found that the majority of patients who attempted pregnancy following IPAA were able to conceive, most without reproductive assistance. Seventy-four percent of patients reported no pregnancy-related complications and 68% had uncomplicated deliveries. The decision to pursue cesarean should be related to obstetrical concerns rather than the presence of an IPAA. Additionally, the use of minimally invasive surgery was associated with significantly lower rates of impaired fecundity.

## Presentation #29

### *Trauma Competition*

#### **INCREASING ANATOMIC INJURY IS ASSOCIATED WITH COST IN APPENDICITIS**

Eric J. Finnesgard, Matthew C. Hernandez M.D., Johnathon M. Aho M.D., Martin D. Zielinski M.D.

**Presenter:** Eric Finnesgard BA

Mayo Clinic, Rochester, MN

**Background:** The World Society for Emergency Surgery determined that, for appendicitis managed with appendectomy, there is a paucity of evidence evaluating costs with respect to disease severity. The American Association for the Surgery of Trauma (AAST) disease severity grading system is valid and generalizable for appendicitis.

**Objective:** To evaluate hospitalization costs incurred by patients with disease severity stratified by the AAST grading system. We hypothesized that increasing AAST grade would be associated with greater cost.

**Methods:** Single institution review of adults ( $\geq 18$  years of age) undergoing appendectomy for acute appendicitis during 2010-2016. Demographics, comorbidities, operative details, hospital stay, 30-day complications and institutional cost data were collected. AAST grades were assigned by two independent reviewers based on operative findings. Costs were normalized to median grade I cost.

**Results:** Evaluated patients ( $n=1187$ ) had a median [IQR] age of 37 [26-55] and 45% ( $n=542$ ) were female. Median Charlson comorbidity index was 1 [0-2]. Surgical management included laparoscopy ( $n=1122$ , 94%), laparoscopy converted to laparotomy ( $n=39$ , 3.4%), midline laparotomy ( $n=16$ , 1.3%) and McBurney's incision ( $n=10$ , 0.8%). Median AAST grade was 2 [1-3]. Median duration of hospitalization was 1 [0-2] day and 77% ( $n=912$ ) of patients had no complication. Increasing AAST grade was associated with cost ( $p<0.0001$ ). Cost was also associated with increasing comorbidity defined by Charlson index, complication severity defined by Clavien-Dindo ( $p<0.0001$ ) and duration of hospital stay ( $R^2=0.33$ ).

**Conclusion:** Increasing AAST anatomic severity is associated with cost and important clinical outcomes. Standardizing disease nomenclature and diagnosis may improve cost-effective care in appendicitis.

## Presentation #30

### *Trauma Competition*

#### COMPARISON OF PENETRATING COLON TRAUMA OUTCOMES BETWEEN AFRICAN AMERICAN AND CAUCASIAN MEN

Skube SJ, Lindgren B, Fan Y, Jarosek S, Melton GB, McGonigal MD, Kwaan MR

**Presenter:** Steven Skube MD

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**Background:** The colon is the second most commonly injured organ in patients sustaining penetrating abdominal trauma. The standard of care for colon injury has evolved from repair with fecal diversion to primary anastomosis or primary repair. Previous studies have demonstrated a ten-fold higher rate of penetrating abdominal trauma in African American men. Racial disparities have been both published and disputed in trauma patient mortality, functional outcomes, and rehabilitation.

**Objective:** The aim of this project was to assess racial disparities in the surgical care of trauma patients with penetrating colon trauma by evaluating differences in stoma formation and post-operative outcomes.

**Methods:** We identified men over the age of 14 in the National Trauma Data Bank between 2010-2014 who had operative intervention for colon trauma. Patients with rectal injury and those transferred to another facility were excluded. The primary outcome was stoma formation with secondary outcomes including post-operative morbidity and mortality. A multivariate logistic regression was performed for ostomy formation controlling for race and significant co-variables.

**Results:** Our query resulted in identification of 7,324 men with penetrating colon trauma requiring operative intervention (4916 African American, 2408 Caucasian). 18.5% of Caucasian patients and 19.6% of African American patients underwent fecal diversion with stoma formation ( $p = 0.283$ ). African American patients were younger with a median age of 27 (range 15-86) versus 35 (range 15-88), more likely to self-pay (37.1% versus 29.9%), and more likely to be injured by firearm (88.3% versus 70.2%). African American patients had less overall post-operative morbidity (50.7% versus 63.0%,  $p = <0.001$ ). On multivariate analysis, the odds of receiving an ostomy for African American vs Caucasian patients was similar (odds ratio=0.95, 95% CI: 0.83-1.10). Factors associated with stoma formation in penetrating colon trauma are shown in Table 1.

**Conclusion:** This analysis did not demonstrate a difference in stoma formation between African American and Caucasian men. Multivariate analysis confirmed expected findings that trauma severity (firearm, GCS, ISS) increased the odds of receiving ostomy. The protocol-based management approach to emergency trauma care potentially decreases the risk for the racial biases that could lead to these disparities demonstrated in other healthcare settings.

## Presentation #31

### *Trauma Competition*

#### OUTCOMES 30 YEARS AFTER SEVERE TRAUMATIC BRAIN INJURY: UTILITY OF INITIAL OUTCOME SCORES FOR LONG TERM PREDICTION

Molly E. Hubbard, MD; Abdullah Bin Zahid, MD; Gabrielle Meyer, DO; Kathleen Vonderhaar, MD; David Balser, MD; David Darrow, MD; Anne Kleeberger, Drake Burri, Vikalpa Dammavalam, Shivani Venkatesh, David Tupper, PhD; Sarah Rockswold, MD; Thomas Bergman, MD

**Presenter:** Molly Hubbard MD

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**Background:** Traumatic brain injury (TBI) is one of the leading causes of morbidity and mortality in the US. The effects of TBI on quality of life may not become apparent for years after the injury. There are conflicting reports in the literature regarding long term outcomes. Physicians are often asked to predict long term functional and cognitive outcomes, with limited data available.

**Objective:** Here we use the initial Glasgow Coma Scale (GCS) and the 12 month Glasgow Outcome scale score (GOS) to predict long term cognitive status.

**Methods:** Patients with severe TBI (GCS  $\leq 9$ ) who previously participated in hyperbaric oxygen for severe TBI clinical trial during the 1980s were followed up with and compared to healthy controls without history of TBI. A health questionnaire, sports concussion assessment tool version 3 (SCAT3) and the Telephone Interview for Cognitive Status-modified (TICS-m) were completed over the phone and compared with controls using t-test. GCS at admission and 12-month GRS were used to predict to TICS-M at 30 years using linear regression.

**Results:** Forty-five of the initial 168 subjects were confirmed alive, and 37 (13 females; mean age: 52.43 years S.D. 10.7) consented. Controls (n=58; 23 females; mean age = 54 years, S.D. 11.5) had lower symptom severity score (6.7 S.D. 12.6 versus 20.6 S.D. 25.3;  $p=0.005$ ), lower total number of symptoms (3.4 S.D. 4.7 versus 7.12 S.D. 6.5;  $p=0.006$ ), higher standardized assessment of concussion score (25.6 S.D. 2.8 versus 21.2 S.D. 6.9;  $p=0.001$ ), and lower corrected MPAI-4 (22.3 S.D. 17.0 versus 43.7 S.D. 12.8;  $p<0.001$ ). GCS at admission did not predict cognitive status at 30-years assessed using TICS-M ( $p=0.345$ ). The Glasgow Outcome Scale score at 12-months was correlated to TICS -M at 30 years ( $R=0.548$ ,  $p<0.001$ ).

**Conclusion:** Remote history of TBI disrupts the lives of survivors long after injury. Admission GCS does not predict cognitive status 30 years after TBI. The GOS at 12-months predicted the cognitive status assessed using TICS-M score at 30 years.

## Presentation #32

### *Trauma Competition*

#### **MASSIVE TRANSFUSION PROTOCOL IN NON-TRAUMA PATIENTS: THE EFFECT OF TRANSFUSION RATIOS ON MORTALITY.**

Victor Vakayil MBBS, Malavika Chandrashekar BS, Amanda Lord BS, Julie Welbig, Nicole Dodge Zantek MD, PhD, James Harmon MD FACS, PhD.

**Presenter:** Victor Vakayil MBBS

University Of Minneapolis, Minneapolis, Minnesota

**Background:** Current massive transfusion protocols (MTP) are designed for trauma resuscitation. These protocols often disregard underlying patient comorbidities and the functional status of various organ systems, which may hence be inadequate in a non-trauma setting.

**Objective:** Evaluate the effect of transfusion ratios on mortality in a non-trauma setting.

**Methods:** A retrospective 2-year review of all non-trauma ICU patients who had an MTP activation at a single institution was performed. Clinical variables, comorbidity scores, and blood transfusion ratios were analyzed. Plasma: Red Blood Cell (RBC) and Platelet: RBC ratios were classified as a high (>1:1) or low category (

**Results:** 72 non-trauma patients with an MTP activation from 2013 & 2015 were analyzed. The mean age and body mass indexes were  $53.51 \pm 16.50$  years and  $28 \pm 97.5$ , respectively. The most common etiology was patients with liver disease (n=42) and variceal bleeds (n=8). The mean units of RBC, apheresis platelets, plasma and cryoprecipitate used for 12 hours prior to 24 hours after MTP activation were  $12.1 \pm 13.2$ ,  $4.2 \pm 4.1$ ,  $10.4 \pm 13.8$ , and  $1.3 \pm 2.4$ , respectively. Univariate analysis identified age, bilirubin, and baseline platelet count (PC) to be significantly associated with 30-day mortality (P-values < 0.05). High vs. low Plasma: RBC and Platelet: RBC transfusion ratios showed no significant association with 30-day mortality (P-value > 0.05). A multivariate regression model constructed by adjusting for age, comorbidity status, baseline PC, hemoglobin, mean arterial pressure, and liver functioning, showed no association of high vs. low transfusion ratios to 30-day mortality. (Plasma:RBC, adjusted OR=2.044, P-value= 0.246, Platelet:RBC, adjusted OR= 0.461, P value= 0.461).

**Conclusion:** 30-day mortality was not significantly different in patients who received a high Plasma: RBC or Platelet: RBC ratio compared with those who received a low ratio; however, patient specific factors were significant. Furthermore, achieving hemostasis may be physiologically different in a non-trauma cohort of patients. A standard protocol that overlooks baseline comorbidities may be inadequate in a non-trauma setting; further research may be warranted to better characterize and improve the management of bleeding in non-trauma ICU patients.

## Presentation #33

### *Trauma Competition*

#### **HOSPITAL OR HOSPICE; WHERE DO ELDERLY PATIENTS DIE?**

Kristin Colling, MD; Kaysie Banton, MD.

**Presenter:** Kristin Colling MD

University of Minnesota, Minneapolis, Minnesota

**Background:** Elderly trauma patients constitute a unique patient population; this population continues to account for a rising number of our trauma patients and is known to be at risk for worse outcomes. Trauma surgeons need to be adept at identifying the different needs of these patients, as well as have the ability to have frank discussions with these patients and their families regarding treatment options, goals of care, code status and quality of life. Knowing that these elderly patients are at higher risk of death after a trauma compared to younger patients, can we, in addition to improving survival outcomes, help those patients who do die following a trauma do so according to their own wishes and in comfort, instead of in the hospital?

**Objective:** The goal of this study was to evaluate where elderly patients die, and to identify any differences in patients that discharge to hospice from our service compared to those who died in the hospital.

**Methods:** We conducted a retrospective review of all trauma patients admitted to our Level II Trauma hospital between January 2015 and December 2017. Elderly patients were defined as patients age 65 and older. Patient demographics of age, sex, mechanism of injury, injury severity score, type of injury, comorbidities, code status and whether palliative care was involved were collected. Results are reported as median for nonparametric variables and mean for normally distributed variables. Statistics were performed using SPSS version 22, and used student t-test or Chi Square tests as appropriate. P values < 0.05 were considered significant.

**Results:** During our study period, 16 elderly trauma patients were discharged to hospice and 38 elderly trauma patients with in-hospital mortality. Hospice discharge accounted for 30% of patients with mortalities after their injury. The overwhelming cause of injury was a fall (100% in hospice group and 97% in in-hospital mortality group). The two groups were surprisingly similar (Table 1). Patients discharged to hospice were significantly more likely to have had a DNR code status prior to admission. All patients who died in the hospital had an ICU admission, compared to only 7 (47%) of patients discharged to hospice. Only one patient discharged to hospice did not have a palliative care consult during their hospitalization, and this patient was on hospice prior to admission to the hospital. Comparatively, only 23 (61%) of patients that died in the hospital had a palliative care consult before their death ( $p = 0.02$ ).

**Conclusion:** As many previous studies have demonstrated, elderly patients have a significantly higher risk of mortality than younger patients after a traumatic injury. Our study demonstrated that patients discharged to hospice were less likely to have an ICU admission, although their injuries and injury severity scores were similar. They were also more likely to have had a



palliative care consult. Elderly trauma patients may benefit from an early palliative care consult, to help limit ICU admission, address goals of care and may allow patients to be discharged home or to hospice sooner, which could lead to better quality of life in their final days.

## Presentation #34

### *Trauma Competition*

#### USE OF FOUR -FACTOR PROTHROMBIN COMPLEX CONCENTRATE IN PATIENTS WITH LIVER DISEASE

Victor Vakayil MBBS, Jared Larson PharmD, Emily Coler PharmD, Malavika Chandrashekar BS, Amanda Lord BS, Nicole Dodge Zantek MD, PhD, James Harmon MD, PhD, FACS.

**Presenter:** Victor Vakayil MBBS

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**Background:** Four-factor prothrombin complex concentrate (4F-PCC) is approved in the United States for the reversal of acquired coagulation factor deficiency induced by Vitamin K antagonist (VKA) therapy. 4F-PCC is often used off-label in patients with liver disease (LD). Currently, there is limited evidence to support the use of 4F-PCC in patients with LD to reverse coagulopathy and long-term outcomes regarding thromboembolic complications and mortality are not known.

**Objective:** To evaluate the safety and efficacy of 4FPCC in patients with Liver Disease.

**Methods:** A retrospective analysis of clinical outcomes was performed on patients with LD who received 4F-PCC between April 2013 and November 2016 at a single academic medical center. Patient demographics, clinical variables, and safety and efficacy outcomes were reviewed. Data are presented as percentage of evaluable patients or average [minimum, maximum] unless otherwise noted.

**Results:** Thirty patients with LD who received 4F-PCC were analyzed, including 8 (26.7%) on concomitant VKA therapy. INR correction to  $< 1.5$  was achieved in 20% of patients [4 (50%) on VKA, 2 (9.1%) not on VKA]. The average reduction in INR was 2.4 [-0.5, 6.0] in the VKA group, compared to 0.9 [-0.3, 6.3] in the non-VKA group. Resolution of bleeding, defined as stable/improved radiographic findings or hemoglobin drop  $< 20\%$  from baseline, was achieved in 50% of patients with documented hemorrhage [4 (57.1%) in VKA group, 8 (47.1%) in the non-VKA group]. Overall 30-day mortality was 50% [3 (37.5%) in VKA group, 12 (54.5%) in the non-VKA group,  $P=0.409$ ]. The average MELD score of patients who died ( $33.1 \pm 6.8$ ) was higher than those who survived ( $24 \pm 7.33$ ,  $P=0.002$ ). Similarly, the average MELD score was higher in the non-VKA group ( $30.5 \pm 7.9$ ) vs the VKA group ( $23 \pm 7.3$ ,  $P=0.025$ ). The predicted mortality using the MELD score for patients who died was 52.6%, which is similar to the observed mortality rate in this cohort. Three thromboembolic events (10%) were observed, 1 (12.5%) in VKA group and 2 (9.0%) in the non-VKA group.

**Conclusion:** 4F-PCC was used in patients with LD with and without concomitant VKA therapy. Although safety endpoints remain unequivocal (as the observed mortality was similar to what would be predicted), in terms of efficacy (INR correction and bleeding resolution) our data suggest that response to 4F-PCC is suboptimal in patients with LD.

## Presentation #35

### *Trauma Competition*

#### **30 YEAR OUTCOMES AFTER SEVERE TRAUMATIC BRAIN INJURY: ANALYSIS OF A PEDIATRIC POPULATION**

Molly E. Hubbard, MD; Abdullah Bin Zahid, MD; Gabrielle Meyer, DO; Kathleen Vonderhaar, MD; David Balsler, MD; David Darrow, MD; Anne Kleeberger, Drake Burri, Vikalpa Dammavalam, Shivani Venkatesh, David Tupper, PhD; Sarah Rockswold, MD; Thomas Bergman, MD

**Presenter:** Molly Hubbard MD

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**Background:** The pediatric traumatic brain injury (TBI) population may have pronounced and persistent deficits in neuropsychological, behavioral, adaptive and academic outcomes. Interruption of normal developmental capabilities may occur in a pediatric TBI patient as they age, which is not appreciated in the adult TBI patient. However, long term follow up of pediatric samples has been limited. The question remains whether these deficits continue to be more pronounced and persistent years after the injury.

**Objective:** The purpose of this study is to describe the functional outcomes of subjects less than or equal to 18 years old at the time of severe TBI (pediatric-onset) relative to those subjects greater than 18 years old at time of severe TBI (adult-onset) approximately 30 years after injury.

**Methods:** Thirty-two patients with severe traumatic brain injury ( $GCS \leq 9$ ) who were previously enrolled in a study at a Level One Trauma center during the 1980s were re-contacted. Participants completed a detailed health questionnaire and underwent the Telephone Interview for Cognitive Status-modified (TICS-m) to evaluate cognitive function. Statistical analyses were calculated for group differences using a Pearson's Chi-Square test where all cell values remained five or above, and where this was violated Fisher's Exact test was used instead. Statistical significance was accepted as  $p \text{ value} < 0.05$ ; all tests were two-tailed.

**Results:** Of the 32 participants, 19 (56.25%) were over 18 years old at time of injury (mean age 30.5 years) and 14 (43.75%) were less than or equal to 18 years old at time of injury (mean age 13.7 years). Follow-up duration was 30 years (mean 29.66, median 29.00) from date of injury. Fifty-three percent of the population had abnormal cognitive status (TICS-m score  $\leq 32$ ) with the mean TICS-m score for the pediatric-onset group being 29 and the adult-onset group being 34 ( $p=0.0852$ ). With regard to the pediatric-onset participants, 62% had completed at least some college, 50% reported working either full or part-time, 64% handled their own finances (vs 83% of adult-onset), and 79% could climb one flight of stairs (vs 94% of adult-onset). However, patients with adult-onset TBI were more likely to report at least one arrest compared to pediatric TBI patients ( $p=0.048$ , 66% vs 31%).

**Conclusion:** This study provides functional outcomes of severe pediatric TBI patients 30 years after injury and compares them to their adult counterparts. Of the two groups, pediatric-onset TBI patients reported more severe functional outcomes, however due to small numbers this was

not statistically significant. Though within the margin of error, the overall trend suggests there may be a difference between pediatric-onset TBI patients and adult-onset TBI patients 30 years after injury. Certainly, further research is needed to help clarify long term functional outcomes of severe pediatric-onset TBI patients and how they differ from the adult-onset TBI patient.