PRACTICE MANAGEMENT™ 2018
JANUARY 26-28 | HYATT REGENCY NEW ORLEANS | NEW ORLEANS, LA

First Place FAER Research Award Winner

Presentation Number: 29

1.1 Quality Improvement

Title: Improving Surgical Antibiotic Prophylaxis Process To Reduce Postoperative Wound Infections

Authors: G. Lynde, V. O. O'Reilly-Shah;
Department of Anesthesiology, Emory University, Atlanta, GA.

Abstract Body: Improving Surgical Antibiotic Prophylaxis Process To Reduce Postoperative Wound Infections
Introduction:
Surgical antibiotic prophylaxis prevents perioperative wound infections.[1] Optimal antibiotic administration as defined as the right drug, at the right dose, and at the right time. In a manual audit of anesthesia records of patients at our medical center reported to the National Surgical Quality Improvement Project (NSQIP) registry, it was determined that only 83% of patients undergoing major abdominal surgery were receiving appropriate surgical prophylaxis although nearly 100% were documented by the providers as compliant.[2] This sort of discrepancy has been previously reported as well. [2-4] As a result of our audit, we undertook a quality improvement project to improve compliance withprophylactic antibiotic administration.
Methods:
A multidisciplinary team composed of Anesthesiologists, Surgeons, Nursing staff, Pharmacists, and Project Managers met as part of a Lean/Six Sigma project to improve antibiotic compliance. An education campaign was initiated early on. A process map detailing the steps for proper antibiotic administration was created. We identified 24 distinct steps in administering antibiotic prophylaxis that was subsequently streamlined to a total of 15 steps. First, we provided case-specific standard prophylaxis guidelines to all anesthesia providers, eliminated surgeon ordering, and provided an antibiotic tackle box to the anesthesia care teams.
Next, compliance scorecards were emailed to all members of the perioperative team: a monthly scorecard with overall totals, and a daily report, sent within 48 hours, only for cases where whole-case antibiotic prophylaxis was not achieved. An algorithm was developed to automate identification of failures.
We evaluated the baseline compliance rate of antibiotic prophylaxis, and compared the effectiveness following the education campaign and the change in process. We combined our compliance data with NSQIP outcomes (SSI, sepsis/shock) to assess the early impact of our intervention.
Results:

3,478 pre-implementation cases were evaluated for antibiotic compliance and wound infections and sepsis. The overall compliance rate was 87%, with 91.5% of cases compliant with first dose and 70% of cases compliant with redose. The 451 non-compliant cases demonstrated an SSI rate of 8.6%, while the 3,027 compliant cases demonstrated an SSI rate of 4.5% ($p<0.001$). There was a 7.5% incidence of sepsis in non-compliant cases and a 3.2% rate in compliant cases ($p<0.001$). Subsequent to implementation, the overall, initial, and redose compliance rates rose to 89.2%, 92.0%, and 72.5% respectively and provider satisfaction with the overall process rose.
Discussion:
Reducing the complexity of the antibiotic prophylaxis process resulted in improvement in both initial and overall compliance rates. The addition of scorecards and case-based feedback resulted in a significant increase in redose compliance rate. While it is too early to determine the actual impact of these changes on NSQIP reported infections, based on the increased overall compliance rate and redose rate would expect to reduce the number of wound infections by 4.1%. In our system, this would result in a reduction of 10 wound infections and 11 cases sepsis per year in the general surgery population.
1.
Hawn MT, Richman JS, Vick CC, Deierhoi RJ, Graham LA, Henderson WG, et al. Timing of surgical antibiotic prophylaxis and the risk of surgical site infection. JAMA surgery. 2013;148(7):649-57.
2.
O'Reilly-Shah VO, Sanford J, Lynde GC. Self Attestations Do Not Accurately Reflect Patient Care. American Society of Anesthesiologists Annual Meeting; 10/2028; Boston, MA2017.
3.
Klinger G, Carmeli I, Feigin E, Freud E, Steinberg R, Levy I. Compliance with surgical antibiotic prophylaxis guidelines in pediatric surgery. European Journal of Pediatric Surgery. 2015;3(02):199-202.

Summary: Reducing the complexity of the surgical antibiotic prophylaxis protocol from 24 steps to 15 improved overall compliance rates from 87% to 89.2%. Providing scorecards to all operative team members had the greatest impact on redose rate compliance (70% to 80%). Based on historical NSQIP infection rates, these changes would be expected to reduce the number of wound infections by 10 per year and the number of patients experiencing sepsis by 11.

Second Place FAER Research Award Winner

Presentation Number: 39

1.1 Quality Improvement

Title: Enhancing Perioperative Antibiotic Stewardship in Penicillin Allergic Patients Through Education and Systems-Based Improvements

Authors: C. Simmons[1], J. Hong[2], P. Moine[3];
[1]Anesthesiology, University of Colorado, Denver, CO, [2]Denver, CO, [3]Univ of CO Denver, Aurora, CO.

Abstract Body: Introduction: Antimicrobial stewardship is a coordinated program that promotes the appropriate use of antimicrobials (including antibiotics), improves outcomes, reduces resistance, and decreases the spread of infections caused by multi-drug resistant organisms. Individuals with beta-lactam allergies are often misclassified resulting in ordering and administration of alternative antibiotics with suboptimal efficacy leading to overutilization of broad spectrum antibiotics and subsequent multi-drug resistant organisms (MDRO) and increased costs. In addition, penicillin (PCN) allergies have been associated with increased mortality and ICU admission, prolonged hospital length of stay (LOS), and increased rates of *clostridium difficile* infection.[1] Recent studies suggest up to 95% of patients with reported PCN allergy are not truly allergic. [2] In addition, previously reported cross-reactivity of cephalosporins with PCN was ~10%, new evidence suggests <1% are truly allergic. Utilizing SMART AIMs, PDSA Cycle, and Root Cause Analysis (RCA) methodology we developed an educational program with the goal of lowering inappropriate prescription and administration of antibiotics to patients with documented PCN allergy. **Methods:** A retrospective chart review was performed using EPIC Clarity database to evaluate all patients with documented PCN allergy having total joint arthroplasty (hips and knees) for the 6-month period prior to the educational intervention. Educational materials were created and delivered to two groups 1) drug prescribers: Orthopedic team, and drug administrators: Anesthesia team. Each group completed a pre-educational exam along with a ~30min lecture detailing literature review of recent perioperative antibiotic guidelines for PCN allergic patients and instructions for following antibiotic prescribing algorithm. A post-education exam was then completed. Prescribing patterns and administration of cefazolin vs. other antibiotic were tracked at 1month, 6weeks, and 6 months. **Results:** A total of 87 orthopedic residents and anesthesia providers took part in the intervention. Pre-education testing revealed that only 71% of orthopedic residents and 83% of anesthesia providers would administer cefazolin to patients with reported mild PCN allergy. For moderate PCN allergy the results were 14% and 23% respectively. Post-education testing showed a 71% improvement, with 100% of orthopedic residents and 97% of anesthesia providers selecting cefazolin for mild PCN allergic patients. Retrospective analysis of perioperative utilization improved in the 283 patients reviewed. Pre-intervention ~20% of mild PCN allergic patients received cefazolin compared with >40% post-intervention, a nearly 50% advancement. **Conclusion:** Inappropriate prescription of perioperative antibiotics leads to adverse effects such as increased rate surgical site infection, increased LOS, ICU admission, and development of antibiotic resistance. Financial impacts associated are significant. Inaccurate documentation of true PCN allergy

further promotes improper administration of antibiotics. Small-scale, but targeted provider education leads to both enhanced prescribing and delivery of appropriate antimicrobial therapy and results in improved clinical outcomes. Further improvements may exist with systems based changes to Electronic Health Record (EHR) order sets and physician prompts, and developing perioperative antibiotic allergy testing. Continued re-education of providers is essential to ensure adequate understanding and implementation of protocols.

Summary: Antimicrobial stewardship is a coordinated program that promotes the appropriate use of antimicrobials (including antibiotics), improves outcomes, reduces resistance, and decreases the spread of infections caused by multi-drug resistant organisms. Individuals with beta-lactam allergies are often misclassified resulting in ordering and administration of alternative antibiotics with suboptimal efficacy leading to overutilization of broad spectrum antibiotics and subsequent multi-drug resistant organisms (MDRO) and increased costs. Utilizing SMART AIMs, PDSA Cycle, and Root Cause Analysis (RCA) methodology we developed an educational program with the goal of lowering inappropriate prescription and administration of antibiotics to patients with documented PCN allergy.

Third Place FAER Research Award Winner

Presentation Number: 36

1.4 Research in Perioperative Management

Title: Utilizing a "Value" Incentive to Rapidly Introduce Evidence Based Practice Across a Large Multihospital Health Care System

Authors: N. Shah[1], J. Artman[2], S. M. Littwin[3], M. E. Hudson[4];
[1]Department of Anesthesiology, University of Pittsburgh Medical Center, Pittsburgh, PA,
[2]Department of Anesthesiology, University of Pittsburgh of Medical Center, Pittsburgh, PA,
[3]Pittsburgh, PA, [4]Finleyville, PA.

Abstract Body: **Introduction:** For the past several years, evidence-based medicine has guided healthcare reform to improve quality of care while reducing cost. Implementation of evidence-based medicine is often not straightforward. Based on the literature, it takes an average of 17 years to develop and implement guidelines to change clinical practices[1]. Efforts are often unsuccessful due to disincentives in the form of complexities to making notable changes to system practices. Common challenges include: requiring providers to change their routines, time and cost for implementation, and organizational culture that fosters the status quo etc.[2] University of Pittsburgh Medical Center, Department of Anesthesiology, a University Physicians Practice, rapidly introduced evidence-based practices across 11 separate departmental divisions spanning 18 surgical facilities utilizing a value-based incentive program. **Methods:** A “value” incentive was introduced requiring identification and introduction of metrics aimed at improving patient quality and/or reducing expenses in care delivery. Evidence-based metrics: lung protective ventilation; intraoperative glucose monitoring and treatment; transfusion trigger; and albumin use were selected. For transfusion trigger and albumin use, projected savings from reduction in RBC and albumin use was calculated. To aid in achieving compliance, a modest incentive (<2.5% of total compensation) was paid to providers who succeeded in the defined metric goals. For FY16 and 17, thresholds for goal improvement were established for each six-month incentive period. Data was collected for the two months prior to introduction of the metrics and standardized education was provided to department members. Performance by division and by individual anesthesiologist was collected monthly and feedback was provided to department leadership. **Results:** As seen in Table 1, within six months there was a rapid increase in compliance to goal thresholds for each metric and continued to increase over the subsequent six months. For albumin usage, all sites achieved the goal threshold of less than 7% of anesthetics within six months as well. While all metrics improved quality, the transfusion trigger and albumin usage provided a projected annual direct cost savings of $382,800 and $907,894 respectively. **Discussion:** Incentives have been used for decades to improve performance in many industries and more recently healthcare. Previously, large academic institutions were able to implement evidence-based measures in 18 months by focusing on key areas of infrastructure including leadership, information technology, education methods and measurement of metrics performance[3]. In our institutional model financial incentives provide an avenue to incorporate evidence-based medicine as a rapid change agent for best clinical practice in a large, complex, multi-site healthcare organization. **References** 1. Morris, Z. S., Wooding, S., & Grant, J. (2011,

Dec). The answer is 17 years, what is the question: understanding time lags in translational research. 2. Kristensen, Nanna, Camilla Nymann, and Hanne Konradsen. "Implementing research results in clinical practice- the experiences of healthcare professionals." BMC Health Services Research. Feb 10, 2016.3. "Accelerating the Use of Best Practices: The Mayo Clinic Model of Diffusion." The Joint Commission Journal on Quality and Patient Safety.

	Intraoperative Diabetes Monitoring and Treatment			Lung Protective Ventilation			Packed Red Blood Cell Transfusion			Albumin Usage	
Institution	June 2016*	December 2016	June 2017	June 2016*	December 2016	June 2017	June 2016*	December 2016	June 2017	Percent Usage FY2016	Percent Usage FY2017 (July-Current)
Site A	21.2%	75.0%	90.9%	47.1%	91.8%	89.2%	60.0%	100.0%	100.0%	2.0%	0.4%
Site B	8.0%	60.0%	75.0%	67.0%	80.0%	77.4%	67.0%	100.0%	100.0%	3.6%	1.6%
Site C	61.2%	75.4%	81.8%	69.9%	89.4%	90.5%	67.0%	93.0%	95.0%	8.8%	5.0%
Site D	15.7%	86.9%	81.0%	45.5%	89.6%	89.3%	83.0%	100.0%	100.0%	4.6%	1.0%
Site E	30.0%	78.1%	74.1%	49.7%	97.1%	93.6%	48.0%	100.0%	100.0%	4.2%	2.0%
Site F	59.8%	78.7%	83.3%	83.2%	92.7%	95.8%	58.0%	84.0%	88.0%	16.7%	6.8%
Site G	67.4%	81.1%	82.4%	65.2%	91.5%	89.0%	67.0%	91.0%	79.0%	16.2%	1.8%
Site H	10.3%	76.3%	93.3%	52.2%	96.1%	94.8%	31.0%	71.0%	67.0%	13.7%	0.9%
Average Compliance	34.2%	76.4%	82.7%	60.1%	91.0%	90.0%	60.1%	92.4%	91.1%		

*Average from May and June 2016 prior to implementation

Summary: Implementing evidence-based medicine into practice has been a challenge faced by many providers for years. There have been numerous models and ideas designed to facilitate the diffusion of information into the clinical practice. Our department used a value incentive in order to aid the implementation of evidence-based practice and noted a rapid increase in compliance amongst providers at numerous sites. In addition to improving quality, there was a significant cost reduction in the delivery of care as well. As healthcare continues to reform, evidence-based medicine will be instrumental at helping managers and providers improve quality while reducing cost.

Presentation Number: 9

1.1 Quality Improvement

Title: Colorectal and Bariatric Enhanced Recovery After Surgery in a Non-Academic Institution: An Anesthesia Led Quality Initiative

Authors: V. Morton;
Anesthesia, Providence Anesthesiology Associates, Charlotte, NC.

Abstract Body: Colorectal and Bariatric Enhanced Recovery After Surgery in a Non-Academic Institution: An Anesthesia Led Quality Initiative
Author: V. Morton DNP, MSN, AGNP-BC
Affiliation: Providence Anesthesiology Associates
Introduction: Enhanced Recovery after Surgery (ERAS) pathways have been shown to improve patient outcomes by reducing hospital length of stay (LOS), decreasing post-surgical complications, and improving patient satisfaction[1,2,3]. One in four surgical patients experiences a complication following surgery, each of which adds $6500 to the cost of care[4]. Additionally, independent of preoperative risk, the occurrence of a 30-day complication can reduce long-term survival by 69%[5].
ERAS pathways were an Anesthesia led initiative in colorectal surgery at a non-academic private hospital in May 2016, which then expanded to include bariatric surgery in February 2017.
Methods: As of May 2016, all colorectal surgical patients for two specific surgeons were identified as ERAS when scheduled for surgery. The pathway focused on multiple elements: preoperative patient education beginning in the surgeon's office, more extensive education when seen at the pre-admission testing (PAT) clinic, carb loading to include one 330mL Clearfast drink the night before surgery and one 3 hours before surgery, preoperative Alvimopan, postoperative nausea and vomiting (PONV) protocol, multimodal analgesia to include transversus abdominal plane blocks, reducing or eliminating opioid consumption, intraoperative goal directed fluid therapy utilizing a stroke volume optimization protocol, early PO intake, and early and frequent mobilization. As of February 2017, a bariatric pathway for 3 specific surgeons was implemented. The bariatric protocol includes the same above elements.
Results: 270 patients were included in the intervention group with matched retrospective controls. The intervention was associated with reductions in LOS: colorectal 4.5 to 2.05 days (p= 0.0114), bariatric 2.15 to .95 days (p= 0.002). Readmission rates for both groups have remained unchanged. Both groups showed significant reductions in postoperative opioid consumption as well as decreased PACU time. Overall, there has been a reduction in cost per case by 20% (p=0.032) in the colorectal intervention cohort.
Conclusion: The Anesthesia led quality initiative has proven to be successful. The success can be attributed to collaboration with the colorectal and bariatric surgeons, adding a dedicated clinical and quality outcomes position to the anesthesia group for program oversight, outcomes and compliance data collection/analysis, and continual re-education of the nursing staff. The implementation of ERAS pathways has proven to be economically beneficial to the hospital system and improves the overall quality of life for patients.

References:

1.
Lau, CS, Chamberlain, RS. *Enhanced Recovery After Surgery Programs Improve Patient Outcomes and Recovery: A Meta-analysis.* World J Surg 2017 April; 41(4): 899-913.
2.
Varadhan KK, Neal KR, Dejong CH, Fearon KC, Ljungqvist O, Lobo DN. The enhanced recovery after surgery (ERAS) pathway for patients undergoing major elective open colorectal surgery: a meta-analysis of randomized controlled trials. Clin Nutr 2010; 29(4): 434-440.
3.
Greco M, Capretti G, Beretta L, Gemma M, Pecorelli N, Braga M. Enhanced Recovery Program in Colorectal Surgery: a meta-analysis of randomized control trials. 2014 June; 38(6): 1531-1541.
4.
Boltz MM, Hollenbeak CS, Ortenzi G, Dillon PW. Synergistic Implications of Multiple Postoperative Outcomes. Am J Med Quality, 2012 Feb; 27(5):383-390.
5.
Khuri SF, Henderson WG, DePalma RG, Mosca C, Healey NA, Kumbhani DJ. Determinants of Long-Term Survival After Major Surgery and the Adverse Effect of Postoperative Complications. Ann Surg, 2005 Sept; 242(3):326-341

Summary: An anesthesiology led enhanced recovery program can be successfully implemented and sustained if collaboration exists with the participating surgeons. A private anesthesia group led the quality improvement initiative in the colorectal surgical population in May of 2016 with improved outcomes. The program expanded to the bariatric surgical population in February of 2017. Since the implementation, there has been a reduction in length of stay and complications in both the colorectal and bariatric cohorts. Additionally, there has been a 20% reduction in cost per case in colorectal surgery.

Presentation Number: 10

1.1 Quality Improvement

Title: Improving ICU Handoffs By Enhancing Existing Tools

Authors: S. Strowd, A. M. Murray;
Anesthesiology, Loyola University Medical Center, Maywood, IL.

Abstract Body: Background: The Department of Anesthesiology at Loyola Medical Center is responsible for the care of the patients in the 14-bed Cardiothoracic ICU. Weekday coverage models require an ICU handoff every 12 hours. Handoffs, a time for potential miscommunication and uncoordinated care, need to be especially organized in the intensive care setting. Institutional data obtained from the GME CLER Officer reported that 57% of residents/fellows surveyed from six different departments admitted having GIVEN a poor sign out but 87% had RECEIVED a poor sign out; suggesting limited self-awareness and insufficient processes to identify ineffective handoffs.[1] These data did not specify whether or not the handoff was in an ICU setting. A previously-designed ICU handoff tool (housed in the electronic health record, EPIC) was poorly understood and confusing to use, contributing to weak compliance and lapses in safe transitions of care. Our study evaluated the efficacy of the EPIC handoff tool with the addition of a step-by-step user guide, a hard copy tool, to aid compliance during this important point of care. A secondary aim was to query residents more specifically about ICU handoffs. Methods: A step-by-step user guide for the EPIC handoff tool (including pictures and arrows) was created by a resident in August 2016 to guide completion of the ICU handoff from the resident covering days to the resident covering nights. Face-to-face resident handoffs were completed at bedside with the assistance of the EPIC handoff tool and the step-by-step user guide. The efficacy of the guide with the EPIC ICU handoff tool, and the adequacy of the handoff was evaluated by residents within the department via survey sent to all residents participating in an ICU handoff between August 2016-September 2017. Results: Residents responded that 60% of the time they received an adequate ICU handoff. 30% were unsure if they received adequate handoff and 10% reported that they had experienced a poor handoff in the past year. 90% reported that the tool along with the user guide included sufficient information for a safe handoff. 100% of residents found the user guide helpful. Discussion: Handoff communication is a new APSF safety initiative and recognized by ACGME and The Joint Commission as an essential area for improvement. Handoffs can be poor due to several factors including interruptions, lack of preparation, lack of understanding, poor personal interactions and failure of a structured report.[2] Electronic handoffs are thought to improve patient outcomes and can standardize and optimize handoffs.[2,3] Our goal of this quality improvement project was to use the previously-designed EPIC handoff tool in its full capacity by adding a helpful user guide. Not only was the guide sufficiently informative, but it was also unanimously helpful to residents during an ICU handoff. Survey responses also allude to resident uncertainty in identifying the adequacy of a handoff, possibly because residents are unaware of downstream effects when items slip through the cracks of an inadequate handoff. This study was only able to demonstrate enhanced use of electronic assistance with handoffs and in the future we hope to study more effective methods to detect an inadequate handoff.
[1]CLER Focus Round 2 Survey Data, Loyola University Medical Center, GME CLER Officer. September 2016-May 2017. [2]Lorine A, Henson C. All Handoffs Are Not the Same: What

Perioperative Handoffs Do We Participate in and How Are They Different? APSF. 2017; 32: 29-30.3Cheah LP, Amott DH, Pollard J, et al. Electronic medical handover: Towards safer medical care. Med J Aust. 2005;183:369-372.

Summary: ICU Handoffs are a time for error and miscommunication. At Loyola Medical Center a step-by-step user guide was created for the EPIC handoff tool to help assist in ICU handoffs.

Presentation Number: 13

1.1 Quality Improvement

Title: The Value Proposition for Open Carpal Tunnel Release in the Operating Room or Procedure Room

Authors: M. Tsai[1], J. Nolan[2], B. Jorgensen[3], J. A. Martin[4], W. C. Paganelli[5], A. B. Shafritz[6]; [1]Anesthesiology; Orthopaedics and Rehabilitation (by courtesy), University of Vermont Larner College of Medicine, Burlington, VT, [2]Orthopaedics and Rehabiltation, University of Vermont Medical Center, Burlington, VT, [3]University of Vermont College of Medicine, Burlington, VT, [4]Anesthesiology, Univerisity of Vermont Larner College of Medicine, Burlington, VT, [5]Anesthesiology, University of Vermont Larner College of Medicine, Burlington, VT, [6]Orthopaedics and Rehabiltiation, University of Vermont Larner College of Medicine, Burlington, VT.

Abstract Body: Introduction: Carpal tunnel release (CTR) is a common procedure performed over 400,000 times per year in the United States.[1] Open CTR can be performed in an operating room (OR) or an outpatient procedure room with considerable differences in time, labor and supplies for each setting.[2,3,4] Porter has argued that health care delivery can be measured by the following definition[5]: The Disabilities of the Arm, Shoulder and Hand (DASH) Outcome Measure is a self-report questionnaire designed to measure and monitor changes in physical function and symptoms in patients with any or several musculoskeletal disorders of the upper limb.[6] In this study, we used the DASH to analyze the clinical outcomes for the same patients to ascertain the applicability of the Porter's value proposition. **Methods:** Using the DASH questionnaire, we calculated the average outcomes for patients who underwent CTR in the OR or the procedure room. Pre and post CTR DASH scores were gathered via chart review. For those patients without post CTR DASH scores, requests were sent by mail and follow-up was made by telephone. The difference between pre- and post-surgery DASH scores was calculated for patients who had CTR in the OR vs. outpatient procedure room using Microsoft Excel (Microsoft Corporation, Redmond, WA). The average difference between the pre and post DASH scores for each group were then compared using as independent t-test (GraphPad PRISM). **Results:** A full summary of the pre- and post-surgery DASH scores for each group of patients can be found in Table 1. The mean difference (pre-surgery DASH score - post-surgery DASH score) for the OR was 20.07±19.41 (mean±SD). The mean difference for procedure rooms was 21.48±13.90. The mean difference between the two groups was not statistically significant (p=0.7419). **Conclusions:** In this study, we show that CTRs performed in a procedure room increases the value of the health care delivery chain. Here, the clinical outcomes for CTR performed in two distinct settings are equivocal. Previously, we demonstrated that performing CTR in a procedure room costs 33.2% less than performing open CTR in the OR using a time-driven activity-based costing model. Further, these cost savings do not occur at the expense of lesser clinical outcomes for patients undergoing CTR. Hospital administrators can expand framework for surgeries which can be performed either in an office, ambulatory or outpatient, surgical setting. **References:** [1] Thoma A, Veltri K, Haines T, Duku E. Plast Reconstr Surg.

2004;114(5):1137-46. [2] Leblanc MR, Lalonde J, Lalonde DH. Hand. 2007; 2(4):173-8. [3] Davison PG, Cobb T, Lalonde DH. Hand. 2013;8(1):47-53. [4] LeBlanc MR, Lalonde DH, Thoma A, Bell M, Wells N, Allen M, Chang P, McKee D, Lalonde J. Hand. 2011;6(1):60-3. [5] Porter ME, Teisberg EO. Boston, MA: Harvard Business Press; 2006. [6] The DASH Outcome Measure. Institute for Work and Health. http://www.dash.iwh.on.ca/about-dash.

Summary: There is a substantial degree of variability where carpal tunnel release (CTR) procedures are performed. By demonstrating that the clinical outcomes for CTR performed in two distinct settings are equivocal, we demonstrate that there is inherent value depending on the health care setting.

Presentation Number: 14

1.1 Quality Improvement

Title: Understanding and Modifying Distractions During Induction of Anesthesia

Authors: C. E. Tanis-Arens, M. T. Wiisanen, W. K. Kwass, O. R. Schantz;
Loyola University Medical Center, Maywood, IL.

Abstract Body: Introduction: Distractions are prevalent in the operating room (OR) environment and pose a risk to patient safety. For the anesthesiologist, they come from many sources such as electronic devices, conversations, and clinical alarms. At our institution, anesthesia providers have noted distractions during induction. OR staff may be counting instruments, returning pages, or having personal conversations while the anesthesia team induces. Not only are these activities distracting, the lack of assistance is problematic in situations when support or equipment are needed, as in an unanticipated difficult airway, lost IV access, or hemodynamic instability. Our project aims to determine the sources and prevalence of distractions during induction, in an effort to improve patient safety. Methods: Distractions during induction of anesthesia were tracked using a survey which was filled out by CA-1 residents after completing OR cases. The areas we looked at were nursing and/or surgeon availability to assist, extraneous conversation, music playing, audibility of monitors, and whether distractions were perceived to interfere with patient care. Additional factors recorded were the nature of the case (scheduled or emergent), surgical service, and ASA physical status. Results: Thus far, our survey has tracked induction conditions during 52 surgical cases across 11 specialties. Six cases were emergent and the rest were routine. In every case, there was talking during induction; it was rated as moderate or high volume in 54% of cases. Music was playing during six inductions. In 14 cases (27%), neither the RN nor surgical service were at bedside during induction. The respondents did not report any instances of asking for quiet in the operating room, although they also did not report inability adequately hear the monitors. In this sample, there were no untoward patient outcomes reported. Discussion: Although still ongoing, our QI project has indicated areas for improvement. In every case, there was talking during induction, often at a high volume. Auditory stimuli have been shown to impair the anesthesiologist's ability to concentrate. One study found a 17% decrease in the ability of anesthesia residents to detect changing pulse oximeter tone while performing tasks with background noise present, compared to performing a task in a quiet environment. Efforts to reduce auditory distraction can be focused on physician and nursing education. Anesthesia providers should take an active role in maintaining a distraction free environment. Additionally, nursing education may be helpful to increase awareness of common distractors and their impact on patient care.
Further benefit could come from an institutional culture change regarding presence during anesthetic induction. In 27% of cases no one was available to assist; a simple change of having an RN or surgical resident at bedside would ensure assistance is readily available if necessary. We also believe this change would improve communication among the OR team.
Additional opportunity exists for us to characterize sources of distraction during maintenance and emergence phases. We hope that by understanding the prevalence of distractions during induction we can make changes to improve patient safety. Our next step will be to perform resident education and repeat our survey to evaluate for improvement. Reference: R. Stevenson,

Ph.D., J. Schlesinger, M.D., M. Wallace, Ph.D.; Effects of Divided Attention and Operating Room Noise on Perception of Pulse Oximeter Pitch Changes: A Laboratory Study. Anesthesiology 2013;118(2):376-381. doi: 10.1097/ALN.0b013e31827d417b.

Summary: Distractions are prevalent in the operating room (OR) environment and can pose a risk to patient safety. Our Quality Improvement project examines the distractions created by other OR personnel during the induction of anesthesia. We collected data about the conditions during induction during 52 surgical cases. We found that conversation occurred in every case, frequently at a high volume. By examining the occurrence of distracting events, we can implement changes to improve both patient safety during induction and communication of the OR team.

Presentation Number: 15

1.1 Quality Improvement

Title: Mandatory Environmental Savings Initiative (MESI): Cost Comparison of Anesthetic Techniques in a Large University Hospital System

Authors: E. E. Lebovitz[1], M. E. Hudson[2], S. M. Littwin[3];
[1]University of Pittsburgh Medical Center, Pittsburgh, PA, [2]Finleyville, PA, [3]Pittsburgh, PA.

Abstract Body: Introduction: Modern anesthesia faces demanding challenges to continue technological improvements, lower costs, and improve outcomes in our current healthcare environment. The practice of anesthesia has monetary effects within the healthcare system including preoperative testing, control of operating and recovery room usage, and consuming of large amounts of hospital supplies and services which represent 3-5% of the total health care costs in the United States[1]. Within a single surgical case, profit generation by anesthesia providers is capped by factors including the billable time of the anesthetic, procedural coding of the operation, medically necessary invasive monitor placement, and surgical time constraints such as case length. Thus, to improve the bottom line, anesthesia providers must enact cost saving measures in the perioperative period. These must take into consideration equipment (reusable and disposable), medication usage, and anesthetic type based on patient preference, patient physiology, and the ability to have efficient operating room utilization.**Methods:** In this study, we analyzed prices for medication and equipment purchased in the Spring of 2017 for various hypothetical cases at our institution. In these cases, we utilized standardized equipment (Table 1), induction medications (Table 2), and analyzed various methods of maintenance anesthesia including various inhaled agents and total intravenous anesthesia (Table 3). Analysis of cases utilizing neuromuscular blockade and reversal was also calculated. **Results:** For our inguinal hernia repair on an 80-kg male, the total cost for a standard set up of non-reusable equipment was $57.07. Induction medications cost $29.50. Additional cost for neuromuscular blockade and reversal with rocuronium, neostigmine, and glycopyrrolate amounted to $94.78. Maintenance anesthesia varied significantly depending on the type (inhaled agents vs. TIVA) and on volatile agent used, e.g. isoflurane vs. sevoflurane. Our analysis revealed a 48% reduction in cost of medications utilized throughout the case when comparing a two-hour case performed under sevoflurane with neuromuscular blockade and reversal compared to TIVA without neuromuscular blockade ($147.73 vs. $77.54).**Conclusions:** We have performed a cost analysis of equipment and medications utilized by anesthesia providers in the perioperative period. Anesthetic technique can dramatically alter costs of providing care for similar patients undergoing the same type surgery. They can also alter other important variables time to recover and length of PACU stay. Pain and/or nausea/vomiting in the course of the PACU time also can be considered, but was not part of the initial cost saving measures. Further studies should analyze the impact of these management decisions on patient safety, patient/provider willingness to change techniques, and overall perioperative care costs.

Summary: We have performed a cost analysis of equipment and medications utilized by anesthesia providers in the perioperative period. Anesthetic technique can dramatically alter costs of providing care for similar patients undergoing the same type surgery. Further studies

should analyze the impact of these management decisions on patient safety, patient/provider willingness to change techniques, and overall perioperative care costs.

Presentation Number: 17

1.1 Quality Improvement

Title: OR KPI Self-Service Reporting

Authors: C. Turner[1], E. Lee[2];
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Abstract Body: With operating rooms being one of the top revenue sources in acute-care setting, it is crucial to monitor key performance indicators (KPI) such as case volume, room turnover, delays, and block utilization in order to maximize efficiency. Putting such data in the hands of perioperative leaders empowers them to pivot quickly based upon current operational data. We present our collaborative effort in creating a one-stop solution for OR KPIs as a case study in increasing self-service reporting capacity while lowering the technical overhead to meet an organization's data demand. UW Health had two main roadblocks in efficient OR KPI reporting. The first was the collection of duplicate reports covering the same metric, with conflicting business logic and little documentation. Secondly, data consumers would wait in a long queue for ad-hoc data requests which could not be fulfilled with existing reports. On the IT side, the overhead of maintaining these reports, while churning out ad-hoc datasets, was high especially during Epic upgrades. To meet these challenges, our analytics team, OpTime application team, and perioperative leadership leveraged OpTime KPI package and QlikView. The former enabled transparency and replicability of KPI definitions by setting business rules within Epic Hyperspace (e.g. what is the room turnover threshold, should an add-on case be considered a first case?). QlikView provided an interactive, self-service reporting platform allowing the data consumers to bypass the request queue. The QlikView Surgical Operations Dashboard was delivered mid-2016. In 2017, the application has been accessed more than 1,700 times by 160 unique users (clinicians, OR managers, department administrators, etc). The application allows data consumers to pull data with replicable business logic whenever needed from a single place in a flexible output format, along with pre-configured visualizations. High-level KPIs can be drilled down to the case level for locations, services, and individuals. Datasets generated in ad-hoc queries are exportable for further analysis and presentation. The best ROI was yielded in scaling ad-hoc reporting: 1,050 different datasets have been generated by users and exported in 2017; none of these had to go through our IT department as a data request. We have since gone through two major Epic upgrades and opened a brand new surgical center. There was only a single issue that needed to be fixed in the application post-upgrade. No new reports were needed to meet the new surgical center's operational reporting needs; their location-specific business rules and data automatically flowed into the application once configured within Hyperspace. We have retired 50 individual Crystal and WebI reports; more are slated for retirement.

Summary: The authors describe a Qlikview Dashboard that allows Perioperative Managers self-service access to the Key Performance Indicator (KPI) reporting of data from within Epic Hyperspace.

Presentation Number: 19

1.4 Research in Perioperative Management

Title: Overlapping Surgery: A Case Study for OR Throughput and Efficiency

Authors: A. J. Morris[1], J. A. Sanford[2], E. J. Damrose[3], S. H. Wald[1], B. Kadry[4], A. Macario[5]; [1]Anesthesiology, Stanford Health Care, Stanford, CA, [2]Little Rock, AR, [3]Laryngology, Stanford Health Care, Stanford, CA, [4]Stanford - Anesthesia School of Medicine, Menlo Park, CA, [5]Stanford, CA.

Abstract Body: Overlapping surgery is commonly performed in academic medical centers, although recent scrutiny in the lay press has raised debate about the merits and safety of the practice. Overlapping surgery may shorten patient wait times, increase patient access to surgeons with specialized skill sets, increase operating room (OR) efficiency and throughput for facility and surgeon, and allow for the education and training of medical students, residents and fellows. This paper discusses the rationale and impact of overlapping surgery as an approach for OR efficiency and throughput and a system to monitor it, which can allow for ease of auditing and creation of a surgeon-specific Key Performance Indicator. Such an indicator could be used for reporting to hospital leadership and for comparison with other quality metrics, such as patient safety indicators, to gauge the impact of overlapping surgery on surgical outcomes and postoperative complications.

Summary: The fundamentals of OR management depend on policies that optimize safety, access, throughput, efficiency, and staff satisfaction. We present overlapping surgery as a strategy toward these goals.

Presentation Number: 21

1.4 Research in Perioperative Management

Title: Developing an Operating Room Scorecard for a Large, Multi-hospital Health System

Authors: A. V. Giedraitis, J. Artman, B. Stewart, S. Mammarella, M. Hudson;
Anesthesiology, UPMC, Pittsburgh, PA.

Abstract Body: Introduction: In the new value-based world of medicine, where budget-based payment methodologies are a growing reality, maintaining accurate cost profiles for surgical facilities and departments of anesthesiology is vital. Further, understanding conditions that impact this cost can be valuable for goal setting and planning in surgical services. As such, our department developed a scorecard in which several adult hospitals and ambulatory surgery centers (ASCs) were compared based on four factors thought to impact cost: operating room (OR) utilization, billing concurrency, hospital overtime, and average hospital staff full-time equivalents (FTEs) per OR hour. In doing so, we identified which hospitals were lagging behind peers and what factors may have led to these differences.
Methods: Operating room utilization was calculated utilizing a novel CRNA billed-to-staffed work hours ratio; utilization only pertained to weekdays from 7am to 3pm. Billing concurrency calculations were based on all billing concurrency data. Hospital overtime was calculated as a percentage of total salaries and defined as the percent total paid time categorized as overtime (>40 hours per week) via our employee time-keeping (Kronos) system. Average hospital staff FTEs per OR hour were simple calculations based on staff FTEs and staffed OR hours. Each surgical facility was subsequently ranked in the four identified metrics, and a number value was assigned and benchmarked against similar facilities (hospital or ASC). The values were then totaled for an overall score. Rankings were also assigned based on each hospital's or ASC's cost per OR hour.
Results: Trends in overall performance can be seen in Figure 1. Hospitals with higher cost per OR hour tended to also have the lowest overall score in the rankings. A higher ranking, and total lower score, corresponded to a combination of improved OR utilization and billing concurrency, less hospital overtime, and lower average hospital staff FTEs per OR hour.
Discussion: The adoption of a scorecard that compares various factors thought to impact cost allows for a straightforward, transparent way for different stakeholders to assess how their surgical facility is performing relative to comparable sites. The fact that the various hospital rankings did not directly correlate with OR costs per hour suggests that there are additional factors that were not evaluated, or that the degree of impact varies by factor. With this aid, hospital leadership can assess where a particular hospital is lagging its peers and what variables allow certain hospitals to outperform. Understanding factors that may influence OR costs per

hour can help guide changes to improve this metric in a competitive health care economic environment.

UPMC Surgical Services

Adult Allegheny County Hospitals

Hospital	OR Utilization	Billing Concurrency	Hospital Overtime	Average Hospital Staff FTEs/OR Hour	Total Score	Total Score Rank	Cost/OR Hour Rank
A	3	3	1	2	9	1	2
B	4	2	2	3	11	2	3
C	1	5	5	1	12	3	6
D	2	4	3	5	14	4	5
E	5	1	4	4	14	4	1
F	6	7	7	7	27	6	4
G	7	6	8	6	27	6	7
H	8	8	6	8	30	8	8

Adult Allegheny County ASCs

Hospital	OR Utilization	Billing Concurrency	Hospital Overtime	Average Hospital Staff FTEs/OR Hour	Total Score	Total Score Rank	Cost/OR Hour Rank
A	1	2	3	1	7	1	1
B	4	1	1	5	11	2	4
C	2	4	5	2	13	3	2
D	3	5	2	4	14	4	5
E	5	3	4	3	15	5	3

Summary: Maintaining accurate cost profiles for departments of anesthesiology is vital in the new value-based world of medicine. To help accomplish this, we developed a scorecard that compared facilities based on four factors that impact cost: operating room utilization, billing concurrency, hospital overtime, and average hospital staff full-time equivalents per OR hour.

Presentation Number: 22

1.1 Quality Improvement

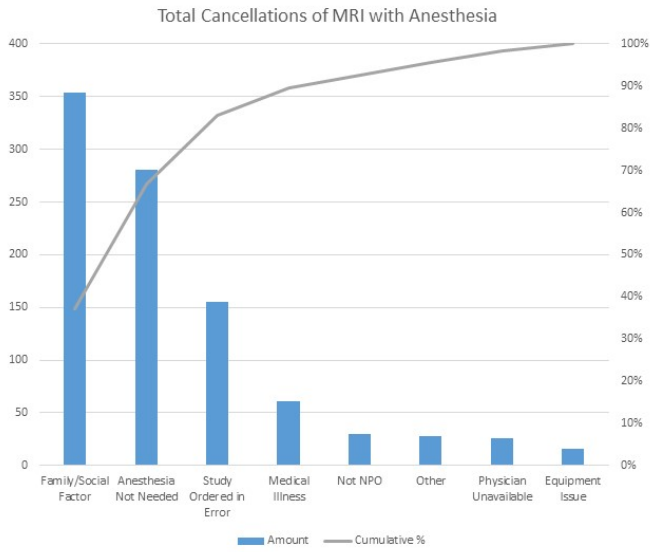
Title: The Incidence and Risk Factors for Cancellation of MRI Studies Scheduled With Anesthesia in a Tertiary Care Academic Medical Center

Authors: M. Sathyamoorthy[1], P. G. Amolenda[2], G. Wilson[3], A. Jones[3], C. Turman[3];
[1]Pediatric Anesthesia, University of Mississippi Medical Center, Jackson, MS, [2]Brandon, MS, [3]University of Mississippi Medical Center, Jackson, MS.

Abstract Body: Background and Objective Cancellations of MRI cases scheduled with anesthesia can lead to inefficient use of hospital resources. This study aimed to identify the incidence and the significant patient and system factors impacting cancellations. **Methods:** This retrospective quality improvement study included a period of one year from September 1, 2016, to August 30, 2017, at the University of Mississippi Medical Center. It is the only academic medical center and children's hospital in the state. All children (age ≤18yrs) and adults (age >18yrs) who were scheduled to have MRI done under anesthesia during the study period were included. Data were extracted from electronic health records using EPIC reporting. The report identified all the patients who were canceled within a day of their scheduled time. All patients who completed the MRI study without anesthesia were also considered canceled for this study purpose, since anesthesia personnel were assigned to the case and were available on standby. Primary outcome measures were age, outpatient vs. inpatient status and the reason for cancellation. Reasons for cancellation were audited by reviewing patients' records for accuracy. Patient factors considered were patients not showing up for the study due to various family and social factors, fasting violation, and medical illness not optimized for anesthesia. The system factors were study ordered with anesthesia but done without, the study ordered in error, anesthesia provider not available, MRI incompatibility or mechanical breakdown, and other undocumented causes. **Results:** Out of a total 2651 patients who were scheduled with anesthesia, 951 (35.8%) were canceled. The top 3 causes of cancellation were family/social factor (37%), anesthesia not needed (30%), and study ordered in error (16%) (Figure 1). The rate of cancellation was 32% in children (652/2060) and 51% in adults (299/591). More outpatient procedures were canceled in children (81% vs. 19%) as compared to adults (38% vs. 62%). In children, the most common reasons for cancellation were family/social factor (45.9%) and anesthesia not needed (27.8%). In adults, anesthesia not needed (33.4%) and study ordered in error (26.4%) were the top reasons for cancellation (Table 1). **Conclusion:** The causes of this very high incidence of case cancellations and non-utilization of previously scheduled anesthesia services are multifactorial and likely need several systematic interventions. We propose calling the patients 2 to 3 days in advance to remind them of their appointment, answer any questions, and try to resolve any conflicts. Also, improved screening of patients who would need anesthesia and educating healthcare providers about the appropriate ordering of studies that require anesthesia could improve efficient use of limited resources.

Figure 1. Pareto Chart illustrating common reasons of cancellation of MRI studies scheduled with anesthesia

Table 1. Patient characteristics and Reasons for cancellation



Demographics	Children (≤18yr)	Adults (>18yrs)	Total
Number of MRI scheduled with anesthesia	n=2060	n=591	n=2651
Number of Out-patients	1599 (77.6)	263 (44.5)	1862 (70.2)
Number of In-patients	461 (22.4)	328 (55.5)	789 (29.8)
Number of Cancellation	652 (32)	299 (51)	951 (35.9)
Number of MRI completed	1408 (68)	292 (49)	1700 (64.1)
Reasons for Cancellation	**Children (≤18yr)**	**Adults (>18yrs)**	**Total**
Family/Social Factor	300 (46.1)	54 (18.1)	354 (37.2)
Anesthesia Not needed	181 (27.8)	100 (33.4)	281 (29.5)
Study Ordered in Error	76 (11.6)	79 (26.4)	155 (16.3)
Medical Illness	40 (6.1)	21 (7.0)	61 (6.4)
Not NPO	15 (2.3)	15 (5.0)	30 (3.2)
Other	21 (3.2)	7 (2.3)	28 (2.9)
Physician Unavailable	12 (1.8)	14 (4.7)	26 (2.7)
Equipment Issue	7 (1.0)	9 (3.0)	16 (1.7)

Data presented as number of patients (%)

Summary: This quality improvement study found a high incidence of case cancellations and non-utilization of previously scheduled anesthesia services in the only tertiary academic center in

the state of Mississippi. The causes are multifactorial and likely need several systematic interventions. We propose calling the patients 2 to 3 days in advance to remind them of their appointment, answer any questions, and try to resolve any conflicts. Also, improved screening of patients who would need anesthesia and educating healthcare providers about the appropriate ordering of studies that require anesthesia could improve efficient use of limited resources.

Presentation Number: 23

1.1 Quality Improvement

Title: Using Information Technology to Target Intervention to Reduce Medication Waste and Cost by Changing Syringe Size

Authors: J. Yuan;
Washington University in St. Louis, St. Louis, MO.

Abstract Body: Using information technology to target intervention to reduce medication waste and cost by changing syringe size

Jennifer Yuan, MD, MBA, Ivan Kangrga, MD, PhD, Jason Gillihan, MD, Rachel Wolfe, PharmD
Department of Anesthesiology, Washington University in St Louis, 660 Euclid Ave., St Louis, Missouri

Abstract
Background: Cost containment is a major concern in the current healthcare industry, and perioperative drugs are a large source of preventable medication waste in a hospital. In addition, drug shortages is also an issue hospital pharmacies frequently struggle with. This study analyzes the impact of ephedrine syringe size change on the medication usage, waste, and cost reduction in our institution.
Methods: The total dose of ephedrine administered in a case was obtained from the electronic medical record and the data was analyzed to evaluate the minimum, maximum, and mean dose of ephedrine. Based on the analysis, we determined that an average of 48% of a syringe of ephedrine is not administered during an anesthetic case. In May 2017, Barnes Jewish hospital pharmacy changed the ephedrine syringe from 50 mg (10 mL) to 25 mg (5 mL). We analyzed ephedrine use 6 months pre and post intervention to determine the change in average drug dose per case, as well as medication waste, and overall cost savings.
Results: It was observed that after the syringe size was changed, average ephedrine dose per case decreased from 26.5 mg (SD 0.5) to 21 mg (SD 0.57), resulting in an overall reduction in total drug waste from 48% to 16% per syringe. This also reduced our monthly ephedrine acquisition cost by 44.4%.
Conclusion: Hospital waste reduction can be achieved by leveraging information technology and targeting focused interventions. By evaluating ephedrine use in the electronic medical record, our pharmacy was able to implement a straightforward intervention to achieve significant cost savings.

Summary: Cost containment is a major concern in the current healthcare industry, and anesthetic drugs are a large source of preventable medication waste in a hospital. In addition, drug shortages is also an issue hospital pharmacies frequently struggle with. In May 2017, Barnes Jewish Hospital reduced the size of ephedrine syringes from 50 mg to 25 mg and and reduced medication waste from 48% per syringe to 16%.

Presentation Number: 24

1.3 Challenging Cases and their Innovative Solutions in Practice Management

Title: Frailty and the Preoperative Assessment

Authors: L. Lepczyk, R. G. Soto;
Department of Anesthesiology, Beaumont Hospital, Royal Oak, MI.

Abstract Body: An 80yo female with debilitating multiple sclerosis presented for a robotic assisted total abdominal hysterectomy and bilateral salpingo-oophorectomy for high-grade serous uterine cancer. The patient was wheelchair bound. Her physical exam revealed severe upper extremity contractures and a sacral decubitus ulcer. She had no CAD risk factors or symptomatology. Per the ACA/AHA guidelines on perioperative cardiac evaluation, pharmacologic stress testing should be considered in a patient with poor or unknown functional capacity if the testing results would impact decision making. It was felt that the testing would not impact decision making for the palliative surgery. Her post-operative course was complicated by trocar site hernia, ischemic bowel requiring bowel resection, intra-abdominal sepsis leading to septic shock. In addition, she suffered acute hypoxic respiratory failure secondary to aspiration pneumonia, later complicated by pulmonary embolism. We will discuss the assessment of frailty and its role in the perioperative setting.

Summary: Anesthesiologists today frequently encounter frail elderly patients, however frailty is rarely taken into account in the preoperative assessment. Frailty is an independent predictor of postoperative complications, institutionalization and death. Adequate pre-operative screening of physiologic reserves in elderly patients could help identify at-risk individuals so that optimization strategies could be employed.

Presentation Number: 25

1.1 Quality Improvement

Title: Self-Service Reporting of Quantitative Provider Practice Evaluation

Authors: C. Turner[1], A. M. Becker[1], L. Stephenson[1], E. Lee[2];
[1]Anesthesiology, University of Wisconsin, Madison, WI, [2]Enterprise Analytics, UW Health, Madison, WI.

Abstract Body: A critical component of quality improvement is equipping providers with meaningful information regarding their practices. This requires not only obtaining accurate data but also presenting these data in an intuitive and efficient manner which allows providers to benchmark themselves to their peers. UW Health Department of Anesthesiology tracks a set of quantitative metrics in operational efficiency and clinical excellence that are also included in provider's Ongoing Provider Practice Evaluation (OPPE). Operational metrics include first-case on-time starts and back-to-back room turnover. Perioperative clinical measures include timely prophylactic antibiotics administration, on-time preoperative evaluations, participation in case debriefing, and frequency of PACU nausea and vomiting. These metrics used to be tracked separately in individual reports and compiled for each provider quarterly in a cumbersome manual process.Anesthesia leadership and the analytics team set out to consolidate these metrics into an automated one-stop-shop reporting interface which will be accessed by faculty, residents, or anesthetists at any time. The interface was implemented as a QlikView application with data accessed and refreshed from Epic Hyperspace daily. With a single click, providers will be able to personalize the application to their practice measures for whatever time period they desire, and benchmark themselves against the overall departmental distribution including percentile rankings. Each metric definition and calculation logic can be displayed by the user for transparency. Authorized providers can create ad-hoc queries to drill further and pinpoint areas in need of improvement at the case level. The application is now a major component of the OPPE process for all faculty, CRNAs, and Anesthesiologists Assistants and is being incorporated into resident training reports.The initial version of the application includes the 6 metrics mentioned above, plus the providers' percentage of completed AQI registry submissions. It has been designed to scale easily to more metrics as data become available for outcome (e.g., mortality, morbidity), patient experience, and billing (e.g., unbillable records, AR aging). We also plan to embed the application within Epic Hyperspace with automated personalization to further lower any access barriers to the data. We look forward to continuously improving this low-overhead, self-service reporting tool to facilitate ongoing conversations and interventions for anesthesia quality improvement.

Summary: The authors describe a Qlikview Dashboard that allows access to provider and departmental practice metrics and OPPE data on demand.

Presentation Number: 26

1.4 Research in Perioperative Management

Title: Using an Anesthesiology Trained Chronic Pain Physician for Perioperative Inpatient and Outpatient Pain Management as Part of the Perioperative Surgical Home

Authors: N. Shah[1], T. D. Emerick[2];
[1]Anesthesiology, UPMC, Pittsburgh, PA, [2]Mars, PA.

Abstract Body: Introduction: In an era where there are increasing numbers of surgical procedures being performed and a current opioid epidemic, surgeons and anesthesiologists are working closer together to effectively manage post-operative pain. This is even a bigger challenge in patients who have substance abuse, chronic pain, or are using high levels of oral morphine equivalents. It has been well documented that sub-optimal acute pain management in surgery can lead to various negative consequences including increased morbidity, impaired physical function and quality of life, prolonged opioid use during and after hospitalization and increased cost of care due to prolonged stay. It is clear that patients with chronic pain often are concerned about their pain management throughout the perioperative period. Discussions surrounding pain management often dominate the surgeon's surgical consultations, which make it difficult for surgeons to conduct their own preoperative evaluation and discuss the specifics of the procedure. Analogous to a preoperative anesthesia assessment clinic, we have developed a novel approach with the Department of Neurosurgery to pre-operatively evaluate high risk and challenging chronic pain patients undergoing various neurosurgical procedures to develop a plan to manage post-operative pain. **Methods:** In conjunction with the department of neurosurgery, appropriate referral patients were by physicians and physician assistants. No definitive criteria for referral were used; instead, chronic pain consultation referrals were left up to the discretion of the neurosurgical team. These patients would be evaluated in the chronic pain clinic pre-operatively and a plan would be determined on how to manage pain after the procedure. Once the patient was admitted for the surgical procedure, the chronic pain team would be consulted and would then enact the plan determined at the initial outpatient visit. On discharge, a pain plan would be given to the patient and patient's primary care provider/chronic pain specialist who was managing the condition pre-operatively would guide further pain management. **Results:** Since inception of the program in July 2017, a small cohort of patients (n=8) has undergone this novel approach of an outpatient pre-operative evaluation by a chronic pain specialist. Patients that were referred included the following: 1. Patients with a history of substance abuse on outpatient addiction maintenance therapy, 2. Patients with preoperative high oral morphine equivalent usage, and 3. Patients who specifically requested a pain clinic consultation. Amongst these patients, almost all described feeling less anxious about their pain management throughout the perioperative period. **Discussion:** With this new approach to managing postoperative pain in select patient populations, it is possible that this strategy is effective in reducing the anxiety and improving the satisfaction among this cohort of chronic pain patients. Patients have anecdotally mentioned a sense of comfort knowing there was a plan in place to manage their pain. The patients also expressed satisfaction in the continuity of seeing the same chronic pain team members post-operatively. Furthermore, this approach likely allowed the neurosurgical staff to focus on the surgical tasks at hand and not perioperative acute-on-chronic pain management. In

an era where reimbursements are becoming tied to patient satisfaction, approaches such as this one can help hospitals improve their quality of care. Further implementation of such an approach in conjunction with other surgical departments can help improve quality of care in chronic pain patients undergoing a wide variety of surgical procedures. After this pilot program, the next likely step would be a larger-scale program that involves a statistical analysis of patient satisfaction, provider satisfaction, and perioperative outcome measures.

Summary: A novel approach to perioperative inpatient and outpatient pain management led by chronic pain specialists may lead to improved patient satisfaction and increased quality of care. With increased collaboration with surgical colleagues, patients with certain criteria such as long standing chronic and substance abuse can be more effectively managed perioperatively under the care of a chronic pain team.

Presentation Number: 27

1.4 Research in Perioperative Management

Title: Using Performance Frontiers to Track the Operational Implications of Block Allocations

Authors: M. Tsai[1], T. Wong[2], M. W. Breidenstein[2], J. R. Slauterbeck[3], J. F. Lawlis[3], C. E. Nichols[4];
[1]Anesthesiology; Orthopaedics and Rehabilitation (by courtesy); Surgery (by courtesy), University of Vermont Larner College of Medicine, Burlington, VT, [2]Anesthesiology, University of Vermont Larner College of Medicine, Burlington, VT, [3]Orthopaedics and Rehabilitation, University of Vermont Larner College of Medicine, Burlington, VT, [4]Orthopaedics and Rehabilitation, University of Vermont Larner College of Medicine, Bur, VT.

Abstract Body: Hospital committees and physicians spend an inordinate amount of time requesting block times. MacGregor divided organizational processes into two groups: Theory X and Theory Y. Theory X organizations function in a top-down manner. Decisions and mandates are handed down from above. Theory Y organizations use a bottoms-up process to optimize processes. In theory, the former organizations may be more efficient; the latter, less efficient. However, when it comes to the perioperative services, bottoms-up management may create more efficient workflows. Previously, we applied multi-objective optimization to basic operating room management metrics. In this study, we demonstrate that performance frontiers can be used to track the impact of tactical allocations on operational metrics. In 2014, the Department of Orthopaedics and Rehabilitation began negotiations to absorb the staff and resources of a private community orthopedic group, Associates in Orthopedics. Concomitant with the merger, the department chair approached the OR Operations Committee with a request to internally manage the block allocations. The new tactical allocations went into effect April 1, 2015. Using WiseOR® (Palo Alto, CA), we extracted the total after-hours surgical minutes and opportunity-unused minutes for the Ambulatory (FAH) from April 1, 2014, to March 31, 2016. The ambulatory center serves as the predominant location for orthopedic services. After-hours minutes was defined as the time utilized after 17:30 Monday through Friday. Opportunity-unused minutes was defined as the time within a block allocation where a service could adequately perform another case and elective time-in-block as the time which a service used a block allocation. Pareto optimality was viewed graphically using GraphPad Prism (v7.01 La Jolla, CA). For each month, over-utilized time, defined as the sum of elective and emergent after-hours minutes, was plotted on the x-axis and under-utilized time, defined as opportunity unused time, was plotted on the y-axis. These x,y coordinates were ordered temporally and then plotted with directional vectors to show the changes in over-utilized and under-utilized time across various months. All data and calculations were maintained on Microsoft Excel (Redmond, WA). We used Microsoft Excel (Redmond, WA) for database entry. In Figure 1, we demonstrate that the performance frontier for operating room management metrics moves to a more efficient front following the reallocation of block time. In brief, we demonstrate that performance frontiers support a resource-based view of perioperative services. From the perspective of an operating room manager, tactical block allocations and daily operational issues occupy both sides of a great divide. On one side, the operations research literature is littered with mathematical models demonstrating the most efficient system with which to allocate sources. On

the other side, clinical directors use heuristics and psychological biases to manage the daily workflow, blind to the historical data and forced to work with the decisions from tactical and strategic committees. Future work should use asset and operational frontiers to optimize clinical workflows.

Summary: In 2015, the Department of Orthopaedics and Rehabilitation implemented new block allocations. Previously, we applied performance frontiers to basic operating room management metrics. Here, we demonstrate that performance frontiers can be used to track the impact of tactical allocations on operational metrics. Future work should use asset and operational frontiers to optimize clinical workflows.

Presentation Number: 30

1.1 Quality Improvement

Title: Designing a "Totalcare" Clinic: An Anesthesiologist's Utility in a Multidisciplinary Musculoskeletal Health Clinic at a Large Academic Medical Center

Authors: H. E. Hundley[1], T. D. Emerick[2];
[1]Department of Anesthesiology, University of Pittsburgh Medical Center, Pittsburgh, PA,
[2]Department of Anesthesiology, Division of Chronic Pain, University of Pittsburgh Medical Center, Pittsburgh, PA.

Abstract Body: Introduction
Just like other sectors of the U.S. economy, today's age of health care is consumer driven. Patients are demanding an increased sense of collaboration between various medical specialties, as well as medically-innovative options for patients, all delivered in a cost-effective and efficient manner. Outpatient clinics that embrace innovation to thrive in a consumer driven economy are essential to meeting these patient demands. Chronic pain, like other medical specialties, needs to adopt more innovative models of outpatient care. At a large academic medical center, one innovative model includes the idea of a "total care" musculoskeletal health clinic, that combines numerous specialties and providers under one clinic for an enhanced care plan for patients. This clinic is an important example of an anesthesiologist's involvement in the Perioperative Surgical Home.

Methods
A multidisciplinary clinic was established in July 2015 for musculoskeletal health-related issues. The goal of this clinic was to integrate numerous medical specialties under one clinic to improve patient care and also drive cost savings. Physicians from the departments of Physical Medicine and Rehabilitation and Anesthesiology were the primary providers at this clinic. Physicians from the department/division of Rheumatology, Neurosurgery, and Orthopedic Surgery were also involved. The clinic was staffed by an anesthesiologist one half day per week. New patients also saw a physical therapist on the same day as their first appointment with the primary provider. Patients could also schedule to see a dietician and pain psychologist who were also embedded in the same clinic. Multidisciplinary case conferences involving providers from all specialties occurred on a monthly basis to further integrate and streamline patient care. Referral sources to the clinic include primary care providers, emergency room providers, orthopedic surgeons, and neurosurgeons.

Results
For FY2016 (the first year of the clinic), there were 297 total patients seen at the musculoskeletal health clinic by all providers. 109 of these patients were evaluated by the dietician, 67 elected to see the pain psychologist, 13 saw rheumatology, and 9 patients saw a sleep medicine provider. Opioids ranked as the fourth highest medication as far as number of dollars spent on medications among the musculoskeletal health clinic patients prior to the start of the clinic, and dropped to the sixth highest among this same cohort of patients after one year in the musculoskeletal clinic. Referrals were received from primary care physicians (42%), neurosurgery (15%), physical medicine and rehabilitation (13%), self-referral (13%), orthopedic surgery (10%), rheumatology (4%), and emergency medicine (2%).

Discussion

The “total care” model of outpatient health care is likely to continue to grow in this consumer driven economy. An anesthesiology-trained chronic pain physician can be part of a multidisciplinary clinic that reduces costs and improves the quality of care. This clinic option provides increased access to health care in a convenient manner where the patient interfaces with numerous providers on the same visit. A common criticism by patients is lack of communication between providers about specific patient issues; this clinic can help address that critique by designated multidisciplinary case conference discussions each month. In the future, cost savings analyses need to be completed to further elucidate any potential savings for the hospital system that can be attributed to this clinic.

Summary: The “total care” model of outpatient health care is likely to continue to grow in this consumer driven economy. An anesthesiology-trained chronic pain physician can be part of a multidisciplinary “total care” clinic to streamline patient care in a cost-effective, efficient manner and enhance the anesthesiologist’s involvement in the Perioperative Surgical Home. Lack of communication between providers about specific patient issues is a common criticism reported by patients; this clinic model can help address this issue with designated monthly multidisciplinary case conference discussions.

Presentation Number: 31

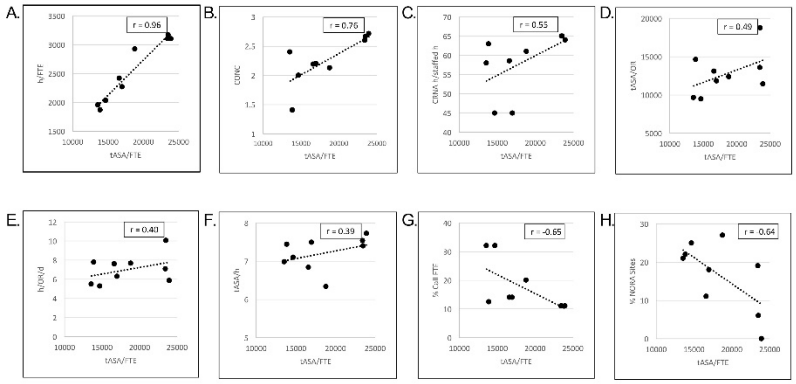
1.4 Research in Perioperative Management

Title: Productivity Factors Impacting Generation of Total ASA Units Per Full-Time Equivalent in Anesthesiology

Authors: E. E. Lebovitz[1], C. M. Molzahn[2], M. E. Hudson[3];
[1]Anesthesiology, University of Pittsburgh Medical Center, Pittsburgh, PA, [2]University of Cincinnati, Pittsburgh, PA, [3]Finleyville, PA.

Abstract Body: Introduction: Productivity measurements have long been used to evaluate and compare physicians and physician practices. Many practices track individual and group productivity and use these data to develop incentives or performance-based compensation plans. For revenue generation, Anesthesiology uses a complex approach based on a relative value system, the ASA Relative Value Guide (ASA RVG), which measures work via a base unit reflecting the complexity of the preoperative evaluation and difficulty of planning and performing the anesthetic, time units that reflect the total time engaged in the care of the patient, and modifier units. Anesthesiology is unique in that factors outside anesthesiologist control impact opportunity for revenue generation and make comparisons between providers and facilities challenging. **Methods:** We utilizes data from the multicenter University of Pittsburgh Physicians Department of Anesthesiology (FY16) to demonstrate factors influencing productivity opportunity by surgical facility, between department divisions and subspecialties within multispecialty divisions, and by individuals within divisions. Individual productivity was evaluated on a per full-time equivalent (FTE) basis by site with significant differences found between facilities. tASA/FTE was compared with each of the listed variables to establish possible correlation. **Results:** tASA/FTE had a strong positive correlation with billable hours per FTE (h/FTE; $p<0.01$) and concurrency (CONC; $p<0.01$), and had a high positive correlation with CRNA billed to staffed hours' percent (CRNA h/staffed h), though this did not reach statistical significance. tASA/FTE was negatively correlated with call FTE percent (CallFTE%; $p<0.05$) and % non-OR anesthetizing locations (NORA%). A moderate degree of positive correlation was found between tASA/FTE and tASA/OR, h/OR/d, and tASA/h, though these did not reach statistical significance. **Conclusions:** The current healthcare economic environment has led to an increased interest in benchmarking anesthesiology productivity to evaluate and compare the *value* of Anesthesiology expenses. An understanding of factors impacting productivity both within and outside anesthesiologist control can allow adjustments to be made for fair workload and compensation distribution within performance-based compensation plans or with productivity incentives.

Figure 1. Correlation of tASA/FTE with factors impacting productivity



Summary: The current healthcare economic environment has led to an increased interest in benchmarking anesthesiology productivity to evaluate and compare the *value* of Anesthesiology expenses. An understanding of factors impacting productivity both within and outside anesthesiologist control can allow adjustments to be made for fair workload and compensation distribution within performance-based compensation plans or with productivity incentives.

Presentation Number: 33

1.1 Quality Improvement

Title: Understanding Revenue Streams: Prevalence of Substance Abuse in Inpatient Chronic Pain Patients at a Large, University-based Hospital

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Abstract Body: Introduction
An inpatient chronic pain consult service may find that a significant number of their new consults focus on substance abuse and not true chronic pain issues. Patients with a history of substance abuse or those on maintenance therapy for substance abuse often have more challenging treatment plans and/or exposure to other comorbidities. Anesthesiology residency programs or pain fellowships, however, may not provide adequate training for the management of patients with history of substance abuse. As a result, consults involving substance abuse may be deferred to other services (e.g. addiction psychiatry, toxicology, or internal medicine). The goals of this project were to: (1) identify the prevalence of substance abuse in new inpatient chronic pain consults at a large academic hospital, and (2) determine the need for additional training of staff and trainees regarding management of patients with a history of substance abuse.
Methods
A retrospective review of new inpatient chronic pain consults at a large academic hospital was conducted from October through November 2017. A total of 53 new consultations were reviewed. Currently, there are no formal guidelines for the ordering physician to determine if the consultation is appropriate or related to substance abuse versus true chronic pain.
Results
Forty-nine percent of consultations involved patients with a history of substance abuse. Twenty-six percent of patients used just prior to admission. The reported drug of choice was heroin or opiates in 42% and 19% of cases, respectively. The remainder of patients used a combination of controlled or illicit substances. Thirty-five percent of consult patients were currently in treatment at the time of admission. Forty-six percent of patients with a history of abuse did not have a history of treatment, 75% of which used just prior to admission. The most frequent reasons for consultation included: postoperative pain management (34%) and pain management in patient with history of substance abuse (38%).
Discussion
It is estimated that approximately 20-30% of chronic pain patients suffer from opioid misuse, abuse, and addiction and that a significant proportion of primary care patients who screen positive for illicit substances use because they are in pain. At our institution, 49% of new chronic pain consultations involved patients with a history of drug abuse and 26% of patients had abused illicit or controlled substances just prior to admission. Anesthesiology and chronic pain training at our institution do not provide extensive training in substance abuse treatment. As a result, inpatient consults involving chronic pain patients suffering from addiction are often deferred to other services. This lack of training in addiction medicine compromises the ability of chronic pain physicians to adequately address substance abuse, a condition directly associated with some medications used to treat chronic pain. Improvements in addiction medicine training could

increase the retention of consults, thereby diversifying the chronic pain service line and opening new revenue streams. For these reasons, we propose that specific training in addiction medicine be added to the anesthesiology residency and chronic pain fellowship at our institution.

Summary: An inpatient chronic pain consult service may find that a significant number of new consults focus on substance abuse and not true chronic pain issues. Anesthesiology residency programs or pain fellowships, however, may not provide adequate training for management of patients with history of substance abuse and consults involving substance abuse may be deferred to other services resulting in lost revenue. Forty-nine percent of consultations at our institution involved patients with a history of substance abuse. We propose that specific training in addiction medicine be added to the anesthesiology residency and chronic pain fellowship at our institution to improve patient care and retain chronic pain consults in patients with a history of substance abuse.

Presentation Number: 40

1.1 Quality Improvement

Title: An Evaluation of an Educational Intervention on the Attitudes and Compliance of a Standardized Intraoperative Handoff for Senior Staff Anesthesiologists, Anesthesiology Residents, and Certified Registered Nurse Anesthetists at an Academic Institution

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Abstract Body: Introduction: Intraoperative transfers of care (or "handoffs") from one anesthesia care team member to another have become a focus of quality improvement in anesthesiology. At our institution and across the country, intraoperative handoffs occur frequently each day. It is well established in the literature that handoffs and other tasks are best performed utilizing a checklist. We developed and instituted an EMR-based intraoperative transfer of care tool to help decrease errors made during handoffs. The standardized handoff tool functions as a checklist of the necessary information that must be completed by anesthesia care team members for each intraoperative transfer of care. The goal of this study was to evaluate the effects of an educational intervention on the attitudes towards and compliance with the standardized handoff tool.
Methods: A longitudinal survey pre-post study was conducted. A survey consisting of six "always", "sometimes", or "never" questions regarding attitudes towards handoffs and the use of the handoff tool was developed and utilized for data collection. Data was collected pre- and post-intervention. The intervention phase consisted of a Grand Rounds presentation of literature regarding handoffs and education on the handoff tool. The marginal homogeneity test was used to compare the survey responses before and after the intervention. Fisher's Exact test was used to compare the distribution of the change in survey responses between the different anesthesia team roles. Statistical significance was set at $p = 0.05$.
Results: Ninety-four anesthesia care team members were invited to complete the pre- and post-surveys, and forty-two completed both for comparison. Preliminary data demonstrates significant differences in the pre- and post-survey for three of six survey questions. The questions with a significant difference include use of a formalized handoff for each transfer of care ($p=0.041$), performed handoffs to include all categories on the handoff tool ($p=0.010$), and received handoffs including all categories in the handoff tool ($p=0.007$). Documentation within the EMR to compare an objective rate of compliance before and after the intervention is pending through retrospective chart review.
Conclusion: Compliance with a standardized, intraoperative anesthesia handoff is critical to improving quality of care and patient safety. New tools are being introduced to improve the quality of handoffs, and it is important that anesthesia care team members are properly educated on the use and significance of these new tools related to patient safety. This study demonstrates that, after a simple educational intervention, self-reported compliance with a formalized handoff and delivery of complete handoffs became more frequent among senior staff anesthesiologists, anesthesia residents, and nurse anesthetists in the anesthesia care team at a tertiary, teaching

hospital. Further investigation is warranted to understand long-term sustainability and actual compliance to handoff procedures following an educational intervention.

Summary: An educational intervention to improve intraoperative anesthesia handoffs via a standardized checklist was performed for anesthesia care team members at an academic institution. A pre- post-intervention survey showed significant change in three of six survey questions. Measured objective rates of compliance with the standardized handoff via documentation in the EMR is ongoing and may be used to determine long-term sustainability of this quality improvement initiative.