Mini Oral Session I

Cefoxitin vs. Ceftriaxone and Metronidazole in Reducing Surgical Site Infection in Trauma Laparotomy Population

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Background:
Surgical site infections (SSIs) is a substantial burden in terms of morbidity and cost to the healthcare system. It is reported to be around 15-25% in all abdominal surgeries. Perioperative antibiotic choice has an impact on the rate of SSI. Even then, there has been limited data to show how the perioperative antibiotic choice affects the rate of SSI in the trauma patient population undergoing abdominal surgery. At our institution, we previously used Cefoxitin as a perioperative antibiotic choice. We have made a transition to Ceftriaxone and Metronidazole in the past few years. The goal of this study is to examine how perioperative antibiotic choice affects the rate of surgical site infection in the trauma patient population undergoing laparotomies.

Hypothesis:
We hypothesized that there will be a lower rate of SSI in patients who received ceftrixaone & metronidazole vs. those who received cefoxitin alone.

Methods:
This is a retrospective review of the patients admitted to the Trauma service at Sentara Norfolk General who underwent emergent trauma laparotomies from January 2015 to June 2020. We then compared the rate of surgical site infections in patient who received cefoxitin vs ceftriaxone/metronidazole within a 30 day period. Inclusion criteria – ages 18-89, underwent an exploratory laparotomy, exclusively cefoxitin or rocephin/flagyl for perioperative antibiotic. Exclusion criteria – deceased within 7 days of operation, had perioperative antibiotics other than ceftriaxone/metronidazole or cefoxitin.

Results:
A total of 375 patients underwent trauma laparotomies from the above date range. After removing patients who did not meet the inclusion criteria, there were a total of 273 patients. 139 patients received cefoxitin for perioperative antibiotics. 134 patients received ceftriaxone/metronidazole for perioperative antibiotics. 19/139 (13.7%) had SSI in the cefoxitin group. 13/134 (9.7%) had SSI in the ceftriaxone/metronidazole group. There was no statistical difference in the rate of surgical site infection between the two groups ($p = 0.31$)

Conclusions:
There was no statistically significant differences in the rate of surgical site infection based on the choice of perioperative antibiotics. On further subset analysis, there was also no differences in rate of SSI in patients who had evidence of bowel injury during their operation(s) in both groups. Although there is a trend revealing fewer SSIs in the ceftriaxone/metronidazole group, it is not statistically significant. Overall, in patients who undergo trauma laparotomies, there may not be a difference in using cefoxitin vs. ceftriaxone/metronidazole in reducing the risk of SSI's.

Improving Proper Use of antibiotic Prophylaxis

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Background:

Surgical site infections are largely avoidable and up to one-half can be prevented through the successful implementation of clinical practice guidelines. Timely surgical antibiotic prophylaxis (SAP) administration is one of most effective management strategy to reduce SSI. As part of an ongoing surgical quality improvement project at Yekatit12 Hospital (Y12) we assessed current surgical antibiotic prophylaxis practices.

Hypothesis:

We hypothesized that preoperative prophylactic antibiotic administration would not be entirely compliant with best practices per Ethiopian national surgical antibiotic prophylaxis administration guidelines.

Methods:

Data were collected from December 2020 to January 2021 on 119 patients undergoing general and obstetric surgery at Yekatit 12 Hospital Medical College via direct observation traine nurses and analyzed using SPSSv25. A fishbone and driver diagrams were used for root cause analysis and change idea generation along with brainstorming the stakeholders.

Results:

Table 1. Surgical prophylactic antibiotics administration at Yekatit 12 HMC.

Total N=119	Wound class	#	Status of antibiotics	#	%
Elective cases	Clean	24	Given	19	79.2
	Clean-contaminated	11	Given	11	100
	Contaminated	2	Given	2	100
Emergency cases	Clean	46	Given	44	95.6
	Clean contaminated	27	Given	27	100
	Contaminated	6	Given	5	83.3
	Dirty	3	Given	3	100

Most 93% of patients received surgical prophylactic antibiotic, however none of them received medications as per national guideline for preoperative antibiotic prophylaxis indication. Out of 119 patients, 95% had skin incision within 60 minutes. All patient with time of incision > 60 minutes were given antibiotics in the ward.

Conclusions:

This baseline study shows that proper administration of surgical antibiotics prophylaxis is not as per national standard, with particular gaps in the prophylactic antibiotic administration for clean, elective cases. Further study, process improvement and the development of local antibiograms is recommended.

Antibiotic course before and after positive wound culture and bacterial species in patients with open long-bone fracture

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Background:
To decrease infection rates, EAST and TQIP recommend prophylactic antibiotics for open fractures, emphasizing early initiation within 1h of hospital arrival and discontinuation after ≤72h. However, infection develops despite these practices.

Hypothesis:
Overdiagnosis of infection may have led to inappropriately extended antibiotic courses in patients with open fractures.

Methods:
We performed a retrospective case series of adult patients with open long-bone fractures who developed bacterial colonization or infection of their open fracture wounds as determined by positive culture at 6 level 1 trauma centers in 1/1/18-12/31/19. Demographics, clinical characteristics, treatments, and cultured organisms were recorded on all patients.

Results:
There were 16 patients with open long-bone fractures who had a positive bacterial culture during the study period (Table 1). Eleven patients (69%) received prophylactic antibiotics within 1h of arrival, and 15 (94%) received antibiotics within 6h. Wound irrigation was performed within 1h of arrival in 9 (56%) patients and within 6h in 14 (88%) patients. Patients with positive cultures had these collected a median of 10d (IQR 7-15d) after arrival. The median duration of the prophylactic antibiotic course was 6d (IQR 4-8d) for those patients with no positive cultures during this initial course. The median antibiotic course after a positive culture was 20d (IQR 9-32).

Table 1. Clinical characteristics of open fractures, bacteria detected on culture, and treatment courses

Patient	Sex	Age	Cause of injury	Fracture location	Fracture grade	Arrival to positive culture collection (d)	Species present	Infection types	Arrival to IV abx (h)	IV abx coverage	Initial abx course (d)	Abx course after positive culture (d)	Arrival to washout (h)
1	M	24	Pedestrian struck by car	Femur	3a	18	*Enterobacter cloacae* complex, *Enterococcus faecalis*	Gram+, gram-, anaerobic	2	Gram+, gram-, aerobic	7	4	2
				Tibia	3c		*Enterobacter cloacae* complex, *Enterococcus faecalis*						
2	F	42	MVA	Tibia	3a	13	Rare gram+ cocci in pairs, *Stenotrophomonas maltophilia*, *Acinetobacter baumannii*	Gram+, gram-, aerobic	1	Gram+, gram-, aerobic, anaerobic	3	48	1
3	F	27	MVA	Femur	3a	23	*Prevotella bivia*, *Staphylococcus* sp.	Gram+, gram-, anaerobic	<1	Gram+, gram-, aerobic, anaerobic	4	41	1
4	M	35	ATV accident	Tibia	3a	5	*Clostridium sporogenes*, *Klebsiella oxytoca* /*Enterobacter raffinosus*, *Pseudomonas fluorescens* /*Stenotrophomonas* sp.	Gram+, gram-, aerobic, anaerobic	<1	Gram+, gram-, aerobic, anaerobic	4	10	<1
5	M	67	MCA	Tibia	3c	11	*Enterococcus faecalis*	Gram+, anaerobic	<1	Gram+, gram-, aerobic, anaerobic	6	6	<1
6	M	46	ATV accident	Radius	3c	3	*Cutibacterium acnes*, *Streptomyces* sp., *Acinetobacter baumannii*, *Stenotrophomonas maltophilia*, *Ochrobactrum anthropi*	Gram+,gram-, aerobic, anaerobic	<1	Gram+, gram-, aerobic, anaerobic	49 (positive culture during initial course)	46	<1
7	M	37	Explosion	Radius	3c	9	*Pseudomonas aeruginosa*	Gram-, aerobic	11	Gram+, gram-, aerobic, anaerobic	32 (positive culture during initial course)	24	11
				Ulna	3c		*Citrobacter braakii*						
8	F	32	Aircraft accident	Radius	3a	8	*Streptomyces* sp., *Acinetobacter baumannii*	Gram+, gram-, aerobic	<1	Gram+, gram-, aerobic, anaerobic	25 (positive culture during initial course)	18	1
9	M	23	MCA	Tibia	3b	9	*Enterococcus faecalis*	Gram+, anaerobic	1	Gram+, gram-, aerobic	5	30	3
10	M	28	MVA	Humerus	3a	<1 (8hr)	*Enterococcus durans*	Gram+, anaerobic	<1	Gram+, gram-, aerobic, anaerobic	36 (positive culture during initial course)	36	8
11	M	59	MVA	Tibia	Unknown	14	*Burkholderia cepacia*, *Mycobacterium fortuitum* complex	Gram+, gram-, aerobic	<1	Gram+, gram-, aerobic, anaerobic	10	5	<1
12	M	72	Pedestrian struck by car	Tibia	3b	3	Rare mixed gram- flora, few *Escherichia* sp., few *Enterobacter cloacae* complex, few mixed gram+ flora	Gram+, gram-, anaerobic	<1	Gram+, gram-, aerobic, anaerobic	1	9	4
				Fibula	3b		Few mixed gram+ flora, rare mixed gram- flora, few *Enterobacter cloacae* complex, few *Escherichia* sp.						
13	M	36	MVA	Fibula	3c	9	Moderate *Pseudomonas fluorescens* complex, moderate *Enterobacter cloacae* complex	Gram-, aerobic, anaerobic	3	Gram+, gram-, aerobic, anaerobic	29 (positive culture during initial course)	22	4
				Tibia	3c		Moderate *Pseudomonas fluorescens* complex, moderate *Enterobacter cloacae* complex						
				Fibula	3b		Few *Enterobacter cloacae* complex						
				Tibia	3b		Few *Enterobacter cloacae* complex						
14	M	32	MVA	Fibula	3b	15	Rare *Staphylococcus* sp.	Gram+, anaerobic	6	Gram+, gram-, aerobic, anaerobic	10	9	1
				Tibia	3b		Rare *Staphylococcus* sp.						
15	M	27	MVA	Tibia	1	22	Few *Enterobacter cloacae* complex	Gram+, anaerobic	3	Gram+, gram-, aerobic	8	30	1
				Fibula	1		Few *Enterobacter cloacae* complex						
16	M	61	MCA	Tibia	3b	15	Anaerobes (unspecified)	Anaerobic	<1	Gram+, gram-, aerobic, anaerobic	17 (positive culture during initial course)	9	3

Abx, antibiotics; MVA, motor vehicle accident (car); MCA, motorcycle accident; ATV, all-terrain vehicle.

Conclusions:

Most patients in this study received timely washout and appropriate initiation of prophylactic antibiotics. The positive cultures collected contained bacterial species potentially representative of superficial colonization or debris left from incomplete washout (Table 1). However, positive cultures led to extended courses of antibiotics (median 20d), without proper determination of whether the result indicated actual infection. Even when there were no positive cultures during the initial prophylactic course, patients still received prophylactic antibiotics for longer than the recommended duration (median 6d). Improved methods of differentiating infection from colonization and adherence

to EAST/TQIP guidelines for prophylaxis are needed to ensure more responsible antimicrobial stewardship at the six participating sites and reduce extended antibiotic courses.

Role of empiric anti-fungal therapy in patients with perforated peptic ulcers

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Background:
It is unclear if the addition of anti-fungal therapy for perforated peptic ulcers (PPU) leads to improved outcomes.

Hypothesis:
We hypothesized that empiric anti-fungal therapy is associated with better clinical outcomes in critically ill patients with PPU.

Methods:
The 2001-2012 Medical Information Mart for Intensive Care (MIMIC-III) database was queried for patients with PPU and the included subjects were split into two groups depending on receipt of anti-fungal therapy. Propensity score matching by surgical intervention, mechanical ventilation (MV), and vasopressor administration was then performed and clinically important outcomes were compared. Multiple logistic regression was performed to calculate the odds of a composite endpoint (defined as “alive, hospital-free, and infection-free at 30 days”).

Results:
A total of 89 patients with PPU were included, of which 52 (58%) received empiric anti-fungal therapy (Table 1). Propensity score matching resulted in 37 pairs. On logistic regression controlling for surgery, vasopressors, and MV, receipt of anti-fungal therapy was not associated with higher odds (OR=1.5, 95% CI 0.5, 4.7, p=.4798) of the composite endpoint (Table 2).

Conclusions:
In critically ill patients with perforated peptic ulcer, receipt of anti-fungal therapy, regardless of surgical intervention, was not associated with improved clinical outcomes. Selection bias is possible and therefore randomized controlled trials are required to confirm/refute causality.

		Anti-fungal therapy		
	Total (n=89)	No Anti-fungal (n=37)	Anti-fungal (n=52)	p-value
Age (years)	64 [53-78]	62 [52-77]	65 [55-78]	0.54
Female (%)	44 (49)	20 (54)	24 (46)	0.60
Weight (kg)	80.2 [70.1-97.4]	75.0 [69.0-90.0]	84.0 [71.6-100.0]	0.27
Comorbidities				
Hypertension (%)	32 (36)	11 (30)	21 (40)	0.42
Diabetes mellitus (%)	9 (10)	3 (8)	6 (12)	0.73
Coronary artery disease (%)	9 (10)	2 (5)	7 (14)	0.30
Perforated ulcer type				
Gastric (%)	28 (31)	9 (24)	19 (36)	
Duodenal (%)	54 (61)	25 (68)	29 (56)	
Gastrojejunal (marginal) (%)	6 (7)	3 (8)	3 (6)	
Unspecified (%)	1 (1)	0	1 (2)	
Lactic acid level on admission	1.7 [1.4-3.4]	1.5 [1.0-3.4]	1.7 [1.4-3.3]	0.51
Vasopressors on admission (%)	10 (11)	2 (5)	8 (15)	0.18
Mechanically ventilated on admission (%)	18 (20)	5 (14)	13 (25)	0.28
Surgery (%)	50 (56)	19 (51)	31 (60)	0.58
Anti-fungal duration (days)	7 [4-12]		7 [4-12]	

Data are presented as median [IQR] for non-parametric continuous variables and frequency (%) for categorical variables.

		Propensity Score Matched		
	Total (n=89)	No anti-fungal (n=37)	Anti-fungal (n=37)	p-value
Hospital LOS (days)	12 [7-21]	9 [6-13]	16 [10-24]	**0.001**
30-day hospital-free days	13 [0-20]	20 [0-23]	9 [0-17]	**0.007**
ICU LOS (days)	4 [2-9]	3 [1-5]	6 [2-10]	**0.03**
Ventilator days	0 [0-0]	0 [0-0]	0 [0-1]	**0.001**
30-day ventilator-free days	30 [30-30]	30 [30-30]	30 [29-30]	**0.001**
Intra-abdominal abscess (%)	13 (15)	4 (11)	4 (11)	1
In-hospital mortality (%)	20 (23)	10 (27)	7 (19)	0.58
Alive, hospital-free, and infection-free at 30 days (%)	52 (58)	23 (62)	22 (59)	1

Data are presented as median [IQR] for non-parametric continuous variables and frequency (%) for categorical variables. LOS = length of stay; ICU = intensive care unit

Is Antibiotic Prophylaxis Indicated for Transperineal Prostate Biopsy? Local Antibiogram Findings to Inform Selection

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Background:

Transperineal (TP) prostate biopsy avoids rectal flora with less infectious risk than transrectal biopsy. The role of antibiotic prophylaxis remains undefined.

Hypothesis:

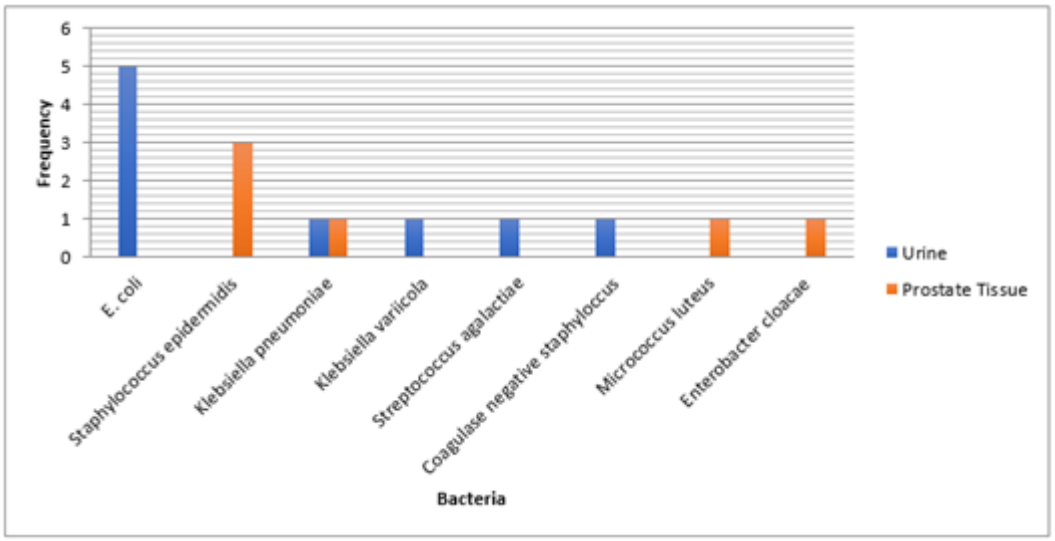
We examined genitourinary and rectal colonization in men undergoing transperineal prostate biopsy to guide future antibiotic selection.

Methods:

We evaluated patients undergoing TP biopsy at a single ambulatory surgical center from 2019 to 2020. Preoperative negative urinalysis was required, and procedural IV cefazolin and gentamacin prophylaxis was used. Catheterized urine, prostate tissue, and rectal swab cultures were taken at the

time of the procedure. We examined culture positivity, resistance patterns, and procedural complications.

Results:
146 TP biopsies were included. Median age was 65 (61-72), mean prostate volume was 60 (11-226), and mean PSA was 7.8 (0.84-60). 13 (8.9%) patients harbored positive genitourinary cultures including 7 (4.79%) positive urine cultures, 4 (2.74%) positive prostate tissue cultures, and 2 (1.37%) with bacteria in both the urine and prostate tissue. Escherichia coli was the most common bacteria on urine culture and staphylococcus epidermidis was the most common bacteria on prostate culture (Table 1). There were 8 unique bacteria isolated with variable resistance patterns (Table 2). Fluoroquinolone resistance was identified in 9/64 (14%) of the rectal swab isolates reflecting the overall community-level resistance. Despite culture findings, there was no post biopsy sepsis or infectious complications. One patient developed CAUTI-sepsis at day 10 secondary to prolonged catherization.



		GRAM POSITIVE ISOLATES																								
		Beta Lactam Antibiotics											Inhibitor Combinations			Quinolones		Aminoglycosides			Others						
Organism	# Isolates	Ampicillin	Penicillin	Oxacillin	Aztreonam	Cefazolin	Cefepime	Cefoxitin	Ceftriaxone	Ertapenem	Imipenem	Meropenem	Ampicillin / Sulbactam	Amoxi-Clavulanic Acid	Piperacillin Tazobactam	Ciprofloxacin	Levofloxacin	Amikacin	Gentamicin	Tobramycin	Teicoplanin	Vancomycin	Erythromycin	Clindamycin	Tetracycline	Rifampin	Trime Sulfa	Nitrofurantoin
Staphylococcus epidermidis	3		0	67		67							67						67			100	33	67	67	100	67	
Micrococcus luteus	1			0		0							0						100			100	100	100	100	100	100	
Coag. Neg. staphylococcus	1																											
Streptococcus agalactiae	1																											
		GRAM NEGATIVE ISOLATES																										
Escherichia coli	5	60			100	100	100	100					60	80	80	80	80	100	100	100	100						60	100
Klebsiella pneumoniae	2	0			100	100	100	100	100	100	100	100	100		100	100	100	100	100	100	100						100	
Klebsiella variicola	1	0			100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100						100	
Enterobacter cloacae	1	0			100	0	100	0	100	100	100	100	0	0	100	100	100	100	0	0							100	
Data Presentation: 1. Duplicate Isolates Excluded 2. Numbers represent % Susceptible 3. Graged out cells indicate drugs not tested																												

Conclusions:
In this review of transperineal prostate biopsies using single-dose IV cefazolin and gentamicin prophylaxis, 8.9% (n=13) of men harbored occult positive urine and/or prostate tissue cultures at the time of biopsy despite negative urinalysis, although there were no immediate infectious

complications. Thus, there seems to remain a risk of infectious complications and prophylaxis should be considered based on local resistance patterns.

Improving antibiotic stewardship in acute appendicitis through risk-based empiric treatment selection.

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Background:
Empiric antimicrobial treatment selection for the management of appendicitis is based on patient risk of infection with drug-resistant pathogens. Based on available guidelines, only high risk patients should receive extended spectrum antibiotics. After observing prescribing habits at our institution, a substantial use of piperacillin-tazobactam was noted.

Hypothesis:
Implementation of an educational initiative directed at surgical and emergency medicine residents would reduce inappropriate antimicrobial use and improve cost-efficiency of care for acute appendicitis.

Methods:
Utilizing Plan-Do-Study-Act methodology, a quality improvement project was performed at an academic medical center. We designed educational materials to guide risk-based empiric antimicrobial treatment selection for adult patients presenting with acute appendicitis. Project implemention was on January 1, 2020. High risk criteria included presence of shock, presence of one or more comorbidities, and healthcare associated appendicitis. Retrospective chart review of eligible patients was conducted between January 1, 2019 to December 1, 2020. Pre-post implementation analysis and run charts were performed. Primary outcome was receipt of the correct antibiotic by risk criteria. Secondary outcomes included antibiotic cost. Pre- and post-intervention implementation were compared using univariate analysis with statistical significance set at $p<0.05$.

Results:
A total of 138 patients, including 85 patients in the pre-implementation group and 53 in the post-implementation group, underwent laparoscopic appendectomy for acute appendicitis. Demographics, vital signs, and lab results were similar between the two groups, the exception being heart rate (Pre= 77.6 + 16.0, Post= 87.5 + 18.7, p=0.002). Compared to the pre-implementation group, the post-implementation group were 19.1% more likely to receive the correct antibiotic based upon risk criteria (Pre=31.8%, Post= 50.9%, p= 0.03). Ceftriaxone plus metronidazole usage increased 58.5% (Pre=9.4%, Post=67.9%, p<0.0001). Mean pharmacy cost per patient was reduced by $32.40 (Pre= $60.20 + $25.53, Post= $27.80 + $24.20, p= <0.0001). There were no differences in complications (Pre=2.4%, Post=0%, p=0.26) or readmissions (Pre= 2.34%, Post= 1.9%, p=0.86).

Conclusions:
Following an implementation period of educational awareness, we observed an increase in the number of patients receiving the appropriate antibiotics. Importantly, prescribing habits were altered with no adverse impact on clinical outcomes. The next phase of this quality improvement project will address sustainability by incorporating an electronic medical record order set to integrate just-in-time education within the provider workflow.

Can MRSA Nasal Screening Safely Guide Empiric Vancomycin De-Escalation for Suspected Pneumonia in Surgical Patients?

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Background:
In surgical patients with bacterial pneumonia, empiric regimens routinely include vancomycin for methicillin resistant *Staphylococcus aureus* (MRSA) coverage. Nare MRSA PCRs detect MRSA colonization and have been used to predict MRSA pneumonia and guide vancomycin discontinuation in medical patients. This has not been studied in surgical patients who are higher risk for MRSA colonization. The goal of this study was to assess if we can safely reduce empiric vancomycin therapy by validating MRSA nasal swab PCR in surgical patients with bacterial pneumonia.

Hypothesis:
MRSA nasal swab PCR screening can effectively rule out MRSA pneumonia in surgical patients.

Methods:
We performed a single center, retrospective cohort study of adult surgical patients with MRSA PCR nasal swabs performed January 1, 2020 through December 31, 2020. We included patients with bacterial pneumonia, diagnosed based on positive respiratory cultures treated with antibiotics. We calculated predictive values for MRSA pneumonia with MRSA nasal swab PCR screening, using respiratory culture as the diagnostic gold standard. We also evaluated PCR turnaround time for de-escalation effectiveness.

Results:
Seventy-three patients had a MRSA nasal PCR and diagnosis of bacterial pneumonia. The patients were majority male (81%) and non-white (79%) with an average age of 50 years. Six (8%) patients had confirmed MRSA pneumonia, and all six had positive MRSA nasal PCRs. Overall, the MRSA nasal PCRs were positive in 16 (22%) patients. The MRSA nasal swab PCR demonstrated 100% sensitivity, 85% specificity, 38% positive predictive value, and 100% negative predictive value (Table 1). The MRSA nasal PCR resulted, on average, 6 hours after collection.

		Culture Results		
		MRSA Pneumonia	Non-MRSA Pneumonia	
Nasal Swab	MRSA Detected	6	10	16
	MRSA Not Detected	0	57	57
		6	67	73

Conclusions:
In this study of surgical patients, there was no MRSA pneumonia in patients with a negative MRSA nasal swab PCR, indicating its high negative predictive value. The quick turnaround time of the MRSA PCR allows for early discontinuation of empiric vancomycin, often after one dose, in patients with a negative result. MRSA PCR reduces vancomycin use and laboratory monitoring cost and may decrease the development of resistant bacterial strains and risk of nephrotoxicity from empiric antibiotic combination.

Effect of early antibiotic administration on deep tissue infection rates among open tibia fractures

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Background:
The American College of Surgeons Trauma Quality Improvement Program recommends that patients with open fractures receive prophylactic antibiotics within one hour of presentation. However, considerable variability exists among society guidelines, and optimal timing of antibiotic prophylaxis has not been established.

Hypothesis:
Administration of antibiotic prophylaxis within one hour of presentation reduces the risk of deep tissue infections among patients with open tibia fractures.

Methods:
This retrospective, observational, single-center study included adults admitted at an academic Level 1 Trauma Center with open tibia fractures from January 2015 to May 2017. Patients were excluded for length of stay <48 hours or incomplete data on antibiotic administration. Patients receiving antibiotics within 60 minutes of presentation (early group) were compared to those receiving antibiotics >60 minutes (late group). The primary outcome was the proportion of clinically significant deep tissue infections in early vs. late groups. Statistical analysis was done with Cox proportional hazards models and propensity scores adjusting for covariates, including age, tobacco use, and number of fractures. Additional sensitivity analyses compared the subset of Gustilo-Anderson grade III open fractures.

Results:
Analysis included 229 open tibia fractures, 153 (67%) in the early group and 76 in the late group. Median time from presentation to antibiotic administration was 28.2 minutes (interquartile range, IQR, 13.8-105 minutes). Overall, 23 (10%) developed deep infections at a median 25 days. Of 132 grade III fractures (57.6%), 18 (14%) developed deep infections despite receiving antibiotics at a median 20.4 minutes (IQR, 12-70.2 minutes). There was no significant difference in the primary outcome of deep infection between the early and late antibiotic groups, and no difference in deep infection with increasing time-to-antibiotic administration. After adjusting for covariates, Gustilo-Anderson grade was the only factor predicting a significant risk of developing a deep infection. Trauma team activation was associated with a higher chance of receiving antibiotics within 60 minutes.

Conclusions:
This study does not provide convincing evidence that antibiotic prophylaxis within one hour of presentation reduces the risk of deep tissue infections in patients with open tibia fractures. However, our institutional practice of prompt administration of prophylactic antibiotics for this population (median <30 minutes) has led to a low infection rate. Our study reaffirms the importance of Gustilo-Anderson open fracture grading in assessing the risk of downstream deep tissue infections.

Short term vs. Long term Empiric Antibiotic treatment for open facial fractures. Is there a difference in Outcome?

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Background:
There continues to be significant debate regarding antibiotic management for trauma patients with open facial fractures. This debate is most notable in regards to the use and duration of empiric treatment.

Hypothesis:

We hypothesized that longer antibiotic courses of empiric antibiotics are associated with improved clinical outcomes for these patients.

Methods:
Our prospectively maintained Trauma Registry was queried from 2005 to 2018 for patients diagnosed with open facial fractures. Demographics, fracture types, antibiotic treatments, and outcomes were abstracted. Patients with AIS scores >2 in other anatomical regions were excluded. Patients were stratified into two groups: short-term antibiotic treatment (≤7 days) and those receiving long-term antibiotic treatment (>7 days). These short-term and long-term groups were subsequently analyzed by Chi-Square and continuous variables by the Student t-test using STATA.

Results:
84 patients were identified as having open facial fractures. 57 patients (66.9%) received short-term antibiotic treatment and 27 (32.1%) received long-term treatment. A total of 4 of the 84 patients (4.8%) were diagnosed with facial abscesses related to the facial fracture. All 4 of these infections were diagnosed in patients who received short-term empiric antibiotics in the initial admission, 3 out of these patients (75%) were readmitted due to infectious complications, and 2 (50%) went back to the OR for wound washout. Despite no significant differences in demographics or ISS between the two groups, patients receiving long-term antibiotic therapy were more likely to be admitted to the ICU (88.9% vs. 26.3%, $p<0.001$), increased ICU days (12.7 ± 9.4 days vs. 3.0 ± 1.7 days; $p<0.001$) and were more likely to go to the OR (85.2% vs. 63.1%; $p=0.049$).

Conclusions:
Open facial fractures pose a complex clinical challenge, as there is currently insufficient evidence to evaluate the efficacy of short-term vs. long-term antibiotic treatment. While our data demonstrate that failure in early aggressive empiric therapy may lead to infectious-related readmissions, longer antibiotic courses were associated with greater resource utilization. Prospective trials with larger cohorts are required to further assess the proper empiric management of these complex traumatic injuries.

The association between fecal contamination and outcomes after emergent colorectal resection: A post hoc analysis

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Background:
The impact of fecal contamination on clinical outcomes in patients undergoing emergent colorectal resection is unclear.

Hypothesis:
We hypothesized that fecal contamination is associated with worse clinical outcomes regardless of operative technique.

Methods:
This is a post hoc analysis for an Eastern Association for the Surgery of Trauma-sponsored multicenter study that prospectively enrolled patients undergoing urgent/emergent colorectal resection. Subjects were categorized according to method of colonic management (primary

anastomosis [ANST] vs. ostomy [STM]). Propensity score matching (1:1) by age, weight, Charlson Comorbidity Index, and preoperative vasopressor use was performed. Subjects were then grouped into Absence vs Presence of fecal contamination and chi-squared analysis was performed to compare the composite outcome (anastomotic dehiscence, surgical site infection (SSI), and fascial dehiscence).

Results:
A total of 342 subjects were included, of which 119 (35%) had ANST and 223 (65%) had STM (Table 1). Propensity score matching resulted in 238 subjects, of which 75 (32%) had fecal contamination (Table 2). After controlling for provider-selected operative technique, fecal contamination was associated with higher odds of the composite outcome (OR: 3.76, 95% CI: (2.06, 6.94) p=.008).

Conclusions:
In patients undergoing emergent colorectal resection, fecal contamination, regardless of operative technique, is associated with worse clinical outcomes. Selection bias is possible, thus randomized controlled trials are needed to confirm or refute a causal relationship.

		Colonic management method	
	Total (n=342)	ANST (n=119)	STM (n=223)
Age (years)	64 [54, 73]	62 [49, 71]	65 [56, 74]
Female (%)	159 (47)	52 (44)	107 (48)
Weight (kg)	76 [65, 92]	77 [65, 92]	76 [64, 91]
Height (cm)	168 [160, 177]	168 [160, 177]	168 [161, 177]
Tobacco (current or former) (%)	163 (48)	56 (47)	107 (48)
Diabetes (%)	85 (25)	27 (23)	58 (26)
Liver disease (%)	23 (7)	2 (2)	21 (9)
Cerebrovascular disease (%)	32 (9)	12 (10)	20 (9)
Ischemic heart disease (%)	54 (16)	15 (13)	39 (18)
Congestive heart failure (%)	48 (14)	14 (12)	34 (15)
Malignancy (%)	72 (21)	28 (24)	44 (20)
Chronic kidney disease (%)	56 (16)	13 (11)	43 (19)
Chronic pulmonary disease (%)	62 (18)	17 (14)	45 (20)
Inflammatory bowel disease (%)	9 (3)	2 (2)	7 (3)
Prior laparotomy (%)	95 (28)	32 (27)	63 (28)
CCI			
0	45 (13)	26 (22)	19 (9)
1	52 (15)	26 (22)	26 (12)
2	62 (18)	29 (24)	33 (15)
3	39 (11)	12 (10)	27 (12)
4	72 (21)	19 (16)	53 (24)
≥5	158 (46)	50 (42)	108 (48)

Data are presented as median [IQR] for non-parametric continuous variables and frequency (%) for categorical variables. CCI = Charlson Comorbidity Index

	Propensity score matched on method of colonic management			
		Fecal contamination		
	Total (n=238)	No (n=163)	Yes (n=75)	p-value
Hospital LOS (days)	12 [7-21]	11 [6-17]	16 [9-29]	**<.001**
ICU LOS (days)	3 [0-8]	2 [0-7]	4 [2-10]	**.0015**
Anastomotic dehiscence (%)	16 (7)	7 (4)	9 (12)	.054
SSI (%)	50 (21)	24 (15)	26 (35)	**<.001**
Facial dehiscence (%)	11 (5)	6 (4)	5 (7)	.33
In-hospital mortality (%)	19 (12)	9 (12)	28 (12)	1
Composite endpoint: Anastomotic dehiscence, SSI, and facial dehiscence (%)	65 (27)	30 (18)	35 (47)	**.008**

Data are presented as median [IQR] for non-parametric continuous variables and frequency (%) for categorical variables. LOS = length of stay; ICU = intensive care unit; SSI = surgical site infection

Which Combinations of EGS Procedures Increases the Risk of Mortality?

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Background:
It is unknown whether certain combinations of Emergency General Surgery (EGS) procedures performed in one admission confer additional risk of mortality.

Hypothesis:
We hypothesized that specific combinations of procedures (e.g. hernia repair plus bowel resection) would be associated with differential mortality odds, compared with patients who had only one EGS procedure.

Methods:
Using the 2017 National Inpatient Sample, we identified patients with the following EGS procedures types identified by ICD-10 code: colon, small bowel (SB), hernia, lysis of adhesions (LoA), ulcer procedures, gallbladder (GB), debridement, other laparotomy (Exlap), and other laparoscopy. Frequency of combinations were identified using association rule mining. Using logistic regression, we assessed the odds of mortality with singleton procedures, all possible dyads (2-procedure combinations), and the most common triads (3-procedure combinations) while adjusting for age, sex, payer, race and Elixhauser comorbidity count. Patients with any single procedure was the reference group and results are presented as Odds Ratio; 95% CI.

Results:
A total of 216,317 EGS patients (median age 57 [IQR 43-70], 50.6% female) were included, and 2.8% died. Singleton and dyad combinations are presented (Table). Dyad combinations that included Exlap generally had the highest risk of mortality, with the combination of Ulcer/Exlap having the highest risk of death (15.5; 13.7-17.5). Dyad combinations with the lowest risk of mortality were: GB/Hernia (0.2; 0.1-0.5) and GB/LoA (0.6; 0.4-0.95). The most common triads included colon/LoA/SB (3.6, 2.8-4.6), and LoA/SB/Hernia (2.1, 1.5-3.2).

Table: Odds Ratios for Singleton Procedure Types and Dyad Combinations

	Gallbladder	Debridement	Hernia	Lysis	Laparoscopy	Colon	Ulcer	SB	Laparotomy
Gallbladder	0.26* (0.23-0.30)	2.20 (0.93-5.19)	0.21* (0.09-0.46)	0.60* (0.38-0.95)	0.70 (0.47-1.03)	1.16 (0.58-2.31)	1.29 (0.52-3.21)	1.49 (0.72-3.12)	5.26* (2.57-10.76)
Debridement		0.60* (0.56-0.65)	1.38 (0.78-2.41)	1.47 (0.59-3.71)	2.33 (0.55-9.96)	3.65 (2.28-5.84)	0.47 (0.06-3.47)	5.25* (2.86-9.66)	4.86* (2.15-11.01)
Hernia			0.61* (0.52-0.73)	0.84 (0.57-1.13)	0.71 (0.26-1.92)	1.81* (1.27-2.59)	1.78 (0.90-3.53)	2.60* (2.08-3.23)	5.87* (3.51-9.81)
Lysis				1.21* (1.04-1.41)	0.78 (0.34-1.76)	1.97 (0.88-1.62)	1.75 (0.94-3.25)	2.97* (2.53-3.49)	3.86* (2.16-6.89)
Laparoscopy					1.77* (1.36-2.31)	1.98* (1.11-3.54)	2.26 (0.80-6.35)	1.48 (0.75-2.92)	9.30* (4.03-21.49)
Colon						2.12* (1.93-2.34)	6.37 (3.44-11.77)	4.55* (4.04-5.12)	6.48* (4.41-9.53)
Ulcer							3.31* (2.82-3.88)	3.17* (2.03-4.96)	15.47* (13.72-17.46)
SB								3.85* (3.41-4.34)	8.31* (5.15-13.40)
Laparotomy									11.66* (9.87-13.77)

Singleton Procedures are presented on the diagonal. * Indicates odds ratio p<0.05 in logistic regression, adjusted for age, sex, payer, race and Elixhauser comorbidity count.

Conclusions:
Specific combinations of EGS procedures confer a higher risk of mortality when compared with the mortality of individuals with only a single EGS procedure. Combined surgeries with the enteral tract (ulcer, SB, colon) also have increased risk of death, suggesting that encountering gut flora is a key mediator of risk. These findings suggest the need for greater preoperative discussion and planning for those patients who are likely to undergo multiple procedures in a single admission.

Multimorbidity and Long-term Survival after Admission for Emergency General Surgery Disease

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Background:
Multimorbidity (MM) is the co-occurrence of chronic disease, functional limitations, and geriatric syndromes. The effect of MM on long-term survival after admission for emergency general surgery (EGS) in geriatric patients is unknown.

Hypothesis:
We hypothesized MM would have variable survival effects for different EGS diseases.

Methods:
We utilized the Medicare Current Beneficiary Survey with linked Medicare data (1992-2013) to identify non-institutionalized older patients (aged 65+) who were surveyed yearly on health and

function. We calculated a validated MM score (range MM0-MM3) by assigning 1 point each for chronic disease, functional limitations, or geriatric syndromes. No MM (MM0/MM1) was used as a reference group. Disease groups included biliopancreatic (BP), colon, peptic ulcer/gastrointestinal bleeding (PUD), or small bowel/appendix/other. Age, sex, operative management, and time to death up to 3 years were collected. Kaplan-Meier survival curves and adjusted Cox proportional hazards models were estimated for the population and disease groups.

Results:
Of 1,938 participants, 59% were female, 37% had surgery, and 19% died. Median follow-up was 380 days. The most common diseases were colon (36%) and BP (25%). Most patients had moderate to severe MM (MM2=43%, MM3=38%). Survival was highest after BP and lowest with PUD (Figure). Surgery was associated with improved survival in BP but lower survival in PUD (Table). MM3 was associated with increased risk of death for all groups; the largest effect was in BP.

Conclusions:
Moderate to severe MM is typical in older patients admitted for EGS disease. Severe MM—the co-occurrence of chronic disease, functional limitations, AND geriatric syndromes–is associated with a significantly increased hazard for mortality in EGS patients. After adjusting for sex, age, and surgery, the impact of severe MM on the hazard of death was significant across all EGS conditions.

Figure. 3-Year Survival After Admission for an Emergency General Surgery Diagnosis

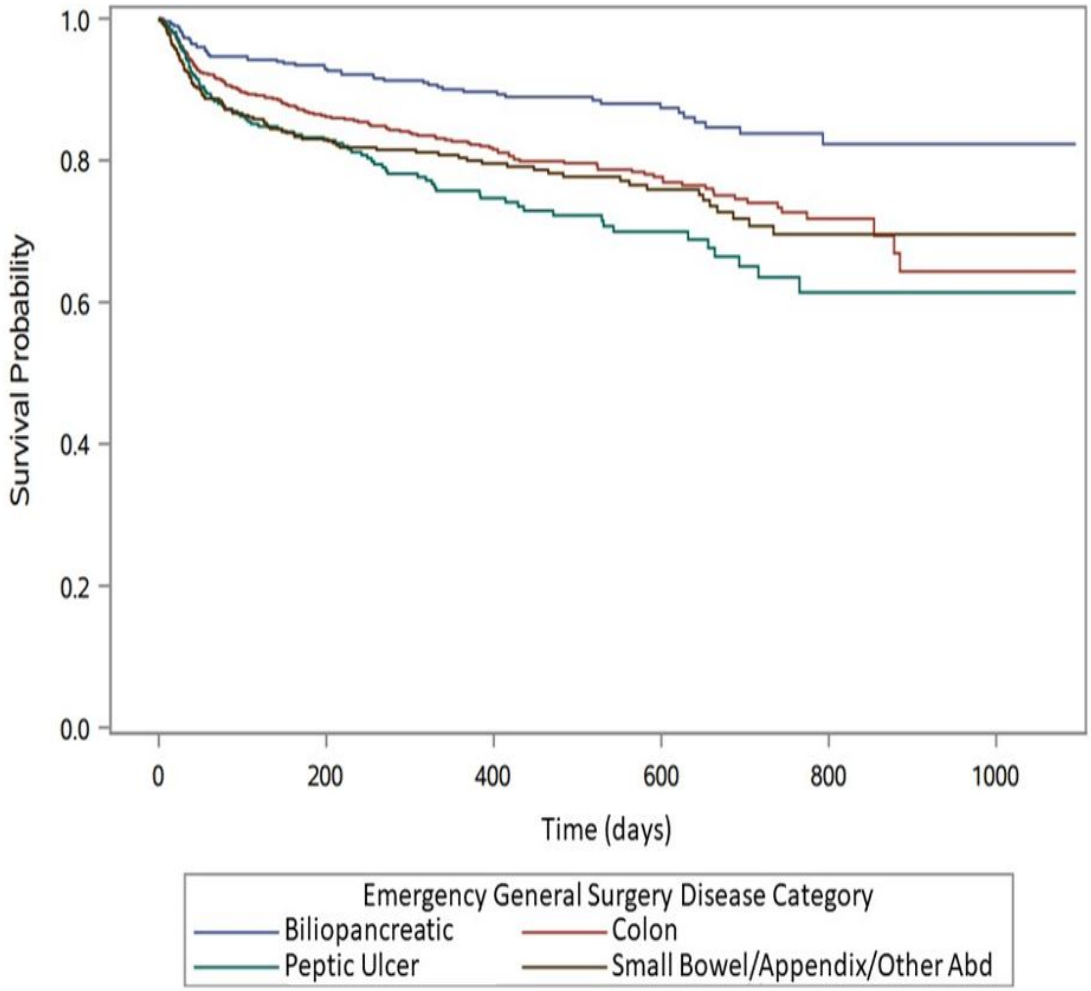

Table. Cox Proportional Hazards Models for 3-Year Mortality

Variable	All EGS n=1938	Biliopancreatic n=483	Colon n=715	Peptic Ulcer or GI Bleed n=315	Small Bowel or Appendix n=425
Surgery Performed	0.71 (0.56-0.90)*	0.57 (0.32-0.97)*	1.14 (0.78-1.66)	2.52 (1.20-5.31)*	0.64 (0.40-1.02)
Age	1.05 (1.03-1.06)*	1.07 (1.03-1.12)*	1.05 (1.03-1.09)*	1.02 (0.98-1.05)	1.05 (1.02-1.08)*
Male Sex	1.91 (1.55-2.35)*	2.12 (1.20-3.77)*	1.75 (1.26-2.44)*	2.53 (1.59-4.02)*	1.72 (1.14-2.61)*
Multimorbidity					
MM0/MM1	Ref	Ref	Ref	Ref	Ref
MM2	1.26 (0.90-1.77)	0.94 (0.37-2.38)	1.50 (0.89-2.53)	1.31 (0.64-2.67)	1.30 (0.62-2.72)
MM3	2.08 (1.48-2.91)*	2.72 (1.10-6.70)*	1.92 (1.13-3.25)*	2.14 (1.08-4.26)*	2.16 (1.03-4.52)*
Model Concordance	0.66	0.73	0.65	0.64	0.67

*Hazard Ratios (95% CI), alpha=0.05

Mini Oral Session II

Signs of Ongoing Infection Predict Mortality in V-V ECMO for COVID-19 ARDS

Zachary Bergman, University of Minnesota, Jillian Wothe, University of Minnesota, Fatima S. Alwan, University of Minnesota, Arianna Lofrano, Hennepin Medical Center, John Bohman, Mayo Clinic, Ramiro Saavedra-Romero, Hennepin Medical Center, Matthew Prekker, Hennepin Medical Center, Elizabeth Lusczek, University of Minnesota, Gregory J. Beilman, University of Minnesota, Melissa E Brunsvold, University of Minnesota

Background:
The use of V-V ECMO has been established as a successful therapy for severe ARDS in COVID-19 infection (Barbaro et. al., 2020). Survival has been reported between 62-74%, similar to outcomes of V-V ECMO for non-COVID-19 indications (Combes et. al., 2018). However, ECMO is a resource-heavy intervention and these patients often require long ECMO runs and prolonged stays in the ICU (Schmidt et. al., 2020). Identifying factors associated with mortality can provide insight into who should be considered for this intervention in the setting of COVID-19 and when goals of care should be addressed for those on prolonged ECMO.

Hypothesis:
Infectious complications of patients with COVID-19 ARDS placed on VV ECMO predict mortality.

Methods:
This was a retrospective cohort study that included all patients who were placed on either V-V ECMO or a hybrid of V-AV ECMO at one of 4 ECMO Centers of Excellence in the state of Minnesota between March 1, 2020 and November 1, 2020. Primary outcome was survival to 60-day follow-up. Secondary outcomes were hospital complications, infectious complications, and complications from ECMO.

Results:
There were 46 patients who met criteria during this study period and 30 survived to 60-day follow up (65.2%). Prior to cannulation, older patient age (55.5 in non-survivors versus 49.1 years in survivors, p = 0.03), lower P/F ratio (62.1 versus 76.2, p=0.04), and higher SOFA score (8.1 versus 6.6, p=0.02) were identified as risk factors for mortality. Following ECMO cannulation, increased mortality was associated with increased number of antibiotic days (25.9 versus 14.5, p=0.04), increased number of

transfusions (23.9 versus 9.9, p=0.03), elevated WBC at post-ECMO days 1-3, elevated D-dimer at post-ECMO day 21-27, and decreased platelet count from post-ECMO days 14 and onward (Figure 1).

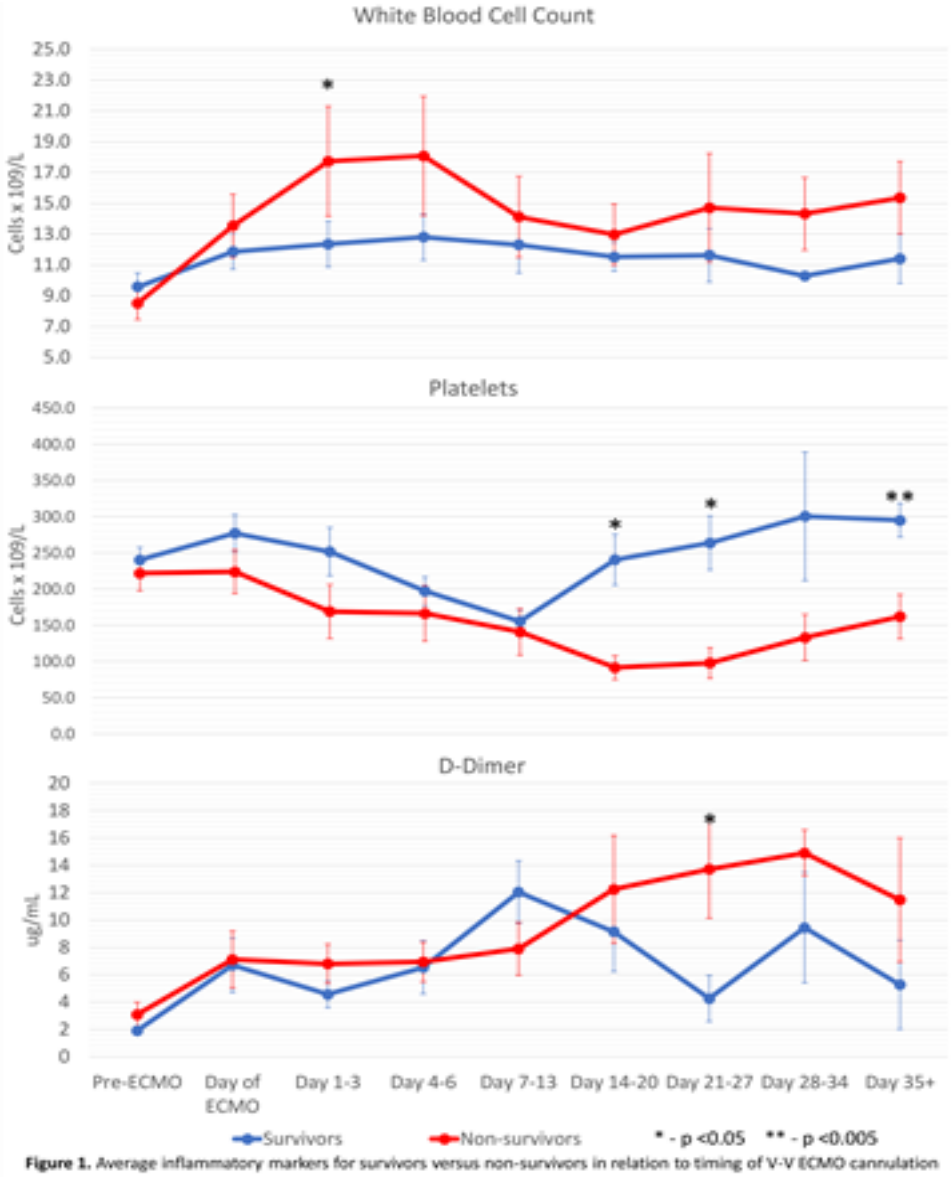

Figure 1. Average inflammatory markers for survivors versus non-survivors in relation to timing of V-V ECMO cannulation

Conclusions:
Multiple markers of infection including leukocytosis, thrombocytopenia, and increased antibiotic days are associated with increased mortality in patients placed on VV ECMO for COVID-19 infection and subsequent ARDS. Knowledge of these factors may assist with determining appropriate candidates for this limited resource as well as direct goals of care in prolonged ECMO courses.

Evaluation of a COVID-19 Designated Cohort Hospital in Minnesota

Fatima S. Alwan, , Zachary Bergman, Christopher Tignanelli, Jeffrey G. Chipman, Gregory J. Beilman, University of Minnesota

Background:

To address the unique challenges of the COVID-19 pandemic, M Health designated a single hospital within the system to serve as the hospital for both surge capacity and to cohort COVID-19 patients. Bethesda Hospital was previously utilized as a long-term acute care hospital (LTACH), but was rapidly and efficiently converted and functioned for 34 weeks during the peak of the pandemic. We aim to evaluate the outcomes of COVID-19 patients in the context of a cohort hospital for the COVID-19 pandemic.

Hypothesis:
Designating one hospital as a location to cohort COVID-19 patients is a feasible solution to isolate patients and minimize the risk of in-hospital transmission of COVID-19.

Methods:
Bethesda was transformed to a 96-bed hospital with 45 ICU beds and 51 medical beds. Patients diagnosed with COVID-19 requiring hospitalization throughout the M Health Fairview system were transferred as appropriate to Bethesda-COV using centralized triage process. We utilized literature as published to allow rapid cycle protocols and quality improvement and created a centralized database for all patients cared for with COVID-19 throughout our system. This data was used to analyze patient survival, morbidities, admission labs and vitals, and complications during hospitalization. Admission vitals, co-morbidities, and in-hospital complications were compared between hospital and ICU patients. Admission labs were compared using a t-test.

Results:
[See Figure attached.]

There were 878 total COVID-19 admissions to Bethesda-COV with an 86% survival rate. Albumin, WBC, CRP, ferritin, D-dimer, lactate, and procalcitonin were significantly different in the ICU patients compared to floor patients (P – value < 0.05).

Conclusions:
Bethesda Hospital was utilized during the COVID-19 pandemic as a designated site to cohort COVID-19 positive patients in the M Health Fairview hospital system. The organizational strategy to cohort patients reduced waste from fragmentation in the system and limited healthcare provider exposures associated with multiple hospitals. The cohort hospital approach is a viable way to address the evolving needs demanded of healthcare systems as it allows rapid-cycling learning and improvement during the COVID-19 pandemic.

Elective surgery in the time of COVID: implementation of a Perioperative Surgical Home model for Pre-op COVID-19 Testing

Lexie Vaughn, Jill Kinch, Kim Isenberg, Jeffrey S. Upperman, Vanderbilt University Medical Center

Background:
Early in the COVID-19 pandemic, elective surgeries were halted across the United States. In the interim, health care systems were challenged to prioritize safe and efficient pre-procedural testing. The pediatric population presented unique issues with testing access, safety, and limited resources.

Hypothesis:
We hypothesized that implementation of a Pre-procedure COVID-19 Testing Strategy would streamline perioperative care in the pandemic era for elective surgical and procedural volume while maintaining patient and hospital staff safety and preserving scarce resources.

Methods:
With IRB approval, we conducted a prospective observational mixed method study to explore the impact of a COVID-19 mitigation strategy in a pediatric tertiary care center. We conducted focus groups with content experts and hospital leadership. Themes were converted to strategic objectives

and content experts in perioperative planning developed a throughput algorithm. Case level data were extracted from the electronic health record and internal administrative databases. A paired Wilcoxon signed rank test was used for comparison of mean pre- (5/4/19 – 3/23/2020) and post-implementation (5/4/2020 – 3/1/2021) case volume and cancellation rate.

Results:
Experts determined that patient education, results reporting, and testing allocation were key objectives for our strategy. Clinical algorithms and content were developed and validated and clinical leaders assessed readiness for adoption through team-based meetings. In the pre-implementation period, an existing screening mechanism examined only 5% of over 22,000 scheduled cases. With our Pre-procedure COVID-19 Testing Strategy, 100% of scheduled cases (N= 20,466) were screened an appropriately triaged through our algorithm. There was no significant difference in the rate of case cancellation between the pre-implementation and post-implementation periods (9.2% and 9.5%, respectively; p= 0.19). Only 7.6% (N=134) of all cancellations in the post-implementation period were for a COVID-related reason, with 3.2% (N=57) due to failed pre-op testing and only 1.6% (N=28) secondary to a positive test. We report an asymptomatic COVID-19 positivity rate of 0.83% in this population. Of the over 19,000 tests tracked in our system, only 3.6% (N=720) rapid tests were utilized.

Conclusions:
With implementation of our pre-procedure COVID-19 Strategy, we demonstrate successful mitigation of barriers to pre-procedural testing through personalized patient/family education and improved operational efficiency with no increase in case cancellation due to COVID-19 and appropriate use of scarce resources.

Thrombotic Events and Anticoagulation-Related Bleeding Complications of COVID-19 Critical Illness

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Background:
COVID-19 critical illness (C19CI) has protean, consequential manifestations of its profound pro-inflammatory, hypercoagulable state. Thrombosis (T) is common, and high D-dimer levels, reflecting activated coagulation, correlate with morbidity and mortality (M). Anticoagulant prophylaxis appropriate for C19CI is debated amid concern about bleeding (B). Recently, for reasons unstated, the data monitoring/safety board of a NIH-sponsored trial (ACTIV-4) of full-dose anticoagulation for COVID-19 paused enrollment of C19CI patients (pts). Herein we review our results with full heparinization for C19CI.

Hypothesis:
Neither T events nor B affect the outcome of C19CI.

Methods:
Prospective study of 111 consecutive C19CI pts cared for by an acute care surgery service from March-June, 2020. 110 required mechanical ventilation. Coagulation biomarkers were followed, and pts were anticoagulated from admission with enoxaparin 1 mg/kg q 12 h (est. glomerular filtration rate [GFR] >30 mL/min) or unfractionated heparin IV (est. GFR $\leq$30 mL/min). Dosing and adjustments

were monitored by anti-Xa levels. Incidents of T (arterial, venous, catheter-related) and B were noted. Data shown as %, median [IQR]. Stats: Kruskal-Wallis, logistic regression; a=0.05.

Results:
32 pts (28%) had T, 23 (20%) had B, and 14 (12%) had both (TB); 42 (40%) pts were unaffected (C). APACHE II and M were as follow: C 24 {18, 30], 31%; T 28 [24, 31], 25%; B 27 [23, 30], 22%; TB 29 [19, 35], 14% (all, p=ns). D-dimer levels (N=5,000, normal < 229 ng/mL) were higher (p<0.001) among those with T with (3,037 [1,662, 6,745]) or without B (2,357 [1,361, 3,350]) compared with those with C (1,184 [486,2,125]); or B only (1,374 [1,164, 2,244]). There were no differences in anti-Xa or fibrinogen levels, or dosing of heparin or enoxaparin. Two logistic regression models (dependent variable, M) evaluated TB as T or TB as B. For TB as T, neither T (OR 0.59, 95% CI 0.22-1.54), B (0.60, 0.17-1.91), nor male sex (1.49, 0.52-4.99) predicted M; whereas also for TB as B, neither T (0.69, 0.23-1.97), B (0.52, 0.17-1.45), nor male sex (1.42, 0.48-4.82) predicted M.

Conclusions:
Although unquestionably serious morbidity, neither thrombosis nor bleeding predicted mortality of this prospective cohort with COVID-19 critical illness, perhaps because mortality was slightly (p=ns) higher amongst unaffected patients. The data support continued full-dose heparinoid prophylaxis for these pts.

Racial and Gender Wound Complication Disparities in Emergency General Surgery

Victoria Adomshick, Case Western Reserve University, Vanessa P. Ho, MetroHealth, Shanina Knighton, Case Western Reserve University, Laura Brown, MetroHealth Medical Center

Background:
Disparities regarding complications after Emergency General Surgery (EGS) by race and gender have not been well characterized. Given that race is a social rather than biological determination, the recognition of racial disparities in association with wound complications (WC) or mortality may help illuminate opportunities to improve equity in postoperative care needs and prevent deaths among Nonwhite patients. Our study aim was to characterize WC and mortality after EGS by race and gender.

Hypothesis:
We hypothesized that racial minorities would be at a greater risk for developing WC after EGS.

Methods:
We utilized the 2017 National Inpatient Sample to identify EGS patients by ICD-10 codes. Our primary outcome was development of a WC (infection or seroma). In-hospital mortality was our secondary outcome. Race groups included: White, Black, Hispanic, Asian/Pacific Islander, Native American, and other. Gender was grouped as male or female. Logistic regression was performed using an interaction term of race and gender, adjusted for age, procedure type, hospital region, payer, and Elixhauser comorbidity score. White males were the reference group for all regressions.

Results:
208,760 patients were identified, of whom 65% were white. Nonwhite male race groups had higher or similar odds of death with lower or similar odds of WC (Table). Despite Black males' lower odds of WC (0.81, 0.75-0.88) among all groups, Black males have higher odds of death (OR 1.21, 1.08-1.35) compared to other race groups. Overall, females had a higher or similar odds of WC than males and a lower or similar odds of death compared to white males. Of all groups, white females had the highest odds of WC (1.28, 1.23-1.34).

Conclusions:

WC and mortality trended in opposite directions for many race-gender groups. Nonwhite race groups were associated with fewer WC but were sometimes associated with higher mortality. These trends could be explained by survival bias, differences in diagnosis, differences in documentation, true differences in rates of WC and or biases that exist when acknowledging symptoms, patient complaints, and pain. Future studies examining race-gender risks associated with EGS-related WC and mortality are needed to produce policies and guidelines that optimize equitable outcomes.

Gender x Race Interaction	Wound Complication Odds Ratio (95% CI)	Death Odds Ratio (95% CI)
Male		
White	1.0 (Reference)	1.0 (Reference)
Black	0.81 (0.75-0.88)*	1.21 (1.08-1.35)*
Hispanic	0.81 (0.75-0.88)*	1.01 (0.89-1.16)
Asian/Pacific Islander	1.01 (0.84-1.22)	1.19 (0.92-1.51)
Native American	0.64 (0.42-0.88)*	0.97 (0.60-1.58)
Other	0.82 (0.70-0.96)*	1.51 (1.22-1.87)*
Female		
White	1.28 (1.23-1.34)*	0.92 (0.86-0.99)*
Black	1.11 (0.99-1.23)	0.81 (0.69-0.95)*
Hispanic	1.05 (0.94-1.19)	0.74 (0.60-0.90)*
Asian/Pacific Islander	0.71 (0.54-0.94)*	0.91 (0.64-1.30)
Native American	1.25 (0.81-1.94)	1.65 (0.85-3.19)
Other	1.03 (0.82-1.29)	0.57 (0.40-0.80)*

*indicates $p<0.05$.Logistic regressions are adjusted for age, procedure type, hospital region, payer, and Elixhauser comorbidity score.

Examining the Use of Race and Ethnicity in Surgical Site Infection Research

Alexandra Ferre, Cleveland Clinic, Samantha Olafson, Albert Einstein, Star Tiko, Lankenau Medical Center, Shanina Knighton, Case Western Reserve, Vanessa P. Ho, MetroHealth

Background:
Despite wide-ranging evidence of disparities throughout medicine, there is no uniform practice for the use of race or ethnicity as study variables. Recent standards have proposed that race and ethnicity be defined by study authors, and the reason for use in the study should be specified to reduce the false equivalence of race, ethnicity, and biology.

Hypothesis:
We hypothesized that race and ethnicity would be infrequently defined in modern literature about surgical site infections (SSI).

Methods:
We queried PubMed for studies published in 2019-2020 which were performed in the United States with SSI as a primary or secondary outcome. Case reports, case series and review articles were excluded. Full text review was completed to assess whether race, ethnicity, or both were included in

introduction, methods, results, or discussion sections. In addition, we collected whether the study defined or described race or ethnicity. Data are described as N (%).

Results:
898 studies underwent title and abstract review. 128 studies met inclusion criteria, of which 119 could be obtained by the authors for data extraction. Race and ethnicity were not discussed at all in 65 (54.6%) articles. Race or ethnicity were reported in 32 (26.9%) methods, 52 (43.7%) results, and 9 (7.7%) discussions sections (See Table). One paper primarily studied race and SSI, and was the only paper to use race in the title or introduction, and was the only paper which defined race. No papers defined ethnicity.

Conclusions:
Race is infrequently included as a variable in SSI research. Ethnicity is rarely studied. When race/ethnicity is included, there is typically a lack of definition. When results on race are reported, they are rarely discussed. The inclusion of race/ethnicity as variables in scientific data should be done mindfully and with clear intent. The universal goal of reducing health disparities will require thoughtful evaluation of the topics of race and ethnicity and the subsequent effects on health outcomes, including surgical site infections.

Demographic and housing characteristics can add guidance to vaccination triage and public health measures in a pandemic

Andrew H. Stephen, Mohammed Arafeh, Morgan Askew, Charles A. Adams, Jr., Jason Aliotta, Debasree Banerjee, Michael D. Connolly, Tareq Kheirbek, Mitchell Levy, Stephanie Lueckel, Leonard Mermel, Sean Monaghan, Daithi S Heffernan, Warren Alpert Medical School of Brown University

Background:
Severe COVID-19 has had an enormous impact on society, health systems, and the economy. The primary goal of vaccination programs and public health measures is to reduce the burden of severe cases. To this point, vaccine distribution in most states has been guided by age and occupation. We examined a large cohort of ICU cases in a single state and propose that detailed demographic and housing data can help guide vaccine triage and public health measures to reduce cases of severe COVID-19 in the future, as well as reducing severe cases involving novel pathogens in future pandemics.

Hypothesis:
Demographics and housing characteristics are unique among patients with severe COVID-19 compared to the local population.

Methods:
A descriptive, retrospective review was done of all patients with COVID-19 requiring ICU admission in our three-hospital healthcare system. The majority of COVID-19 ICU admissions in Rhode Island were to our healthcare system. Demographic and housing characteristics were recorded via patients' charts and online real estate marketplaces (Zillow, Redfin, and Movoto). We compared our patient's characteristics to those of the overall state population obtained from the 2020 census review, the Rhode Island 2020 housing fact book, and the 2018 HUD market analysis.

Results:
There were 729 patients in our sample. Overall mortality was 42%. Average length of stay among survivors was 19.5 (+/- 1.0) days. Compared to Rhode Island's population, severe COVID-19 patients were older (64 +/- 0.5 vs 44.1 yrs; $p<0.001$), more often male (60.0% vs 48.6%; $p<0.01$), non-White (48.7% vs 28.6%; $p<0.001$) and lived in areas of lower median income ($51,981 vs $64,340; $p<0.001$). Our patients more often resided in multi-family homes (53 vs 44%; $p<0.00001$), and in single-family (272k vs 387k) and multi-family (120k vs 330k) homes of lower median estimated value.

Their homes were of lower square footage (1,400 vs 1,688), were older (mean, 1943 vs 1969), and the single-family homes had fewer bedrooms and bathrooms. All of the top 8 over-represented zip codes for ICU admissions are within the 10 poorest zip codes in the state. Among all COVID-19 ICU patients, there was no difference in mortality when accounting for demographics and housing characteristics.

Conclusions:
To return our society, health systems and the economy to a more functional level requires reduction of severe COVID-19 cases. Currently, only Alaska and Washington incorporate housing features into their vaccine priority groupings. This unique review of housing data can augment local vaccine triage, future booster plans, and public health measures.

Gender disparity in medical comorbidity distribution that affect trauma related infectious outcomes

Carmen Fahlen, Andrew H. Stephen, Daithi S Heffernan, Warren Alpert Medical School of Brown University

Background:
Trauma remains a leading cause of death and long-term disability across all ages. Considerable discrepancies have been noted between sexes with respect to trauma outcomes, especially among patients with trauma related critical illness. Women tend to suffer higher rates of complications including infectious complications following admission for traumatic injuries. Medical co-morbidities are known to be significant drivers of these complications. However, there is very little data addressing sex discrepancies among prevalence of pre-trauma medical comorbities.

Hypothesis:
Among trauma patients, a significant sex-based disparity will exist with respect to medical co-morbidities that are known to affect trauma related outcomes.

Methods:
This is a 3 year retrospective chart review of admitted adult blunt trauma patients. Patients were divided by sex (male:female) and by age – young 18-35; middle 36-64; and geriatric >/=65 years old. Charts were also reviewed for mechanism of trauma, injury severity, hospital course, and outcomes. Medical comorbidities, extracted from the charts, were only those medical comorbidities known to exist prior to the trauma. The number and specific type of comorbidities also assessed. Chi-squared analysis was used for categorical data, and Student's t-test or Mann-Whitney U was used for continuous data. Significance was set at $p<0.05$.

Results:
Overall, 10.985 patients were admitted, 4672 (42.5%) were women. Women were older (67.5+/-0.3 vs 52.5 +/-0.3;$p<0.001$). Within age groups, there was no significant differences with respect to mechanisms of injury. Motor vehicle collisions were the predominated among both young women and young men. Fall from standing predominated among geriatric patients. Overall women were more likely to have any comorbidity upon presentation (82% vs 72%; $p<0.001$). However, among geriatric patients, elderly women had fewer average pre-trauma comorbidities (2.6 +/- 0.02 vs 2.8+/-0.03;$p<0.03$). With respect to specific diseases women were significantly less likely to be diagnosed with diabetes (19.1% vs 24.2%;$p<0.001$) or COPD (12.8% vs 10.7%;$p=0.04$), or with steroid use. Geriatric women were more likely to have been diagnosed with dementia (19.1% vs 13.1%;$p<0.001$), considered functionally dependent (31.3% vs 21.5%;$p<0.001$) or carry a DNR status upon presentation (17.6% vs 14.7%;$p=0.008$)

Conclusions:

Sex related disparities exist with respect to comorbities that are known to affect infectious trauma outcomes including diabetes and COPD. A lack of a diagnosis may not always imply the lack of disease, but may reflect limited access to care. An unrecognized sex-bias may exist with respect to disease screening.

Potrait of Microbiology Profile and Appropriate Selection of Antimicrobials in cIAI cases in Fatmawati General Hospital

Indah Jamtani, Rofi Y. Saunar, Fatmawati General Hospital

Background:
Determination of pathogenic etiology and microbial resistance plays a vital role in the clinical management of complicated intra-abdominal infections (cIAI), specifically for the administration of appropriate empiric antibiotics.

Hypothesis:
As data on the ever-evolving landscape of pathogenicity and antimicrobial resistance in cases of cIAI in Indonesia is currently limited, this study aims to provide a clinical picture of the most commonly found microbiomes and their resistance patterns in cases of cIAI in Indonesia.

Methods:
A total of 44 cIAI cases were retrospectively compiled from past emergent and elective surgeries conducted in Fatmawati General Cental Hospital, Jakarta, Indonesia from the months of April – October 2020. Intraoperative samples (tissue, pus, or swab samples) were acquired in 12 of these cases from which cultures were performed and corresponding antimicrobial resistance were studied.

Results:
Klebsiella pneumoniae was the most prevalent pathogen found (27.3%), followed by *Escherichia coli* (18.2%). Isolates were found to be most susceptible towards the ertapenem, meropenem, and amikacin (85.7% of isolates were sensitive to each of those antibiotics respectively), whereas 85.7% of isolates were resistant to both ampicillin and amoxicillin respectively. *Candida tropicalis* was found in 1 sample (9.1%) and was sensitive to all antifungals tested.

Conclusions:
Gram-negative bacteria, particularly *K.pneumonia* and *E.coli* were found to be the most common isolates in cases of cIAI in this study. Carbapenems in combination with the aminoglycoside Amikacin is suggested as appropriate empirical therapy in cases of cIAI in Fatmawati General Cental Hospital, Jakarta, Indonesia.

Adapting Infection Prevention and Control Assessment Tools for Use in Low- and Middle-Income Countries

Chandler Hinson, World Surgical Infection Society, Robert G. Sawyer, World Surgical Infection Society, Steven Senglaub, World Surgical Infection Society, Angie Sway, World Surgical Infection Society, Joseph S. Solomkin, World Surgical Infection Society, Amos Oburu, Ace Research Africa

Background:
There are many existing infection prevention and control (IPC) tools developed and validated by large organizations. These tools are generally created with little input from professionals working in lower-income regions. Recent publications have highlighted the disproportionate burden of surgical site infections (SSI) in LMICs and the very limited data on surgical conditions and practices in these regions. There is a need for quality improvement in SSI/IPC/patient safety in lower-level facilities in LMIC. A starting point would be to adapt available tools for use in resource-limited facilities. Our goal was to assess IPC capacity of facilities by analyzing health care-associated infection (HAI)

surveillance; hospital workload, workforce, and infrastructure; environmental cleaning; and surgical operative practices.

Methods:
We created an adapted survey using components from the WHO's *Guideline on Core Components for IPC* and *Essential Surgical Care Situational Analysis Tool.* Purposive sampling was used to identify 23 health facilities across 7 counties in Kenya. Cesarean section was used as bellwether procedure because it is a high-volume procedure in LMICs. Permission to conduct the survey was solicited from facility leadership. Two surveyors visited each facility to complete the adapted assessment framework.

Results:
All facilities had an IPC program and 22/23 reported that their program was supported by facility leadership and an IPC team. Only 10 facilities reported a specific IPC budget. 16 had adequate lab support. 12 conducted HAI surveillance and 11/12 monitored for SSIs. Most had adequate and reliable water (22) and power (21), but only 15 reported functioning hand hygiene stations. 15 allowed bed-sharing. Over 75% of facilities did not follow the WHO recommended pre-operative practices on bathing, hair removal, and skin preparation. Almost all (96%) of facilities administered systematic antibiotic prophylaxis (Abx), but none provided only pre-op Abx and the reported timing of administration generally ran contra to established recommendations. 78.2% provided both pre- and post-op Abx, and 17.4% facilities provided only post-op Abx.

Conclusions:
This survey was a time and resource efficient way of collecting the data needed to understand the variables associated with surgery, SSI, and IPC in lower levels facilities. Clear targets for surgical practice improvement were identified, and the workforce and infrastructure data will be used to design effective and sustainable solutions.

Mini Oral Session III

Novel Cold Plasma Treatment Decreases Bacterial Burden in a Dose-Dependent Manner

Mary Oliver, Medstar Health Research Institute, Liam Kirkpatrick , Firefighters' burn and surgical research laboratory, Bonnie Carney, Firefighters' burn and surgical research laboratory, Lauren Moffatt, Firefighters' burn and surgical research laboratory, Jeffrey W Shupp, Medstar Health Research Institute

Background:
Cold Atmospheric Plasma (CAP) is a partially ionized gas that can be produced under atmospheric pressure at room temperature. CAP has antimicrobial effects due to charged particles, UV photons, and reactive oxygen species. CAP also stimulates cell migration and proliferation which promotes healing without negatively affecting healthy tissues. Development of a handheld cold plasma generator (CPG) would have practical clinical applications to surgical sites and incisions.

Hypothesis:
CAP applied with a novel CPG will decrease pathogenic bacteria colony formation in a dose-dependent manner in-vitro.

Methods:
In the first treatment technique, 10^2 CFU of either Staphylococcus aureus, Acinetobacter baumannii, and Pseudomonas aeruginosa were plated and CAP treatments were administered for either 15, 30, or 45 seconds. In the second treatment technique, 10^6 CFUs were plated, and CAP was applied to the center of the plate for 10 seconds. Povidone Iodine (PI) was used as a positive control for both

applications. Plates were subsequently incubated at 37°C overnight and photos for zone of inhibition (ZOI) measurements and CFU counts were taken (Figure 1).

Results:
CAP decreased S. aureus, A. baumannii, and P. aeruginosa levels in both treatment arms. All three CAP sweep treatments led to CFU reduction, with the 30 and 45 sec CAP treatments decreasing CFUs by a Log 2 reduction for all species. Additionally, 10 sec CAP treatments created ZOIs that were consistently larger than the positive control, and to a statistically significant degree in P. aeruginosa (p=0.0068).

Conclusions:
Bacterial colonization and overgrowth in wounds can lead to acute and chronic infection and negatively impacts wound healing. These data suggest that CAP applied with a novel CPG can inhibit bacterial growth. The CPG has potential to be clinically useful for surgical wounds and incisions because its antimicrobial mechanism is not hindered by antibiotic resistance. Future work is currently being conducted on a plethora of bacterial species including gram positive and negative species with differential resistance and sensitivity profiles and will further our understanding of the CPG's antimicrobial properties.

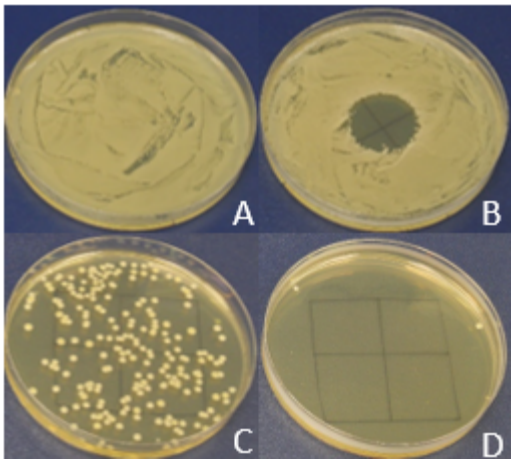


Figure 1. S. aureus. Agar diffusion negative control (A). Agar diffusion 10sec CAP (B). CAP Sweep negative control (C). CAP Sweep 45sec treatment (D).

Does Dilution Increase the Risk of Pollution in Trauma Patients? A Secondary Analysis of Patients from the PAMPer Trial

Husayn Ladhani, MetroHealth Medical Center, Laura Brown, MetroHealth Medical Center, Peter Kanuika, MetroHealth Medical Center, Jason Sperry, MD, MPH, University of Pittsburgh Medical Center, Frank X Guyette, MD, MPH, University of Pittsburgh Medical Center, Joshua Brown, MD, MCS, University of Pittsburgh Medical Center, Brian Daley, University of Tennessee, Richard Miller, Vanderbilt University Medical Center, Brian G. Harbrecht, University of Louisville, Herb Phelan, University Medical Center, Jeffrey Claridge, MetroHealth Medical Center

Background:
Studies have shown an increased risk of nosocomial infections (NIs) with transfusion of packed red blood cells (PRBCs), but the risk associated with use of non-blood fluid products is unknown.

Hypothesis:
Increased volume of non-blood fluids given in the first 24 hrs after injury will be associated with development of NI.

Methods:

We performed a secondary analysis of trauma patients with hemorrhagic shock in the PAMPer trial who survived at least 3 days and had infection data available. Variables include demographics, co-morbidities, injury characteristics, type and volume of blood and non-blood fluid products given during first 24 hrs after injury, and outcomes. Bivariate comparison between patients with and without NI was performed to identify factors associated with infection. Backwards conditional multivariate logistic regression was performed using covariates significant on bivariate analysis to identify independent risk factors for NI. AUC for the model was calculated.

Results:

265 pts were identified with median age 45 yrs, 71% male, 85% blunt mechanism of injury, and median ISS 22. Median volume of non-blood fluid products given was 6L. Medium volume of PRBCs given was 4 units. The incidence of NI was 36% (94 pts). Inpatient mortality was 10% (26 pts). Results for bivariate analysis is shown in Table 1. Logistic regression identified male gender, NSAID use, anti-HTN medication use, blunt mechanism, and PRBC transfusion as independent risk factors for development of NI (Table 2). Volume of non-blood fluid products was not independently associated with NI. AUC for the model was 0.800.

Table 1. Bivariate Comparison Between Patients With and Without Nosocomial Infection

N = 265	**No Infection (n=171)**	**Infection (n=94)**	***p****
Median age, years (IQR)	42 (26-59)	51 (34-62)	0.054
Male gender (%)	115 (67%)	75 (80%)	0.030
NSAID use (%)	3 (2%)	10 (13%)	0.001
Anti-HTN medication use (%)	24 (15%)	24 (29%)	0.008
Blunt mechanism of injury (%)	138 (81%)	87 (93%)	0.010
Traumatic brain injury (%)	50 (29%)	40 (43%)	0.029
Chest injury (%)	113 (66%)	81 (86%)	<0.001
Abdominal injury (%)	92 (54%)	64 (68%)	0.024
Median ISS (IQR)	22 (14-29)	27 (17-34)	0.002
Non-blood fluid volume, mL (IQR)	5625 (3809-8443)	6700 (4439-9536)	0.036
Plasma transfusion, units (IQR)	2 (0-4)	2 (2-7)	0.002
PRBC transfusion, units (IQR)	3 (1-7)	5 (3-12)	<0.001
Platelet transfusion, units (IQR)	0 (0-1)	0 (0-1)	0.041

*Groups compared using Mann-Whitney U test for continuous variables, and Chi-square test or Fischer Exact test as appropriate for categorical variables; $p<0.05$ was considered statistically significant

Table 2. Logistic Regression Model for Nosocomial Infection

Covariate	**OR (CI)**	***p***
Male gender	2.67 (1.24-5.78)	0.012
Any NSAID Use	10.46 (2.12-51.51)	0.004
Anti-HTN Medication Use	2.54 (1.14-5.67)	0.023
Blunt mechanism of injury	5.35 (1.61-17.74)	0.006
Median PRBC units	1.16 (1.09-1.24)	<0.001

Conclusions:

Volume of non-blood fluid products given in the first 24 hrs after injury does not appear to increase the risk of NI in trauma patients with hemorrhagic shock. PRBC transfusion continues to be an independent risk factor in a dose-dependent fashion. Baseline demographics and co-morbidities also appear to have significant correlation with development of NI, which warrants further study.

Bacteremia Rates in Patients undergoing Urgent Cholecystectomy

Kristin P. Colling, Saint Mary's Medical Center - Essentia Health, Kassandra Dindinger-Hill, University of Minnesota Medical School - Duluth Campus, Melissa Harry, Essentia Institute of Rural Health, Sharon Moran, Saint Mary's Medical Center - Essentia Health

Background:
Gallbladder disease is one of the most common disease processes cared for in the US, and can range from symptomatic gallstones to severe systemic infections from cholangitis. It is unclear how often patients undergoing urgent cholecystectomy have bacteremia, as the data reporting this is lacking.

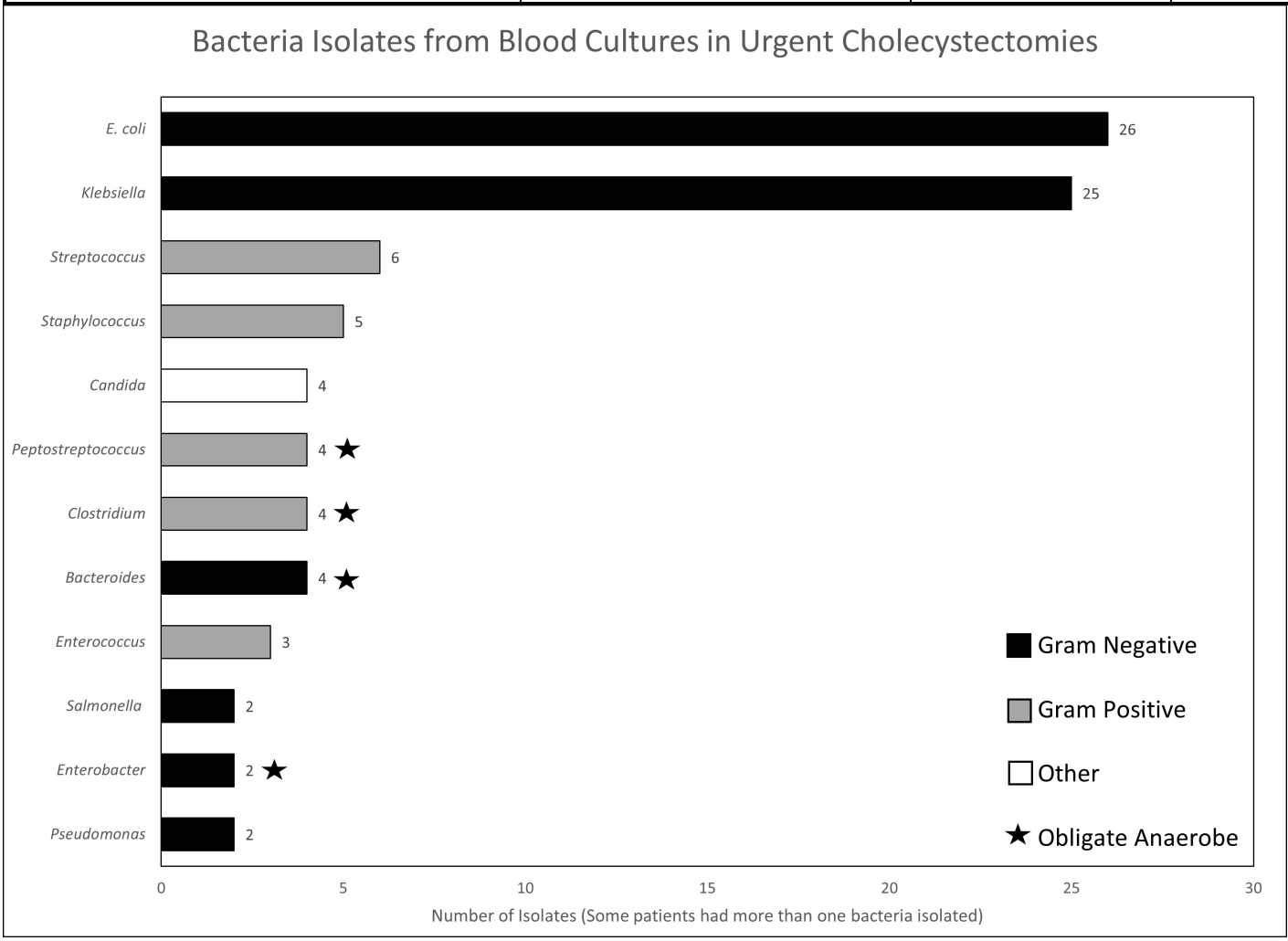
Hypothesis:
Blood cultures will be performed rarely in patients undergoing emergent cholecystectomy, and that positive cultures will be associated with worse outcomes.

Methods:
We performed a retrospective review of all patients admitted to a single institution between January 2009 and December 2018 who underwent urgent cholecystectomy by our acute care surgery team.

Results:
During the study period, 1,147 patients underwent urgent cholecystectomy for the above diagnoses. 311 (27.1%) had blood cultures drawn within 7 days of surgery. Of patients with cultures drawn, 75 patients had at least one positive blood culture (24.1%). Patients with positive cultures were older, had significantly longer hospitals stays and had higher in-hospital and one year mortality rates (4% compared to 0.4%; p = 0.045). Cholangitis was the primary diagnosis in only 5% of urgent cholecystectomies performed but accounted for 27% of the positive blood cultures. The image depicts bacteria isolates obtained from the positive blood cultures, gram negative bacteria were most common.

	All Cholecystectomies N = 1,147	**Positive Blood Culture** N = 75	**Negative Bl Culture** n = 263
Age *mean (SD)*	54.9 (19.3)	69.7 (14.4)	63.6 (17.2
Female *n (%)*	661 (57.6)	24 (32.0)	96 (40.7)
Race *n (%)*			
White	1053 (91.8)	70 (93.3)	214 (90.7
Black	12 (1.0)	0 (0.0)	1 (<1.0)
Native American	65 (5.7)	5 (6.7)	19 (8.1)
Primary Diagnosis			
Cholecystitis	781 (68.1)	39 (52.0)	140 (59.3
Cholangitis	62 (5.4)	20 (26.7)	22 (9.3)
Choledocholithiasis	110 (9.6)	8 (10.7)	16 (6.8)
Gallstone Pancreatitis	194 (16.9)	8 (10.7)	58 (24.6)
Charlson score *Median (IQR)*	0 (0-1)	2 (0-3)	1 (0-2)
Length of Stay (Days) *Median (IQR)*	3 (2-5)	8 (5-14)	5 (3-9)

In-Hospital Mortality *n (%)*	5 (0.4)	3 (4.0)	1 (0.4)
1 year Mortality *n (%)*	54 (4.7)	16 (21.3)	22 (9.3)



Conclusions:
Blood cultures were obtained in about a quarter of cholecystectomies, and about 1 in 4 had positive cultures. Although positive cultures were not common, they were associated with significantly worse patient outcomes.

Microbiology swabs in perianal abscess drainage - a retrospective cohort study in a UK district hospital

Adam O'Connor , Tameside General Hospital, shariq sabri, Tameside General Hospital, Sana ullah , Tameside General Hospital

Background:
In the United Kingdom, there is widely varying practice between individual surgeons with regards to microbiology specimen use during perianal abscess drainage. This study aims to assess what impact microbiology swabs taken during incision and drainage of acute perianal abscesses in our hospital have on post-operative clinical course. Demographics and microbiological patterns were also analysed.

Hypothesis:
Microbiology results are not being appropriately acted upon or followed up following acute perianal abscess drainage.

Methods:
Data from emergency operative theatre lists were interrogated for patients undergoing incision and drainage of perianal abscess in the period March 2019-March 2020. Each record was analysed and age, sex, smoking status, diabetic status, presence of microbiology specimen from operation, organism growth and post-operative fistula-in-ano development were all recorded.

Results:
71 patients met inclusion criteria. 55 (77.5%) of patients had pus swabs sent at drainage of their abscess for microbiology analysis. Of 55 patients swabbed, 20 (36%) had no organism growth, 22 (40%) had anaerobic growth which was also most common. Of all 55 swabs sent, only 14(25%) were acknowledged. The presence of smoking ($P<0.05$) was statistically significant for association with fistula-in-ano development in the long term and was the only statistically significant predictor of fistula-in-ano in our study.

Conclusions:
Currently, our data may indicate that microbiology swabs do not influence management of patients with acute perianal abscess. There appears to be discrepancies in whether or not swabs are taken and acted upon, dependent on individual surgeon preference. No apparent group of organisms in this study significantly indicated future fistula-in-ano development. We would suggest larger, national scale studies to further explore our conclusions.

F is for Failure: Group F Streptococcus and Abscess Drainage as Initial Treatment of Perforated Appendicitis in Children

Benjamin Keller, Stephen Bickler, Hariharan Thangarajah, Karen Kling, Nicholas Saenz, Romeo Ignacio, Jr, John Bradley, Jeffrey Koning, Timothy Fairbanks, David Lazar, University of California, San Diego

Background:
Perforated appendicitis with a well-defined abscess is often managed initially with percutaneous drainage and antibiotic therapy, followed by interval appendectomy. The purpose of this study is to evaluate outcomes of children with perforated appendicitis and Group F streptococcus (ie. S. anginosus or S. milleri) isolated from abscess culture at the time of percutaneous drainage.

Hypothesis:
In children with perforated appendicitis, the presence of Group F strep in abscess culture will lead to an increase in failure of percutaneous drainage.

Methods:
A single institution, retrospective chart review was performed of patients 0-18 years old undergoing percutaneous drainage as initial therapy for perforated appendicitis from June 2015 to May 2020. Unless allergic, patients were initially treated with the same intravenous antibiotic and transitioned to oral antibiotics tailored to culture sensitivities. Demographic and clinical data were collected. The primary outcome was failure of initial percutaneous drainage as defined by additional drainage procedures, hospital readmission, or early interval appendectomy prior to a scheduled interval operation.

Results:
As initial treatment of perforated appendicitis, 4,126 patients underwent appendectomy and 109 patients underwent percutaneous drainage. Of those undergoing drainage, twenty-two (20%) patients grew Group F strep in their abscess culture and were demographically similar to those without Group F strep (Table). Escherichia coli and Bacteroides fragilis were the most common pathogens to grow in culture alongside Group F step, and their frequency of growth in abscesses without Group F strep was similar. Failure of initial percutaneous drainage was higher in patients with Group F strep (45%

vs 11%, p<0.001) as demonstrated by additional drainage procedures (p=0.01), hospital readmission (p<0.001), and early interval appendectomy (p=0.01).

	Group F Strep (n=22)	No Group F Strep (n=87)	*p-value*
Gender			
- Male	16 (73%)	56 (64%)	0.8
- Female	6 (27%)	31 (36%)	
Age (years), mean (SD)	11.4 (4.1)	9.7 (4.4)	0.1
Duration of symptoms (days), mean (SD)	7.6 (3.2)	7.4 (3.4)	0.78
WBC on presentation ($x10^3/\mu L$), mean (SD)	17.0 (6.4)	20.4 (7.0)	**0.04**
CRP on presentation (mg/dL), mean (SD)	19.4 (13.4)	19.2 (11.3)	0.96
Presence of a fecalith	14 (64%)	55 (63%)	1.00
Abscess diameter (cm), mean (SD)	5.9 (1.4)	6.9 (2.5)	**0.02**
Number of percutaneous drains, median (range)	1 (1-3)	1 (0-3)	0.76
Length of stay (days), mean (SD)	7.8 (3.6.5)	7.2 (4.0)	0.69
Failure of initial drainage	10 (45%)	10 (11%)	**<0.001**
- Additional drainage procedures	27%	7%	**0.01**
- Readmission prior to interval	36%	6%	**<0.001**
- Early interval appendectomy	14%	0%	**0.01**
Interval appendectomy performed	19 (86%)	79 (92%)	0.69
Time to interval appendectomy (days), median (IQR)	53 (43-82)	62 (44-74)	0.69

Table - Demographic and outcome Data

Conclusions:
The presence of Group F strep in abscess culture is associated with a higher failure rate of percutaneous drainage for initial treatment of perforated appendicitis. The clinical course of patients with Group F strep in abscess culture may be more complicated than patients without Group F strep. Specific antibiotic regimens should be considered in the setting of this pathogen to decrease the failure rate of percutaneous drainage.

A Microbial Analysis of Patients with Frostbite Injury

Jacob Joram, Heather Carmichael , Patrick Duffy, Anne Wagner, Arek Wiktor, University of Colorado School of Medicine

Background:
Patients with frostbite experience complex wounds with a high rate of amputation. Despite this, there exists a paucity of data on the characterization of microbial organisms in frostbite wounds. We sought to examine the microbiology of frostbite wounds in this vulnerable patient population.

Hypothesis:
Wound culture positivity is associated with severity of frostbite.

Methods:
A retrospective review was conducted on patients aged >18 years old admitted for frostbite injury during a three-year period (2015-2019) at our ABA-verified burn center. Demographics, location/severity of injury, need for surgery, and culture data (type of sample and microorganisms identified) were recorded. Cultures from initial admission up to 90 days post-injury were considered. Associated factors including alcohol, drug use, homelessness, and major comorbidities were also abstracted.

Results:
96 patients were analyzed. Baseline demographics included: 83 male (87%), median age 36 years [IQR 27-51], median LOS of 7 days [IQR 3-13]. Most patients (n=58, 60%) had lower extremity injury, versus upper extremity (n=23, 24%), or both (n=15, 16%). Overall, 499 cultures were analyzed: most common swabs (n=318), followed by blood cultures (n=68), urine (n=22), tissue (n=16) skin (n=13), bone (n=8) and abscess (n=8). Of these, 280 cultures were from frostbite wounds. Overall, 44 (46%) patients grew positive cultures in frostbite wounds. Patients with positive cultures had significantly higher age (44 vs 31 years, p=0.009), were more likely to be homeless (55% vs 31%, p=0.03), had longer length of stay (12 vs 4 days, p<0.001), and higher need for amputation (61% vs. 29%). The most common species found in wound cultures were Staphylococcus species, 36.1% (n=101/280), followed by Streptococcus species (n=33/280, 11.8%), gram negative rods (GNRs) (n=35/280, 12.5%), and gram positive rods (GPRs) (n=12/280, 4.3%). Over time, cultures were more likely to become positive (Figure), with changes in bacterial isolate types. Of patients tested in the first week (n=33), 6% grew GNRs vs. 33% (n=15) after 4 weeks (p=0.02).

Conclusions:
Positive cultures appear to be associated with severity of injury, age, and homelessness. Bacterial isolate types change over time. Understanding the microbiology of frostbite wounds can help practitioners with the diagnosis and treatment of these complex wounds.

Reinfection after Explantation of Infected Mesh: Are the Same Microorganisms Involved?

Radwan Dipp Ramos, William O'Brien, Kalpana Gupta, Kamal M.F. Itani, VA Boston Healthcare System

Background:
It is unclear if a history of mesh explantation for infection is associated with a new infection after subsequent hernia operations. In this study we investigate how often the same causative organism is cultured in the initial explantation and subsequent repairs.

Hypothesis:
We hypothesized that the rate of recurrence after mesh hernia repair for infection was more likely to occur with certain pathogens, specifically S. aureus.

Methods:
We obtained data on patients undergoing ventral/incisional, umbilical and inguinal hernia repairs from the Veterans Affairs Surgical Quality Improvement Program during 2008-2015. Manual review was performed on all patients with an administrative code indicative of mesh explantation, and those with explantation for infection were retained. We then obtained data on cultured organisms from the mesh site at the time of index explantation and at any re-repair or subsequent explantation.

Results:
Among 332 patients who underwent mesh explantation for infection after hernia repair, 272 had a subsequent hernia repair. Of these, 117/272 (43.0%) were reinforced with mesh, 153/272 (56.2%) with sutures, and unknown technique in 2 patients.

A recurrent infection occurred in 66/272 (24.3%). Of those with implanted mesh, 39/117 (33.3%) had infection recurrence, with 13/39 (48.7%) requiring a mesh explantation due to infection.

A culture was obtained in 42/66 (63.6%) patients at the time of reinfection. No growth was reported in 2/42 (4.8%), compared with a single organism in 29/42 (69.0%), and multiple organisms in 11/42 (26.2%). Among patients with a culture performed and single organism growth, the most prevalent species was *S. aureus* (n=26/29 [89.7%]) of which 7 (26.9%) were methicillin resistant, followed by gram-negatives (n=3/29 (10.3%]).

In patients with positive cultures at both reinfection and index explantation, the organism was the same in 17/33 (51.5%). *S. aureus* was the most common pathogen causing recurrent infection (11/17 (64.7%); of which 7/17 (41.2%) were MSSA and 4/17 (23.5%) MRSA. *P. aeruginosa*, *other gram-negative rod*, *S. epidermidis, Streptococcus anginosus group*, and *Diphteroids* each caused one recurrence. All others (16/33 [48.5%]) were different organisms.

Conclusions:
Identification of organisms at time of prosthetic infection is helpful not only in treating the initial infection, but important in prevention of infection with the same organisms after subsequent repairs. Same organism re-infection should not be underestimated, particularly when *S. aureus* is isolated.

Phospholipid Nanoparticles Improved Blood Pressure and Oxygenation of Septic Shock When Conventional Measures Failed

Cuthbert O. Simpkins, Vivacelle Bio, Inc.

Background:
Worldwide 10 million people die of septic shock yearly. Seventy percent of COVID deaths are due to septic shock. The pathway to mortality is hypotension that is resistant to fluids and vasoressors. Much of this is due to overproduction of nitric oxide. Attempts to elevate blood pressure using nitric oxide synthase inhibitors failed in clinical trials. It was not possible to reduce the bioavailability of nitric oxide without stopping its production. We have overcome this problem by infusng a fluid, VBI-S, that is comprised of hydrophobic phospholipid nanoparticles. Since nitric oxide is hydrophobic we surmised that it would preferentially localize to VBI-S. This would result in reducing its bioavailability without interfering with its production. Using mass spectroscopy we found that nitric oxide is readilly taken up and released from VBI-S as we expected based on its oil/water partition coefficient of 3.4. Based on our findings a phase Iia clinical trial of VBI-S has been initiated.

Hypothesis:
We hypothesized that infusion of VBI-S would elevate blood pressure in septic shock patients with relative hypovolemia regardless of the ineffectiveness of vasopressors.

Methods:
Six patients in severe septic shock who were hypotensive while on vasopressors were given VBI-S. Two of the patiets were given VBI-S after cardiac arrest. Three of the patients had COVID. All six were on ventilators with a P/F ratio of less than 1.5. The P/F ratio could not be measured in the cardiac arrest patients. Both of these patients were receiving 100% oxygen. In both patients the oxygen required decreased.

Results:
In all six patients both blood pressure and oxygenation improved. No complications of infusing VBI-S were observed.

Result of VBI-S Infusion in Patients with Septic Shock Refractory to Vasopressors

Case	**Source**	MAP (mmHg) before VBI-S	MAP (mmHg) After VBI- S and Volume Emulsion	Oxygen Parameter Before VBI-S	Oxygen Parameter After VBI-S
1	Physician Initiated	39	59 500 ml bolus	P/F = 1.31	P/F = 2.34
2	Physician Initiated	43	69 500 ml bolus	P/F =1.32	P/F = 2.35
3	Clinical Trial	68	86 765 ml bolus	P/F = 0.63	P/F = 1.16
4	Physician Initiated Suspected COVID patient	67 Survived Cardiac arrest	67 1000 ml bolus Levophed reduced to off while VBI-S given	FiO2=100%	FiO2= 50%
5	Physician Initiated Suspected COVID patient	0 Survived Cardiac arrest	69 1000 ml bolus	O2sat =55%	O2sat=100%
6	Physician Initiated COVID Positive	68	78 200 ml at 83 ml/hr	P/F= 0.56	P/F= 1.99

Conclusions:

1. VBi-S improves blood pressure in septic shock patients even when vasopressors have failed

2. VBI-S improves oxygenation in septic shock patients
3. Based on these findings a phase IIa clinical trial is now underway.

Perioperative antibiotics affect oral microbiome without improving outcomes in burn patients

John Keyloun, Medstar Health Research Institute, Jeremy Chen See, Juniata College, Mary Oliver, Medstar Health Research Institute, Bonnie Carney, Medstar Health Research Institute, Robert Ball, Medstar Health Research Institute, Melissa McLawhorn, Medstar Health Research Institute, Justin Wright, Wright Labs, Regina Lamendella, Juniata College, Lauren Moffatt, Medstar Health Research Institute, Jeffrey W Shupp, Medstar Georgetown University Hospital

Background:
Wound infection is a source of morbidity and mortality for burn patients. Systemic antibiotics are often necessary to treat infected wounds and sepsis in this population. However, perioperative antibiotic prophylaxis for routine excision and grafting procedures is a debated topic. Generally, systemic antibiotics are known to impact the host microbiome. The effect of perioperative antibiotics on clinical outcomes for burn patients and their microbiome is unknown.

Hypothesis:
A single dose of perioperative antibiotics will alter the oral microbiome in burn patients.

Methods:
Patients with minor (<10% TBSA) and uncomplicated thermal burns anticipated to require a single excision and grafting operation were enrolled and randomized to receive a single perioperative dose of cefazolin (ABX) or no antibiotics. Photos for blinded clinician wound assessments, blood, wound biopsies and swabs for culture, and saliva for oral microbiome (16S rRNA) analysis were collected before and after wound excision, at the first dressing takedown, and at the first follow-up visit (10-14 days).

Results:
Patient characteristics are presented in Table 1. There were no significant differences between groups in rates of wound re-epithelialization, infectious complications, or graft loss. There were also no significant differences in bacterial alpha diversity between groups on oral swabs over time. Principal Coordinates Analysis revealed follow-up oral swabs clustered based on group ($p=0.06$). Partial least squares discriminant analysis shows increasing separation over time, reflecting increasing beta diversity in the ABX group. Linear discriminant analysis effect size (LEfSe) plot showed enrichment of greater than 50 bacterial taxa within the ABX patients ($LDA \geq 2$, $p \leq 0.05$) at follow-up.

Table 1. Demographics and Injury Characteristics

Characteristic	All	Antibiotics	No Antibiotics	P-value
No. of patients, No. (%)	28 (100%)	12 (42.9%)	16 (57.1%)	-
Male, No. (%)	19 (67.8%)	6 (50%)	13 (81.3%)	0.11
Age, yr, mean ± SD	41.2 ± 14.7	45.8 ± 12.1	37.9 ± 15.9	0.16
BMI, mean ± SD	29 ± 5.4	30.6 ± 5.5	28.6 ± 5.4	0.35
%TBSA burned, median (IQR)	2 (1.1-5.9)	2 (1.5-3.5)	2 (1-5.9)	0.96
LOS (days), median (IQR)	6 (4-7)	6 (5-6)	6.5 (4-8)	0.53

Abbreviations: BMI, Body Mass Index; TBSA, Total Body Surface Area; LOS, Length of Stay

Conclusions:

Perioperative antibiotics did not affect clinical outcomes. However, these data suggest that a perioperative antibiotic can impact the oral microbiome at follow-up. Emerging antibiotic resistance highlights the importance of stewardship, which calls for judicious use of antibiotics. Future work with additional samples will better characterize the impact of antibiotics on the host microbiome of burn patients.

Evaluating sepsis criteria in detecting alterations in clinical, metabolic and inflammatory parameters in burn patients

Carly Knuth, Sunnybrook Health Sciences CenterSarah Rehou, Sunnybrook Health Sciences Center, Chris Auger, Sunnybrook Research Institute, Marc G. Jeschke, Sunnybrook Health Sciences Center

Background:
Sepsis is the leading cause of morbidity and mortality in burn patients. Diagnosing sepsis in the burn population remains a challenge given that the post-burn systemic response is clinically similar to the traditional symptoms of sepsis. Currently, there are three definitions used to diagnose sepsis in burn patients: American Burn Association (ABA) sepsis criteria, Mann-Salinas et al. (MS) predictors of sepsis, and the Sepsis-3 consensus definition. Here, we compared biochemical mediators in burn patients that met one of three current sepsis criteria to determine which definition best reflected the biochemical pattern of systemic sepsis in order to distinguish the superior definition.

Hypothesis:
We hypothesized that clinical, metabolic and inflammatory markers will allow for the identification of a valid sepsis definition in burn patients.

Methods:
Adult, non-futile patients with a ≥20% total body surface area (TBSA) burn were included here. Sepsis was prospectively diagnosed and documented by the burn team based on specific clinical criteria. This sepsis cohort was then used to apply the three definitions of sepsis. Patients were then stratified into non-septic (n=97) or septic (n=51) populations and further categorized into populations that met the criteria for ABA (n=29), MS (n=14) and Sepsis-3 (n=44). Resting energy expenditure (REE) was measured via indirect calorimetry and plasma cytokines were detected by multiplex assays.

Results:
Of the 51 septic patients, 57% (n=29), 27% (n=14), and 86% (n=44) met the criteria for ABA, MS and Sepsis-3, respectively. There were no differences in age, gender, or %TBSA among groups. The average septic onset was 15.6 ± 2.61 days post-burn. Mortality increased in all septic patients (24%) in comparison to non-septic burn patients (8%). However, MS displayed the highest rate of mortality (50%) compared to ABA (21%) and Sepsis-3 (25%). While predicted REE signalled towards a decrease from early to late timepoints post-burn ($p=0.15$), Sepsis-3 was the only criteria to detect a signal towards an increase in predicted REE between timepoints ($p=0.11$). Further, 8 of the 10 markers analyzed here that are known to be associated with sepsis, including TNF-α, IL-10, and IL-1β, were significantly upregulated in patients who met Sepsis-3 criteria. However, ABA detected increases in just 2 markers while MS failed to detect any differences in cytokines in comparison to non-septic patients.

Conclusions:
Sepsis-3 outperformed ABA and MS criteria in clinical, metabolic, and biochemical trajectories. We therefore confirmed our previous study indicating that Sepsis-3 should be used as definition for sepsis in burn patients.

Use of Broad-Spectrum Antibiotics and Sepsis-3 Criteria in Burns

Luis Enrique Meza, Sarah Rehou, Shahriar Shahrokhi, Sunnybrook Health Sciences Centre

Background:
Sepsis is diagnostic challenge in critically ill patients; especially so in the burn population because the signs and symptoms of sepsis are pervasive after injury. The Sepsis-3 criteria identify organ dysfunction as an acute change in SOFA score ≥ 2 points consequent to infection. The objective of this study was to evaluate if Sepsis-3 criteria were fulfilled when broad-spectrum antimicrobial therapy was started in a burn cohort.

Hypothesis:
We hypothesized that the initiation of antimicrobial therapy without indication has led to an increase in morbidity and mortality in burn patients.

Methods:
We included all adult (≥ 18 years) patients with an acute burn admitted to our burn centre within 2 days of injury between 2016 and 2019. Only patients that received meropenem or piperacillin/tazobactam during their acute hospitalization period were included. Patients were stratified based on the Sepsis-3 definition using evidence of infection and evaluation of organ failure in the 48-hour period prior to administration of antibiotics.

Results:
We studied 70 patients, with 24 patients in the control group and 46 patients in the Sepsis-3 group. Demographics were similar among the control and Sepsis-3 groups: mean age was 44 ± 18 versus 48 ± 18 years (p=0.372); but injury severity was significantly different: median percent TBSA burn 18% vs. 32% (p=0.003) and proportion of inhalation injury 13% vs. 50% (p=0.002). Length of stay (LOS) was significantly longer in the Sepsis-3 group, control group median 23 days vs. median 43 days (p<0.001). However, LOS/TBSA was not significantly different in the control group compared to the Sepsis-3 group: median 1.6 vs. 1.4 days per percent TBSA burn (p=0.777). Mortality was similar among the groups: 13% vs. 20% (p=0.526). The proportion of patients diagnosed by a physician with sepsis was also similar with 21% in the control group vs. 33% in the Sepsis-3 group (p=0.406).

Conclusions:
Though the Sepsis-3 group had greater injury severity, mortality and LOS in-hospital, when normalized to TBSA, was similar. Patients were diagnosed by the physician with sepsis in less than a third of patients. This raises the question of why broad-spectrum antibiotics were started. Potentially, patients were treated based on clinical suspicion of sepsis instead of delaying treatment until diagnosis was confirmed. Benefits of early antibiotic administration must be considered in conjunction with antimicrobial stewardship.

My ICU has bacteremia/fungemia! What's the prognosis?

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Background:
Bloodstream infections (BSI) are a leading cause of morbidity and mortality in the critically ill.

Hypothesis:
We describe the characteristics and outcomes of patients with bacteremia or fungemia in the intensive care unit (ICU).

Methods:

The 2001-2012 Medical Information Mart for Intensive Care (MIMIC-III) database was queried for subjects with culture-positive BSI, who were then stratified into mono- and polymicrobial BSI based on cultures. Descriptive analysis was performed for demographics and clinically important outcomes for the most common monomicrobial BSI. Pairwise comparison was then performed between bacterial and fungal BSI. A composite endpoint “Alive and hospital-free at 30 days” was calculated.

Results:

Of 2334 subjects with BSI, 2091 (90%) were monomicrobial. Median infection day post-ICU admission was 1 [0-7] (Table 1). Of monomicrobial BSI, the most common bacteria were: *S. aureus* (38%), of which 8% (3% of overall) were methicillin-resistant; *E. coli* (19%); and *K. pneumoniae* (9%). The most common fungal BSI were *C. albicans* and *C. glabrata* (4% and 2% of overall). Patients with monomicrobial bacteremia had better outcomes compared to those with fungemia: ICU length of stay (LOS, days) (4 [2-9] vs. 6 [3-16], p<.001), hospital LOS (13 [7-25] vs. 20 [11-33], p<.001), in-hospital mortality (25% vs. 40%, p<.001), and alive and hospital-free at 30 days (61% vs. 36%, p<.001) (Table 2).

Conclusions:

The majority of BSI in the ICU are monomicrobial. Clinical outcomes vary according to organism and are uniformly worse with fungemia. However, the majority of patients will be alive and hospital-free by 30 days after ICU admission. These modern epidemiologic findings will help clinicians with prognosis and patient/family counseling.

	Total (n=2334)
Age (years)	66 [54-77]
Female (%)	962 (41)
Weight (kg)	78 [65-97]
Smoker (%)	78 (3)
Hypertension (%)	435 (19)
Diabetes mellitus (%)	232 (10)
Coronary artery disease (%)	175 (7)
Lactic acid (mg/dL)	2 [1-3]
Vasopressor (%)	243 (10)
Ventilated (%)	151 (7)
ICU Day of Infection	1 [0-7]

Data are presented as median [IQR] for non-parametric continuous variables and frequency (%) for categorical variables.
ICU = intensive care unit

		Bacterial								Fungal	
	Total (n=1969)	S. aureus (n=795)	MRSA (n=61)	E. coli (n=406)	K. pneumoniae (n=179)	E. faecium (n=177)	E. faecalis (n=153)	P. aeruginosa (n=86)	E. cloacae (n=44)	C. albicans (n=78)	C. glabrata (n=51)
ICU stays per patient	1 [1-1]	1 [1-1]	1 [1-1]	1 [1-1]	1 [1-1]	1 [1-1]	1 [1-1]	1 [1-1]	1 [1-1]	1 [1-1]	1 [1-1]
Ventilator days	0 [0-0]	0 [0-0]	0 [0-0]	0 [0-0]	0 [0-0]	0 [0-0]	0 [0-0]	0 [0-0]	0 [0-0]	0 [0-0]	0 [0-0]
ICU LOS (days)	4 [2-9]	4 [2-8]	4 [2-8]	2 [2-5]	3 [2-7]	6 [2-15]	5 [2-13]	4 [2-10]	6 [2-17]	9 [3-16]	6 [3-16]
Hospital LOS (days)	14 [7-25]	14 [9-25]	14 [9-27]	8 [5-16]	10 [6-22]	27 [13-42]	14 [9-27]	14 [9-25]	23 [11-36]	22 [12-33]	16 [10-36]
In-hospital mortality (%)	511 (26)	205 (26)	13 (21)	73 (18)	51 (29)	67 (38)	31 (20)	24 (28)	9 (20)	30 (38)	21 (41)
Alive and hospital-free at 30 days (%)	1168 (59)	479 (60)	37 (61)	312 (77)	107 (60)	57 (32)	92 (60)	50 (58)	23 (52)	30 (38)	17 (33)

Data are presented as median [IQR] for non-parametric continuous variables and frequency (%) for categorical variables. ICU = intensive care unit; LOS = length of stay

Mini Oral Session IV

Enhanced Recovery After Surgery pathways and rates of significant surgical infections in colorectal surgery

Yulia Kostenko, Sydne Muratore, Reece Boyd, Deborah Davis Merritt, Saint Joseph Hospital

Background:
Postoperative surgical infections in colorectal surgery are potentially preventable complications with significant impact on mortality, morbidity, and medical care costs. Our institutional NSQIP Semi-Annual Report has demonstrated an increase in postoperative surgical site infections, anastomotic leaks (AL) and other infections resulting in readmission and return to OR rates in patients undergoing colorectal surgery concurrent with the advent of Enhanced Recovery After Surgery (ERAS) pathways. Non-steroidal anti-inflammatory drugs (NSAIDs) represent an essential ERAS component. With debate in the literature about NSAIDs possible adverse effects on wound healing, the association between NSAIDs and an increase in infectious complications requires further exploration.

Hypothesis:
The objective of this study was to examine the effect of perioperative use of NSAIDs on infectious complications resulting in readmission and return to OR in colorectal surgery patients at our institution.

Methods:
This was a retrospective case-control study using our hospital's 2018-2019 ACS NSQIP database of patients undergoing colorectal surgery. The study group consisted of 356 patients undergoing colonic or rectal resection with primary anastomosis or ostomy. The non-infectious complication group of 322 patients was compared to 34 patients with infectious complications resulting in readmission or return to OR. These complications included superficial and deep space infections, AL, Clostridium difficile infection, sepsis, pneumonia and urinary tract infection. In addition to NSQIP data, chart review determined the perioperative use of celecoxib, ketorolac and ibuprofen. Pearson chi square, Fisher's exact tests and Student's t-tests were used to compare variables.

Results:
The non-infectious and infectious complication groups were comparable with no statistically significant differences ($p<0.05$) between patients' age, gender, diagnosis, steroid use, preoperative radiation, bowel prep, or elective or emergent nature of the surgery. The statistical analysis demonstrated no association between the rate of significant surgical infections (SSI) and NSAID use [OR 0.76, 95% CI 0.34-17, $p = 0.5$]. In the subgroup analysis, there was no association between SSI and the use of COX-2 selective NSAID celecoxib [OR 1.1, 95% CI 0.49-2.43, $p = 0.8$] as well as nonselective NSAIDs ibuprofen [OR 0.57, 95% CI 0.28-1.16, $p = 0.15$] and ketorolac [OR 0.79, 95% CI 0.39-1.61, $p = 0.58$].

Conclusions:
Perioperative use of both COX-2 selective and non-selective NSAIDs in colorectal surgery patients had no independent impact on SSI. These results support the ongoing perioperative administration of NSAIDs within our ERAS protocol.

Alcoholism and Infection Risk in the Intensive Care Unit

Kristin P. Colling, Saint Mary's Medical Center - Essentia Health, Alexandra Kraft, University of Minnesota Medical School - Duluth Campus, Melissa Harry, Essentia Institute of Rural Health

Background:
Alcohol is the most frequently abused drug in US, and alcohol dependence and cirrhosis are common diagnoses in intensive care unit (ICU) patients.

Hypothesis:
We hypothesize that alcoholism will be associated with increased infection rates.

Methods:
A retrospective chart review of all patients admitted to the ICU from January 2017-March 2019 at a tertiary referral hospital serving a large rural population was performed. Patients with diagnoses of alcoholism, alcohol dependence and alcoholic cirrhosis were included. Patients were excluded if they did not require ICU care (no intubation, organ failure, ICU medications). Patient demographics, hospital course, infection type, culture results and mortality were collected and evaluated, p values < 0.05 were considered significant.

Results:
527 patients met inclusion and exclusion criteria. The most common admitting diagnoses were GI bleed (18%), cardiopulmonary failure (18%) trauma (17%), acute withdrawal (13%), sepsis (13%), complications of liver failure (9%) and suicide/overdose (7%). Patient demographics and risk factors for infection are depicted in the table. Infection occurred in 40% of patients.

In multivariate analysis, when controlling for age, sex, BMI, liver failure, CKD, thrombocytopenia, complications and receipt of blood transfusion, infection remained an independent predictor of in-hospital mortality (adjusted odds ratio 3.3 (95% CI 1.7-6.4). Other independent risk factors significant for risk of mortality were liver failure on admission, and in-hospital complications. Septic shock developed in 57% of infections and was associated with an increased risk of mortality (38% versus 2% p<0.001).

Pneumonia was the most common infection (70%), followed by urinary tract infection (13%), skin/soft tissue infections (14%), bacteremia (17%), intraabdominal infections (10%) and *C. difficile (*1%). Cultures were obtained in 74% of pneumonias, most common being *S. aureus* (17%; 11% MSSA and 6% MRSA), *H. influenzae (13%),* and *S. pneumoniae (12%).* Pneumonia was associated with higher in-hospital mortality (22% versus 8%, OR 3.3; p < 0.001).

	All patients n=527	Infection n= 211 (40%)	Odds Ratio for Infection	P value
Age; years *Median (Range)*	56 (18-86)	57 (20-86)	NA	0.26[a]
Sex (Female) *n (%)*	160 (30%)	68 (32%)	1.2 (0.8-1.7)	0.45
Race *n (%)*			NA	0.3
White	418 (79%)	160 (76%)		
Black	11 (2%)	4 (2%)		
Native American	88 (17%)	43 (20%)		
Asian	6	2		
Unknown	4 (2%)	2 (2%)		
Rural *n (%)*	189 (36%)	88 (42%)	1.5 (1.1-2.1)	0.02
Insurance *n (%)*			NA	0.25
Uninsured	112 (21%)	40 (19%)		
Private	72 (14%)	28 (13%)		
Medicare	156 (30%)	73 (35%)		
Medicaid	187 (36%)	70 (33%)		
ICU Length of Stay; *median days (IQR)*	3 (2-6)	5 (3-10)	NA	<0.001[a]
Hospital Length of Stay; *median days (IQR)*	8 (4-13)	10 (6-18)	NA	<0.001[a]
Liver Failure Present on Admission *n (%)*	241 (46%)	116 (55%)	1.9 (1.3-2.7)	<0.001
Diabetes Mellitus *n (%)*	111 (21%)	48 (27%)	1.1 (0.7-1.8)	0.44
Chronic Renal Disease *n (%)*	85 (15%)	48 (23%)	2.4 (1.5-3.9)	<0.001
Thrombocytopenia *n (%)*	194 (37%)	94 (45%)	1.7 (1.2-2.5)	0.003
In Hospital Mortality *n (%)*	63 (12%)	48 (23%)	5.9 (3.1-10.8)	<0.001

Abbreviations: ICU: Intensive Care Unit; IQR: Interquartile Range

[a] Mann-Whitney U test. All dichotomous variables were compared using Chi Square Tests.

Conclusions:

Alcoholism and cirrhosis are common comorbidities in ICU patients. Infection occurs frequently in alcoholic ICU patients, most commonly pneumonia, and was associated with increased mortality.

Rapid Source Control Laparotomy vs Primary Facial Closure in Management of Colonic Perforation and in Septic Shock

Kevin Carroll, South Shore University Hospital - Northwell Health, Rachael Seddighzadeh, Palisades Medical Center, Ayolola Onayemi, Palisades Medical Center, Yen-Hong Kuo, Jersey Shore University Medical Center, Jason Sciarretta, Emory, John Mihran Davis, South Shore University Hospital - Northwell Health, Nasim Ahmed, Jersey Shore University Medical Center

Background:

Damage control laparotomy (DCL) has been widely accepted for use in trauma patients with intra-abdominal injuries, hypothermia, coagulopathy, and acidosis. The use has evolved in the acute care setting to include surgical patients with acute intestinal perforations without clear evidence to support such practice.

Hypothesis:

Patients in shock would benefit from rapid source control laparotomy over primary fascial closure.

Methods:
All patients with colon perforations in septic shock were studied using data from the 2014-2016 National Surgical Quality Improvement Program (NSQIP) data was queried. These patients were then separated by surgical intervention into two groups: rapid source control laparotomy (RSCL) vs primary fascial closure (PFC). Patients from each group were cross-matched according to demographics and comorbid conditions. The data was analyzed comparing operative time, 30-day mortality, complications, and length of stay between the groups.

Results:
Of the 104 patients who qualified for the study, 55 underwent PFC and 49 underwent RSCL. Cross matching resulted in 49 patients in each group. Univariate analysis revealed no statistically significant difference in OR times between the two groups (PFC=126.5+/-60.5 minutes; RSCL=115.2+/-70.4; *p*=0.401). Furthermore, the 30-day mortality rate (PFC=6, RSCL=20, p=0.006), rates of failure to wean from a respirator (>48hours) (PFC=21, RSCL=40; *p*=0.001), and rates of resulting renal failure (PFC=2, RSCL=10; *p*=0.043) of the RSCL group were significantly higher.

Conclusions:
Our data provides evidence to suggest that RSCL may not be beneficial in septic patients with colon perforation.

Is Appendicitis and Appendiceal Abscess a Disease of the Aging Population?

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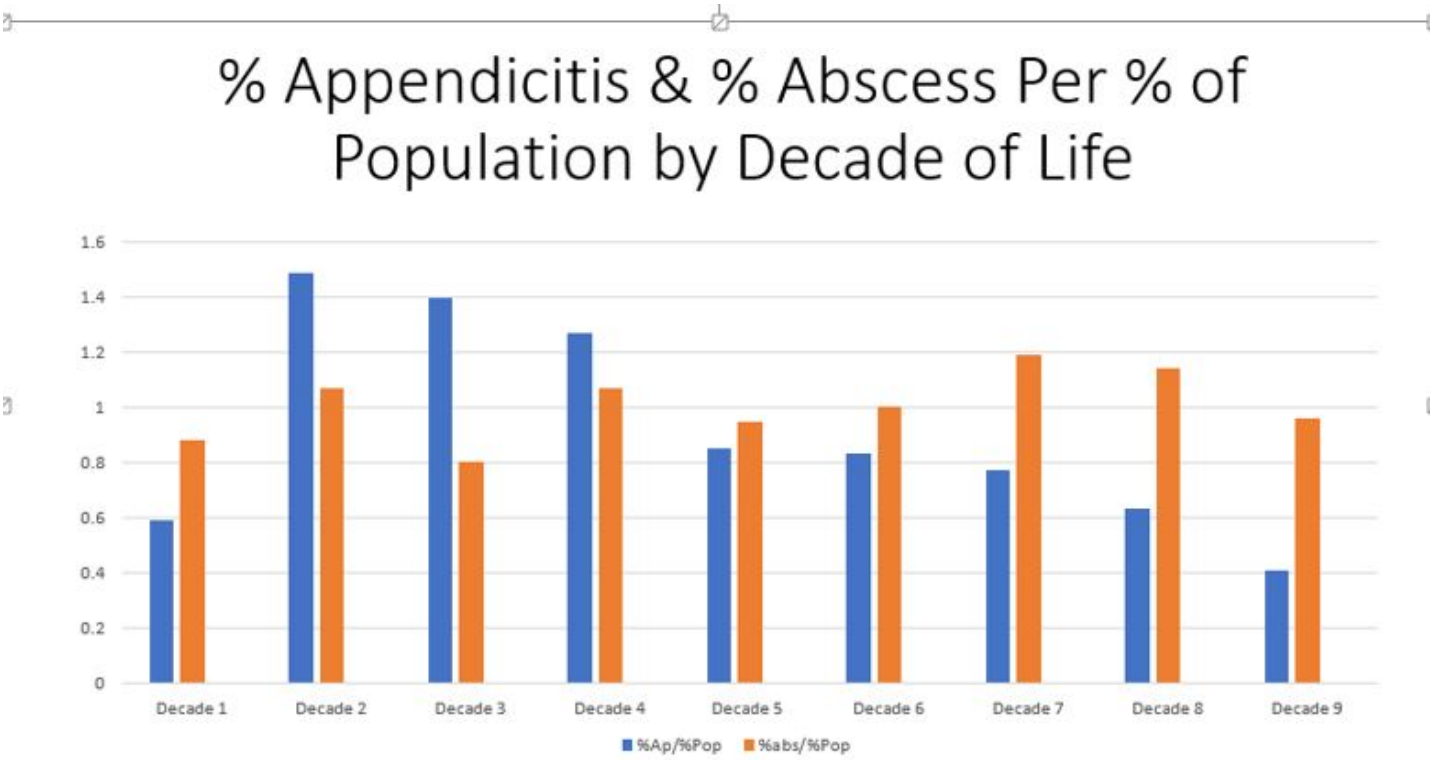
John Mihran Davis, South Shore University Hospital - Northwell Health

Background:
Acute appendicitis is the most common worldwide indication for emergent surgery. Surgical management for early appendectomy has been well accepted; however, the paradigm has been shifting with an aging population, what appears to be a higher incidence of adults and a rising use of laparoscope to appendectomy. The purpose of this paper is to assess by age the incidence of appendicitis (A) and appendiceal abscess/mass (AAb).

Hypothesis:
The incidence of simple appendicitis and complicated appendicitis is increasingly more common in an older population than previously appreciated.

Methods:
The 2018 NY Statewide Planning and Research Cooperative System (SPARCS) database was assessed to identify for appendicitis and age of patients, in addition, NY state census was utilized to have the age distribution of the population. A total of 93,810 were evaluated with appendicitis. Population was divided by decade of life and the percentage of population by decade of life was compared with the percentage of appendicitis and abscesses for that range. The resulting integer reflects the incidence as a function of the population. A number greater than 1 indicates the incidence is higher than the population for that decade.

Results:



The first of life two decades account for 29% of appendicitis patients. Patients in the 3rd, 4th, 5th and 6th decades of life account for 56.3% of patients. Patients presented with an abscess in 3.3% of the total population. Sixty-five percent of patients who presented with AAb were over the age of 30 at the time of initial presentation. The risk of appendiceal abscess at presentation is triphasic with a peak in the 2nd decade, 4th decade and 7th decades of life (figure).

Conclusions:

This data shows A and AAb occur most frequently after the age of 30. These data suggest a re-evaluation of the use of incidental appendectomy in our laparoscopic era and in our aging population.

Percutaneous Drainage for Perforated Appendicitis: Now What?

Christina Theodorou, UC Davis Medical Center, Sarah Stokes, UC Davis Medical Center, Mennatalla Hegazi, UC Davis Medical Center, Payam Saadai, UC Davis Medical Center, Jonathan Emerson Kohler, UC Davis Medical Center, Shinjiro Hirose, UC Davis Medical Center, Diana Farmer, UC Davis Medical Center, Erin Brown, UC Davis Medical Center

Background:

One-third of children with appendicitis present with perforation, and some undergo percutaneous abscess drainage rather than appendectomy, but there is no consensus on best practices for drain management.

Hypothesis:

We aimed to analyze drain-related outcomes of children undergoing percutaneous drainage for perforated appendicitis to develop a drain management pathway.

Methods:

Patients <18 years old undergoing primary percutaneous drainage for perforated appendicitis at a tertiary children's hospital 2014–2019 were identified. The primary outcome was drain duration.

Secondary outcomes included antibiotic duration, length of stay (LOS), drain output and imaging prior to removal, recurrent abscess, and hospital costs.

Results:
Primary percutaneous drains were placed in 12.2% (n=36) of patients with perforated appendicitis. Median antibiotic duration was 14.6 days, and median drain duration was 8.0 days, with most removed before discharge (61.1%). Children with drains removed before discharge had a median output of 7 ml in the 24 hours preceding drain removal, compared to a median output of 30 ml in the 24 hours preceding hospital discharge in children discharged with drains in place (p=0.0003). Patients discharged with drains had longer drain duration (13 vs. 6 days, p=0.0001), but shorter LOS (5.4 vs. 7.6 days, p=0.04) and lower hospital costs ($16,315.80 vs. $23,268.60, p=0.026). One patient required drain replacement and one had aspiration of a recurrent abscess. Most patients (n=22, 61.1%) had imaging prior to drain removal. There was no difference in recurrent abscess formation between patients who had imaging prior to drain removal (n=1/22, 4.5% with imaging, n=1/14, 7.1% without imaging, p=1.0).

Conclusions:
Children undergoing percutaneous drainage for perforated appendicitis have low rates of recurrent abscess following drain removal. Children discharged with drains had longer drain duration but shorter LOS and lower costs. The utility of imaging prior to drain removal in this population requires further evaluation. These details on drain-specific outcomes in children with perforated appendicitis have not been previously investigated and can be used to design a drain management protocol for prospective evaluation.

Discordance Between Radiologist and Surgeon for Appendicitis Category and the Effect on Clinical Outcomes

Khaled Abdul Jawad, Eva Urrechaga, Alessia Cioci, Hang Zhang, Saskya Byerly, Rishi Rattan, Gerd Pust, Nicholas Namias, Daniel Yeh, University of Miami Miller School of Medicine

Background:
The Association for the Surgery of Trauma (AAST) grading criteria uses subscales for radiologists (Rad), surgeons (Surg) and pathologists (Path), though these groups may differ in assessment. We reviewed the Eastern Association for the Surgery of Trauma (EAST) Multicenter Study of the Treatment of Appendicitis in America: Acute, Perforated and Gangrenous (MUSTANG) database to determine rates of discordance and clinical consequences of inaccuracy.

Hypothesis:
We hypothesized that surgeon assessment is concordant with pathologic diagnosis and that when discordant, patient outcomes were significantly worse.

Methods:
A confusion matrix was constructed for pairs among Rad, Surg, and Path. Accuracy is reported using chronologically latest diagnosis as gold standard. “Concordance” (C) was achieved when both agreed on the diagnosis and “Discordance” (D) when they disagreed. A composite endpoint (“COMP” = 30-day incidence of surgical site infection, abscess, wound complication, Clavien-Dindo complication, secondary intervention, ED visit, hospital readmission, and mortality) was compared between C vs. D groups via c^2 test with Bonferroni correction to define statistical significance (p=.05/9 =.005).

Results:
Surg/Rad diagnostic accuracy is displayed in the **Figure**. For each pair and diagnosis, subjects were categorized as C or D and compared for the incidence of COMP. Surg/Path: 16% vs. 26% (p=.006, NS by Bonferroni) for acute (A), 39% vs. 33% (p=.39) for gangrenous (G), and 48% vs. 37% (p=.035, NS by Bonferroni) for perforated (P). Rad/Path: incidence of COMP for C/D was 17% vs. 42%

(p<.001) for A, 27% vs. 31% (p=.95) for G, and 56% vs. 48% (p=.48) for P. Rad/Surg: incidence of COMP for C/D was 17% vs. 40% (p<.001) for A, 36% vs. 26% (p=.43) for G, and 51% vs. 39% (p=.29) for P.

Conclusions:
In appendicitis treated by appendectomy, surgeons are most accurate at diagnosing acute appendicitis and least accurate at gangrenous appendicitis. Radiologists were less accurate for all categories of appendicitis. Even when the surgeon was wrong, clinical outcomes were not significantly worse. However, when the radiologist was wrong about acute appendicitis, patients had significantly worse clinical outcomes.

Path \ Surg	Acute **(A)**	Gangrenous **(G)**	Perforated **(P)**	Total
Acute **(A)**	2040 (94%)	96 (38%)	110 (25%)	2246
Gangrenous **(G)**	56 (3%)	106 (42%)	24 (5%)	186
Perforated **(P)**	66 (3%)	48 (20%)	311 (70%)	425
Total	2162	250	445	2857

Path \ Rad	Acute **(A)**	Gangrenous **(G)**	Perforated **(P)**	Total
Acute **(A)**	2041 (82%)	80 (49%)	35 (27%)	2156
Gangrenous **(G)**	162 (7%)	22 (14%)	11 (8%)	195
Perforated **(P)**	272 (11%)	61 (37%)	84 (65%)	417
Total	2475	163	130	2768

Surg \ Rad	Acute **(A)**	Gangrenous **(G)**	Perforated **(P)**	Total
Acute **(A)**	2045 (81%)	90 (58%)	16 (13%)	2151
Gangrenous **(G)**	177 (7%)	31 (20%)	23 (19%)	231
Perforated **(P)**	297 (12%)	35 (22%)	81 (68%)	413
Total	2519	156	120	2795

Diagnostic Concordance Diagnostic Discordance

Splenectomy versus imaging-guided percutaneous drainage for splenic abscess: a systematic review and meta-analysis

Jillian Wothe, Barite Gutama, Mengli Mengli, Dawn Hackman, Haitao Chu, Jennifer Rickard, University of Minnesota

Background:
Splenic abscess (SA) is a rare and often fatal illness. In the past, splenectomy was the preferred intervention for SA, but it has been associated with high mortality and morbidity. Recently,

percutaneous drainage (PD) has emerged as a treatment for simple, small splenic abscesses and for patients who are unable to tolerate a large operation.

Hypothesis:
We hypothesize that patients with splenic abscess treated with PD will have lower mortality and morbidity compared to those treated with splenectomy.

Methods:
We conducted a systematic review of multiple international databases to identify studies that reported outcomes of splenectomy and/or PD for the treatment of splenic abscess. We then conducted separate meta-analyses for both mortality and morbidity using a bivariate generalized linear mixed model.

Results:
48 retrospective observational studies from 21 countries were included in the meta-analysis. For mortality rate, 27 studies compared splenectomy and PD while 12 used PD only and 9 used splenectomy only. Data for major complications were available in 18 two-arm studies, 7 single-arm studies with PD, and 7 single-arm studies with splenectomy. Only 52% of studies reported abscess characteristics. Overall, there were 613 patients, 290 of which were treated with splenectomy and 323 underwent PD. Only 394 patients had the complication status recorded; 185 of them were treated with splenectomy. Mortality rate was 12% (95% confidence interval (CI): 8%, 17%) in patients undergoing splenectomy compared to 8% (95% CI: 2%, 14%) in those who underwent PD (Figure 1). Complication rates were 27% (95% CI: 15%, 38%) in the splenectomy group compared to 17% (95% CI: 10%, 24%) in the PD group (Figure 2).

Conclusions:
PD is associated with a trend towards lower complication and mortality rates compared to splenectomy in the treatment of splenic abscess. However, due to the heterogeneity of the data we are unable to draw definitive conclusions and further prospective studies are needed.

Infectious complications are associated with readmissions and mortality after trauma

Elinore Kaufman, University of Pennsylvania,Alexis Zebrowski, Icahn School of Medicine at Mount Sinai, Phillipe Loher, Thomas Jefferson University, Douglas Wiebe, University of Pennsylvania, Daniel Holena, University of Pennsylvania, Brendan Carr, Icahn School of Medicine at Mount Sinai

Background:
Infectious complications contribute to prolonged length of stay and in-hospital mortality after injury, but longer-term outcomes are unknown. We used a novel data linkage strategy to assess the impact of infectious complications on readmissions and long-term mortality for injured older adults.

Hypothesis:
Trauma patients who develop infectious complications have higher risk of mortality and readmission.

Methods:
We identified injured patients age ≥ 65 admitted to Pennsylvania trauma centers, 2013-2014 using a state trauma registry. Patients were matched to their Medicare claims using demographics, injury date, and injury characteristics. Infectious complications identified from registry data were pneumonia, urinary tract infection (UTI), soft tissue infection, septicemia, sepsis, empyema, sinusitis and central nervous system infection. Readmissions and 12-month mortality were identified from claims data. We compared in-hospital and 1-year mortality and 30- and 90-day readmission rates between patients with infections (IC) vs. no complications (NC). Multivariable logistic regression models incorporating physiology, injury characteristics, and patient characteristics identified predictors of mortality and readmission.

Results:
Of 15,474 included patients, 1,860 had a complication (12.0%) including 824 (5.3%) infections. UTI was most common (458, 3.0%) followed by pneumonia (349, 2.3%). Patient characteristics are in the table. Among ICs, 126 (15.3%) died in hospital and another 201 (24.4%) died within 1 year compared to 612 (4.5%) and 1,678 (12.3%) of NC patients. Infection was an independent predictor of inpatient (OR 2.5, 95% CI 1.9, 3.2) and 12-month mortality (OR 2.5, 95% CI 2.1, 3.1). At 30 days, 19.3% of ICs and 13.6% of NCs were readmitted. At 90 days, 37.0% ICs and 23.7% NCs had been readmitted. Infection predicted readmission at both time points (OR 1.6, 95% CI 1.3-2.0 for 30 days; OR 2.1, 95% CI 1.7-2.5 for 90 days).

Conclusions:
Injured patients who develop infections are at high risk for readmissions and for mortality up to 12 months. Infection may serve as an indicator of high risk or as a causal factor in long-term mortality. Novel data linkages can extend our understanding of trauma outcomes beyond the registry and beyond the hospital stay.

Consensus Current Procedural Terminology Code Definition of Source Control for Sepsis: A Modified Delphi Procedure

Shimena Li, University of Pittsburgh, Robert Handzel, University of Pittsburgh, Katherine Shapiro , University of Pittsburgh, Daniel Tonetti, University of Pittsburgh, Matthew R. Rosengart, University of Pittsburgh, Daniel Hall , Veterans Affairs Pittsburgh Healthcare System, Christopher Seymour, University of Pittsburgh, Edith Tzeng , University of Pittsburgh, Katherine Reitz, University of Pittsburgh

Background:
Surviving Sepsis Campaign guidelines mirror surgeons' gestalt – rapid source control is paramount. Unlike antibiotic administration and perfusion support, these recommendations lack high-quality evidence and are ungraded. To evaluate source control and sepsis outcomes, internally valid administrative data methods are needed to identify source control procedures.

Hypothesis:
Current Procedural Terminology (CPT) codes can accurately identify source control procedures.

Methods:
Over five modified Delphi rounds, two independent reviewers identified pertinent CPT codes. In each round, codes with perfect agreement were retained or excluded while disagreements were reviewed by four additional critical care and surgical experts. Consensus codes were validated by manually reviewing 400 patient charts that met Sepsis-3 criteria (2010-2017) to identify gold standard source control procedures. Consensus codes were applied to validation data and assessed with sensitivity, specificity, predictive values, and likelihood ratio derived posttest probabilities.

Results:
Of 1,230 eligible CPT codes, 609 consensus codes represented source control procedures. Of 400 patients with sepsis, 39 (10%; 95%CI 7-13%) underwent gold standard procedures and 29 (7%; 95%CI 5-10%) consensus code procedures. 30 unique consensus codes were identified (20% abdominal, 10% genitourinary, 14% hepatopancreatobiliary, 23% orthopedic/neurologic, 23% soft tissue, 10% intrathoracic) which had 62% (95%CI 45-77%) sensitivity, 99% (95%CI 97-100%) specificity, 83% (95%CI 64-94%) positive and 96% (95%CI 93-98%) negative predictive values. With pretest probability at sample prevalence (10%), an identified consensus code had a posttest probability of 83% (95%CI 66-92%) while absence of consensus code had a probability of 4% (95%CI 3-6) for truly undergoing a source control procedure. Descriptions of codes for false positives and

negatives are summarized in **Table**.

Table. *Current Procedural Terminology* (CPT) code, description and anatomic group for source control procedures identified with consensus CPT codes only (false positives) and gold standard chart review only (false negatives).

CPT code	Case Freq.	CPT code description	CPT code anatomic group
False Positives (CPT consensus code source control identification only)			
31645	1	Bronchoscopy, rigid or flexible, including fluoroscopic guidance, when performed; with therapeutic aspiration of tracheobronchial tree, initial (eg, drainage of lung abscess)	Intrathoracic
11010	1	Debridement including removal of foreign material at the site of an open fracture and/or an open dislocation (eg, excisional debridement); skin and subcutaneous tissues	Orthopedic/neurologic
43277	1	Endoscopic retrograde cholangiopancreatography (ERCP); with trans-endoscopic balloon dilation of biliary/pancreatic duct(s) or of ampulla (sphincteroplasty), including sphincterotomy, when performed, each duct	Hepatopancreatobiliary
49406	1	Image-guided fluid collection drainage by catheter (eg, abscess, hematoma, seroma, lymphocele, cyst); peritoneal or retroperitoneal, percutaneous	Abdominal
32551	1	Tube thoracostomy, includes connection to drainage system (eg, water seal), when performed, open (separate procedure)	Intrathoracic
False Negatives (Gold standard chart review identification only)			
11044	1	Debridement, bone (includes epidermis, dermis, subcutaneous tissue, muscle and/or fascia, if performed); first 20 sq cm or less	Orthopedic/Neurologic
49406	1	Image-guided fluid collection drainage by catheter (eg, abscess, hematoma, seroma, lymphocele, cyst); peritoneal or retroperitoneal, percutaneous	Abdominal
None	13	*Absence of administrative CPT code identified in electronic health record*	Not applicable

Conclusions:

We created and validated a tool to identify source control procedures using administrative data. This powerful tool has broad applicability and can aid the critical evaluation of treatments and outcomes for septic patients undergoing source control procedures.

Difference in Survival and Complications Between Patients Undergoing Surgery for Fractures in Metastatic Bone Disease

Neal Kapoor, Olivier Groot, Massachusetts General Hospital, Amanda Lans, Massachusetts General Hospital, Stein Janssen, Academisch Medisch Centrum Universiteit van Amsterdam, Peter Twining, Massachusetts General Hospital, Michiel Bongers, Massachusetts General Hospital, JJ Verlaan, University Medical Center Utrecht, Joseph Schwab, Massachusetts General Hospital

Background:
To assess differences in (1) 90-day and 1-year survival and (2) 30-day postoperative complications and infections, reoperations, intraoperative blood loss, anesthesia time, perioperative blood transfusion and duration of hospitalization between surgical treatment of impending versus pathologic fractures in long bone metastases after propensity score matching.

Hypothesis:
Surgical treatment of impending fractures will increase survival and reduce complications versus pathologic fractures in long bone metastases.

Methods:
We retrospectively performed a propensity score matched cohort study of 1064 patients of which 462 had impending and 602 had pathologic metastatic long bone fractures. After matching on 22 variables, including primary tumor type and visceral metastases, 270 impending cases were adequately matched with 270 pathologic fracture cases. The propensity score matching technique reduces the effect of potential confounders on outcomes by generating clinical equipoise between both groups. The primary outcome was assessed by the Mantel–Cox test for differences in 90-day and 1-year survival between the matched groups. The secondary outcomes were assessed by the McNemar test for categorical and Wilcoxon signed rank test for continuous outcomes.

Results:
90-day survival was not significantly different between both groups, but 1-year survival was significantly higher in the impending fracture group (hazard ratio (HR), 1.09, 95% confidence interval (CI), 0.79-1.51, p-value=0.589 and HR, 1.25, 95% CI, 1.00-1.56, p-value=0.047, respectively). Of the secondary outcomes, the impending fracture group had fewer reoperations (OR, 2.50, 95% CI, 1.92-7.86, *P*=0.049); lower intraoperative blood loss (*P*=0.03); less blood transfusions (*P*=0.01); and shorter anesthesia time (*P*=0.04), but no significant differences were found for postoperative complications or infections, and hospitalization.

Conclusions:
This study found that patients who treated for an impending pathologic fracture had a significantly higher 1-year survival, lower intraoperative blood loss, less perioperative blood transfusions, shorter anesthesia time, and fewer reoperations than patients with a pathologic fracture of the long bone.

Mini Oral Session IV

Enhanced Recovery After Surgery pathways and rates of significant surgical infections in colorectal surgery

Yulia Kostenko, Sydne Muratore, Reece Boyd, Deborah Davis Merritt, Saint Joseph Hospital

Background:
Postoperative surgical infections in colorectal surgery are potentially preventable complications with significant impact on mortality, morbidity, and medical care costs. Our institutional NSQIP Semi-Annual Report has demonstrated an increase in postoperative surgical site infections, anastomotic leaks (AL) and other infections resulting in readmission and return to OR rates in patients undergoing

colorectal surgery concurrent with the advent of Enhanced Recovery After Surgery (ERAS) pathways. Non-steroidal anti-inflammatory drugs (NSAIDs) represent an essential ERAS component. With debate in the literature about NSAIDs possible adverse effects on wound healing, the association between NSAIDs and an increase in infectious complications requires further exploration.

Hypothesis:
The objective of this study was to examine the effect of perioperative use of NSAIDs on infectious complications resulting in readmission and return to OR in colorectal surgery patients at our institution.

Methods:
This was a retrospective case-control study using our hospital's 2018-2019 ACS NSQIP database of patients undergoing colorectal surgery. The study group consisted of 356 patients undergoing colonic or rectal resection with primary anastomosis or ostomy. The non-infectious complication group of 322 patients was compared to 34 patients with infectious complications resulting in readmission or return to OR. These complications included superficial and deep space infections, AL, Clostridium difficile infection, sepsis, pneumonia and urinary tract infection. In addition to NSQIP data, chart review determined the perioperative use of celecoxib, ketorolac and ibuprofen. Pearson chi square, Fisher's exact tests and Student's t-tests were used to compare variables.

Results:
The non-infectious and infectious complication groups were comparable with no statistically significant differences ($p<0.05$) between patients' age, gender, diagnosis, steroid use, preoperative radiation, bowel prep, or elective or emergent nature of the surgery. The statistical analysis demonstrated no association between the rate of significant surgical infections (SSI) and NSAID use [OR 0.76, 95% CI 0.34-17, $p = 0.5$]. In the subgroup analysis, there was no association between SSI and the use of COX-2 selective NSAID celecoxib [OR 1.1, 95% CI 0.49-2.43, $p = 0.8$] as well as nonselective NSAIDs ibuprofen [OR 0.57, 95% CI 0.28-1.16, $p = 0.15$] and ketorolac [OR 0.79, 95% CI 0.39-1.61, $p = 0.58$].

Conclusions:
Perioperative use of both COX-2 selective and non-selective NSAIDs in colorectal surgery patients had no independent impact on SSI. These results support the ongoing perioperative administration of NSAIDs within our ERAS protocol.

Alcoholism and Infection Risk in the Intensive Care Unit

Kristin P. Colling, Saint Mary's Medical Center - Essentia Health, Alexandra Kraft, University of Minnesota Medical School - Duluth Campus, Melissa Harry, Essentia Institute of Rural Health

Background:
Alcohol is the most frequently abused drug in US, and alcohol dependence and cirrhosis are common diagnoses in intensive care unit (ICU) patients.

Hypothesis:
We hypothesize that alcoholism will be associated with increased infection rates.

Methods:
A retrospective chart review of all patients admitted to the ICU from January 2017-March 2019 at a tertiary referral hospital serving a large rural population was performed. Patients with diagnoses of alcoholism, alcohol dependence and alcoholic cirrhosis were included. Patients were excluded if they did not require ICU care (no intubation, organ failure, ICU medications). Patient demographics, hospital course, infection type, culture results and mortality were collected and evaluated, p values < 0.05 were considered significant.

Results:
527 patients met inclusion and exclusion criteria. The most common admitting diagnoses were GI bleed (18%), cardiopulmonary failure (18%) trauma (17%), acute withdrawal (13%), sepsis (13%), complications of liver failure (9%) and suicide/overdose (7%). Patient demographics and risk factors for infection are depicted in the table. Infection occurred in 40% of patients.

In multivariate analysis, when controlling for age, sex, BMI, liver failure, CKD, thrombocytopenia, complications and receipt of blood transfusion, infection remained an independent predictor of in-hospital mortality (adjusted odds ratio 3.3 (95% CI 1.7-6.4). Other independent risk factors significant for risk of mortality were liver failure on admission, and in-hospital complications. Septic shock developed in 57% of infections and was associated with an increased risk of mortality (38% versus 2% p<0.001).

Pneumonia was the most common infection (70%), followed by urinary tract infection (13%), skin/soft tissue infections (14%), bacteremia (17%), intraabdominal infections (10%) and *C. difficile (*1%). Cultures were obtained in 74% of pneumonias, most common being *S. aureus* (17%; 11% MSSA and 6% MRSA), *H. influenzae (13%),* and *S. pneumoniae (12%).* Pneumonia was associated with higher in-hospital mortality (22% versus 8%, OR 3.3; p < 0.001).

	All patients n=527	**Infection n= 211 (40%)**	**Odds Ratio for Infection**	**P value**
Age; years *Median (Range)*	56 (18-86)	57 (20-86)	NA	0.26[a]
Sex (Female) *n (%)*	160 (30%)	68 (32%)	1.2 (0.8-1.7)	0.45
Race *n (%)*			NA	0.3
White	418 (79%)	160 (76%)		
Black	11 (2%)	4 (2%)		
Native American	88 (17%)	43 (20%)		
Asian	6	2		
Unknown	4 (2%)	2 (2%)		
Rural *n (%)*	189 (36%)	88 (42%)	1.5 (1.1-2.1)	0.02
Insurance *n (%)*			NA	0.25
Uninsured	112 (21%)	40 (19%)		
Private	72 (14%)	28 (13%)		
Medicare	156 (30%)	73 (35%)		
Medicaid	187 (36%)	70 (33%)		
ICU Length of Stay; *median days (IQR)*	3 (2-6)	5 (3-10)	NA	<0.001[a]
Hospital Length of Stay; *median days (IQR)*	8 (4-13)	10 (6-18)	NA	<0.001[a]
Liver Failure Present on Admission *n (%)*	241 (46%)	116 (55%)	1.9 (1.3-2.7)	<0.001
Diabetes Mellitus *n (%)*	111 (21%)	48 (27%)	1.1 (0.7-1.8)	0.44
Chronic Renal Disease *n (%)*	85 (15%)	48 (23%)	2.4 (1.5-3.9)	<0.001
Thrombocytopenia *n (%)*	194 (37%)	94 (45%)	1.7 (1.2-2.5)	0.003
In Hospital Mortality *n (%)*	63 (12%)	48 (23%)	5.9 (3.1-10.8)	<0.001

Abbreviations: ICU: Intensive Care Unit; IQR: Interquartile Range

[a] Mann-Whitney U test. All dichotomous variables were compared using Chi Square Tests.

Conclusions:

Alcoholism and cirrhosis are common comorbidities in ICU patients. Infection occurs frequently in alcoholic ICU patients, most commonly pneumonia, and was associated with increased mortality.

Rapid Source Control Laparotomy vs Primary Facial Closure in Management of Colonic Perforation and in Septic Shock

Kevin Carroll, South Shore University Hospital - Northwell Health, Rachael Seddighzadeh, Palisades Medical Center, Ayolola Onayemi, Palisades Medical Center, Yen-Hong Kuo, Jersey Shore University Medical Center, Jason Sciarretta, Emory, John Mihran Davis, South Shore University Hospital - Northwell Health, Nasim Ahmed, Jersey Shore University Medical Center

Background:
Damage control laparotomy (DCL) has been widely accepted for use in trauma patients with intra-abdominal injuries, hypothermia, coagulopathy, and acidosis. The use has evolved in the acute care setting to include surgical patients with acute intestinal perforations without clear evidence to support such practice.

Hypothesis:
Patients in shock would benefit from rapid source control laparotomy over primary fascial closure.

Methods:
All patients with colon perforations in septic shock were studied using data from the 2014-2016 National Surgical Quality Improvement Program (NSQIP) data was queried. These patients were then separated by surgical intervention into two groups: rapid source control laparotomy (RSCL) vs primary fascial closure (PFC). Patients from each group were cross-matched according to demographics and comorbid conditions. The data was analyzed comparing operative time, 30-day mortality, complications, and length of stay between the groups.

Results:
Of the 104 patients who qualified for the study, 55 underwent PFC and 49 underwent RSCL. Cross matching resulted in 49 patients in each group. Univariate analysis revealed no statistically significant difference in OR times between the two groups (PFC=126.5+/-60.5 minutes; RSCL=115.2+/-70.4; p=0.401). Furthermore, the 30-day mortality rate (PFC=6, RSCL=20, p=0.006), rates of failure to wean from a respirator (>48hours) (PFC=21, RSCL=40; p=0.001), and rates of resulting renal failure (PFC=2, RSCL=10; p=0.043) of the RSCL group were significantly higher.

Conclusions:
Our data provides evidence to suggest that RSCL may not be beneficial in septic patients with colon perforation.

Is Appendicitis and Appendiceal Abscess a Disease of the Aging Population?

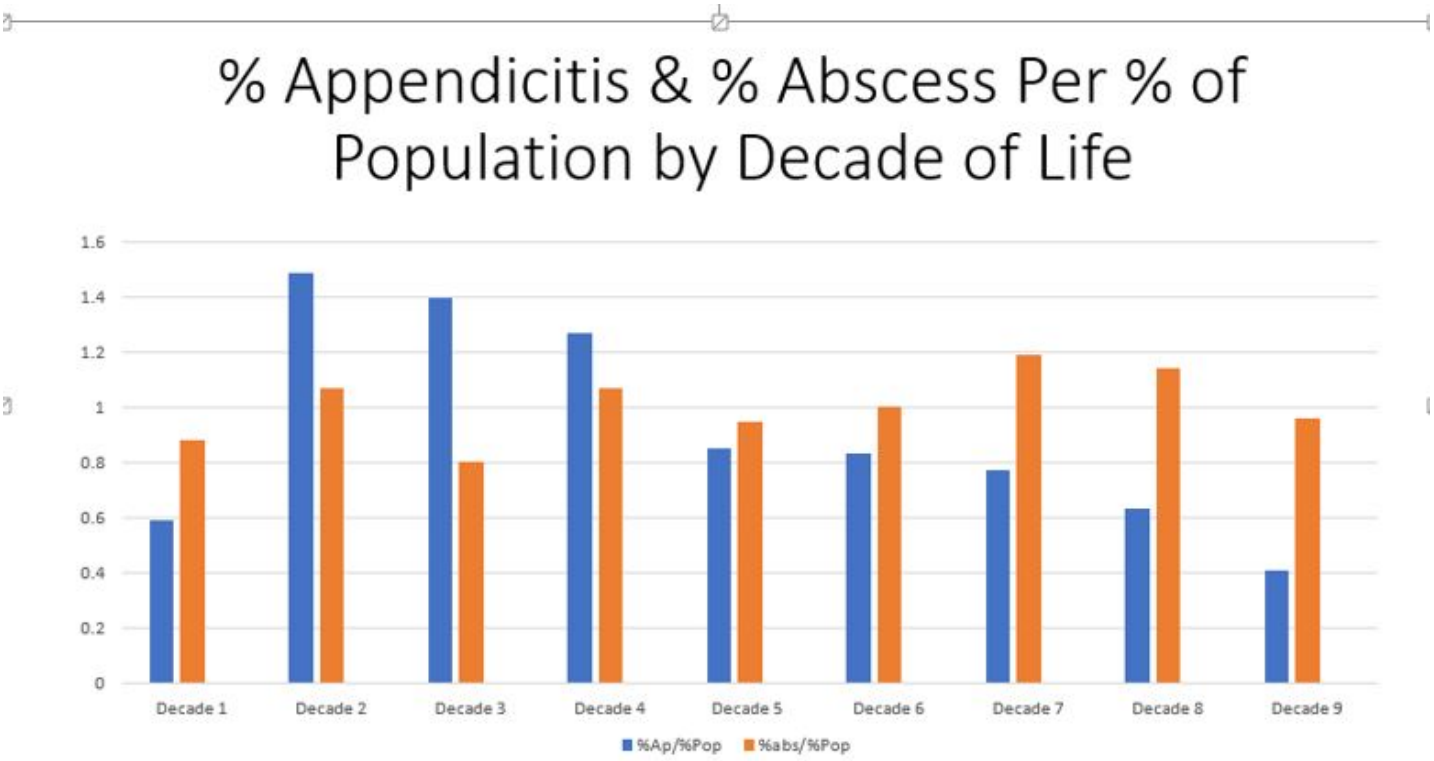
Nico Fuentes, Andrew Bates, Dominick Gadaleta, David Pechman, John Mihran Davis, South Shore University Hospital - Northwell Health

Background:
Acute appendicitis is the most common worldwide indication for emergent surgery. Surgical management for early appendectomy has been well accepted; however, the paradigm has been shifting with an aging population, what appears to be a higher incidence of adults and a rising use of laparoscope to appendectomy. The purpose of this paper is to assess by age the incidence of appendicitis (A) and appendiceal abscess/mass (AAb).

Hypothesis:
The incidence of simple appendicitis and complicated appendicitis is increasingly more common in an older population than previously appreciated.

Methods:
The 2018 NY Statewide Planning and Research Cooperative System (SPARCS) database was assessed to identify for appendicitis and age of patients, in addition, NY state census was utilized to have the age distribution of the population. A total of 93,810 were evaluated with appendicitis. Population was divided by decade of life and the percentage of population by decade of life was compared with the percentage of appendicitis and abscesses for that range. The resulting integer reflects the incidence as a function of the population. A number greater than 1 indicates the incidence is higher than the population for that decade.

Results:



The first of life two decades account for 29% of appendicitis patients. Patients in the 3rd, 4th, 5th and 6th decades of life account for 56.3% of patients. Patients presented with an abscess in 3.3% of the total population. Sixty-five percent of patients who presented with AAb were over the age of 30 at the time of initial presentation. The risk of appendiceal abscess at presentation is triphasic with a peak in the 2nd decade, 4th decade and 7th decades of life (figure).

Conclusions:
This data shows A and AAb occur most frequently after the age of 30. These data suggest a re-evaluation of the use of incidental appendectomy in our laparoscopic era and in our aging population.

Percutaneous Drainage for Perforated Appendicitis: Now What?
Christina Theodorou, Sarah Stokes, Mennatalla Hegazi, Payam Saadai, Jonathan Emerson Kohler, Shinjiro Hirose, Diana Farmer, Erin Brown, UC Davis Medical Center

Background:
One-third of children with appendicitis present with perforation, and some undergo percutaneous abscess drainage rather than appendectomy, but there is no consensus on best practices for drain management.

Hypothesis:
We aimed to analyze drain-related outcomes of children undergoing percutaneous drainage for perforated appendicitis to develop a drain management pathway.

Methods:
Patients <18 years old undergoing primary percutaneous drainage for perforated appendicitis at a tertiary children's hospital 2014–2019 were identified. The primary outcome was drain duration. Secondary outcomes included antibiotic duration, length of stay (LOS), drain output and imaging prior to removal, recurrent abscess, and hospital costs.

Results:
Primary percutaneous drains were placed in 12.2% (n=36) of patients with perforated appendicitis. Median antibiotic duration was 14.6 days, and median drain duration was 8.0 days, with most removed before discharge (61.1%). Children with drains removed before discharge had a median output of 7 ml in the 24 hours preceding drain removal, compared to a median output of 30 ml in the 24 hours preceding hospital discharge in children discharged with drains in place (p=0.0003). Patients discharged with drains had longer drain duration (13 vs. 6 days, p=0.0001), but shorter LOS (5.4 vs. 7.6 days, p=0.04) and lower hospital costs ($16,315.80 vs. $23,268.60, p=0.026). One patient required drain replacement and one had aspiration of a recurrent abscess. Most patients (n=22, 61.1%) had imaging prior to drain removal. There was no difference in recurrent abscess formation between patients who had imaging prior to drain removal (n=1/22, 4.5% with imaging, n=1/14, 7.1% without imaging, p=1.0).

Conclusions:
Children undergoing percutaneous drainage for perforated appendicitis have low rates of recurrent abscess following drain removal. Children discharged with drains had longer drain duration but shorter LOS and lower costs. The utility of imaging prior to drain removal in this population requires further evaluation. These details on drain-specific outcomes in children with perforated appendicitis have not been previously investigated and can be used to design a drain management protocol for prospective evaluation.

Discordance Between Radiologist and Surgeon for Appendicitis Category and the Effect on Clinical Outcomes

Khaled Abdul Jawad, Eva Urrechaga, Alessia Cioci, Hang Zhang, Saskya Byerly, Rishi Rattan, Gerd Pust, Nicholas Namias, Daniel Yeh, University of Miami Miller School of Medicine

Background:
The Association for the Surgery of Trauma (AAST) grading criteria uses subscales for radiologists (Rad), surgeons (Surg) and pathologists (Path), though these groups may differ in assessment. We reviewed the Eastern Association for the Surgery of Trauma (EAST) Multicenter Study of the Treatment of Appendicitis in America: Acute, Perforated and Gangrenous (MUSTANG) database to determine rates of discordance and clinical consequences of inaccuracy.

Hypothesis:
We hypothesized that surgeon assessment is concordant with pathologic diagnosis and that when discordant, patient outcomes were significantly worse.

Methods:
A confusion matrix was constructed for pairs among Rad, Surg, and Path. Accuracy is reported using chronologically latest diagnosis as gold standard. “Concordance” (C) was achieved when both agreed on the diagnosis and “Discordance” (D) when they disagreed. A composite endpoint (“COMP” = 30-day incidence of surgical site infection, abscess, wound complication, Clavien-Dindo complication, secondary intervention, ED visit, hospital readmission, and mortality) was compared between C vs. D groups via c^2 test with Bonferroni correction to define statistical significance (p=.05/9 =.005).

Results:
Surg/Rad diagnostic accuracy is displayed in the **Figure**. For each pair and diagnosis, subjects were categorized as C or D and compared for the incidence of COMP. Surg/Path: 16% vs. 26% (p=.006, NS by Bonferroni) for acute (A), 39% vs. 33% (p=.39) for gangrenous (G), and 48% vs. 37% (p=.035, NS by Bonferroni) for perforated (P). Rad/Path: incidence of COMP for C/D was 17% vs. 42% (p<.001) for A, 27% vs. 31% (p=.95) for G, and 56% vs. 48% (p=.48) for P. Rad/Surg: incidence of COMP for C/D was 17% vs. 40% (p<.001) for A, 36% vs. 26% (p=.43) for G, and 51% vs. 39% (p=.29) for P.

Conclusions:
In appendicitis treated by appendectomy, surgeons are most accurate at diagnosing acute appendicitis and least accurate at gangrenous appendicitis. Radiologists were less accurate for all categories of appendicitis. Even when the surgeon was wrong, clinical outcomes were not significantly worse. However, when the radiologist was wrong about acute appendicitis, patients had significantly worse clinical outcomes.

Path \ Surg	Acute **(A)**	Gangrenous **(G)**	Perforated **(P)**	Total
Acute **(A)**	2040 (94%)	96 (38%)	110 (25%)	2246
Gangrenous **(G)**	56 (3%)	106 (42%)	24 (5%)	186
Perforated **(P)**	66 (3%)	48 (20%)	311 (70%)	425
Total	2162	250	445	2857

Path \ Rad	Acute **(A)**	Gangrenous **(G)**	Perforated **(P)**	Total
Acute **(A)**	2041 (82%)	80 (49%)	35 (27%)	2156
Gangrenous **(G)**	162 (7%)	22 (14%)	11 (8%)	195
Perforated **(P)**	272 (11%)	61 (37%)	84 (65%)	417
Total	2475	163	130	2768

Surg \ Rad	Acute **(A)**	Gangrenous **(G)**	Perforated **(P)**	Total
Acute **(A)**	2045 (81%)	90 (58%)	16 (13%)	2151
Gangrenous **(G)**	177 (7%)	31 (20%)	23 (19%)	231
Perforated **(P)**	297 (12%)	35 (22%)	81 (68%)	413
Total	2519	156	120	2795

Diagnostic Concordance Diagnostic Discordance

Splenectomy versus imaging-guided percutaneous drainage for splenic abscess: a systematic review and meta-analysis

Jillian Wothe, Barite Gutama, Mengli Mengli, Dawn Hackman, Haitao Chu, Jennifer Rickard, University of Minnesota

Background:
Splenic abscess (SA) is a rare and often fatal illness. In the past, splenectomy was the preferred intervention for SA, but it has been associated with high mortality and morbidity. Recently, percutaneous drainage (PD) has emerged as a treatment for simple, small splenic abscesses and for patients who are unable to tolerate a large operation.

Hypothesis:
We hypothesize that patients with splenic abscess treated with PD will have lower mortality and morbidity compared to those treated with splenectomy.

Methods:
We conducted a systematic review of multiple international databases to identify studies that reported outcomes of splenectomy and/or PD for the treatment of splenic abscess. We then conducted separate meta-analyses for both mortality and morbidity using a bivariate generalized linear mixed model.

Results:
48 retrospective observational studies from 21 countries were included in the meta-analysis. For mortality rate, 27 studies compared splenectomy and PD while 12 used PD only and 9 used splenectomy only. Data for major complications were available in 18 two-arm studies, 7 single-arm studies with PD, and 7 single-arm studies with splenectomy. Only 52% of studies reported abscess characteristics. Overall, there were 613 patients, 290 of which were treated with splenectomy and 323 underwent PD. Only 394 patients had the complication status recorded; 185 of them were treated with splenectomy. Mortality rate was 12% (95% confidence interval (CI): 8%, 17%) in patients undergoing splenectomy compared to 8% (95% CI: 2%, 14%) in those who underwent PD (Figure 1). Complication rates were 27% (95% CI: 15%, 38%) in the splenectomy group compared to 17% (95% CI: 10%, 24%) in the PD group (Figure 2).

Conclusions:
PD is associated with a trend towards lower complication and mortality rates compared to splenectomy in the treatment of splenic abscess. However, due to the heterogeneity of the data we are unable to draw definitive conclusions and further prospective studies are needed.

Infectious complications are associated with readmissions and mortality after trauma

Elinore Kaufman, University of Pennsylvania, Alexis Zebrowski, Icahn School of Medicine at Mount Sinai, Phillipe Loher, Thomas Jefferson University, Douglas Wiebe, University of Pennsylvania, Daniel Holena, University of Pennsylvania, Brendan Carr, Icahn School of Medicine at Mount Sinai

Background:
Infectious complications contribute to prolonged length of stay and in-hospital mortality after injury, but longer-term outcomes are unknown. We used a novel data linkage strategy to assess the impact of infectious complications on readmissions and long-term mortality for injured older adults.

Hypothesis:
Trauma patients who develop infectious complications have higher risk of mortality and readmission.

Methods:
We identified injured patients age ≥ 65 admitted to Pennsylvania trauma centers, 2013-2014 using a state trauma registry. Patients were matched to their Medicare claims using demographics, injury date, and injury characteristics. Infectious complications identified from registry data were pneumonia, urinary tract infection (UTI), soft tissue infection, septicemia, sepsis, empyema, sinusitis and central nervous system infection. Readmissions and 12-month mortality were identified from claims data. We compared in-hospital and 1-year mortality and 30- and 90-day readmission rates between patients with infections (IC) vs. no complications (NC). Multivariable logistic regression models incorporating physiology, injury characteristics, and patient characteristics identified predictors of mortality and readmission.

Results:
Of 15,474 included patients, 1,860 had a complication (12.0%) including 824 (5.3%) infections. UTI was most common (458, 3.0%) followed by pneumonia (349, 2.3%). Patient characteristics are in the table. Among ICs, 126 (15.3%) died in hospital and another 201 (24.4%) died within 1 year compared to 612 (4.5%) and 1,678 (12.3%) of NC patients. Infection was an independent predictor of inpatient (OR 2.5, 95% CI 1.9, 3.2) and 12-month mortality (OR 2.5, 95% CI 2.1, 3.1). At 30 days, 19.3% of ICs and 13.6% of NCs were readmitted. At 90 days, 37.0% ICs and 23.7% NCs had been readmitted. Infection predicted readmission at both time points (OR 1.6, 95% CI 1.3-2.0 for 30 days; OR 2.1, 95% CI 1.7-2.5 for 90 days).

Conclusions:

Injured patients who develop infections are at high risk for readmissions and for mortality up to 12 months. Infection may serve as an indicator of high risk or as a causal factor in long-term mortality. Novel data linkages can extend our understanding of trauma outcomes beyond the registry and beyond the hospital stay.

Consensus Current Procedural Terminology Code Definition of Source Control for Sepsis: A Modified Delphi Procedure

Shimena Li, University of Pittsburgh, Robert Handzel, University of Pittsburgh, Katherine Shapiro , University of Pittsburgh, Daniel Tonetti, University of Pittsburgh, Matthew R. Rosengart, University of Pittsburgh, Daniel Hall , Veterans Affairs Pittsburgh Healthcare System, Christopher Seymour, University of Pittsburgh, Edith Tzeng , University of Pittsburgh, Katherine Reitz, University of Pittsburgh

Background:
Surviving Sepsis Campaign guidelines mirror surgeons' gestalt – rapid source control is paramount. Unlike antibiotic administration and perfusion support, these recommendations lack high-quality evidence and are ungraded. To evaluate source control and sepsis outcomes, internally valid administrative data methods are needed to identify source control procedures.

Hypothesis:
Current Procedural Terminology (CPT) codes can accurately identify source control procedures.

Methods:
Over five modified Delphi rounds, two independent reviewers identified pertinent CPT codes. In each round, codes with perfect agreement were retained or excluded while disagreements were reviewed by four additional critical care and surgical experts. Consensus codes were validated by manually reviewing 400 patient charts that met Sepsis-3 criteria (2010-2017) to identify gold standard source control procedures. Consensus codes were applied to validation data and assessed with sensitivity, specificity, predictive values, and likelihood ratio derived posttest probabilities.

Results:
Of 1,230 eligible CPT codes, 609 consensus codes represented source control procedures. Of 400 patients with sepsis, 39 (10%; 95%CI 7-13%) underwent gold standard procedures and 29 (7%; 95%CI 5-10%) consensus code procedures. 30 unique consensus codes were identified (20% abdominal, 10% genitourinary, 14% hepatopancreatobiliary, 23% orthopedic/neurologic, 23% soft tissue, 10% intrathoracic) which had 62% (95%CI 45-77%) sensitivity, 99% (95%CI 97-100%) specificity, 83% (95%CI 64-94%) positive and 96% (95%CI 93-98%) negative predictive values. With pretest probability at sample prevalence (10%), an identified consensus code had a posttest probability of 83% (95%CI 66-92%) while absence of consensus code had a probability of 4% (95%CI 3-6) for truly undergoing a source control procedure. Descriptions of codes for false positives and

negatives are summarized in **Table**.

Table. *Current Procedural Terminology* (CPT) code, description and anatomic group for source control procedures identified with consensus CPT codes only (false positives) and gold standard chart review only (false negatives).

CPT code	Case Freq.	CPT code description	CPT code anatomic group
False Positives (CPT consensus code source control identification only)			
31645	1	Bronchoscopy, rigid or flexible, including fluoroscopic guidance, when performed; with therapeutic aspiration of tracheobronchial tree, initial (eg, drainage of lung abscess)	Intrathoracic
11010	1	Debridement including removal of foreign material at the site of an open fracture and/or an open dislocation (eg, excisional debridement); skin and subcutaneous tissues	Orthopedic/neurologic
43277	1	Endoscopic retrograde cholangiopancreatography (ERCP); with trans-endoscopic balloon dilation of biliary/pancreatic duct(s) or of ampulla (sphincteroplasty), including sphincterotomy, when performed, each duct	Hepatopancreatobiliary
49406	1	Image-guided fluid collection drainage by catheter (eg, abscess, hematoma, seroma, lymphocele, cyst); peritoneal or retroperitoneal, percutaneous	Abdominal
32551	1	Tube thoracostomy, includes connection to drainage system (eg, water seal), when performed, open (separate procedure)	Intrathoracic
False Negatives (Gold standard chart review identification only)			
11044	1	Debridement, bone (includes epidermis, dermis, subcutaneous tissue, muscle and/or fascia, if performed); first 20 sq cm or less	Orthopedic/Neurologic
49406	1	Image-guided fluid collection drainage by catheter (eg, abscess, hematoma, seroma, lymphocele, cyst); peritoneal or retroperitoneal, percutaneous	Abdominal
None	13	*Absence of administrative CPT code identified in electronic health record*	Not applicable

Conclusions:

We created and validated a tool to identify source control procedures using administrative data. This powerful tool has broad applicability and can aid the critical evaluation of treatments and outcomes for septic patients undergoing source control procedures.

Difference in Survival and Complications Between Patients Undergoing Surgery for Fractures in Metastatic Bone Disease

Neal Kapoor, Olivier Groot, Massachusetts General Hospital, Amanda Lans, Massachusetts General Hospital, Stein Janssen, Academisch Medisch Centrum Universiteit van Amsterdam, Peter Twining, Massachusetts General Hospital, Michiel Bongers, Massachusetts General Hospital, JJ Verlaan, University Medical Center Utrecht, Joseph Schwab, Massachusetts General Hospital

Background:
To assess differences in (1) 90-day and 1-year survival and (2) 30-day postoperative complications and infections, reoperations, intraoperative blood loss, anesthesia time, perioperative blood transfusion and duration of hospitalization between surgical treatment of impending versus pathologic fractures in long bone metastases after propensity score matching.

Hypothesis:
Surgical treatment of impending fractures will increase survival and reduce complications versus pathologic fractures in long bone metastases.

Methods:
We retrospectively performed a propensity score matched cohort study of 1064 patients of which 462 had impending and 602 had pathologic metastatic long bone fractures. After matching on 22 variables, including primary tumor type and visceral metastases, 270 impending cases were adequately matched with 270 pathologic fracture cases. The propensity score matching technique reduces the effect of potential confounders on outcomes by generating clinical equipoise between both groups. The primary outcome was assessed by the Mantel–Cox test for differences in 90-day and 1-year survival between the matched groups. The secondary outcomes were assessed by the McNemar test for categorical and Wilcoxon signed rank test for continuous outcomes.

Results:
90-day survival was not significantly different between both groups, but 1-year survival was significantly higher in the impending fracture group (hazard ratio (HR), 1.09, 95% confidence interval (CI), 0.79-1.51, p-value=0.589 and HR, 1.25, 95% CI, 1.00-1.56, p-value=0.047, respectively). Of the secondary outcomes, the impending fracture group had fewer reoperations (OR, 2.50, 95% CI, 1.92-7.86, *P*=0.049); lower intraoperative blood loss (*P*=0.03); less blood transfusions (*P*=0.01); and shorter anesthesia time (*P*=0.04), but no significant differences were found for postoperative complications or infections, and hospitalization.

Conclusions:
This study found that patients who treated for an impending pathologic fracture had a significantly higher 1-year survival, lower intraoperative blood loss, less perioperative blood transfusions, shorter anesthesia time, and fewer reoperations than patients with a pathologic fracture of the long bone.

Mini Oral Session V

Patterns of Use and Factors Associated with Sustained Prescription Opioid Use After Necrotizing Soft Tissue Infections

Manuel Castillo-Angeles , Brigham and Women's Hospital, Stephanie Nitzschke, Brigham and Women's Hospital, Tracey Koelhmoos, Uniformed Services University, Zara Cooper, Brigham and Women's Hospital, Ali Salim, Brigham and Women's Hospital, Reza Askari, Brigham and Women's Hospital

Background:
Prolonged opioid use is a major concern when treating pain after surgical procedures. It has been shown that approximately 1.7% of patients are still using opioids at one year after Emergency General Surgery. However, this sustained opioid use has not been studied within the NSTI population. The objective of the current study

was to determine the patterns of use and factors associated with sustained opioid use in patients with NSTI at discharge.

Hypothesis:
We hypothesize that the proportion of patients with NSTI persistently using opioids at one year after discharge will be higher than that reported for EGS.

Methods:
The 2007-2015 TRICARE insurance database was queried for patients 18-64 years, with a diagnosis of NSTI (identified through ICD-9 diagnosis codes). Basic demographic data, clinical characteristics, as well as medical comorbidities were obtained. The opioid prescriptions present at discharge, three months, six months and one year were also obtained. A risk-adjusted Cox Proportional-Hazard model was used to identify predictors of opioid discontinuation to highlight the likelihood of sustained opioid use.

Results:
We identified 2,890 patients with diagnosis of NTSI. Among the 1,083 patients that received an opioid prescription at discharge, 30% filled ≥ 1 opioid prescription after discharge, 10.5% continued opioid use at 3 months, 6.6% at 6 months, and 4.1% at 1 year. After risk-adjusted analysis, older age (45-64 vs. 18-24 years [Ref.], HR: 0.55, p<0.01), married status (HR: 0.88, p=0.03), previous diagnosis of anxiety (HR: 0.56, p=0.03), pre-existing comorbidities (defined by Charlson Comorbidity Index ≥ 1, HR: 0.42, p<0.01) and length of stay (HR: 0.97, p=0.001) were associated with decreased likelihood of opioid discontinuation or higher likelihood of sustained opioid use at one year. Being retired (HR: 1.35, p<0.01) and being in the Midwest region (HR: 1.47, p<0.01) were associated with higher likelihood of opioid discontinuation, or a lower likelihood of sustained opioid use. Gender, race, and prior diagnosis of depression were not significant predictors of sustained opioid use.

Conclusions:
Even though less than 5% of NSTI patients continued to use opioids for more than 1 year after discharge, this was higher than the reported rate after EGS. Further research needs to focus on developing strategies and guidelines to adequately prescribe and discontinue opioids in the NSTI population.

Modern Pathogenesis of Necrotizing Soft Tissue Infections

Kathryn Schubauer, Michael Villarreal, Kathia Gonzalez-Gallo, Courtney DiDonato, Adara McCarty, Zoe Krebs, Jon Wisler, The Ohio State University

Background:
Necrotizing soft tissue infections (NSTI) are rapidly progressive, fatal infections of the subcutaneous tissue, fascia, or muscle that require prompt intervention with emergent surgical treatment. We sought to identify modern pathogenesis of NSTIs and further describe presentation and outcomes.

Hypothesis:
Location of primary infection will affect the pathology of necrotizing soft tissue infections.

Methods:
A retrospective, single-institution analysis was performed. Adults 18 years or older with an intraoperative diagnosis of NSTI from November 2011 to September 2020 were included. Prisoners, pregnant women, and patients without intraoperatively confirmed NSTI were excluded from analysis. Patients were placed into cohorts by anatomical location of primary infection (upper extremity, lower extremity, scrotum/perineum/groin, and trunk/neck/head). Continuous and categorical variables were assessed using parametric and non-parametric tests. Statistical significance was defined as $p < 0.05$.

Results:
533 patients met inclusion criteria. Infections with a primary location of the upper extremity were associated with higher rates of IV drug use (52.9%, p<0.0001) and gram-positive only infections (60.78%, p=0.0012)). These patients were younger (46.3 [33-58], p=0.0004), had lower Charlson index (1.7 [1-2], p<0.0001), and lower rates of obesity (35.3%). Patients with infections of the scrotum, perineum, and groin were older (55.1 [46-64], p<0.0001), had higher rates of obesity (69.27%, p=0.0006), and higher rates of diabetes (58.4%,

p=0.0013). This cohort was the most likely to have a polymicrobial infection (63.7%, p=0.0012). Patients with lower extremity infections were most likely to receive an amputation (30.3%, p<0.0001), had the highest rate of kidney disease (14.4%, p=0.0009), and the highest Charlson index (3.4 [1-5]), p<0.0001).

Conclusions:
NSTI are often classified based on microbial composition, but few studies have evaluated microbial composition based on location. These infections are often polymicrobial, requiring broad-spectrum antibiotic therapy. Our analysis shows that microbial composition varies greatly by location. Although further analysis is warranted, location of primary infection may be a feasible tool to narrow or expand antimicrobial coverage.

Mortality and Discharge disposition: Characterizing the burden of NSTI in the United States

Adara McCarty, Anahita Jalilvand, Michael Villarreal, Robert Tamer, Scott Strassels, Kathryn Schubauer, Anghela Paredes, Heena Santry, Jon Wisler, The Ohio State University

Background:
Necrotizing soft tissue infections (NSTIs) are rare and life threatening diseases, characterized by inflammation and necrosis of the tissues within the soft tissue and muscles. The term encompasses a group of diseases, including necrotizing fasciitis, gas gangrene, cutaneous gangrene, and Fournier gangrene. While this disease is highly morbid, the overall burden of these diseases on patients, both during and after the initial hospitalization, is not well understood.

Hypothesis:
Certain risk factors will be a signifigant indicator of worse outcomes in patients presenting with an NSTI.

Methods:
Retrospective data was obtained from the 2012-2016 National Inpatient Sample dataset. Included in analysis were those ≥18 years of age with a primary diagnosis of a Necrotizing soft tissue infection. Risk factors for in hospital mortality and discharge disposition were examined. Continuous variables were assessed using central tendency, t-tests, and Wilcoxon rank-sum tests. Categorical variables were assessed using chi-squared and Fisher's Exact tests. Statistical significance was defined as $p < 0.05$.

Results:
1,030 patient records were reviewed. 63% of patients were male and the overall mean age was 75.4 +/- 8.6 years. 828 (33.0%) patients required emergency surgery for their NSTI diagnosis. The overall mortality was 20%. Several underlying comorbidities were associated with higher rates of mortality including cancer (OR 3.50, p=0.0004), liver disease (OR 2.97, p=0.0096), and kidney disease (OR 2.15, p=<0.0001). Kidney disease was also associated with a higher likelihood of discharge to a skilled nursing facility or rehab (p=<0.0001). Overall, patients discharged to skilled nursing facilities or rehab had higher rates of underlying comorbidities compared to patients that were discharged home (3 or more comorbid illness 84.3% vs. 68.6%, p<0.0001).

Conclusions:
In our National Inpatient Sample dataset we identified several medical comorbidities that are associated with increased rates of in-hospital mortality. Patients with underlying cancers had the highest odds of increased mortality. These data suggest that patients with underlying illnesses, especially cancer, kidney disease, or liver disease have higher mortalities, and are more likely to be discharged to skilled nursing facilities or rehab. It is unclear why these illnesses were associated with these worse outcomes while others were not. These data suggest that these particular comorbid illnesses may have special prognostic implications, although further analysis is necessary to identify the causative factors.

Epidemiology, Outcomes, and the Spectrum of Necrotizing Soft Tissue Infections in Hospitalized Patients

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Background:

Necrotizing soft tissue infections (NSTI) are associated with high morbidity and mortality. Impacting the ability to develop robust screening tools has been the poor characterization of the incidence and epidemiology of NSTI until recently, where sampled cohorts have been used to derive incidence. Our primary aim was to confirm the population-based incidence of NSTI. Secondary aims were to describe patient demographics, comorbidities, anatomic spectrum, outcomes, and to compare the NSTI cohort to the general population.

Hypothesis:
We hypothesized that NSTI is rare, that outcomes remain poor in the modern era, and that it is associated with comorbidities such as hypertension (HTN), diabetes mellitus (DM), and obesity.

Methods:
A retrospective analysis of the California (CA) Office of Statewide Health Planning and Development Patient Discharge Database for 2016 was performed. Patients were selected using ICD-10 diagnosis and procedure codes indicating NSTI and associated debridement, or NSTI and death or hospice. The cohort was compared to publicly available CA population data.

Results:
There were 1910 patients with NSTI for an incidence of 6.3/100,000 person-years. The median age in the NSTI cohort was older than the CA population (55 vs 36 years) and predominantly male (68% vs 49%). Age-adjusted odds ratios for comorbidities in NSTI patients vs CA population were 3.2 (2.9-3.5) for HTN, 10.5 (9.6-11.6) for DM, and 1.7 (1.5-1.8) for obesity. Injection drug use (IDU) was common (39%). The most common anatomic locations were the lower extremity (34%), perineum (26%), upper extremity (11%), and multiple locations (11%). Outcomes included: 32% with septic shock; 46% discharged home; and 13% died. Other outcomes for the study cohort are shown in the table.

Patient outcomes	**NSTI cohort, count (%) or median (IQR), n=1910**
Inpatient outcomes	
Hospital length of stay, days	11 (6-20)
Number of debridements	2 (1-3)
Septic shock	615 (32%)
Received mechanical ventilation	449 (24%)
Amputation	
Upper extremity	24 (7%)
Lower extremity	249 (24%)
Hospital disposition	
Home/self-care	883 (46%)
Skilled nursing /intermediate care facility	600 (31%)
Rehabilitation	40 (2%)
Other inpatient facility	135 (7%)
Death/hospice	252 (13%)
Number of readmissions in 2016	
Zero	1,305 (68%)
One	338 (18%)
Two or more	267 (14%)

Conclusions:
This is the first study to use population-based comprehensive data to derive the incidence of NSTI, similar to recent reports using derived values from sampled data. HTN, DM, and IDU were more frequent in the NSTI cohort than the general population; those without any comorbidities were exceedingly low. Given the substantial association with comorbid disease, targeted prevention of NSTI may be possible.

Necrotizing Fasciitis Debridement Prior to Transfer to a Tertiary Center Does NOT Prevent Mortality or Improve Outcomes

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Background:
Necrotizing fasciitis is a rapidly progressing infection with a high mortality rate. NF requires substantial resources at tertiary centers including surgical, critical care, and wound management to decrease mortality and optimize outcomes. While conventional practice emphasizes rapid initial debridement, prior to transfer, we hypothesized that immediate transfer, without debridement, has equivalent outcomes. If true, this would indicate a priority to rapidly transfer patients to a tertiary center as opposed to first performing a debridement.

Hypothesis:
In NF patients, transfer prior to debridement does not lead to an increase in mortality nor worsen outcomes.

Methods:
A retrospective cohort study of 345 adult patients with confirmed NF was conducted at a single tertiary referral hospital over 20 years. Demographic data, preoperative laboratory risk indicator for Necrotizing Fasciitis (LRINEC) scores on admission and patient outcomes were collected for assessment. Statistical analysis was performed using a student's T-test for continuous variables and Fischer's Exact Test for categorical variables.

Results:
Two hundred fourteen patients were transferred with a diagnosis of NF while 131 were diagnosed locally. Forty-seven patients were debrided prior to transfer while 167 were transferred without debridement. Patients diagnosed with NF after transfer were excluded from length of stay but included in the remainder of analysis. Locally diagnosed patients had similar LRINEC scores (4.96 vs 4.64, $p = 0.285$) with shorter lengths of stay (15.9 vs 20.5 days, $p = 0.021$). Pre-transfer debridement had non-significantly lower LRINEC scores (4.1 vs 4.7, $p = 0.090$) and increased LOS (19.2 d vs 15.3 d $p = 0.109$). Comparison of local and transfer patients showed no difference in: mortality (18.3% vs 22.0%, $p = 0.493$), SIRS (28.2% vs 29.0%, $p = 0.903$) or amputation rate (9.2% vs 10.7% $p = 0.715$). Similarly, between patients debrided prior to transfer and those transferred without debridement, there were no differences in mortality (23.4% vs 21.6%, $p = 0.842$), SIRS (31.9% vs 28.1%, $p = 0.716$) or amputation rate (12.8% vs 10.7%, $p = 0.599$).

Conclusions:
Delay of transfer to perform an initial debridement does not result in decreased mortality, complications or improved outcomes. These results indicate that, against conventional practice, patients with diagnosed or suspected NF at a non-tertiary referral center should prioritize transfer to a tertiary center over early debridement. Larger studies are indicated to identify the specific benefits of regionalization of NF treatment to centers equipped for comprehensive care.

Time to Look for Another Infectious Source? White Blood Cell Trends During Ventilator Associated Pneumonia

Nicole Werner, Alexis Cralley, Ryan Lawless, Barry Platnick, Eric Campion, Mitchell Cohen, Jamie Coleman, Melanie Hoehn, Fredric M. Pieracci, Clay Cothren Burlew, Denver Health and Hospital Authority

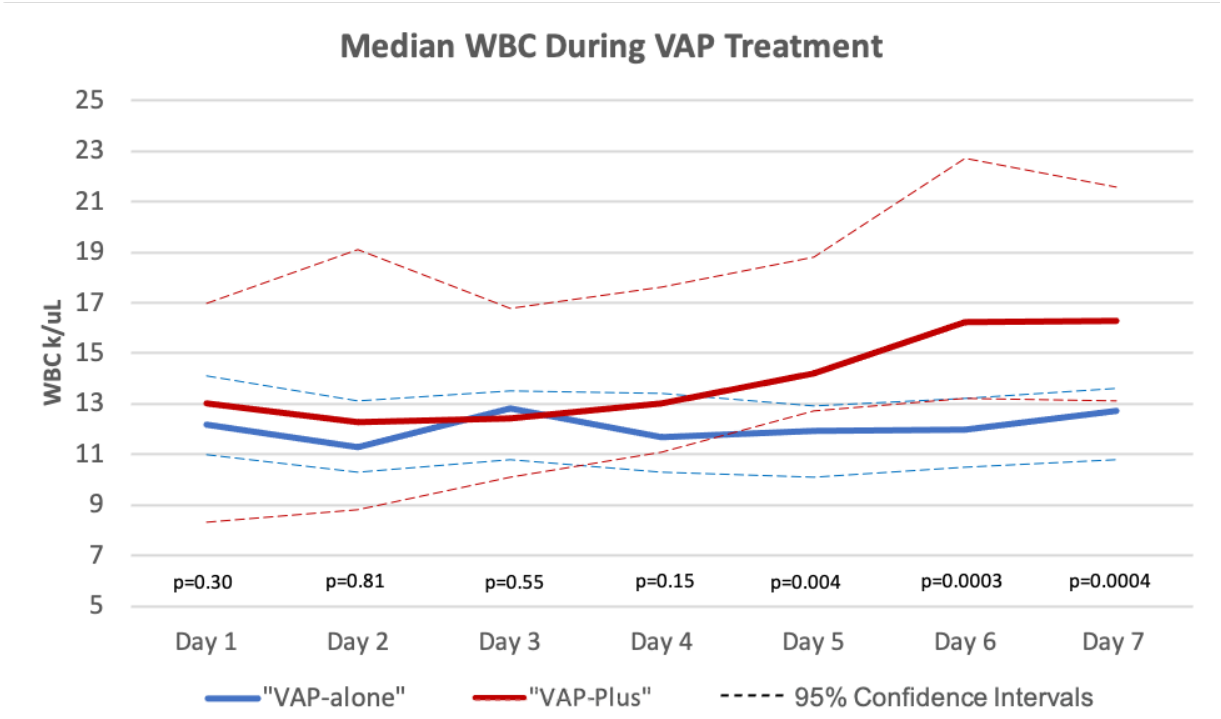
Background:

Ventilator associated pneumonia (VAP) continues to plague intensive care unit (ICU) patients throughout the world. Persistent leukocytosis when receiving VAP treatment may be due to normal inflammatory response, inadequate VAP antimicrobial therapy, or the presence of additional infectious diagnoses.

Hypothesis:
Surgical patients with a VAP and a second infectious source have a different white blood cells (WBC) trend than patients with VAP alone.

Methods:
Retrospective, single center study of surgical ICU patients diagnosed with VAP (≥10^4 CFU/mL on semi-quantitative culture) between 1/2019-6/2020. Chart review was used to identify additional infections diagnosed during VAP treatment; bacteremia was counted if the isolated pathogen was different from the VAP pathogen(s). WBC values were compared between patients treated for VAP alone (VAP-alone) and those with additional infections (VAP-plus) using a Wilcoxon test. Univariate analysis compared admission type, surgeries, and steroid use between the two cohorts.

Results:
89 patients met the study requirements. The average age was 47.1±16.2, 80% were male, and 93% were trauma admissions. Median hospital day of VAP diagnosis was 6 (IQR 3, 10). All patients (100%) were started on initial antibiotics to which the VAP organism was sensitive. 29 (33%) of patients had an additional infection, with a median time of diagnosis on day 5 of VAP treatment. Daily WBC was significantly higher for VAP-plus, as compared to the VAP-alone group, on days 5, 6, and 7 of treatment (Figure). The maximum WBC was also different (VAP-alone 16.5 k/uL v. VAP-plus 21.6 k/uL, p = 0.01). There were no differences in admission types, VAP pathogens, total number of surgeries, or steroid use between the groups.



Conclusions:
Surgical ICU patients with a VAP and an additional infectious source had higher WBC on treatment days 5 through 7 and higher max WBC than patients with VAP alone. Our data suggest that providers should have increased suspicion for additional sources of infection when patients' WBC remains elevated despite appropriate antibiotic therapy.

Factors associated with development of pneumonia in patients with acute traumatic spinal cord injury

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Background:
Spinal cord injury (SCI) has been linked to chronic immune dysfunction, common in lesions T6 and above, related to the impact of autonomic dysfunction on lymphatic systems and alterations in cytokines. Acute immune dysfunction is less well studied. Given that this has implications for outcomes including mortality, we sought to identify trends in injury characteristics, leukocyte patterns, and management to better understand factors associated with the development of pneumonia (PNA) in SCI.

Hypothesis:
We hypothesized that SCI at/above T6 results in greater immune dysfunction and complications, specifically PNA.

Methods:
A retrospective chart review was performed for patients age 18+ who presented to our Level 1 trauma center with traumatic SCI from 2015-2020. Demographics, SCI level, presence of complete SCI, vasopressor use, and complete blood count results for hospital days (HD) 0-7 were queried, along with occurrence and timing of infectious complications. Statistical analysis, including chi-squared tests and Wilcoxon rank-sum tests, were performed comparing these factors and complication rates. Significance was defined as $p<0.05$.

Results:
118 patients were included in the study, with complete injury seen in 36 patients and vasopressors used in 78. Patients with SCI at/above T6 were found to have lower leukocyte counts on admission than those with injuries below T6 (11.9 vs 15.1, $p=0.001$); however, no significant difference was seen on subsequent days.

Patients who developed PNA had higher WBC (HD4-7 $p<0.05$) and double the length of stay of those who did not (34 vs 15 days, $p<0.001$). Level of SCI had minimal bearing on the overall rate of PNA or length of stay, which instead correlated better with presence of complete vs incomplete injury (38.9% vs 19.5%, $p=0.046$; 30 vs 16 days, $p=0.0002$). Vasopressor use was also associated with the development of PNA (35% vs 7.5%, $p=0.002$). Looking specifically at PNA occurring within HD0-7, there was no longer a difference for complete injuries ($p=0.82$); however, exposure to vasopressors was still associated with a higher rate of PNA (27% vs 2.5%, $p=0.001$).

Conclusions:
SCI at/above T6 was associated with reduced leukocytosis as compared to below T6. This was found to have minimal impact on rates of PNA; instead, completeness of SCI and vasopressor use were associated with the development of PNA. The latter may be from alterations in cytokines and has implications for use of MAP augmentation. Further studies are needed to confirm causation of these findings.

Early Tracheostomy Decreases Ventilator Associated Pneumonia in Geriatric Trauma Patients with Rib Fractures

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Background:
Trauma patients with rib fractures are at high risk of developing respiratory failure resulting in prolonged mechanical intubation and tracheostomy placement. Previous studies in trauma patients have found an association between early tracheostomy (ET) insertion and improved clinical outcomes. To our knowledge, there is an absence of data that has evaluated the impact of early tracheostomy in critically injured geriatric trauma patients who present with respiratory failure combined with rib fractures.

Hypothesis:
We hypothesized that early tracheostomy insertion is associated with decreased ventilator associated pneumonia (VAP) in geriatric trauma patients with rib fractures.

Methods:
All patients (age ≥55) admitted with one or more rib fractures to our level I trauma center from 2010 to 2018 with an Abbreviated Injury Score ≤2 for other regions undergoing tracheostomy placement were included in the study. Demographics, comorbidities, injury related variables, culture data, and clinical outcomes were abstracted. Patients were stratified into two cohorts: ET (≤7 days of ventilation) vs. late tracheostomy (LT) (>7 days of ventilation). The primary outcome of our study was VAP. The secondary outcomes were all-cause mortality, hospital length of stay (LOS), ICU LOS, and ventilator days. Students t-test was used for continuous variables and $\chi 2$ test was used for categorical variables.

Results:
A total of 97 geriatric patients with traumatic rib fractures required intubation. Of these, 15 patients (15%) had tracheostomy placement. 6 (40%) patients had ET and 9 (60%) patients had LT. Patients who had ET were significantly older (71.5 vs. 61.8 years, p=0.04). There were no other significant differences found between the groups in regard to demographics, comorbidities, Injury Severity Score (ISS), or rib fracture characteristics. Patients who had LT placement had a significantly higher incidence of VAP (88.9% vs. 33.3%, p=0.03) and longer ventilator days (22.8 vs. 10.4, p=0.04) when compared to the ET group. The most common causative organisms of VAP in the ET cohort were *E. coli* and *S. aureus* and in the LT group was *P. aeruginosa*. No significant differences were found in mortality, hospital LOS, or ICU LOS.

Conclusions:
Early tracheostomy is associated with significantly lower ventilator days and a 2.5-fold decreased risk of developing VAP. In addition, delayed tracheostomy is associated with a greater number of resistant gram negative pathogens. Clinicians should strongly consider tracheostomy within 7 days of intubation in this high risk population. Future prospective trials with larger cohorts are warranted.

Cervical collar placement among TBI and cervical injury patients does not increase incidence of pneumonia

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Background:
Up to 93% of patients with traumatic brain injuries (TBI) develop dysphagia which can lead to aspiration, pneumonia, and even death. Cervical collars (c-collars) restrict pharyngoesophageal segment opening, increase hyoid anterosuperior elevation and epiglottic inversion times which can cause dysphagia.

Hypothesis:
C-collar use will be associated with pneumonia and other complications.

Methods:
This retrospective study included geriatric patients (aged ≥ 65 years old) with a TBI or cervical spine injury admitted to a level I trauma center from January 2016 to December 2018. Patients with a c-collar placed were compared to patients without a c-collar. The primary outcome was pneumonia. Secondary outcomes included: aspiration, swallow therapy for dysphagia, respiratory failure, and death.

Results:
704 patients were included, 21.2% had a c-collar and 78.8% did not. Overall, the mean age was 77 years, 50% were female, and the mean ISS was 13. Patients were comparable in demographics, ISS, and GCS. Of the patients with a c-collar 3.4% developed pneumonia compared to 3.6% of those without a c-collar, p=0.88. However, there was a significantly higher proportion of patients with a c-collar who had swallow therapy for dysphagia, 54.4% vs. 38.0%, p<0.001. Among patients with a c-collar, there were no differences in development of pneumonia for patients who had swallow therapy compared to patients who did not have swallow therapy, 2.5% vs. 4.4%, p=0.66. Respiratory failure occurred significantly more frequently in patients with a c-collar than patients without, 16.8% vs. 6.7%, p<0.001. No statistically significant difference in aspiration occurred in patients with a c-collar than without, 7.4% vs. 4.1%, p=0.10, or in-hospital mortality, 8.7% vs. 4.7%, p=0.06. After adjustment, wearing a c-collar did not significantly increase the odds of pneumonia [OR (CI):0.7 (0.3, 2.0)], aspiration [OR (CI): 1.5 (0.7, 3.2)], or death [OR (CI): 1.6 (0.7, 3.6)]. After adjustment, patients with a c-collar had significantly higher odds of needing swallow therapy for dysphagia [OR (CI): 1.9 (1.3, 2.8)] and for respiratory failure [OR (CI): 2.8 (1.6, 5.1)].

Conclusions:
Although there was no difference in the rate of pneumonia or aspiration between groups, patients with c-collars required more swallow therapy and were at an increased risk for dysphagia and respiratory failure. Screening for dysphagia among patients with c-collars may reduce the risk for respiratory failure.

Traumatic Brain Injury with Facial Fractures, an Added Risk for Ventilator Associated Pneumonia.

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Background:
Ventilator associated pneumonia (VAP) is associated with significant morbidity and mortality in critically injured trauma patients. Although, there is a positive correlation between the presence of facial fractures and the severity of brain injury, there is a paucity of data that has evaluated whether the combination of injuries are associated with a higher incidence of VAP.

Hypothesis:
We hypothesize that the combination of facial fractures and TBI is associated with a higher incidence of VAP compared to facial fractures and TBI alone.

Methods:
Prospective data were collected on 4966 critically injured trauma patients admitted to our surgical ICU from 2010 to 2016 who were diagnosed with either facial fractures or traumatic brain injury. Patients were stratified into 3 cohorts: TBI alone, FF alone or both. The clinical diagnosis of VAP was confirmed with bronchoalveolar lavage. Outcome was evaluated by hospital and ICU length of stay, ventilator free days and mortality. Univariate analysis was conducted using student's t-test and chi square analysis. Multivariate analysis was conducted and adjusted for age, gender and ISS.

Results:
Of the 4966 patients who with either TBI, FF or both, 255 patients met our inclusion criteria. The majority (76%) were male and Caucasian (58%). 49 (19.22%) of these patients developed VAP. Patients with the combination of TBI and FF had a significantly greater ISS (25.1 ± 11.5 vs 18.1 ± 7.9 vs 11.8 ± 9.6, p=0.0001), hospital days (17.3 ± 17.3 vs 13.2 ± 11.9 vs 11.5 ± 10.8, p=0.016), ICU days (10.1 ± 9.2 vs 9.4 ± 10.2 vs 6.2 ± 7.8, p=0.006), ventilator days (6.9 ± 7.4 vs 6.1 ± 7.5 vs 4.0 ± 5.8, p=0.010) and Ventilator free days (3.4 ± 4.5 vs 3.3 ± 4.3 vs 2.2 ± 2.9, p=0.045) as compared to TBI and FF only cohorts. They also had a higher incidence of ventilator associated pneumonia (VAP) (28.8% vs 17.7% vs 14.0%, p=0.041) and mortality (27.4% vs 26.4% vs 6.1%, p=0.0001) compared to TBI and FF alone cohorts. Logistic Regression models showed that the combination injury patients stayed almost 3 days longer on the ventilator and also had a nearly a 3 fold increased risk for VAP (OR 2.83, CI 0.047 to 0.261, p=0.005).

Conclusions:
Patients with both TBI and FF had significantly greater ventilator days and a three-fold greater risk for developing of VAP as compared to patients with TBI or FF only injuries. Clinicians should aim at earlier diagnosis and treatment of VAP in patients who are admitted to the ICU with both TBI with FF.

Chemical Dependency Evaluation During ICU Admission is Associated with Decreased 1 year Mortality

Kristin P. Colling, Saint Mary's Medical Center - Essentia Health, Alexandra Kraft, University of Minnesota Medical School- Duluth Campus, Melissa Harry, Essentia Institute of Rural Health

Background:

Alcoholism and alcohol abuse are common comorbidities in patients admitted to intensive care units (ICU) and place patients at higer risk for worse outcomes. The acuity of the situation may allow patients receiving chemical dependency (CD) counselling increased motivation for change.

Hypothesis:
In ICU patients with alcohol abuse, CD counselling will improve outcomes.

Methods:
We performed a retrospective review of all ICU patients admitted our institution between March 2018-March 2019 with diagnosis of current alcohol abuse, alcohol dependence, alcoholism or alcoholic cirrhosis. Patients who had quit drinking prior to admission and those that died during the hospital stay were excluded to allow for evaluation of the effect of CD evaluation on long term outcomes (readmission and 1 year mortality). Patient demographics, hospital course, CD evaluation, CD acceptance, and mortality were collected and evaluated using SPSS version 26. P values < 0.05 were considered significant

Results:
526 patients met inclusion criteria. 64 patients had quit drinking prior to admission and 49 patients still drinking died in the hospital and were excluded, leaving 414 patients in the cohort. 72% had a CD evaluation. Many patient factors were associated with rates of CD evaluation (Table). 50% of patients with CD evaluation accepted treatment at discharge. Readmissions within 6 months of discharge for alcohol related issues were common (50%). Readmission rate was not significantly affected by CD evaluation, however CD treatment acceptance at discharge was associated with decreased readmissions (36% vs 57%; p<0.001). Both CD evaluation and CD acceptance were associated with decreased 1-year mortality (CD Evaluation: 12% vs 23%; p = 0.004; CD Acceptance: 7% vs 20%; p=0.001).

	All patients N = 414	**CD Evaluation** N = 303	**No CD Evaluation** N = 111	**P value**
Age; years *Median (Range)*	54 (18-83)	51 (18-76)	60 (27-83)	< 0.001*
Sex (Female)	120 (29%)	85 (28%)	35 (32%)	0.49
Race				
White	324 (78%)	240 (79%)	84 (76%)	0.52
Black	11 (3%)	6 (2%)	5 (5%)	
Native American	50 (17%)	50 (17%)	20 (18%)	
Rural	138 (33%)	99 (33%)	39 (35%)	0.64
Insurance				
Uninsured	78 (20%)	62 (22%)	16 (15%)	
Private	62 (15%)	52 (18%)	10 (9%)	< 0.001
Medicare	100 (25%)	57 (19%)	43 (40%)	
Medicaid	157 (39%)	118 (41%)	39 (36%)	
ICU Length of Stay; *median days (IQR)*	3 (2-5)	3 (2-5)	3 (2-8)	0.24*
Hospital Length of Stay; *median days (IQR)*	8 (4-13)	7 (4-12)	9 (5-17)	0.01*
Comorbidities				
Diabetes Mellitus	78 (18%)	48 (16%)	28 (25%)	0.03
Chronic Renal Disease	46 (11%)	23 (8%)	23 (21%)	< 0.001
Cancer	28 (7%)	16 (5%)	12 (11%)	0.05
Cirrhosis	73 (25%)	55 (26%)	18 (22%)	0.50
Cardiac Disease	230 (56%)	146 (48%)	84 (76%)	< 0.001
Chronic Respiratory Disease	109 (26%)	62 (21%)	47 (42%)	< 0.001
Thrombocytopenia	119 (29%)	79 (26%)	40 (36%)	0.05
Psychiatric Diagnosis	245 (59%)	185 (61%)	60 (54%)	0.20
Reason for Admission				
Acute Intoxication	33 (8%)	31 (10%)	2 (2%)	0.005
Alcohol Withdrawal	62 (15%)	53 (18%)	9 (8%)	0.02
Traumatic Injury	77 (19%)	68 (22%)	9 (8%)	0.001
Sepsis/Infection	41 (10%)	24 (8%)	17 (15%)	0.03
Suicide/Overdose	36 (9%)	33 (11%)	3 (3%)	0.003
Readmission for Alcohol/Liver Issue within 6 months	207 (50%)	144 (48%)	63 (57%)	0.080
1 year Mortality	62 (15%)	36 (12%)	26 (23%)	0.004

Abbreviations: ICU: Intensive Care Unit; IQR: Interquartile Range
* Mann-Whitney U test. All dichotomous variables were compared using Chi Square Tests.

Conclusions:

Patients with current alcohol abuse that require ICU admission are at high risk of mortality within one year. When CD counselling occurs, 50% will accept CD treatment at discharge. Both CD evaluation and acceptance are associated with decreased risk of 1-year mortality. Some patient factors, such as comorbidities, insurance status, and age were associated with decreased rates of CD evaluation and improving these disparities may help decrease mortality and improve patient outcomes.

Comparing Critical Care and Infectious Disease Specialties Using Open Payments Data

Joshua Parreco, Deanna Johnson, Andrew Rosenthal, Gary Curcio, University of South Florida

Background:
Increasing transparency in medical practice by reporting on industry-physician financial relationships has been identified as a key area to strengthen public trust of physicians. The purpose of this study was to compare critical care and infectious disease specialties using the Open Payments Dataset.

Hypothesis:
It was hypothesized that industry payments across critical care and infectious disease specialties would be similar.

Methods:
The 2019 Open Payments Dataset from the Centers for Medicare and Medicaid Services was queried for all payments to physicians with the specialty of surgical critical care, critical care medicine, or infectious disease. The median with interquartile range for total payments per physician was determined and compared by specialty. The Gini index, a measure of income inequality, was calculated for each specialty. A value of 1 indicates that all the payments went to one individual while a Gini index of 0 indicates all individuals received equal payments. The products with the most total payments were quantified and compared by specialty.

Results:
There were 7,241 physicians receiving payments totaling $27.6M during the study period. Surgical critical care (n=679, 9.4%) received $1,342,748 (4.9%) with a median of $134 [$40-$451] and a Gini index of 0.902. Critical care medicine (n=2,225, 30.7%) received $4,202,927 (15.2%) with a median of $113 [$30-$369] and a Gini index of 0.922. Infectious disease (n=4,337, 59.9%) received $22,085,910 (79.9%) with a median of $180 [$53-$845] and a Gini index of 0.915. The product with the most in total payments was Zerbaxa® (ceftolozane and tazobactam) for hospital-acquired bacterial pneumonia and ventilator-associated bacterial pneumonia for a total of $915,612 with 88.4% going to infectious disease physicians.

Conclusions:
Infectious disease physicians receive much more industry financial support, in total and per physician, than critical care physicians. Payments to surgical critical care physicians are the most equitably distributed. This has implications for building patient-physician trust and shaping ongoing industry-physician financial relationships.

Mini Oral Session VI

Severe Trauma Induces an Immature Neutrophil Phenotype

Jennifer Leonard, Annie Hess, Sarbani Ghosh, shin-wen Chang, Philip Spinella, Mark Hoofnagle, Grant V Bochicchio, Isaiah R. Turnbull, Washington University in St. Louis School of Medicine

Background:
Trauma significantly increases the risk of infection. We previously reported that in a small animal model, trauma induces emergency hematopoiesis, characterized by a proliferation of hematopoietic progenitors, including increasing myelopoiesis and mobilization of immature neutrophils out of the bone marrow. Neutrophils are the first responders to infection and immuture neutrophils can cause immunosuppression.

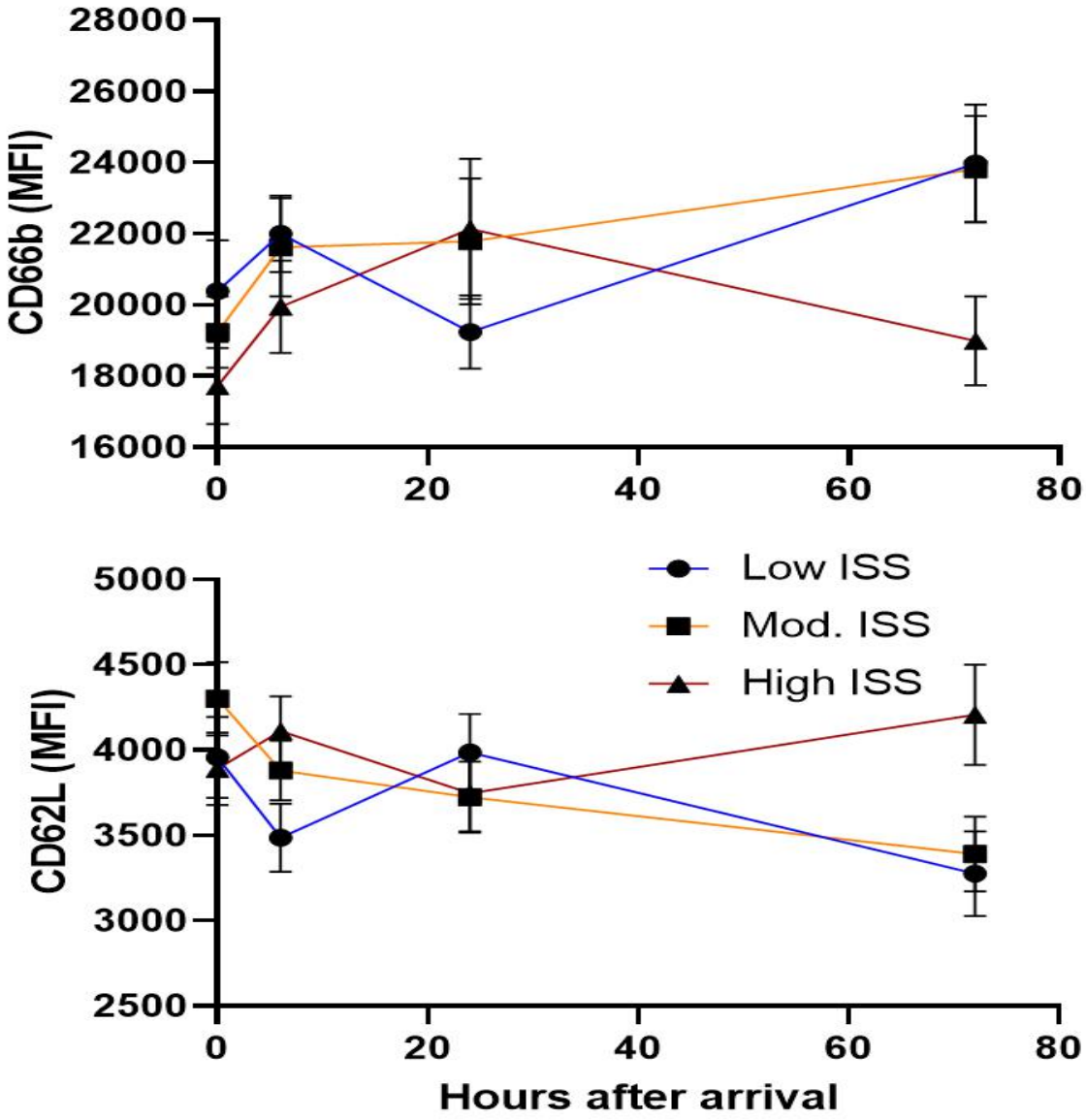
Hypothesis:
Trauma induces a mobilization of immature neutrophils into the circulation

Methods:

Subjects were recruited from a single level-I trauma center. Blood was obtained on arrival and at 6, 24 and 72 hours. Leukocyte phenotype was measured by flow cytometry using a published protocol. Neutrophils were defined as CD14-CD16+CD66b+singlets. Surface levels of CD62L, CD16, CD66b, CD11c, CD11b and HLA-DR was measured. For analysis, subjects were divided into tertiles by Injury Severity Score (ISS): low ISS=0-16; moderate ISS=17-27 and severe ISS>27=3. Data were analyzed by mixed effects modeling followed by Tukey's multiple comparison post-test using GraphPad Prism. These data accrued as part of the previously published TAMPITI trial (Front Immunol. 2020 Sep 8;11:2085.)

Results:

149 subjects were recruited. The average age was 33+/-14 years and the average ISS was 14+/-12. 18 (12%) of the subjects were female. Trauma was associated increased neutrophil frequency: 68% on arrival, 82% at 6 hours, 79% at 24 and 72 hours ($p<0.001$ by ANOVA). Using general estimating equations we found that injury was associated with changes in surface levels of CD62L, CD16, CD66b, CD11c, and changes in the frequency of HLA-DR+ PMN ($p<0.05$ for all). At 72 hours after injury, neutrophils from the most severely injured cohort had higher levels of CD62L and lower levels of CD66b, and there was a significantly lower frequency of HLA DR+ neutrophils ($p<0.05$ by Tukey's multiple comparison post-test).



Conclusions:

Trauma causes a significant shift in circulating neutrophil phenotype that persists for up to 72 hours. Severe injury is associated with an immature, incompletely differentiated CD62Lhi/CD66blo neutrophil phenotype suggesting that neutrophil dysfunction may contribute to the increased risk of infection seen in critically ill trauma patients.

Cost Drivers associated with Infected Hernia Mesh

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Background:
Although synthetic mesh has proven benefits in reducing hernia recurrences, infrequent mesh infections are both morbid and expensive. The purpose of this study is to identify factors during index hernia repair, the postoperative care period, and at the time of infected mesh removal associated with increased costs.

Hypothesis:
Patients with increased risk factors for infected hernia mesh and subsequent repair would incur greater costs associated with ventral hernia repair than those without related risk factors.

Methods:
A review of databases from August 2006 through December 2017 was performed to identify those who underwent ventral hernia repair (VHR) and reoperation for infected mesh removal. Patient demographic and operative details for both procedures including age, body mass index, mesh type, amount of time between procedures, and information regarding interval procedures was obtained. Charts were reviewed up to 180 days following infected mesh removal. Cost data was analyzed for differences in clinical outcomes. Analysis for significant correlations in variables was also performed. Hospital cost data was obtained from the cost accounting system and was analyzed along with clinical outcomes data.

Results:
Thirty-three patients underwent both VHR and removal of infected mesh over the 11-year timeframe. Average cost of the index VHR was 19,048 (+/- 20,792), ranging from 3,926 to 100,411 with a median cost of 12,274. Interim costs averaged 10,045 (+/-21,262), range 0 to 114,659, median 657. Infected mesh removal costs averaged 33,147 (+/- 30,777), range 2,301 to 158,103, median 23,841. In the first 180 days after mesh removal, costs averaged 7,052 (+/- 12,875), ranged from 0 to 45,990, median 1,832. Number of interim visits between initial VHR and removal of infected mesh averaged 9.5 (+/- 11.7), ranged from 0 to 51, median 6. Following mesh removal, patients averaged 5.8 (+/- 5.5) visits, range 0 to 22, median 4. There were no differences between interim and post-removal costs when adjusted for sex, ASA class, BMI, mesh type, or surgical approach. There were no significant correlations between interim costs, post-removal costs, age, duration of initial VHR repair, mesh size, initial defect size, laparoscopy, or BMI as a continuous variable.

Conclusions:
Costs of VHR and subsequent infected mesh removal are unpredictable with no readily apparent cost drivers. With no significant difference in costs associated with surgical approach or timeline between mesh implantation and removal, a value-based approach to management and removal of infected mesh should involve clinical decision making based upon clinical circumstances.

Lab Values are not Predictive of Post-Operative Intra-Abdominal Abscess in Children with Perforated Appendicitis

Susan Zheng, Case Western Reserve University, Eiichi Miyasaka, Rainbow Babies and Children's Hospital

Background:
Intra-abdominal abscess (IAA) is the most common post-operative complication of perforated appendicitis, with approximately 20% of children developing an IAA. Lab values are often routinely obtained in the post-operative period for these patients, but there is limited literature regarding the utility of lab values in predicting who develops an IAA.

Hypothesis:
Lab values are not predictive of IAA development in patients undergoing surgery for perforated appendicitis.

Methods:
This was a single institution retrospective cohort study that included pediatric patients (0-18 years; n=30) who underwent an appendectomy for perforated appendicitis from January 2019 to December 2019. Data were used from a prospectively collected database on the outcomes of pediatric patients undergoing appendectomy. Patients were stratified into those who developed a post-operative IAA (n = 11; group A) and those who did not (n = 19; group B). Post-operative labs (WBC, platelets, hemoglobin, CRP) were examined. Mann-Whitney U test at significance level 0.05 was used to assess for differences between groups.

Results:
Post-operative WBC (group A: 11.7 vs. group B: 8.2; p=0.07), platelets (334 vs. 352; p=0.91), hemoglobin (11.4 vs. 11.7; p=0.78), and CRP (9.6 vs. 7.2; p=0.23) did not differ significantly between groups. Changes in pre-operative to first available post-operative WBC (-1.3 vs. -7.3; p=0.06; Figure), platelets (+26 vs. +42; p=0.51), and CRP (-7.8 vs. -6.0; p=0.60) were also not significantly different. Patients who developed an IAA had a significantly greater hemoglobin decrease (-2.8 vs. -1.6; p=0.01), but no cut-off value specifically predicted abscess formation.

Conclusions:
We conclude that post-operative labs have limited clinical utility in evaluating IAA development in children with perforated appendicitis. Extensive variability and overlap in laboratory values between the two groups limit their use in predicting which patients will develop an IAA and thus, would not impact management for these patients. Our results suggest removing routine labs as part of the post-operative care pathway, which would serve to decrease patient discomfort in children and increase cost savings without compromising patient safety.

To Operate Or Not To Operate: Procalcitonin as a Potential Biomarker for Surgical Necrotizing Enterocolitis

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Background:
Necrotizing enterocolitis (NEC) is a devastating disease that primarily affects the intestinal tract of premature neonates. Procalcitonin has been studied in many diseases, such as sepsis, as a biomarker for risk of progression to severe disease. In this study, we aim to identify if procalcitonin is associated with the development of NEC in neonates and can further be used to differentiate between medical and surgical NEC.

Hypothesis:
Elevated procalcitonin is associated with NEC and can differentiate between surgical and medical NEC.

Methods:
Following IRB approval (#12655), a single-site (The Children’s Hospital at Oklahoma University Medical Center) case-control study using retrospective chart review of infants ≤ 3 months old admitted between January 1, 2010 and January 1, 2020 was performed. Included patients had a procalcitonin level drawn within 72 hours of diagnosis of NEC or had a procalcitonin level drawn in the absence of infectious symptoms to be included in the control group. Recursive partitioning was used to find an optimal procalcitonin cutoff in order to categorize procalcitonin levels. Fisher’s exact or Chi-square tests were used to assess association of NEC and procalcitonin. Significance was assigned if $p<0.05$.

Results:
Overall, 35 infants met the inclusion criteria for the NEC group and 524 met the criteria for the control group. Patients within the NEC group had a significantly higher proportion of procalcitonin levels ≥2ng/mL compared to controls (43% vs 10%, $p<0.0001$). Recursive partitioning identified a procalcitonin cutoff level of 1.4ng/mL. Using this threshold, a higher percentage of patients in the NEC group had elevated procalcitonin compared to controls (48% vs 13%, $p<0.0001$). Procalcitonin remained predictive of NEC even after adjusting for

prematurity (OR 11.1, 95% CI 4.9-25). When comparing patients diagnosed with surgical NEC (stage IIIB) vs medical NEC (stage IIIA or lower), a higher percent of patients with surgical NEC had a procalcitonin ≥ 1.4ng/mL compared with medical NEC (50% vs 39%, p=0.04).

Conclusions:
Elevated procalcitonin has predictive value in the diagnosis of NEC even after adjusting for prematurity. Further, a procalcitonin level of 1.4ng/mL or higher in a patient with NEC may indicate a higher likelihood of the development of surgical compared to medical NEC. However, larger sample sizes and further studies are needed for validation of this cutoff value.

Angioembolization is Indistinguishable from Splenectomy with Respect to Long Term Infectious Risk After Splenic Injury

Meagan Evangelista, Wake Forest School of Medicine, Amy N Hildreth, Wake Forest School of Medicine, Brian Bones, Hakensack Meridian Health, John Levi, Wake Forest School of Medicine, Preston Roy Miller III, Wake Forest School of Medicine

Background:
Angioembolization (AE) is a common adjunct in management of blunt splenic injury, but associated long-term infectious risks are not well described. We evaluated long term infection rates after AE compared to non-operative management without AE (NOM) and splenectomy (SP).

Hypothesis:
Patients with blunt splenic injury who undergo AE will have a higher rate of long term infectious complications than patients who undergo NOM.

Methods:
We performed a review of splenic injuries over a 7 year period. Inclusion criteria were age>15 and return visit within our health system > 30 days from injury. Infectious events included ICD-9/10 codes for bacterial infections, sepsis and severe sepsis occurring >5 days after injury. Medical records were reviewed for follow-up through 7/20/2020. Infection rate was compared by management pathway using multivariable analysis. Potential confounders including injury severity score (ISS), Glasgow Coma Scale (GCS), and initial blood pressure were modeled.

Results:
Analysis of 599 patients with splenic injury admitted between 2005-2011 revealed similar rates of infection between SP and AE (28% vs.23.8%, p=0.62). Both had higher infection rates as compared to 12.7% in NOM (p<0.0001 vs SP, p=0.03 vs. AE). Differences persisted after adjusting for confounders. Management pathway (p = 0.047), ISS (p = 0.004), and presenting GCS (p < 0.0001) were found to be independent predictors for long-term infection risk. Median latency to infection was 21 (IQR 9,155.7) days. Forty-two (46%) of infections occurred after discharge-median latency of 431.5 (IQR 61.7-1366.7).

Conclusions:
Management pathway after splenic injury is an independent predictor for long-term infectious events, with AE and SP having similar rates of infection. Both have significantly higher long-term risk of infection than NOM without AE. Nearly half of these infections occur at a median interval of more than a year after discharge.

Surgical site infections following surgical stabilization of rib fractures: rare but morbid.

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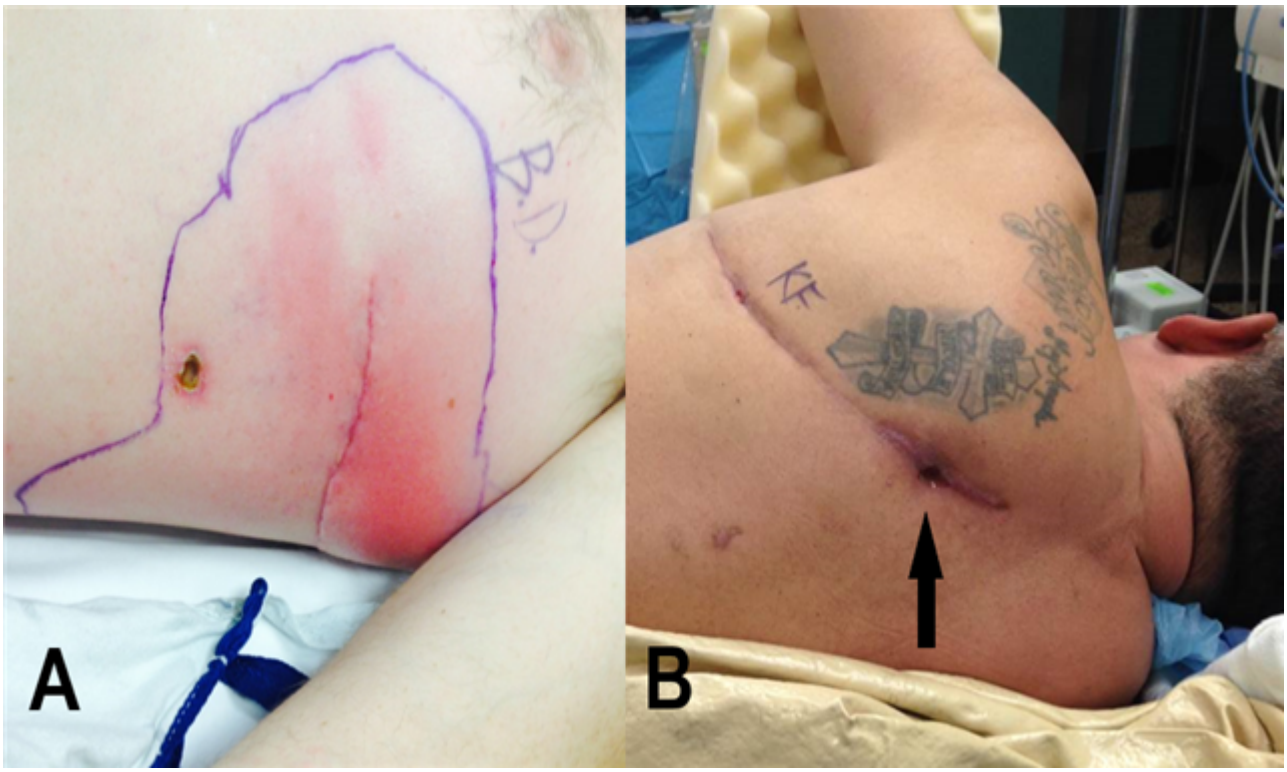
Background:
Surgical stabilization for rib fractures (SSRF) for severe chest wall injuries has been adopted widely over the past decade. Despite extensive experience, little information is available regarding the prevalence and outcomes of surgical site infection (SSI) following SSRF.

Hypothesis:
We hypothesize that SSI following SSRF is uncommon but can be morbid.

Methods:
Patients undergoing SSRF at a Level 1 Trauma Center from 2010-2020 were reviewed for infectious complications. The primary outcome was the prevalence of SSI, documented by clinical examination or radiography as well as systemic markers of infection.

Results:
Of 229 patients undergoing SSRF, 166 (72.8%) were male, the median age was 53 years (P_{25}-$P_{75,}$ 41-63), ISS was 19 (P_{25}-$P_{75,}$ 13-26), with a median of 8 fractured ribs (P_{25}-$P_{75,}$ 6-11). All stabilization plates were titanium. SSRF was performed on post-injury day 1 (P_{25}-$P_{75,}$ 0-2 days) after trauma. All patients received antibiotics within 30 minutes of incision and a median of 4 ribs (P_{25}-$P_{75,}$ 3-6) were repaired. Four (1.8%) patients developed a SSI and all underwent implant removal. Two patients required implant removal within 30 days (on post-operative day 7 and 17) (**Figure 1A**) and two for chronic infection at 7 and 17 months after SSRF (**Figure 1B**). One patient underwent partial explant, and three underwent complete explant without new SSRF. The cultures grew Staphylococcus Aureus bacteria in all patients. After implant removal, all patients received intravenous or oral antibiotics and no additional operative interventions were required. No patients have had a recurrent infection.

Figure 1: Image of an acute SSI (A) and chronic SSI, in which a sinus track had developed, (B; arrow) in two patients following SSRF



Conclusions:
Surgical site infections following SSRF are rare but morbid and can become symptomatic within 1 week to 17 months. When present, implant removal results in complete recovery.

Award Eligible - The Association of Pre-operative Full Body Surgical Preparation with Reduced Incidence of Surgical Site Infection

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Background:
Surgical site infections (SSI) continue to represent a significant source of morbidity and mortality, as well as a major contributor to healthcare costs. The purpose of this study was to determine the effect of implementing a protocol using home pre-operative surgical preparation on the surgical site infection rate at a large, urban safety net medical center.

Hypothesis:
The hypothesis was that the implementation of a protocol using a home pre-operative surgical preparation would be associated with a decrease in the surgical site infection rate.

Methods:
From July through December 2020, nose-to-toes (N2T) full body preparation was applied by patients at home on the morning of elective surgical procedures, consisting of skin cleansing with 2% chlorhexidine wipes, oral cleansing with 0.12% chlorhexidine mouth rinse, and nasal antisepsis with 5% povidone iodine swabs. A single-institution, retrospective observational analysis was conducted. Patients having skin preparation during 2020 were matched with patients having the same operation at the same time of year during 2019. SSI were defined as meeting one of the following criteria $\leq$30 days after an operation: purulent or serosanguinous drainage with surrounding erythema; wound opened by provider; antibiotics prescribed; SSI diagnosed by provider. Assuming a SSI rate of 5% pre-N2T and 2.5% post-N2T, McNemar's test determined that the study would require 293 matched pairs to have 80% power to declare the paired proportions significantly different, with two-sided $p<0.05$.

Results:
For Gynecology, 10 (7.4%) of 135 pre-N2T and 3 (2.2%) of 135 post-N2T patients had a SSI. For Surgical and Gynecologic Oncology, 13 (15.1%) of 86 pre-N2T and 4 (4.7%) of 86 post-N2T patients had a SSI. For Orthopedics, 4 (4.3%) of 94 pre-N2T and 0 of 94 post-N2T patients had a SSI. Overall, 27 (8.6%) of 315 pre-N2T and 7 (2.2%) of 315 post-N2T patients had SSI ($p=0.0004$).

Conclusions:
The implementation of N2T full body preparation was associated with a significant reduction in the incidence of SSI.

Prevalence of Superficial SSI in Children with Neuromuscular Disorders After Laparoscopic Gastrostomy Tube Placement

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Background:
The study of SSI in children with neuromuscular disorders (NMDs) has focused on spinal surgery. Outcomes for abdominal operations are understudied. Given the high number of gastrostomy tubes (G-tubes) placed in this population, understanding superficial surgical site infection (SSI) incidence may guide physician surveillance and management decisions.

Hypothesis:
Children with NMDs have higher odds of developing superficial SSI after laparoscopic G-tube placement.

Methods:
We performed an analysis of elective laparoscopic G-tube placements in inpatient children with no history of malignancy, do-not-resuscitate order, or existing wound infection from NSQIP-P 2018-2019. We stratified the patients based on whether they had NMDs. Propensity scores were calculated and used to match in a 1:1 ratio with 0.01 caliper size using the greedy nearest neighbor approach. Age, asthma, ASA class, cardiac risk factors, nutritional support, ventilator dependance, steroid use, sepsis prior to surgery, inotrope usage, CPR

the week prior, and prior cardiac surgery were included as covariates. A multivariable logistic regression was performed on the matched cohort to estimate the odds ratio (OR) of superficial SSI within 30 days of surgery.

Results:
We screened 252,367 patients from the NSQIP-P 2018-2019 dataset. Of these, 8,935 (3.54%) underwent laparoscopic G-tube placement – 1,567 (17.54%) with NMDs and 7,368 (82.46%) without. 1,982 remained after applying inclusion criteria and propensity score-matching (991 with NMDs and 991 without). We found superficial SSI in 54 (2.72%) children. Children with NMDs had a higher prevalence of superficial SSI within 30 days of laparoscopic G-Tube placement – 36 (3.63%) vs. 18 (1.82%); p=0.013. Additionally, children with NMDs had increased odds of contracting a superficial SSI within 30 days of laparoscopic G-tube placement when compared to non-NMD children (OR= 2.01 [95% CI 1.13 to 3.58], p=0.018).

Conclusions:
Our study represents an important step to understanding infectious surgical outcomes for children with NMDs undergoing common operations. The SSI literature in this population has focused on the outcomes of spinal surgery and our findings reinforce that this population is at increased risk for other postoperative infectious outcomes. More work must be done to understand the cause of this increased superficial SSI rate and to elucidate whether there are other adverse post-operative infectious outcomes in this population so that we may make a positive impact on healthcare utilization costs and antibiotic use.

Clean & Confident: Impact of Sterile Instrument Processing Workshops on Knowledge and Confidence in Five Countries

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Background:
Proper sterilization of surgical instruments is essential for safe surgery, yet reprocessing methods in low-resource settings can fall short of standards. "Training of trainers" (ToT) workshops in Ethiopia and El Salvador instructed participants in sterile processing concepts and prepared participants to teach these concepts. Participant trainers subsequently taught sterile processing workshops at their home institutions.

Hypothesis:
Sterile instrument processing ToT workshops improve participants' knowledge and skills while promoting knowledge sharing locally.

Methods:
Five ToT workshops were conducted between 2018-2020 in Ethiopia and El Salvador. Participants from the El Salvador ToT led nine non-ToT workshops in El Salvador, Guatemala, Honduras, and Nicaragua. Trainers and trainees included nurses and technicians responsible for reprocessing instruments. Didactic and hands-on sessions covered instrument cleaning, packaging, disinfection, sterilization, and transportation. Participants completed multiple-choice pre- and post-tests of knowledge, performed skills, and shared feedback by survey.

Results:
In total, 94 trainees participated in ToT workshops, while 108 participated in non-ToT workshops. Perceived knowledge on a 10-point scale increased in both ToT (2.4±2.6) and non-ToT (2.7±2.5) workshops. While tested knowledge also increased for all, ToT participants improved more than non-ToT participants (ToT: 55±44%, non-ToT 36±12%, p<0.01). The most helpful workshop components were practical activities, handwashing guidance, and training on appropriate use of bleach. Most participants felt "very confident" (ToT: 74%, n=48; non-ToT: 70%, n=72) in their ability to teach the material. However, only 40% (n=25) of ToT and 38% (n=39) of non-ToT participants felt "very confident" in their ability to enact change. Reasons included resistance to change, negative attitudes, lack of respect, and inadequate support.

Table 1. Knowledge and Confidence regarding Sterile Instrument Processing Technique after Training-of-Trainers and non-Training-of-Trainers Workshops in Five Low-and-Middle-Income Countries

	Overall	TOT	Non-TOT
Total: Percent (n)*	100% (202)	47% (94)	53% (108)
Perceived Knowledge *(n=180)* ***Mean Increase of 10 pt ± SD***	2.6 ± 2.5	2.4 ± 2.6	2.7 ± 2.5
Tested Knowledge *(n=202)* ***Mean Percent Increase ± SD***	44 ± 33%	55 ± 45%	36 ± 12%
Helpfulness of Training *(n=180)* ***Mean Increase of 10 pt ± SD***	9.6 ± 1.0	9.3 ± 1.5	9.8 ± 0.5
Teaching Confidence ***Percent Very Confident (n=168)***	71% (120)	74% (48)	70% (72)
Teaching Comfort ***Percent Very Comfortable (n=161)***	58% (94)	60% (35)	57% (59)
Teaching Likelihood ***Percent Very Likely (n=157)***	39% (61)	46% (25)	35% (36)
Confidence in Change ***Percent Very Confident (n=165)***	38% (64)	25% (40)	39% (38)

*Total N for multiple choice test is 202 (ToT n=94, nonToT n=108); total n for survey responses is 180 (ToT n=72, non-ToT=108). Total n per variable is noted in the first column and varies due to missing responses for some questions.

Conclusions:
Sterile instrument processing training workshops meet country-specific needs and improve knowledge and confidence. Future work will facilitate local implementation and evaluate efficacy in improving sterile processing technique.

Reduction of Surgical Site Infections in Total Joint Arthroplasty: A Retrospective Analysis of Anti-Biofilm Therapy

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Background:
In elective orthopaedic procedures, surgical site infections (SSI) cause significant morbidity and mortality and are particularly prominent in joint arthroplasty surgery. Biofilm formation in surgical wounds has been frequently been identified as a cause of failure in preventing and treating these infections. SURGX® Wound Gel (Next Science) was developed to combat and disrupt biofilm formation; it has shown promising results in animal models in chronic wounds but has not been evaluated in prophylactic use in total joint arthroplasty to prevent SSI.

Hypothesis:
Use of SURGX® Wound Gel after elective total joint arthroplasty will yield equal or lower rates of post operative surgical site infection.

Methods:
A retrospective chart review was performed at a single institution comparing the rate of SSI in patients undergoing total hip arthroplasty (THA) and total knee arthroplasty (TKA). Surgical site infection data was collected from patients undergoing THA and TKA procedures between March 10, 2019 – June 10, 2019

(Group A). The same was done for all patients undergoing the same procedure between March 10, 2020 – June 10, 2020 at the same facility and SURGX® was applied over incision following closure (Group B). The rates of SSI were compared between the two groups.

Results:
615 and 129 TJA procedures were identified in the treatment periods identified in 2019 and 2020 respectively. 12 total SSI were noted in 2019 revision cases versus 2 in the 2020 SURGX® group. No superficial infections were identified in the 2020 SURGX® group versus 1 superficial infection in 2019 ($p = 0.317$). No statistical significance was achieved in all cases of SSI.

Conclusions:
Use of SURGX® Wound Gel does not demonstrate any statistically significant decrease in surgical site infection in total joint arthroplasty in our small study. Encouragingly, howerver, there were 0 reported superficial SSI in the experimental group. Larger studies are necessary to further delineate any potential advantage to its use in reducing post-operative infection rates.

Comparing a biofilm-disrupting wound gel to conventional antimicrobial dressings

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Background:
The efficacy of a Biofilm Disrupting Wound Gel (SurgX) was compared to antimicrobial wound dressings for the prevention and elimination of S. aureus and P. aeruginosa bacterial biofilms in a drip flow reactor model by plate counting and confocal microscopy. The silver dressings Acticoat, Aquacel Ag, Keracell Ag, and Microlyte were evaluated. The non-silver dressings tested were Kerecis (fish skin) and Santyl (collagenase).

Hypothesis:
It was hypothesized that SurgX would yield superior biofilm elimination and inhibition as compared to the dressings.

Methods:
Prevention of biofilm formation was evaluated using the colony drip-flow reactor which was developed to mimic the wound environment and evaluate wound dressings. In this model, biofilms are grown on microporous membranes with continuous supply of nutrients from beneath. Biofilm bacteria were enumerated by viable plate count. For confocal scanning laser microscopy (CSLM), the dressing/membrane pairs were removed from the reactor and either stained with LIVE/DEAD viability stains or SYTO 9 and Texas Red conjugated wheat germ agglutinin to image the biofilm biomass.

Treatments that were effective for prevention of biofilm were evaluated for efficacy against mature S. aureus and P. aeruginosa mixed-species biofilms established in drip-flow reactors. This approach was previously shown to produce single-species biofilms with antibiotic tolerance.

Results:
For biofilm prevention, Acticoat, SurgX, Santyl, and Keracis Ag were statistically superior to the other treatments for prevention of growth for both bacterial species ($p< 0.05$). CSLM images showed that the SurgX product was the only one showing superior biofilm growth and biomass prevention. The images also show that the SurgX and Acticoat dressings had superior biofilm growth prevention, as exhibited by the lack of fluorescing bacteria on these samples. Aquacel AG and Santyl had minimal growth, while the other products had a great deal of biofilm growth. The biomass results show that SurgX and Mepilex had less biomass growth than the other products.

For the biofilm elimination testing, only those products that demonstrated prevention were tested (Acticoat, SurgX, KerraCel Ag, Microlyte, and Santyl). BlastX and Acticoat were both statistically superior to Santyl for both organisms ($p<0.05$). SurgX was statistically superior to all treatments for both organisms and the only treatment with greater than 2 log reduction for both organisms (5.88 log for S. aureus and 6.59 log for P. aeruginosa) demonstrating broad-spectrum efficacy.

Conclusions:

SurgX offers superior elimination and inhibition of biofilm in vitro.

Relationship Between Pre-Injury Glycemic Control (HgbA1c) and Infectious Complications in Trauma Patients with Diabetes

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Background:
Many studies have proven that uncontrolled diabetes, reflected by an elevated HgbA1c, has a significant impact on in-hospital infectious complications. However, there is a paucity of data that duplicates these findings in the trauma population.

Hypothesis:
We hypothesized that elevated pre-injury HgbA1c would be a significant predictor of in-hospital infectious complications in trauma patients with diabetes.

Methods:
This was a retrospective study conducted at a level 1 urban trauma center from January 2019 to December 2019 of all trauma patients with a documented history of diabetes and a HgbA1c within three months prior to admission. Patients were divided into two groups according to pre-injury HgbA1c (HgbA1c < 6.5 and HgbA1c ≥ 6.5). Outcomes of interest included hospital and intensive care unit length of stay (LOS), mortality, and in-hospital complications (defined as acute kidney injury, urinary tract infection, pneumonia, wound infection or cellulitis, sepsis, and Clostridioides difficile). 30-day complications, infection, re-admission, and mortality were also examined.

Results:
A total of 624 patients were included. 182 patients had a HgbA1c < 6.5 and 442 had a HgbA1c ≥ 6.5. Patients with a HgbA1c ≥ 6.5 were younger (64.7 vs 69.4, p = 0.0005) and had a higher BMI (32.1 vs 30.1, p = 0.007). Patients with a HgbA1c < 6.5 were more likely to be smokers (34.8% vs 26.2%, p = 0.03) and have ESRD (7.7% vs 2.7%, p=0.005). The HgbA1c ≥ 6.5 group had a higher admission glucose (206 vs 135, p < 0.0001), as well as higher hospital day one, two, and three glucose, and higher post-operative day one glucose in patients who underwent surgery (238 vs 153, p < 0.0001). These patients also required more in-hospital long-acting insulin (56.6% vs 19.8%, p < 0.001) and more insulin drips (7.0% vs 1.1%, p = 0.003). There was no significant difference in hospital LOS, mortality, or 30-day outcomes. Multivariate regression model revealed that patients with a pre-injury HgbA1c ≥ 6.5 were more likely to develop in-hospital infectious complications (OR 1.6).

Table 1: Multivariate Regression Model for In-hospital Complications

Characteristics	OR	95% CI	p
Age >60	1.8	1.2 – 2.7	**0.003**
Female	1.4	0.98 – 2.0	0.066
ISS > 12	1.2	0.7 – 1.9	0.54
Admission glucose > 200	1.03	0.7 – 1.5	0.87
Pre-injury HgbA1c ≥ 6.5	1.6	1.03 – 2.4	**0.036**

Conclusions:
Elevated HgbA1c is a significant predictor of in-hospital infectious complications in trauma patients with diabetes. A large portion of these patients require long-acting insulin or insulin infusions, but do not achieve the in-hospital glucose control observed in the patients with a pre-injury HgbA1c < 6.5.

Does Drains Placement in Surgically Managed Patients with Perforated Peptic Ulcers Prevent Intra-Abdominal Abscess?

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Background:
The annual incidence of perforated peptic ulcers (PPU) in the USA is as high as 14 cases per 100.000 individuals. Operative drain placement continues to be a major source of debate between surgeons, as there is a lack of data and therefore consensus on whether placing drains after PPU repair prevents postoperative intrabdominal abscess (IAA).

Hypothesis:
We hypothesized that the insertion of drains in surgically managed PPU patients decreases the incidence of IAA and thus better outcomes.

Methods:
A prospectively maintained acute and critical care surgery database spanning 2008-2018 was queried for patients with PUD. Patients older than 18 with a diagnosis of PPU who underwent surgical repair were included. Patients managed nonsurgically were excluded. The cohort was divided into two groups: patients managed with drain insertion during surgery and those without a drain placed. Demographics, cultures, and outcomes were abstracted and compared using chi-squared and student's t-test.

Results:
A total of 109 patients had PPU and underwent surgical management. Of these, 52(47%) had drains placed during surgery. Open surgery was the most frequent approach 91% followed by laparoscopic 4.5%, and laparoscopic converted 4.5%; 63(58%) patients had a duodenal ulcer, 44(40%) a gastric ulcer, and 2(2%) gastric and duodenal ulcers. There is no significant difference in age (55±2.12 vs 57±2.53, p=0.66), BMI (28±1.42 vs 27±0.89, p=0.56), and Charlson comorbidity index (4.09±0.40 vs 3.85±0.40, p=0.68) between two groups. Also, patients with and without drains placed had no difference in length of stay (LOS) (14.53±13.45 vs 11.92±12.50, p=0.29), ICU LOS (6.99±1.61 vs 4.33±1.18, p=0.18), antibiotic days (4.46±0.37 vs 4.94±0.34, p=0.33), IAA formation (11.53% vs 14.03%, p=0.69) or mortality (3.85% vs 5.25%, p=0.72). Among patients with IAA (12.84%, n=14), cultures were positive in 67% of PPU with drain placement and 75% without drain placement (p= 0.73). The most common bacteria in IAA cultures was MRSA in patients with drains and Streptococcus anginosus in patients without drains.

Conclusions:
The insertion of intraoperative drains was not associated with a decreased risk of developing an IAA in PPU patients. However, drain insertion was associated with a greater number of multidrug-resistant organisms. Clinicians should reconsider the use of drains in PPU patients. Further research is warranted, level of contamination, and other factors may play a role in the clinicians' decision to place drains.